B&W

BROWN & WILLIAMSON TOBACCO CORPORATION

RESEARCH & DEVELOPMENT

RESTRICTED

R&D-B019-92

PM'S GLOBAL STRATEGY: MARLBORO PRODUCT TECHNOLOGY

A Summary Developed with Input from
BATCO, BATCF, Souza Cruz, and B&W

Compiled by: Mr. D. L. Gordon

October 26, 1992

DISTRIBUTION

Souza Cruz: Mr. L. Saboia, Dr. C. J. P. de Siqueira, Mr. L. T. Caruso

BATCO: Mr. G. A. Read, Dr. R. Crellin

BATCF: Mr. E. Rittershaus, Dr. E. Kausch

B&W: Mr. E. E. Kohnhorst, Dr. J. S. Wigand, Mr. T. F. Riehl

Issued by: Mr. E. E. Kohnhorst

Copy Number: 28

Project Number: 331

RESTRICTED

BROWN & WILLIAMSON TOBACCO CORPORATION

RESEARCH & DEVELOPMENT

R&D-B019-92

PM'S GLOBAL STRATEGY: MARLBORO PRODUCT TECHNOLOGY

Mr. D. L. Gordon

October 23, 1992

ABSTRACT

Philip Morris continues to follow a strategic philosophy in the development and positioning of Marlboro on a worldwide basis. Key product technology is employed consistently whenever and wherever possible to duplicate the gold standard of U.S. Marlboro. New technology is developed and implemented when conditions necessitate change and PM will willingly change Marlboro to maintain what they consider critical technology that contributes to the Marlboro character.

At the same time, Marlboro is a business proposition for PM and, thus, PM will develop Marlboros on a worldwide basis that are quite different to meet local requirements, taste, or needs. However, even in this secondary strategy, PM will not totally sacrifice the Marlboro character and will implement new product technology and/or recipe and design changes as necessary to achieve the primary strategic goal as much as practical. PM will also position products to be able to move to the common strategy as the local marketplace changes in the growing USIB segment.

In updating our knowledge base on Marlboro, we have continued to assess and rank order the product technology deemed critical to the Marlboro character. And, once again, ROOT technology, employed in its many forms, appears to the prime contributor to the Marlboro character. Secondarily, casing and flavor technology and cigarette deliveries are also assessed as being major areas of product contribution and consistency. Together these areas are judged to primarily represent the answer to "What makes a Marlboro?" Technologies such as tobacco selection, processing, and cigarette design are used as flexible parameters to adapt for the primary technologies.

A plausible overall global strategy for PM, therefore, appears to be:

- U.S. Marlboro remains the "gold standard".
- After PM establishes a market position in a given country, products are modified to achieve the primary standard.
- Product technology is managed and products are changed as appropriate to balance the overall Marlboro character with local business constraints.

This report updates our database on Marlboro to include recent data generated in key centers in the BAT Group. The information has been summarized and reviewed by scientists in the various groups and represents a collective judgement of the critical product technologies utilized by PM. This information can assist the BAT product developers by prioritizing activities as we strive for worldwide superiority.

ACKNOWLEDGMENT

This report represents a compilation of product analysis and competitive intelligence gathered over a number of years regarding Marlboro. The experimental work has been conducted primarily at the major BAT laboratories in Southampton, Hamburg, Rio and Louisville. It would have been far too great a task to footnote or reference individual reports issued by the scientists in these centers in each table or figure in this report. However, it is these scientists and their colleagues that we should recognize as the prime contributors to this effort.

Specific acknowledgment for editorial review of the scientific content of this report should also go to members of the BAT organization involved in the WWB project. In this regard, special recognition should be given to R. A. Crellin and W. D. E. Irwin in Southampton; W. Schneider, V. Heemann, E. Kausch in Hamburg; L. Caruso, A. Rodriguez, P. Oliveira in Rio; and T. Riehl, A. McMurtrie, B. B. Chakraborty, R. F. Denier, and J. H. Lauterbach in B&W for their time and effort and contributions in reviewing this document.

A special thanks is also given to Ms. Sheree Reesor, Ms. Sharon Korfhage, and Ms. Debbie Hickman for their efforts in producing this report. Their long hours and extra effort are acknowledged with gratitude.

TABLE OF CONTENTS

BACKGROUND

As a part of our continuing efforts to develop superior products worldwide, this report was put together to update our information regarding Marlboro. The sales of this product have continued to grow and the product itself has come to define a standard of excellence in smoking quality.

By the process of reverse engineering of Marlboro, we seek to gain insight into PM's strategy for product success. If we are able to identify those areas of product technology which PM deems critical, we may gain insight into areas for focus for BAT's ongoing product improvement. We can, thus, assess the critical product technologies which contribute to the Marlboro character, and, by understanding their relative contributions, provide a prioritization matrix for our efforts.

The data and information reported here is a compilation of the work of many brought together into a single document and highlighted to show the points of commonality and difference in Marlboro. Thus, we have reviewed the analytical results generated on Marlboro both 1) over time, and 2) on a country-to-country basis. This has been coupled with competitive intelligence also gleaned over the years about Marlboro's recipe and makeup.

An extensive bibliography is attached to this report. The key reports on Marlboro have been generated over time primarily by scientists in Southampton, Hamburg, Rio and Louisville, and it is the compiled information generated by these individuals which is summarized in this report.

A presentation of this material was made at the August 3-6, 1992 meeting of the WWB team in Louisville. Consensus was reached on the overall strategy PM utilizes in managing Marlboro product technology.

INTRODUCTION

Any review of analytical and competitive information spanning many years and several laboratories needs to be understood in that context. Analytical methods change from time to time, new methods are developed, and competitive information is continually refreshed. One role of the scientist in reviewing this data is to keep this in mind in order to separate real changes from phantom changes. Equally, this is true for sensory data.

This review was targeted to look at Marlboro KS over the last 20 years wherever data is available for common manufacture. The U.S. Domestic Marlboro provides the greatest source of data for this part of the review. Wherever appropriate, other benchmarks were also included such as known B&W and BATCF products and/or RJR's Winston. These other brands serve somewhat as anchors in the data set, even though they also have changed considerably over time. As well, various styles of Marlboro (tar, length, packaging) have been analyzed in order to also obtain a perspective on PM's product strategy.

In compiling data from these various products, from the various laboratories, and over the span of 20 + years, technological insights must also be tempered with business insight. Marlboro is a business for PM. As such, technical and analytical information alone is often insufficient to determine PM's global strategy. Many examples of this have been observed over the years; e.g.,

- Use of different recipes between U.S. factories at the same time.
- Use of multiple European manufacturing locations for a single European product (France, Italy, etc.).
- Shifts from U.S.-Export to local manufacture.
- Use of licensed manufacture (Japan).
- Shifts from one licensed manufacturer to another (Malaysia).

As well, local constraints on tobacco sources, available materials, import restrictions, and regulatory policies must be considered.

From an analytical viewpoint, methods and reporting have changed throughout the BAT group over time. For example, even cigarette paper permeability is reported based on different units of measure (e.g., WTU, l/hr., C). Wherever possible, analytical results have been converted to common measures:

- Ammonia: reported herein as NH3
- Phosphates: reported herein as PO4
- Nitrates: reported herein as NO3
- Permeability: reported herein as Coresta Units
- Pressure Drops: reported herein as inches water gauge

Since analytical methods may also be different, these will be noted where critical interpretation of the results may be influenced.

Finally, we have attempted to look at averages or trends over several years to gain an insight in our interpretation. Any single "sample" of Marlboro may deviate from the norm due to any variety of factors including product variability, sampling variability, manufacture location variability, product age, etc. As we do not always know or understand a "sample's" history, we must look at a position over time whenever possible. Single "snapshot" samples can often mislead the reviewer if taken only in isolation.

The technical review which follows covers major areas of the product technology which could contribute to Marlboro character. This includes: Leaf/Blend, Blend Components, Cigarette Construction, Physical Quality, Processing, Casing/Flavor, and Sensory. The impact of ROOT technology is covered in each specific area where appropriate.

MARLBORO BACKGROUND

Marlboro, on a worldwide basis, continues to show growth in sales and has come to represent a standard of smoking quality for USIB products. Explosive growth in sales in many areas for Marlboro can represent significant challenges to BAT's position in these markets.

Table A-1 in the appendix contains recent information on sales volume for many of the products reviewed in this report. Some key markets and the Marlboro family volume are shown below:

Country	Marlboro Family Volume (Billions)
U.S.A.	133.4
Germany	28.7
France	19.0
Italy	17.4
Spain	10.5
Holland/Belgium	6.6
Argentina	4.2
Switzerland	3.6
Japan	3.5
Brazil	3.3
Hong Kong	2.6

To manufacture Marlboro on a worldwide basis, PM employs many different tactics. This includes U.S.-Export, local manufacture by PM associates, contract/license manufacture by local companies or monopolies, and even licensed manufacture by global competitors. In Europe, with a diversity of countries and the easing of cross-border trade barriers, PM may utilize any of its four manufacturing sites to serve particular markets. As well, they will combine licensed manufacture and import in a country if the business position warrants.

Table 1 shows the suspected and alternate manufacturing location for many of the products contained in this review.

Four main manufacturing locations are available for PM in Europe; Munich and Berlin in Germany, Neuchatal in Switzerland, and Bergen-op-zoom in Holland. It has been reported that in European countries where local manufacture is not done, PM will manufacture product in any of the above countries for importation. France is an example of this. In Italy, furthermore, Marlboro may be purchased which as been imported from one of the European locations as well as which has been manufactured by the Italian Monopoly.

Marlboro in Japan is made by a competitor -- the Japanese Monopoly. In Malaysia, PM has recently switched from manufacture by one global competitor (Rothmans) to another (RJR).

Marlboro in many areas of local manufacture must also "fit" the local situation. In many countries, the use of local tobacco is mandatory (e.g., Japan, Australia, Spain, Malaysia, Argentina, etc.). In many countries, the availability of certain additives is constrained (e.g., Argentina). In other countries, economic constraints are paramount; e.g., weight restrictions and taxation in Australia or leaf tobacco availability in Brazil make the use of low fill value/added cost reconstituted tobacco extremely unattractive. And PM must also meet regulatory requirements in the markets it does business. This includes restrictions in deliveries (e.g., Saudi) and additives (e.g., Germany).

Marlboro is a business proposition for PM. They must treat it as such and conform where necessary to local needs while maintaining a financially attractive proposition. This implies that PM will do whatever is necessary to make Marlboro an attractive business opportunity on a worldwide basis.

At the same time, with the "globalization" of consumer goods growing at a rapid pace, one may infer from the same factors outlined above that PM must employ a common product strategy. In order to maintain product quality and integrity, trademark protection, and, most importantly, provide for a consistency in consumer expectations, PM must likewise provide a consistent product technology strategy whenever feasible.

While meeting the business constraints in the multiple markets, PM strives for a commonality in product technology and product adaptation in order to provide consumer sensory satisfaction. Over the long term, PM has shown a flexible strategy of product change in order to not only satisfy local markets but to alter these to the standard Marlboro characteristics. This has been observed in several key markets where PM, after establishing a market position, will alter Marlboro to move more in the direction of the U.S. sensory character.

The review of this product technology in the following sections will help focus those critical technologies and adaptations which remain the backbone of PM's product strategy.

BLEND

Table 2 gives blend separation results for Marlboro KS in the U.S. for the period 1970-1992. Also included in Table 2 are calculated outputs (poundages) for the various components based on U.S. manufacture of both PM's Domestic and Export volume. Table 3 presents recent summary information for worldwide Marlboro in different groupings. More extensive tables for worldwide Marlboro over time are shown in Appendix Tables A-2 and B-1. Review of this data reveals several aspects of PM's product makeup for overall strategic emphasis. Figures 1-4 show information for U.S. Marlboro graphically.

1. **PM has altered the blend composition of Marlboro over time.**

   Based on the data shown in Table 2, almost all aspects of the product have changed in the U.S. since 1970. Band cast recon has decreased from 18% in 1970 to current levels of 5%. Similarly, paper recon inclusion has increased, and stem levels have decreased. Paper recon now accounts for about 18% of the product and stem for 2-3%.

   On a worldwide basis, we also see changes over time. Most notably decreases in stem inclusion and increases in recon inclusion for the

Euro versions. While the data is somewhat more limited and variable, these same trends (increased recon, decreased stem) can be seen in the Marlboro versions from, for example, Switzerland, Belgium, Finland, Holland, and the UK.

The German version of Marlboro has cycled over time and changed considerably. Expanded tobacco levels have increased significantly. Stem level initially decreased when paper recon was introduced, but, more recently, has subsequently been increasing.

2. **PM's blend strategy is also consistent with local constraints.**

In markets such as Australia, Brazil, and Argentina, where economic and financial issues could be impacted by the use of reconstituted tobacco, PM has not introduced this technology. Both Brazil and Argentina use high processed stem levels at a full utilization/return level of about 20-22%.

Venezuela is at the other end of the spectrum. PM constructed a band cast recon plant in Venezuela and this provides the primary by-product utilization in that country. No paper recon is used in Venezuela and, in fact, excess band cast recon capacity is used to sell product to BAT. It is noteworthy that the bandcast recon level used in Venezuela matches that level used in the U.S. Marlboro in 1970 before paper recon was available to PM in the U.S.

3. **Total by-product utilization divides into groupings but has remained constant in common groupings over time.**

The data in Table 3 suggest a constant by-product utilization (formula) for worldwide Marlboro in those locations where both recon and stem processing are available. This total level is on the order of 25-30% by-products.

Over time, decreases in processed stem inclusion are offset by increases in recon (primarily paper recon). This could indicate that there is a recognition that recon can provide a format for smoke quality improvement that cannot be achieved with processed stem.

Finally, independent calculations indicate that the ca. 20% level of by-products is roughly equivalent to total balance on material utilization vs. purchase, waste generation, etc. - particularly for blended products using Oriental tobacco. The 25% by-product level in the U.S. represents about a 25% over utilization of materials. This is confirmed by the fact that PM continues to purchase stem and scrap on the open market and is also considering reprocessing market returns for recon feedstock.

4. Bandcast recon is used wherever possible.

PM has, over time, introduced bandcast recon wherever feasible. Currently, a 5% level of bandcast is used universally in the U.S., U.S.-Export and Euro versions. Bandcast is not used where economics or regulations make this unattractive; e.g., Brazil, Argentina, Australia. In these locations ROOT technology is often obtained through other means. Venezuela, with a bandcast operation (and no paper recon facilities) stands alone at the other end of the spectrum.

It should be noted that some particular markets demonstrate PM's universal strategy of using bandcast recon whenever possible. One notable case is the UK, where Marlboro was introduced with a much more traditional flue-cured character and then altered over time to obtain the Marlboro/USIB taste. In this case, PM utilized the bandcast recon material to obtain the desired effect.

In the other European countries, PM has altered bandcast level so that a universal 5% inclusion is now seen. Germany is the exception to bandcast use in Europe. No bandcast is used in Germany. Furthermore, in recent years, PM has constructed a plant and started production of bandcast recon in Spain.

5. ET levels increased in U.S. Marlboro when DIET replaced ACET.

Inclusion of expanded tobacco was limited at circa 6% before PM switched from ACET to DIET. This changeover of ET type occurred during the 1980's in the U.S. depending on manufacturing location: Marlboro made in Richmond, VA began including DIET in the late 70's; Marlboro made in the Louisville, Kentucky plant, however, used ACET until the late 80's. Prior competitive information from the mid-1970's confirmed that PM limited ACET inclusion to 3-6% maximum in Marlboro.

Since the introduction of DIET, ET levels increased in Marlboro KS to about 10%. However, it has subsequently dropped to a level of about 7-8%.

6. PM now uses two types of paper reconstituted tobacco.

Analysis of single individual strands of paper reconstituted tobacco have shown that two versions of paper recon are used in the U.S. and Germany. (Note: This is not limiting in extent as other countries have not been analyzed.)

Data are shown in Table 4. One type of recon contains high phosphate levels while the other does not. In total, the ratio of phosphate paper to nonphosphate paper is 2:1.

While there is considerable variation from style-to-style, sample-to-sample within a style, and laboratory-to-laboratory, no pattern of use can be discerned for the U.S. styles. Given the inherent variability of this type of analysis, the overall ratio of 2:1 should be presumed to represent PM's strategy.

However, in Germany, the ratio of high-to-low-phosphate paper recon appears to change as tar level is decreased becoming a 1:1 ratio at the 6 mg level.

The low phosphate recon is suspected to be a neutral filler type recon lacking ROOT technology (i.e., without ammonia, urea, etc.). This recon was probably developed for use in menthol or other products where full ROOT technology may be undesirable. However, some competitive intelligence also indicates that development coincided with changes in the high phosphate paper process.

7. **PM may be hampered by capacity issues.**

The data in Table 2 suggest that capacity issues in several areas may have influenced PM's decisions in altering blend construction over time, particularly in the U.S.

The overall level of bandcast recon has decreased on a continuing basis as total PM cigarette volume has increased. When reviewed on a basis of annual output, total output is reasonably constant indicating a capacity of about 30-35 million lbs./year.

Similar conclusions can also be drawn about processed stem as well as ET. Stem output reduced from about 20+ million lbs./year to roughly one-half that amount in the early 1980's. The timing of this is consistent with competitive intelligence regarding the removal of a stem line in Richmond during the late 1970's or early 1980's. Note the reduction of DIET inclusion in recent years also reflecting a constant output of 40-45 mm lbs/yr.

The capacity of PM's own paper recon plant has been quoted as 70-90 million pounds per year. The introduction of a second paper recon type by at least the mid-to-late 1980's would be consistent with a capacity limitation in their own plant. One speculation is that PM now obtains the nonphosphate sheet from Kimberly-Clark Corporation in the U.S. and/or France. PM may have elected to only produce a neutral filler type of recon for strategic or trade secret concerns. Other recent information, however, suggests that PM has spent considerable engineering effort to increase paper recon output through optimization of their own plant.

Bandcast recon and the various types of paper recon are also used on a worldwide basis. Our intelligence on the sourcing of these materials is limited. At least initially, recon products were sourced from the U.S. particularly to many of the European and selected Far Eastern and Central American locations. (As will be shown later, this too is consistent with many of our detailed chemical analyses.)

However, the availability of capacity for recon production in other areas, particularly Europe (France, Spain), now can leave some doubt about ultimate sourcing. In other countries, where total cigarette output is small (e.g., Panama, Guatemala, etc.) the U.S. remains the most likely source of recon.

Other recent competitive intelligence suggests that PM may be experimenting with bandcast recon (RCB) ex Venezuela in the Brazilian Marlboro.

PM's philosophy has obviously been to change blend construction as capacity limits material availability. Up to this point, significant reinvestment in bandcast recon capacity, processed stem capacity, and DIET capacity has not apparently been made. This may reflect an uncertainty by PM on future volume requirements considering U.S. domestic declines and potential export volatility. To some extent, this is verified from the data in Table 2 as the total cigarette output was relatively flat from 1982 through 1986. Only the explosive growth in Export production from 1987 on has shown an increase in requirement. Consistent with the information discussed above, PM may be handling these capacity issues through process optimization rather than reinvestment or expansion.

BLEND CHEMISTRY

Blend chemistry for Marlboro is shown in the next several tables. These tables have been broken up into groups to reflect several key markers of blend makeup including flue-cured/burley/oriental markers, ammonia additives, and casing practices. As well as comparing Marlboro to itself, other benchmark products are included when appropriate.

Table 5 contains a summary of basic blend chemistry for U.S. Marlboro over time. Table 6 also contains similar information for worldwide Marlboro, benchmark B&W products, and Winston.

1. Marlboro is more flue-cured skewed than traditionally believed.

Comparison of the data in Tables 5 and 6 to known blends presents a picture of suspected PM flue-cured, burley, and oriental inclusion. Based on these and other comparison chemistry (see Figure 5), we would suspect the U.S. Marlboro to have a flue/burley ratio of about 60/40.

Recent analyses of more detailed markers by Southampton also concludes a flue-cured skew for several of the worldwide Marlboros (except Brazil). Newer data, however, obtained from Souza Cruz on Brazilian Marlboro (shown in Table 6) is somewhat different from prior analysis and also suggests a more flue-cured skew.

While traditionally it had been believed that Marlboro was more burley skewed, the above flue/burley blend formula is generally confirmed by analyses of Marlboro from several European markets also.

Analysis of Oriental markers has not been so voluminous over time to help pinpoint Oriental level. Data on 3-methyl-valeric acid is shown in Table 6. Because of the inherent variability between grades of like tobacco, this data suggest similar levels are used in the U.S., German, and Euro versions. The absence of Oriental tobacco in Brazil is also confirmed.

Tables 7 and 8, then, indicate our best estimate of Marlboro blends for key markets.

These tables once again confirm our understanding of a common product strategy employed by PM wherever possible. Major Marlboro volume and growth areas such as the U.S., U.S.-Export, and European have a common blend recipe strategy.

Outside of these major volume markets, Marlboro's blend structure is more variable to comply with local constraints. The lack of recon facilities and the requirement to use local leaf influence blend structure in, e.g., Brazil, Argentina and Australia. Germany is potentially constrained by regulation on additives. And, licensed manufacture and leaf constraints probably influence blends in Japan and Malaysia.

2. **Marlboro on a worldwide basis has both ammoniated and nonammoniated forms.**

Tables 9 and 10 present data regarding ammonia chemistry in Marlboro worldwide as well as other benchmark products. Figure 6 shows a plot of %blend ammonia vs % blend phosphate.

It has long been known that PM uses phosphates, ammonia, and/or diammonium phosphate (DAP) to alter blend chemistry. The role of these compounds in influencing many aspects of the blend and smoke chemistry has been well documented. And these compounds (and their impact on tobacco and smoke chemistry) contribute significantly to Marlboro's sensory character.

Based upon assumptions of normally occurring levels of phosphate and ammonia, predictions can be made as to the qualitative and quantitative impact of these measures. In general, we would assume nonammoniated products to have ammonia levels below 0.15% and more likely below to 0.10%. Above this level, the amount of blend ammonia may depend on the manner in which ROOT technology is introduced. Phosphate levels can be much more variable depending on leaf sourcing, but, generally, phosphate levels of less than 0.5-0.6% would indicate no addition of phosphate. There are, however, exceptions to this based upon the use of local tobaccos (e.g., Australia).

Ammonia and/or phosphate provide much of what is commonly referred to as the PM character. These compounds alter blend and smoke chemistry in order to:

- Reduce irritation (smoke ammonia/carbonyl reactions).
- Enhance nicotine availability (free nicotine).
- Impart unique base flavor notes (reaction products).
- Enhance flavor compounds (reaction products).

These are essential elements of ammonia technology and its beneficial impact on smoke sensory.

Based upon the data in the tables, the products can then be classified in the following matrix:

MARLBORO PRODUCT MATRIX

	AMMONIATED	NONAMMONIATED
Phosphate Containing	U.S. U.S.-Export European (average) Germany (1987) UK (1986) Venezuela Switzerland Brazil (1991)	None
Nonphosphate Containing	Winston Malaysia (1992/RJR) Japan (1991)	Germany (1970's) Australia Brazil (1986) Argentina UK (1980)

The data in these last tables as well as Table 5 also show several changes over time. For the U.S. Marlboro, blend ammonia has seemingly decreased significantly over the last 20 years. Similarly, the phosphate level has also decreased. Both of these decreases occur during the period of decreasing bandcast recon usage.

Table 9 focuses on the recent data for the various styles of European Marlboro. Other than Germany, chemical measures confirm the blend separation values again demonstrating a consistency of product strategy particularly in the use of bandcast recon as a vehicle for ROOT technology.

3. **PM has altered Marlboro over time to introduce ammonia chemistry and, hence, Marlboro character.**

On a worldwide basis, the data in Table 11 show the influence of increasing ammonia levels over time in markets where the taste distinctiveness (i.e., burley character) of ammonia and/or phosphates may have originally been undesirable. Notably, this can be seen in the UK version where blend ammonia increases corresponded with the introduction of bandcast recon. There is also an apparent increase in the ammonia level in the German and Brazilian versions of Marlboro over time. These case studies confirm PM's philosophy of altering Marlboro to obtain a more consistent sensory character comparable to the U.S. standard. In general, PM has first established a market position and then altered Marlboro over time to accomplish this.

Malaysia presents another interesting case. With a shift to using R. J. Reynolds to manufacture Marlboro in Malaysia, the product now shows high ammonia and low phosphate. This is a similar technology package to that used in RJR's U.S. Winston. It is believed that this is accomplished in the U.S. by direct ammoniation of paper recon. One possibility is that this special recon is being imported by RJR.

4. **PM does not "control" blend alkaloids as closely as traditionally believed.**

Figure 7 shows a plot of alkaloid level over time for U.S. Marlboro and Figure 8 breaks this down further by month. Speculation had been made that PM took great pains to control blend alkaloids. However, in general, this does not appear to be the case from the data. Also, it's worth noting that the recent (i.e., 1987-1991) increases in blend alkaloids may correspond with PM's decision to use only U.S. grown burley and flue-cured in U.S. Marlboro.

5. PM does not selectively choose tobaccos for Marlboro.

Table 12 summarizes additional information about the specific flue-cured, burley, and oriental tobaccos used in Marlboro. From a sheer volume consideration alone, it is a necessity that PM must use run-of-the-crop tobaccos, i.e., tobacco from all areas and stalk positions in rough proportions equal to availability. This is also often referred to as natural plant distribution of grades. The inference here is that PM cannot selectively choose tobaccos for Marlboro and must use whatever is available. The exception to this may be in the Oriental where the Izmir type continues to be used in very high proportions.

On a worldwide basis, PM must source tobacco from a variety of locations. Obviously, where required, local tobaccos must be used. And, further, economic and business concerns must influence PM's leaf blend strategy on a worldwide basis. PM may be required to purchase local tobaccos in order to import product, for example.

6. PM has longer durations/aging than BAT.

One final note should be made regarding durations. PM has among the longest aging in the industry at 22 months. Durations in PM Germany are quoted at 16 months but it is unknown if any prior aging has occurred. At 16 months for tobacco stored in Europe, this could reflect operational requirements only.

Prior work in the BAT group had demonstrated little benefit from these extended aging periods, however, PM continues this practice. The rationale for this remains unknown and could range from quality considerations to inventory policies for future sales volume potential.

Tables 13 and 14 focus on the total blend chemistry which might be influenced by casing practices. Figures 9-16 show some of this data graphically.

7. PM has altered its casing over time.

In the U.S. version, two apparent step changes are seen in Marlboro. The first occurred in about 1983-1986 when both total and reducing sugars increased:

	U.S. MARLBORO AVERAGE	
	% Total Sugars	% Reducing Sugars
Pre 1983	9.5	5.9
Post 1986	12.3	8.6

The increase in both cases is roughly the same at about 2.5-3%. As well, the ratio of reducing sugars to total sugars increased from about 0.6 to about 0.7.

The second change is the increase in PG and Glycerine seen from 1988 on.

	U.S. MARLBORO AVERAGE	
	% PG	% Glycerine
Pre 1988	1.4	2.0
Post 1988	1.9	2.3

This change corresponds with the removal of about 0.5% triethylene glycol from the blend.

Cocoa, licorice, and specific sugar data, particularly sucrose, indicate constant levels over time in the U.S. version.

Since data on specific sugars is limited, it is impossible to speculate on the specific sugars which were increased in the 1983 change. As these were reducing sugars, however, glucose and fructose are the most likely specific sugars. These sugars are traditionally used as either burley or flue-cured casings. It is also noteworthy that sucrose levels are reasonable constant over time.

8. PM appears to have two major groupings of worldwide casing practices.

On a worldwide basis, results are more variable depending on manufacturing location and leaf sourcing. Nevertheless, some patterns emerge. The U.S.-Export versions of Marlboro match the U.S. domestic version very well.

While total sugar levels vary considerably depending upon leaf source, the specific sugar sucrose is very constant on a worldwide basis. Sucrose is found naturally in tobacco at much lower levels than other sugars and, therefore, must be added as a casing to obtain total blend levels observed in Marlboro. The relative closeness of sucrose levels implies a consistent casing package. Also noteworthy, except for Panama, Japan, Brazil and Argentina (all of which use local tobaccos), the ratio of reducing sugars to total sugars is reasonably constant at ~ 0.7 -- matching the U.S. version.

This is additionally confirmed by the cocoa and licorice levels. Overall, cocoa levels are consistent around the world at 0.4-0.7%. Licorice data indicates the products fall into two classifications:

Lower Licorice (0.7-1.0%)	Higher Licorice (1.2-1.5%)
U.S. U.S.-Export Panama Venezuela Australia Brazil	Germany European Versions

This is shown in Figure 15 where the two licorice levels can be distinguished.

9. PM employs a constant ratio of PG and Glycerine.

Figure 16 shows a graph of PG and glycerine contents for worldwide Marlboro. This data shows a nearly linear trend indicating a constant ratio of glycerine to PG of about 1.3:1. These humectants can influence the blend's equilibrium moisture content, moisture retention capability, and smoke quality.

Most Marlboro products are clustered around 1.5-2% PG and 2-2.3% glycerine.

10. Total blend chemistry reflects the use of ammonia chemistry.

More recently developed analytical scans can show the influence of ammonia chemistry as markers for product consistency. Data for these are shown in Table 15 and Figure 17.

DF's (deoxyfructosazines) are chemical markers generated as reaction products of ammonia and sugars. Thus, products with significant ammonia chemistry will generally have enhanced levels of DF's. While the level of these compounds can be influenced by product age, comparison of their levels can show any strategies in the relative implementation of ammonia reaction products.

As can be seen from the tables, products generally fall into three categories:

High DF's	Moderate DF's	Low DF's
U.S. U.S.-Export European	Malaysia (RJR) Panama Germany Brazil	Japan Argentina

The highest levels of DF's occur in the products which employ bandcast recon. Products which have moderate levels of DF's have phosphate and/or ammonia, and/or urea containing paper recons. Brazil Marlboro, without recon, contains DAP-treated stems. Table 16 shows a comparison of Brazilian Marlboro compared to the U.S. version. Low DF's imply little or no ammonia chemistry.

Australia, without recon for economic reasons, no longer exhibits significant markers of ammonia chemistry. This coincides with the elimination of ACET. Data is shown in Table 17.

MARLBORO STYLES
TOTAL BLEND

In addition to looking at the full-flavor version of Marlboro, recent data has been generated on various lower tar styles of Marlboro. In many countries, tar deliveries are regulated and, in many others, consumer trends are for lighter or milder products. To help better understand PM's management of a strategy for Marlboro, the lower tar versions in several countries were also evaluated. This was done to determine if PM continues to employ consistent product technology across the Marlboro family.

In the U.S., PM markets Marlboro as four tar levels:

Full-Flavor	~ 16 mg
Medium	~ 13 mg
Lights	~ 10 mg
Ultra	~ 6 mg

These are available in both KS and 100's, as well, soft cup and box styles can be analyzed.

Marlboro Lights versions have also been analyzed on a worldwide basis.

Data on the blend, blend chemistry and casing chemistry of Marlboro styles is contained in Tables 18-24 and Figure 18.

1. For U.S. Marlboro, blend construction is very similar for all styles.

   Blend separation results for the U.S. Marlboro styles are shown in Table 18. Processed stem, paper reconstituted tobaccos, and bandcast reconstituted levels are essentially the same across all styles of Marlboro (tar and length).

   For the Full-flavor, Medium, and Lights products, ET levels are also the same at about 8%. For the Ultra versions, ET is increased to about 12%. This increase in ET for the ultra low delivery is expected and is the normal trend throughout the industry.

2. For worldwide Marlboros, a similar blend structure is used for the lights which matches the parent - except for Germany.

   Blend separation results conducted during project Globe show that the same strategy as PM employs in the U.S. is employed throughout the world. That is, the lower tar/lights versions of Marlboro are the same as the parent in blend makeup.

   Germany remains an exception as shown in Figure 18. In Germany, as tar is reduced, ET level increases and paper recon decreases. The sum of the two (ET + paper recon) remains constant. However, the ET increase should be expected as the German Lights version of Marlboro is less than 6 mg tar - approximating the Ultra version in the U.S.

   Note also from Figure 18, that the total of paper recon plus ET is constant across countries at about 25%.

3. For the U.S. versions, flue/burley ratios and ammonia chemistry are the same for all tar levels.

   Total blend chemistry markers for the U.S. versions are shown in Tables 19-20. These confirm the blend separation results showing no difference between any of the versions.

   Detailed analysis by DS scan and pyrolysis also confirm this. Data is shown in Tables 22-23.

4. For the U.S. versions, casing chemistry measures again show similarity among all styles.

   Table 21 shows the casing chemistry for the U.S. versions of Marlboro. All versions have similar levels of PG, glycerine and cocoa. Licorice levels are the same for all styles except the Ultras which are higher.

5. On a worldwide basis, blend chemistry indicates the lights version is similar to the full-flavor version.

   Data is shown in Table 24. Within the variation expected, the Lights version of Marlboro has the same ammonia and casing chemistry as the parent version.

The conclusion to be drawn from this section is that PM uses the same basic blend, casing and ammonia technology in all versions of Marlboro within a given location. This appears consistent until tar deliveries reach the ultra range (< 6 mg tar) when other changes such as ET level or casing may be altered to meet delivery or taste considerations. Once again, PM is demonstrating a constant strategy of product technology.

BLEND COMPONENTS

Analysis of key chemical compounds has been performed on individual blend components taken from PM cigarettes or obtained as raw materials. These analyses, as well as comparisons to other blend components, are shown in Tables 25-34.

1. PM has changed the formulation of their bandcast recon over time.

   From the data in Tables 25-26, we can see that PM's band cast recon has undergone a formula/process change sometime between the mid-1970's and the mid-to-late 1980's.

SUMMARY OF BANDCAST RECON CHEMISTRY

	% Alkaloids	% Nitrate	% Total Sugars	% Reducing Sugars
Ex-Cigarette				
Up to 1978	2.6	3.0	3.8	2.0
Since 1983	3.2	1.3	6.7	3.5
As-Is				
1974	0.65	3.6	2.0	1.0
1991	0.84	1.0	5.3	3.2

Nitrates were reduced and extra sugars added - particularly nonreducing sugars. The nicotine scavenging potential of this component may also have increased. One noteworthy item is that the phosphate level has remained relatively constant indicating a constant addition of DAP. The nitrates reduction indicates a denitrification step has been added to the process.

The data in Table 26 clearly show the nicotine pickup potential of the band cast recon. In a well-documented exchange process, alkaloids increase in the recon from 0.7% to over 3%, while ammonia decreases from over 2.0% to about 0.5%.

2. PM has significantly altered their paper recon to compensate for decreases in bandcast recon inclusion.

PM's paper recon has also undergone some significant changes over the years. The three seemingly most significant are the reductions in nitrates, the addition of DAP (or phosphates and ammonia), and the addition of urea. These are clearly seen in the data summarized in Tables 27-28.

A PM patent from 1981 (U.S. 4421126) describes a paper recon making process in which part of the solid furnish is treated with additives (such as DAP) rather than the extract liquor as would be common in most paper making processes. PM is also known to practice a paper recon making process in which both sides of the paper fibre are coated with slurry/extract. By so doing, PM has altered their paper recon to obtain some of the band cast character and attributes. This is seen, for example, in the increased alkaloid level indicating some nicotine scavenging potential. The addition of urea also suggests some further ammonia source and/or ammonia chemistry.

As the inclusion of bandcast recon has decreased in Marlboro (due to capacity), paper recon has generally increased. By incorporating bandcast character into the paper sheet and increasing the level of paper recon, PM has been able to compensate to maintain the overall effect and potentially the Marlboro character. Certainly, the paper recon has become more "bandcast-like" through the phosphate addition and ammonia/nicotine exchange behavior.

3. **PM's bandcast recon contains cocoa and licorice.**

   In a recent analysis of the bandcast recon obtained before processing, we have detected the presence of both cocoa and licorice. The levels are higher than would be attributable to feedstocks, and we must assume cocoa and licorice are deliberately added as part of the formula.

4. **PM's recons contain PG as a humectant in addition to glycerine.**

   Propylene glycol has been detected in PM's recons prior to processing. In the past, it had only been believed that glycerine was used. The use of PG should enhance the physical quality of the recon.

5. **The paper recon used in most worldwide products matches the U.S. paper recon.**

   The data shown in Table 29 indicate that the paper recon used in the U.S., U.S.-Export, and German version of Marlboro is essentially the same. All of these materials contain key markers such as phosphate, ammonia, urea, specific sugars, and DF's at similar levels.

   As noted earlier, it's unclear as to the source of recon materials used in the Euro versions. Export from the U.S. should not be ruled out though European sources are available.

One particular exception to this is the paper recon used in the Japanese versions of Marlboro. Visual inspection of the paper recon in Japan shows it to be very different from other types, being very brittle and in small pieces. Notably two KS versions of Japanese Marlboro (soft cup vs. box) have different recons. The box versions sampled in 1991 exhibited high ammonia levels and ROOT technology; the soft cup version sampled in 1992 had recon similar to paper recons found in other domestic Japanese products and had no evidence of ammonia.

DS scan data also confirm the similarities of PM recon components as shown in Tables 30-31. The paper recon from Germany nearly matches that used in the U.S., and Venezuelan RCB provides a fair match to U.S. bandcast recon in several key markers such as phosphates and sugar/ammonia chemistry.

6. **The paper and bandcast recons used in the lower tar U.S. versions of Marlboro are the same.**

Detailed chemical scans of bandcast and paper recon obtained from the lower delivery versions of Marlboro is shown in Table 32. Within each type, these are essentially the same again indicating a constant strategy in product development.

7. **PM made a significant change in moving from ACET to DIET.**

Over the course of the years, PM has used two types of expanded tobaccos - ACET and DIET. ACET used ammonium carbonate to expand the tobacco while DIET uses carbon dioxide. In both cases, it appears that PM is expanding a lightly cased flue-cured tobacco mixture for the majority of their products. Recent analysis of the ET separated from the U.S. Ultra versions, however, indicates that the ET in this version only is a flue/burley mixture estimated at 50:50. Tables 33 and 34 show routine chemical measures for PM's ET.

8. Ammonia chemistry has changed significantly with the above changes in blend components.

We have also reviewed the ammonia chemistry results for the blends and the individual blend components. Current markers used within the BAT group include the major fructosazines (F's) and deoxyfructosazines (DF's). Key comparisons were shown in Table 17.

Note the total 2,5 and 2,6 deoxyfructosazines (expressed as ppm) for Marlboro and the blend components from around the world. The impact of the use of ACET as the expanded tobacco can be clearly seen in these tables. Not only are the ACET values the highest, but the blends containing ACET are also the highest. Also, the German, Australian (with DIET), and Japanese Marlboros, which do not contain any band cast recon, are the lowest in the table. Note also the change in the DF level of the Australian Marlboro due to the elimination of ACET.

One of the key teachings from this data is the impact of the change from ACET to DIET. In making this change, PM greatly reduced the total DF's in the blend. However, no apparent compensation was made.

Most U.S. manufacturers are obtaining an ammoniated effect through the use of DAP in paper recon (Table 35). The exception is RJR where direct ammoniation of the recon is suspected to be practiced - this is also somewhat confirmed by very high fructosazine levels in this RJR recon. The new Malaysian Marlboro made by RJR may employ similar technology.

9. PM continues to use a processed flue-cured stem.

Very little is known about PM's stem component in U.S. Marlboro - only that the stem appears to be an all flue-cured mix. Microscopic evaluation suggests it is an expanded or processed stem similar to the processed stems used in the BAT group. Chemical analysis does not support any belief that the stem is cased or contains any ammonia chemistry.

10. However, PM uses stem as a carrier for ammonia technology in Brazil.

    Recent analysis of the processed stem component removed from Brazilian Marlboro indicates that stem is a carrier for ammonia technology. Without recon available, PM in Brazil are apparently treating their flue-cured stem with DAP.

CIGARETTE CONSTRUCTION

Tables 36-37 show key cigarette construction variables for the soft cup KS version of Marlboro in the U.S. and around the world. The Marlboro KS soft cup product is a nominal 85 mm long product with a 21 mm filter. This data is also shown graphically in Figures 19-31.

1. PM has significantly changed the cigarette design of the U.S. version over time.

   As can be seen from this table, every construction variable except perhaps tobacco weight and paper porosity has been significantly changed at some point. Most of these changes occurred around 1983 except for the addition of ventilation and the more recent increase in ventilation. The following highlights this:

U.S. MARLBORO KS AVERAGES

	Dry Density	Circumference	NTW	Paper Porosity	Paper Citrate
Up Thru 1982	209	24.99	238	29	0.81
1984 On	212	24.84	218	34	0.50

The density increase is due to the circumference reduction at constant tobacco weight. This circumference reduction was a general reduction in the U.S. across all brands and manufacturers.

It is unknown if the nontobacco weight (NTW) reduction represented a deliberate filter rod change or may have been the result of new tow items, tow processing equipment, and control which was then becoming available from suppliers. These improvements in tow from the suppliers were designed to allow filter weight reduction.

2. **Some aspects of Marlboro's cigarette design appear reasonably consistent around the world.**

While data is more scattered and markets more variable, some aspects of Marlboro's cigarette design appear reasonably constant or within reasonable ranges. PM must manufacture Marlboro on a worldwide basis at various tar levels and with varying processes and equipment. These will reflect market desires as well as local capabilities. Furthermore, regulations or material availability in given countries will obviously influence design options.

Despite these inherent variations, and with some notable exceptions, there remains a reasonable agreement in many locations:

	Dry Density	Filter Pressure Drop	Filter Efficiency	Paper Porosity
U.S.A. Range (year-to-year)	210-213	2.7-3.0	38-41	26-41
Germany	217	2.6	37.4	49
Switzerland	212	2.8	38.6	35
Italy	207	2.7	39.4	36
Spain	223	2.8	38.1	37
Belgium	211	2.9	38.4	45
Holland	211	2.8	36.7	38
Brazil	220	2.7		44
Japan	218	3.0		35
Argentina	219	2.7		29

Particularly for the European versions of Marlboro, several characteristics such as density, paper porosity, filter efficiency, and filter pressure drop appear within range of the U.S. version.

Less agreement is noted on paper additives and circumference. And some individual countries such as Yugoslavia with very high density and very high paper permeability vary considerably from the norm.

As we saw with blend construction, blend chemistry, ammonia chemistry and casing chemistry, the Euro versions and the U.S.-Export versions of Marlboro are very similar to the U.S. standard. This again implies a strategic philosophy of product technology management.

CIGARETTE DELIVERIES

Tables 38-39 and Figures 32-36 present cigarette deliveries for Marlboro KS in the U.S. over the same period. As noted in the prior section, several aspects of the Marlboro construction changed in the period around 1983. As well, ventilation was added and more recently increased. Thus, we end up with four periods to consider:

MARLBORO KS AVERAGE

	Construction	Vent	Tar	Nic	Tar/ Puff	Nic/ Puff	T/N
1976-78	Lo Den, Lg Circ, Hi Cit	0	16.9	1.14	2.09	.141	14.85
1979-82	Lo Den, Lg Circ, Hi Cit	9.4	15.8	1.18	1.92	.143	13.51
1984-88	Hi Den, Lo Circ, Lo Cit	9.5	16.8	1.16	1.90	.131	14.54
1989-91	Hi Den, Lo Circ, Lo Cit	12.1	16.3	1.16	1.89	.134	14.14

1. Except for step change associated with the initial addition of ventilation, tar and nicotine deliveries per puff are constant in U.S. Marlboro.

In reviewing the data above, several common themes appear to emerge. With the expected changes in mind due to the addition of ventilation, both tar/puff and nicotine delivery are very constant over time. Tar-to-nicotine ratio is also reasonably constant at 13.5-14.5.

Too little data is available on specific smoke chemistry (Table 39) to allow valid comparison over time.

2. Worldwide Marlboro appears to vary considerably country to country but this is influenced by ventilation.

Table 40 presents data from a worldwide population of Marlboro. At first glance, there appears to be little consistency on a worldwide basis. Obviously, Marlboro appears to be tailored to meet the demands in a given market. Even when other blend factors may be similar in a common manufacture location, design and construction specifics must alter to provide specific products. Nevertheless, if products are further analyzed by ventilation level or tar level, a pattern begins to emerge:

MARLBORO KS AVERAGES

Group	Approx. Ventilation	Tar/Puff	Nic/Puff	T/N
U.S.	~12	1.83	0.128	14.3
U.S.-Export	~12	1.89	0.136	13.9
Spain, Brazil, Argentina, Venezuela, Panama	0	2.03	0.147	13.8
Belgium, Holland, Italy	~10-12	1.86	0.127	14.6
Greece, Suisse	~14	1.75	0.125	14.0
Germany, UK	~16+	1.55	0.121	12.8

Except, or until, ventilation exceeds 16%, the tar-to-nicotine ratio is fairly stable at around 14, again comparable to the 13.5-14.5 range seen in the U.S. over the prior 20 years. Per puff deliveries drop as expected with increasing ventilation. Note also the consistency for the moderately ventilated products (e.g., 10-14%) of the per puff tar delivery at around 1.8 mg/puff. This data is also shown in Figures 37-43 where delivery is shown vs. tar level groupings.

CIGARETTE PHYSICAL PROPERTIES

Table 41 shows cigarette physical properties for U.S. Marlboro over time. As shown below in summary form, PM made concerted efforts in the early to mid-'80's to improve physical properties:

	Dry Density	Conditioned Moisture>	Open Cig PD	Tob Sect PD	Hardness	ES	CR	Puffs
1970-79	210	13.5	4.5	1.8	1.98	20	82	7.9
1980-83	210	13.4	4.7	2.1	2.03	14	95	8.4
1984-88	212	14.1	4.7	2.2	1.78	8	99	8.9
1989-91	212	14.7	4.5	2.2	1.90	6	99	8.7

1. **PM has significantly improved cigarette physical properties.**

   Most notably, improvements were seen in end stability, coal retention, puff number, and hardness (up to 1989). These improvements are of a magnitude greater than would be expected from the slight density increase (<1%). They also correspond with an increase in TSPD. Yet, since ET levels were also initially increased over this period, it cannot be concluded that these changes were the result of process improvements. Note also that as ET levels have decreased in the last few years (from 10% in 1988 to 7% currently), hardness has also deteriorated.

   The increase in conditioned moisture correlates with the humectant changes noted earlier.

2. PM may feel that there is an optimum cigarette pressure drop.

The other interesting change is the recent reduction in open cigarette pressure drop. Figure 44 shows open cigarette PD over time by month. This figure more clearly shows the increases in pressure drop up to 1989. At that point, it appears PM may have become concerned and made a planned decrease in draw by increasing the vent rate.

3. On a worldwide basis, physical properties vary considerably.

Table 42 shows selected cigarette physical properties for worldwide Marlboro. Since cigarette design and construction values can influence these properties, there is less consistency with this data. Overall, Marlboro exhibits very good quality with acceptable ranges of end stability, coal retention, and hardness. Notable deviations are poor end stability on the new (RJR) Malaysian version and poor firmness of the Japanese version.

MARLBORO STYLES
CONSTRUCTION AND DELIVERIES

Lower tar versions of Marlboro were also analyzed in the U.S. and selected markets to compare PM's strategy in cigarette design, construction, and delivery in various markets as products are reduced in tar. Tables 43-44 and Figures 45-56 show summaries of this data.

1. **PM uses standard design technologies to reduce tar in the U.S. versions.**

A summary of the U.S. KS versions is shown below:

	Tar	Tar/Puff	T/N	Filter Efficiency	Vent	Paper Porosity	Paper Citrate
FF	16.2	1.84	14.2	38.8	12.0	35	0.49
MD	12.6	1.62	14.3	42.8	18.7	31	0.52
LT	10.6	1.33	12.9	47.3	22.5	39	0.47
UL	6.0	0.88	11.8	57.7	42.9	44	1.10

The 100's versions follow similar trends as shown in the Figures.

As can be seen, a combination of increased ventilation and increased filter efficiency is used to reduce tar. Except for the Ultras, paper porosity and additives are held constant.

These cigarette design technologies are standard product development and design features for tar reduction as practiced throughout the industry. In summary, they do not represent any unique design features.

Figures 45 and 46 clearly show nearly linear trends for the respective KS and 100's versions for per puff delivery as tar is reduced. This demonstrates a good consistency of T/N ratio and puff number for the various styles. The Ultras, with different construction (e.g., paper, ventilation, filter efficiency, and filter pressure drop as shown in Figures 49-51) follow the expected trends.

2. **Similar technology is used on a worldwide basis at equivalent tar levels.**

Since Marlboro "full flavor" has different absolute tar levels on a worldwide basis, design and delivery data must be compared at equal tar levels. Figures 54-56 show a comparison of U.S. lower tar versions compared to the German versions. In Germany, the Marlboro Lights tar delivery is comparable to the U.S. Ultra version. As can be seen from the figures, similar technologies are again used to reduce tar. This again implies a consistency of design parameters on a worldwide basis.

3. **Marlboro cigarette design technology is more "rigid" than "elastic."**

Table 45 shows relative elasticity values for various Marlboro styles. These further confirm that unique cigarette design technology is not utilized by PM.

PROCESSING

It is probably safe to say that there are as many PM process flows as there are PM factories on a worldwide basis. Certainly, based on intelligence about the major U.S. and German multiple factories as well as third-world factories, PM's process flow is purported to be different to either match local constraints or to reflect new technology and construction. And the use of contract manufacture such as the Japanese Monopoly and RJR further confounds this issue. This makes the review of PM's processing more difficult to assess but at the same time gives less weight to the overall criticality of processing to influence the Marlboro character - although individual unit operations may be critical.

Figure 57 presents our best thinking on a generalized PM process flow. And Figures 58 to 64 present details on time, temperature, moisture, and operating conditions of key unit operations. It should be noted that all moistures are reported PM values which because of differences in moisture (oven volatile) methods will generally be about 1-2% lower than BAT values. In other words, a PM reported moisture of 21% would be equivalent to a B&W-BAT reported value of 22-23%.

1. **For the most part, PM's primary processing appears reasonably standard to industry practice.**

   In overview, PM's primary processing appears very consistent with the state-of-the-art standards employed throughout the tobacco industry. Both the process conditions and process equipment used are within range of those employed throughout the BAT group.

   Some examples are highlighted below:

   Conditioning: PM uses both vacuum conditioning and DCC (Direct Cylinder Conditioning). Moistures and temperatures are generally standard for flue-cured and burley tobaccos. Oriental is processed in a DCC at 125°F.

Casing: A single spray cylinder is used to both steam and case tobaccos.

CLD: Proctor and Schwartz CLD's are used in the U.S. (see next section).

Cutting: Standard cutters, process conditions, and cut widths (30 cpi) are used.

Drying: Rotary dryers are used in an "ITM-mode," i.e. counter current air flow. Tobacco temperatures approach or exceed 200°F and high humidity is obtained. These temperatures and humidities are similar to those seen in the BAT group including those generated using air dryers (e.g., HHD, HTD, etc.).

Flavoring: Flavor is applied in cylinders. Competitive intelligence suggests PM has done considerable work to optimize cylinder design for flavor uniformity.

Blending: Standard blending silos (bulkers) are used.

2. **Recent information challenges conventional beliefs regarding PM burley processing.**

Two recent pieces of competitive information now challenge some of the conventional wisdom associated with PM's processing of burley tobaccos.

In 1991, it was reported that PM in Germany was putting some or all of their traditional "heavy" burley casings on the tobacco after CLD treatment during the top dressing step. At the same time, it was learned that, in the U.S., the recon stream was being topdressed with the burley after CLD. Recent analyses of recon tobaccos prior to processing and from cigarettes tend to confirm this as shown below:

		% Total Sugars	% Reducing Sugars	% Sucrose	% Cocoa	% Licorice
Bandcast Recon	As-Is	5.3	3.2	1.6	0.9	0.7
	Ex-Cigarette	6.4	3.0	2.3	0.9	1.2
Paper Recon	As-Is	5.7	5.1	0.3	0.1	0
	Ex-Cigarette	6.6	5.2	1.1	0.3	0/0.4

While these samples were not obtained at the same time and, hence, variability is a concern, there is enough to suggest that the suspected process is in fact practiced. (Note: Two levels of licorice are shown for paper recon. In general, paper recon samples analyzed ex-cigarette either have licorice or do not. This implies that processing is not the same in all PM factories in the U.S.)

In general, nearly 1% sucrose (a nonreducing sugar) and 0.5% licorice are added as part of the top dressing step. This is further confirmed by the total and reducing sugar increases. Cocoa is apparently not added in the topdressing and remains part of the PM burley CLD package. From this limited data, we cannot, however determine if all licorice is added at the top dressing step.

A second area in which recent competitive information suggests a change in PM's operating philosophy is in the cooling section moisture target during the burley CLD process. The competitive information suggests the following:

Year	% Moisture CLD Cooling Section
ca. 1976	3-6%
1980-1982	6-9%
late 1980's	14-16%

As was noted in the section on blend components, PM may be faced with a capacity issue. If these moisture contents were real and we apply a similar calculation to that shown in Table 2, we can generate the following comparison:

	CLD Evaporative Load Per Pound	CLD Total Evaporative Load (MM)
Mid 70's	0.474	50
Early 80's	0.439	67
Late 80's	0.362	66

These figures suggest a capacity problem. The earlier figure is lower but is also generated before the opening of the Cabarrus Country plant in N.C. This plant represented a total cigarette capacity increase of ~33% matching the increase seen above.

These data suggest PM has increased their moisture targets during redrying. Whether or not the burley casing change is part and parcel of this change is unknown.

CASING & FLAVORING

While prior sections have already covered much of the casing chemistry, Tables 46 and 47 summarize the casing and flavor technology suspected to be used in Marlboro.

1. **Burley casing may be a key contributor to Marlboro.**

On the flue-cured/oriental side, the casing is suspected to be relatively simple though the source of the invert sugar is unknown. Most of the casing technology which contributes to Marlboro is in the burley side. The sucrose source is suspected to be a grade of brown sugar. In addition to the cocoa and high butterfat chocolate liquor, cocoa hulls have been reported to be used (though it is also possible that these could be used in bandcast recon manufacture). Block licorice (or

possibly spray-dried block licorice) is also used. While at one time it was suspected that natural Yucatan honey was used, it is now believed that a synthetic honey is used in Marlboro on the burley casing. The white, noncrystaline powder has not been identified.

- The burley top dressing in 1976 was relatively standard comprising humectants, invert sugar, and flavor compounds.

The prior sections have indicated the potential shift in the addition point of some of these materials. However, as can be seen from some of the prior tables, the overall total level of key components such as sucrose, cocoa, and licorice has been very constant over time.

2. The burley casing has potentially changed little over time.

As could be seen in the earlier tables, it appears that little has changed in the Marlboro casing over time. Specific sugars such as sucrose as well as the cocoa and licorice levels have been relatively constant in the domestic U.S. version of Marlboro since the mid-1970's (Table 13). This leads to the conclusion that PM's burley side casing has remained unchanged and may, therefore, represent a key contributor to Marlboro character.

One change which is noted is the increase in total and reducing sugars which occurred around 1983. Because this change has occurred in reducing sugars, this is suspected to be an increase in the invert sugar level on the flue-cured/oriental side. But because this change also occurred during a period in which DIET was replacing ACET, it may also just indicate a shift in this blend component as ACET has considerably less sugar in the final product than DIET.

As noted earlier, PG and glycerine levels were also adjusted in the late 1980's.

3. Worldwide Marlboro is also reasonably constant in burley casing.

As noted earlier, cocoa and sucrose levels appear reasonable constant on a worldwide basis. Licorice levels fall into two groups: similar to U.S. (ca. 0.8%) or similar to European (ca. 1.2%).

Also as noted in earlier tables, the ratio of reducing to total sugars and the ratio of glycerine to PG are also very constant and consistent around the world.

All of this implies a consistent casing package and particularly a burley casing package is used wherever possible.

4. Flavor technology may be critical.

Less information is confirmed regarding flavor technology used in Marlboro. New analytical techniques are now, however, expanding our knowledge base of Marlboro's flavor package. Recent work has been conducted at both Souza Cruz and BATCO on the "head space" of Marlboro cigarettes. These techniques allow us to determine relatively volatile compounds on Marlboro. By comparing to known tobaccos and other products, some speculations about Marlboro's top flavor can be generated.

At Souza Cruz, over 265 compounds have been identified in the Marlboro headspace of which over 60 were unique to Marlboro. At Southampton, over 400 compounds have been identified, many of which had not been previously detected.

Table 47 summarizes the overview of this continuing area of work. Many of the identified individual compounds have been grouped in this summary. Key evidence is found of many tobacco or sugar reaction products, ammonia technology, and sweetness contributors.

Some evidence of thermal flavor release compounds have been identified by Souza Cruz through analysis of pyrolysis degradation products.

While little is known of the chemistry of Marlboro's flavor over time, competitive information suggests PM places a significant premium on the Marlboro flavor package on a worldwide basis.

SENSORY

Figures 65 to 68 show sensory maps comparing Marlboro in the U.S. as well as worldwide Marlboro. Unfortunately, the sensory methodology utilized does not allow for comparison of these tests except within each - that is, we cannot compare tests across time or between tests. Nevertheless, some conclusions can be drawn.

1. **Marlboro consistently ranks low in "strength" and high in "natural" tobacco taste.**

   In Figures 65 and 67, U.S. Marlboro is compared to other U.S. domestic products. In these two plots, the U.S. Marlboro is consistently perceived as having a more "natural" tobacco taste and is low on the strength scale. In relative terms, the ratings for Marlboro (versus an "anchor" of Winston) show constant positioning over the years.

   Figure 68 shows U.S. smokers' perceptions of worldwide Marlboro. Note that the U.S. Marlboro ranks relatively low over the strength factor just as it did versus other U.S. domestic products. However, the taste scale may be misleading as the range of these samples may not have been large enough to clearly discriminate. This is particularly evident in the relative relationship of the domestic U.S. vs. the U.S.-Export products.

2. **The nonammoniated versions of Marlboro differentiate from the ammoniated versions.**

   Figure 66 shows sensory data from Project Globe plotted on a graph of Taste (air cured = natural?) versus impact (strength?). Again, the U.S. Marlboro rates relatively lower on the strength scale. In this

context, a great degree of relative similarity is seen compared to the U.S. testing shown in Figure 68. In both of these tests also, the Swiss product is perceived at the high end of the taste range.

Note also the clear differentiation of the nonammoniated type products in that plot. The Japanese, Argentinian, Australian and Brazilian Marlboro's tend to rank closer together and are skewed to a "flue-cured" taste. (The Brazilian Marlboro tested during this project was prior to the introduction of ammonia technology.)

Unfortunately, a definitive test of worldwide Marlboro's sensory perception among worldwide Marlboro smokers has not been conducted. Thus, it is difficult to determine the relative degree of taste and sensory experience across the world.

However, most expert smokers agree that the ammoniated versions of Marlboro all display a degree of the Marlboro "character".

3. **Marlboro may alter its "taste" over time to first appeal and then convert smokers.**

When Marlboro has been introduced into a market there is evidence that initial offerings may be closer to that market's traditional taste. Over time, then, PM will alter the product and introduce product technology more consistent with an overall Marlboro sensory character. This type of change has been seen in countries such as UK (traditional flue-cured), Germany (Oriental skew), and Brazil (Amerelinho skew). Over time, PM has implemented product technology - particularly ammonia technology, which will alter characteristics more to the USIB type.

4. **Lower tar version of Marlboro continue to have the same distinctive Marlboro signature.**

In both the Project Globe work and in sensory testing in the U.S., Marlboro's lower tar versions are consistent in smoke quality character. While relative amounts of irritation, impact, and flavor amplitude may vary (as would be expected), the basic flavor characteristics are very similar.

COMPARATIVE CHANGES IN MARLBORO

Many of the above discussions have identified changes which have occurred over time in Marlboro. Significant changes have been identified in blend composition, casing, blend components, and cigarette design over the last 20+ years. To measure the degree of change that has occurred, particularly in terms of frequency, we have compared changes in U.S. Marlboro to B&W's flagship brand, KOOL. These comparisons are shown in Tables 48-49.

1. Marlboro has changed much more frequently and dramatically in the last 7-10 years than KOOL.

   Since 1985, when a new recipe was introduced for KOOL, the changes have been limited to a menthol level adjustment, a reduction in circumference and a cigarette paper change.

   Over the same time, Marlboro has changed much more frequently. In the blend composition, ET level has decreased at least twice, bandcast recon level twice, and paper recon has increased. Urea has been added to the paper recon and a second non-DAP paper recon has been added. ACET has been replaced by DIET with a significant reduction in deoxyfructosazines. The levels of PG and glycerine have been increased resulting in a higher equilibrium moisture. In cigarette design, after a major change in 1983, filter efficiency has decreased and ventilation has increased.

   Thus, compared to B&W's flagship KOOL product, Marlboro has undergone more frequent and potentially more significant change in the last 7 years. The implication is that PM manages product technology change on an ongoing basis to adapt to a changing environment while maintaining Marlboro's smoke character.

CONCLUSIONS

The purpose of this review was to continue to update our knowledge of Marlboro in both the US and around the world over time. These periodic reviews of the technology used in Marlboro will give us some additional insight into the critical product aspects that PM considers important. In this review, we have continued to assess the Marlboro technology in total and in the individual blend components. With this knowledge, we have then weighted the various factors which contribute to the distinctive Marlboro character. These factors can help determine the extent to which PM adopts a global strategy for Marlboro.

As has been repeatedly noted in prior reviews of Marlboro, several factors emerge:

- Marlboro has changed considerably over time.
- Marlboro is different in various markets around the world.

Yet, at the same time:

- There is a relative consistency of Marlboro taste character.
- Several factors of Marlboro's recipe and design appear consistent both over time and around the world.

<u>These factors represent a convincing argument that PM has a consistent product strategy that is employed with Marlboro wherever and whenever possible.</u>

PM also has a secondary philosophy to modify Marlboro whenever necessary to match local requirements. However, even in this secondary strategy, PM will not totally sacrifice Marlboro character and will also develop and implement new technology and recipe/design changes as necessary to achieve the primary strategy as much as practical. Marlboro also remains a business proposition for PM.

Marlboro is the "same" around the world wherever local conditions or constraints allow. This review has demonstrated the significant similarity of Marlboro in:

- U.S.A.
- U.S.-Export
- Europe (except Germany)

Together these areas form the bulk of Marlboro volume on a worldwide basis.

Other countries, although somewhat stand alone in nature due to business or local constraints, have similar product technologies; particularly in the use of ammonia technology and casing and flavor technology. These include:

- Germany
- Brazil
- Venezuela
- Malaysia
- Central Americas

Other markets such as Japan, Australia and Argentina lie outside this concept to some extent. However, the product has been variable in these areas and our data base is limited.

Table 50 shows a brief summary of the aspects of U.S. Marlboro that have changed and those that have remained constant over the years. The changes, as noted in the detailed narrative above, have sometimes been non-mutually-exclusive. For example, as the bandcast recon level has decreased (possibly due to capacity limitations), changes have been implemented in the paper recon recipe to simultaneously achieve at least some of the bandcast effect. This is fundamentally demonstrated, for example, with the nicotine scavenging potential (ammonia transfer) now found in the paper recon where previously this had only been seen in the bandcast material.

PM is obviously not afraid to change Marlboro. Yet they seem to attempt to maintain as much Marlboro character as possible and as the local market will accept. Even in traditional non-USIB markets, PM has implemented at least some degree of Marlboro technology/character and/or poised the brand to accept a more consistent product strategy over time. As these non-USIB markets could shift over time to more of the US type demand, Marlboro will probably also change accordingly. This strategy has already been demonstrated in several European markets and is in the process of changing in Brazil.

What product technology, then, makes Marlboro a Marlboro?

Looking at all of the technology employed in Marlboro on a worldwide basis, ammonia technology remains the key factor. Beyond this, casing (particularly burley casing) and flavor technology are the second largest contributors to the Marlboro character. Other product technology is deployed in a more flexible or tactical manner to support these primary or strategic technologies. Variations in tobacco selection, processing and cigarette construction are thus, used flexibly to support the primary technologies.

Key factors for each of these technology areas are summarized below:

<u>Ammonia Technology</u>

1. Ammonia technology is critical to the Marlboro character, taste, and delivery. Key desirables are:
   - Ammonia in smoke
   - Reduction of gas phase carbonyls
   - Smoke pH increase
   - Free nicotine/nicotine transfer
   - Ammonia-sugar reaction products
   - Ammonia-tobacco component reaction products
   - Nicotine-pectin reactions

2. Wherever and whenever possible, PM uses bandcast recon to achieve many of these desirable characteristics in Marlboro.

3. PM has apparently altered their paper recon over the years to obtain a "bandcast effect." For this reason, the German Marlboro can be classified as an "ammoniated" version.

4. Ammonia technology may also be obtained through other mechanisms; e.g., casing, flavors, reaction products, ammonia source, etc. The addition of DAP to the stem portion of Brazilian Marlboro is an example of this.

Casing/Flavoring

1. While casings are suspected to be very traditional type materials, there is a strong belief that these are very critical to the Marlboro character.

2. PM has maintained casings very constant over time and treats their make-up with great security.

3. PM may utilize other factors such as cooking, particular material grades, etc., to enhance casing effect.

4. Flavor is considered very important to Marlboro taste, character and sensory. Pack aroma is also important.

Leaf/Blend

1. There appears to be no unique smoke quality from tobacco selection and the blend contains run-of-the-crop tobacco.

2. Marlboro has a flue-cured skew, and uses a constant type and level of Oriental.

3. While PM has longer durations/aging, it has not been demonstrated that this is critical.

4. The selection of a flue-cured grade for ET does not appear to be a critical factor.

5. Processed stem does not appear to be critical to unique smoking quality. However, PM may use it to improve physical quality and it is flue-cured stem.

Cigarette Design

1. PM maintains an appropriate nicotine per puff, tar per puff, a good open pressure drop, and an appropriate vent/filtration balance.

2. Other than this, cigarette design parameters do not appear to be critical.

3. As tar levels are reduced, PM applies standard practices in cigarette design.

Processing

1. PM appears to use standard state-of-the-art process conditions. Little, if any, uniqueness can be attributed to PM's process vis-a-vis smoke quality uniqueness.

TABLE 1

Marlboro Manufacturing

Group	Country	Probable MFG Location	Alternate MFG Locations
Europe	UK	Holland	
	France	Holland	Germany
	Spain	Spain	
	Italy	Italy	Holland, Germany
	Greece	Greece	Holland, Germany
	Yugoslavia	Yugoslavia	
	Holland	Holland	
	Belgium	Holland	
	Switzerland	Switzerland	
	Denmark	Germany	Holland
	Finland	Finland	
	Sweden	Switzerland	Holland, Germany
	Norway	Switzerland	
	Germany	Germany	
	Austria	Austria	
Far East	Japan	Japan	
	Australia	Australia	
	Malaysia	Malaysia	In 1992, RJR; Formerly Rothmans
	Indonesia	Indonesia*	*Uses U.S. Cut Rag
Central/South America	Panama	Panama	
	Venezuela	Venezuela	
	Brazil	Brazil	
	Argentina	Argentina	
U.S. Export	Taiwan	U.S.A.	
	Hong Kong	"	
	China	"	
	Thailand	"	
	Saudi Arabia	"	
	Paraguay	"	
	Russia	"	
	Iran	"	
	Israel	"	
	Korea	"	

TABLE 2

BLEND CONSTRUCTION
U.S. MARLBORO KS

Year	ET %	Stem %	Paper Recon %	Bandcast Recon %	Total Recon %	Total Sales (B)	Total MM Lbs. Tobacco (@ 1.65 Lb./1000)	Total MM lbs. Paper Recon	Total MM Lbs. BC Recon	Total MM Lbs. Stem	Total Lbs. ET (MM)
1970			0.0	18.4	18.4	108.0	178.2	0.0	32.8		
****											
1974			2.0	15.1	17.1	151.3	249.6	5.0	37.7		
1975			3.4	13.6	17.0	158.7	261.9	8.9	35.6		
1976			4.4	13.2	17.6	171.6	283.1	12.5	37.4		
1977	4.6	6.8	6.6	13.0	19.6	188.2	310.5	20.5	40.4	21.1	14.3
1978	6.0	6.4	9.3	12.0	21.3	202.0	333.3	31.0	40.0	21.3	20.0
1979	6.8	5.5	11.0	10.0	21.0	216.1	356.6	39.2	35.7	19.6	24.2
1980	7.6	4.2	13.8	9.0	22.8	234.4	386.8	53.4	34.8	16.2	29.4
1981	10.8	4.8	14.0	7.5	21.5	250.6	413.5	57.9	31.0	19.8	44.7
1982	11.4		15.4	7.5	22.9	251.8	415.5	64.0	31.2		47.4
1983	10.8	3.3	15.4	7.5	22.9	247.0	407.6	62.8	30.6	13.4	44.0
1984	11.7	2.6	17.3	7.5	24.8	251.4	414.8	71.8	31.1	10.8	48.5
1985	10.5	2.4	17.3	7.5	24.8	254.6	420.1	72.7	31.5	10.1	44.1
1986	10.0	2.7	15.4	6.6	22.0	260.8	430.3	66.3	28.4	11.6	43.0
1987	10.4		15.8	6.8	22.6	275.7	454.9	71.9	30.9		47.3
1988	10.2	2.4	16.7	6.8	23.5	290.5	479.3	80.0	32.6	11.5	48.9
1989	9.0					299.7	494.5				44.5
1990	7.3	2.6	18.5	6.2	24.7	320.0	528.0	97.7	32.7	13.7	38.5
1991	7.6	2.9	17.4	5.4	22.8	330.0	544.5	94.7	29.4	15.8	41.4
1992	6.8	1.9	18.2	5.4	23.6						

TABLE 3

Marlboro KS
World-Wide Blend Construction

Country	Date	% ET	% Stem	% Paper Recon	% Pandcast Recon	% Total Recon	% Total By-Product
U.S.A.	1991–1992	7.2	2.4	17.8	5.4	23.2	25.6
U.S.A. – Export	1991–1992	8.4	2.5	16.8	6.3	23.1	25.6
Euro-Average	1986–1992	8.1	2.8	17.6	5.1	22.7	25.3
Venezuela	1991	0.0	12.1	0.0	18.2	18.2	30.3
Germany	1989–1992	7.4	7.1	22.3	0.0	22.3	29.4
Malaysia – New	1992	0.0	10.0	17.2	0.0	17.2	27.2
Panama	1991–1992	0.0	10.7	9.8	0.0	9.8	20.5
Japan	1992	0.0	0.0	15.0	0.0	15.0	15.0
Brazil	1986–1991	0.0	21.0	0.0	0.0	0.0	21.0
Argentina	1986–1992	0.0	21.6	0.0	0.0	0.0	21.6
Australia	1986	15.0	13.0	0.0	0.0	0.0	13.0

TABLE 4

Single Strand Analysis of Paper Recon Ex-Cigarettes for Marlboro Styles

TAR	FF	FF	FF	FF	MED	FF	FF	MED	LTS	LTS	ULT	ULT	FF	FF	LTS
STYLE	KS	KS	KS	KS	KS	KS	100	KS	KS	100	KS	100	KS	100	KS
MFG LOCATION	(US)	KY	NC	VA	(US)	(US)	(US)	(US)	(US)	(US)	(US)	(US)	(GER)	(GER)	(GER)
DATE	1987	1991	1991	1991	1991	1992	1992	1992	1992	1992	1992	1992	1992	1992	1992
LABORATORY	B&W	B&W	B&W	B&W	B&W	BATCF	BATCF	BATCF	BATCF	BATCF	BATCF	BATCF	BATCF	BATCF	BATCF
NUMBER OF STRANDS															
High Phosphate	2	13	31	15	5	30	30	38	28	44	37	36	46	34	23
Low Phosphate	8	7	9	5	5	30	10	20	12	14	16	24	11	14	23
% OF STRANDS															
High Phosphate	20	65	80	75	50	50	75	65	70	75	70	60	80	70	50
Low Phosphate	80	35	20	25	50	50	25	35	30	25	30	40	20	30	50

TABLE 5

TOTAL BLEND CHEMISTRY
U.S. MARLBORO KS

Year	Alkaloids (%)	Ammonia (%)	Nitrate (%)	Phosphate (%)	Chlorides (%)	Chlorogenic Acid (%)	Rutin (%)	CA / Rutin RATIO	Urea (%)
1970	2.00	0.46	0.8	1.1					
1971									
1972									
1973									
1974	1.90	0.38	1.1	1.4	0.8	* 1.40			
1975									
1976	1.71	0.28	1.1	1.4		* 1.10			
1977	1.62	0.26	1.1		0.7				
1978	1.84		1.1						
1979	1.76		1.2						
1980	1.60	0.34	1.1		0.6				
1981	1.79		1.3						
1982	1.83		1.0						
1983	1.76	0.50	0.9			0.39	0.25	1.56	
1984	1.76	0.23	0.9	1.0		0.41	0.26	1.58	0.09
1985	1.84	0.21	1.0		0.7	0.41	0.25	1.64	
1986	1.87	0.25	1.0			0.50	0.26	1.92	
1987	1.84	0.25	1.0	1.1	0.8	0.37	0.23	1.61	0.09
1988	1.95								
1989	1.86								
1990	1.97		1.0	0.9		0.43	0.24	1.79	
1991	1.91	0.28	0.7	0.9	0.6	0.44	0.27	1.63	
1992	1.80	0.32	0.9	1.0		0.38	0.25	1.52	0.19

* DIFFERENT METHOD

TABLE 6

Comparison of U.S. Marlboro KS to Other Products Total Blend Chemistry

		% Nitrates	% Chlorogenic Acid	% Rutin	CA/Rutin Ratio	3-Methyl-Valeric Acid (ug/gm)
Marlboro U.S.	1983	0.9	0.39	0.25	1.56	
	1984	0.9	0.41	0.26	1.58	
	1985	1.0	0.41	0.25	1.64	
	1986	1.0	0.50	0.26	1.92	
	1987	1.0	0.37	0.23	1.61	
	1990	1.0	0.43	0.24	1.79	44
	1991	0.7	0.44	0.27	1.63	
	1992	1.0	0.38	0.25	1.52	
Marlboro Suisse	1990	0.8	0.55	0.34	1.62	52
Marlboro Germany	1990	0.7	0.67	0.40	1.68	39
	1992	0.9	0.51	0.33	1.55	
Marlboro Brazil	1990	1.0	0.35	0.30	1.17	0
	1991	1.0	0.84	0.55	1.52	
Winston U.S. (RJR)	1984	1.2	0.53	0.34	1.56	
	1985	1.0	0.49	0.32	1.53	
	1987	1.1	0.44	0.28	1.57	
RICHLAND/VICEROY (B&W)	1991	0.9	0.39	0.28	1.39	

TABLE 7

Suspected Marlboro KS Blend (%)

	U.S.	European	Germany	Brazil
Unexpanded Flue-Cured	29	29	23	47
Expanded Flue-Cured	8	8	10	0
Unexpanded Burley	22	22	20	33
Oriental	15	15	15	0
Processed Stem	2.5	3	10	20
Bandcast Recon	5.5	5	0	0
Paper Recon	18	18	22	0
TOTAL F/B RATIO	63/37	63/37	62/38	59/41

TABLE 8

Revised Blend Construction (%)
Marlboro KS

	U.S.A.	Germany
Unexpanded Flue-Cured	29	23
Expanded Flue-Cured	8	10
Unexpanded Burley	22	20
Oriental	15	15
Processed Stem	2.5	10
Bandcast Recon	5.5	0
High Phosphate Paper Recon	12	15
Low Phosphate Paper Recon	6	7

TABLE 9

European Marlboro KS
Blend and Ammonia Chemistry Markers

	% Bandcast Recon	% Ammonia	% Phosphate
Austria	3.0 *	0.20 *	0.6
Belgium	5.8	0.32	0.7
Denmark	6.0 *	0.29 *	0.6 *
Finland	7.5		
France	4.0 *	0.28	0.9
Greece	5.2	0.28	0.8
Holland	5.4	0.28 *	0.8
Italy	3.4	0.28	0.9
Spain	6.5	0.21 *	0.9
Switzerland	4.5	0.32	0.6
Sweden	5.0 *	0.29	0.6
Yugoslavia	4.4		0.7
United Kingdom	4.0 *	0.26	
Germany	0.0	0.16	0.9
United States	5.4	0.29	1.0

*1980–1986 Data; All Other Data 1989–1992.

TABLE 10

Worldwide Marlboro KS and Comparison Products
Ammonia Chemistry

	% Alkaloids	% Total Sugars	% Reducing Sugars	% Ammonia	% Phosphate
U.S.A.	1.87	12.0	9.2	0.29	1.0
U.S.A. Export	1.94	11.8	8.1	0.29	0.8
Euro–Average	1.84	13.8	9.2	0.28	0.7
Venezuela	1.99	12.7	8.9	0.41	1.0
Germany	1.81	14.5	10.1	0.16	0.9
Malaysia – New	1.91	8.4	7.0	0.41	0.5
Panama	2.06	10.9	6.2	0.18	0.5
Japan	1.95	12.6	7.6	0.15	0.5
Brazil	2.29	7.8	7.0	0.17	1.2
Argentina	1.97	14.2	9.0	0.10	0.5
Australia	2.14	13.0	9.3	0.07	0.8
Winston (U.S.A.)	1.78	9.3	7.8	0.31	0.5
RICHLAND (B&W)	2.08	11.8	7.9	0.29	1.0

TABLE 11

Changes in Ammonia Chemistry
Marlboro Case Studies

Country	Approximate Date	% Bandcast Recon	% Paper Recon	% Ammonia	% Urea	% Phosphates
U.S.A.	1970	18.0	0.0	0.46		1.1
	1984	7.0	15.5	0.25	0.09	1.1
	1992	5.0	18.0	0.32	0.19	1.0
Switzerland	1973	7.0	0.0	0.25		1.3
	1991	5.0	20.0	0.32		0.8
United Kingdom	1974	0.0	11.0	0		0.7
	1986	4.0	16.0	0.26		
Germany	1980	0.0	10.0	0.14		0.6
	1987	0.0	19.0	0.18		1.4
	1992	0.0	22.0	0.17	0.17	0.9
Malaysia	1991	8.0	0.0	0.13		1.0
	1992	0.0	17.0	0.42		0.5
Japan	1986	0.0	12.0	0.11		
	1991	0.0	15.0	0.15		0.5
Australia	1974	0.0	9.0	0.06		0.9
	1986	0.0	0.0	0.14		
	1991	0.0	0.0	0.07		0.8
Brazil	1986	0.0	0.0	0.11		0.7
	1990	0.0	0.0	0.17		1.2

TABLE 12

PM LEAF TECHNOLOGY

I. FLUE-CURED

- Purchase Run of Crop
- U.S. Marlboro Only Uses U.S. Tobaccos
- Outside U.S., Where Possible, Local Manufacture Uses U.S. Flue-Cured
- Purchase 22 Grades Subsequently Reduced to 3-5 Grades
- May Still Keep Belt Designations (?)
- Aging/Duration of 22 Months (Compared to 15 for B&W); Rationale -- Quality?, Consistency?, Flexibility?, Sales Growth?
- Reported to do Chemical Monitoring During Aging
- Purchase Off-shore Tobaccos: Use?

II. BURLEY

- Purchase Run of Crop
- U.S. Marlboro Only Uses U.S. Tobaccos
- Outside U.S., Local Manufacture Will Use Non-U.S. Tobacco
- Purchase 12-15 Grades Subsequently Reduced to 4
- Aging/Duration of 22 Months (compared to 15 for B&W)
- Purchase Off-shore Tobaccos: Use?

III. ORIENTAL

- Predominantly (ca. 80%?) Turkish from Izmir (YB/YAB)
- Medium to Medium High Aromaticity with Cedary Character and Some Fermented Notes (but Grade for Grade not as Aromatic as B&W Grades)
- Remainder of Purchase Predominantly Greek
- Very Little Samsun, Yugoslavian, etc.

TABLE 13

TOTAL BLEND CASING CHEMISTRY
U.S. MARLBORO KS

Year	Propylene Glycol (%)	Glycerin (%)	Cocoa (%)	Licorice (%)	Total Sugar (%)	Reducing Sugar (%)	Fructose (%)	Glucose (%)	Sucrose (%)
1970						7.1			
1971									
1972									
1973									
1974	0.9	1.6							
1975	1.3	1.9	0.6	0.7	10.0	6.0			2.5
1976	1.3								
1977	1.3	2.0		0.8	10.3	7.1			
1978	1.3	1.8			9.0	5.6			
1979	1.4	2.1			9.0	5.4			
1980	1.4	2.2			9.0	4.6			
1981	1.3	1.8			9.5	5.5			
1982	1.4	1.7			9.7	5.5			
1983	1.5	1.9		0.6	11.1	6.8			
1984	1.5	2.0	0.5	0.6	11.2	6.8	2.0	1.7	3.5
1985	1.4	1.9	0.7	0.6	11.9	7.6	2.8	1.8	3.9
1986	1.7	2.1	0.6	0.9	12.4	9.5	2.0	1.3	2.9
1987	1.6	2.1	0.5	0.6	11.5	8.3	2.7	1.9	2.0
1988	1.8	2.3			12.2	8.7			
1989	1.8	2.4			12.4	8.6			
1990	2.0	2.3			12.7	8.6			
1991	1.9	2.3	0.5	0.9	12.8	8.6	2.7	1.7	2.7
1992	2.0	2.4	0.4	0.8	12.1	9.7	3.3	3.3	3.0

B12 58576

TABLE 14

World-Wide Marlboro KS and Comparison Products
Casing Chemistry

	% PG	% Glycerine	Ratio Glycerine/PG	% Total Sugars	% Reducing Sugars	Ratio Reducing/ Total Sugars	% Cocoa	% Licorice	% Glucose	% Fructose	% Sucrose
U.S.A.	1.9	2.3	1.21	12.0	9.2	0.77	0.5	0.8	2.3	2.9	3.2
U.S.A. Export	1.7	2.2	1.29	11.8	8.1	0.69	0.5	0.7	2.7	3.7	2.5
Euro-Average	1.6	2.2	1.31	13.8	9.2	0.67	0.4	1.2	3.2	3.7	3.7
Venezuela	1.1	1.4	1.27	12.7	8.9	0.70	0.4	1.0			
Germany	1.6	2.1	1.31	14.5	10.1	0.70	0.4	1.5	4.2	4.2	3.8
Malaysia - New	1.0	1.3	1.30	8.4	7.0	0.83	0.2	0.2			
Panama	1.4	1.9	1.36	10.9	6.2	0.57	0.6	0.8			
Japan	1.9	1.7	0.89	12.6	7.6	0.60	0.7	0.8	3.6	4.4	3.0
Brazil	0.7	1.0	1.43	7.8	7.0	0.90	0.6	1.0			
Argentina	2.5	0.0	0.00	14.2	9.0	0.63					
Australia	0.7	1.0	1.43	13.0	9.3	0.72	0.4	0.9	3.4	4.3	3.3
Winston (U.S.A.)	0.6	2.2	3.67	9.3	7.8	0.83	0.6	1.0	2.2	2.8	0.0
RICHLAND/VICEROY (B&W)	1.5	1.8	1.20	11.8	7.9	0.67	0.4	1.3	1.1	2.2	2.1

TABLE 15

Worldwide Marlboro KS
DS Scan Data For Total Blend (Normalized Area Counts)

	Nicotine	PG	Sucrose	Phosphate	Urea	DP's	Chloroqenic Acid	Malic Acid	Trihydroxy-Butanoic Acid	Inositol
U.S.A.	1.49	2.94	3.55	0.55	0.04	0.51	0.98	2.10	0.69	2.09
U.S.A. Export	1.57	3.06	3.38	0.60	0.05	0.47	0.95	2.13	0.75	1.99
Euro–Average	1.54	2.50	3.88	0.55	0.04	0.38	1.11	2.15	0.80	2.07
Venezuela	1.55	1.78	7.05 *	0.58	0.00	0.09 *	0.73	1.88	0.54	1.60
Malaysia – New	1.38	1.40	0.34	0.38	0.03	0.26	1.02	1.47	0.56	1.76
Panama	1.52	2.57	4.46	0.43	0.00	0.20	0.82	2.82	0.97	1.66
Japan	1.63	2.77	4.80	0.38	0.00	0.05	1.23	2.10	0.62	2.06
Argentina	1.42	5.78	5.32	0.35	0.00	0.04	1.10	1.73	0.79	2.25
Germany	1.58	3.64	4.89	0.38	0.18	0.15	1.22	2.08	0.79	2.29

*These peaks overlapped.

TABLE 16

Marlboro KS Comparisons
DS Scan Data For Total Blend (Normalized Area Counts)

	U.S.A. *	Brazil *
Nicotine	1.74	2.20
PG	3.48	1.30
Sucrose	4.11	1.03
Phosphate	0.68	0.87
DF's	0.42	0.28
F's	0.21	0.08
Chlorogenic Acid	1.11	1.31
Malic Acid	2.28	2.91
Trihydroxy Butanoic Acid	0.86	1.20
Inositols	2.24	2.42

*1990

TABLE 17

Worldwide Marlboro KS and Comparison Products
Deoxyfructosazine Levels (PPM)

	Total Blend	ET	Paper Recon	Bandcast Recon
PM PRODUCTS WITH ACET				
U.S.A.	3300	15250	4200	4800
Australia	2450	12500	—	—
PM PRODUCTS WITH DIET				
U.S.A.	1560	1480	2140	4460
U.S.A. – Export	1280	—	1400	—
Euro–Average	1051	—	2520	3370
Germany	650	—	2210	—
Australia	360	380		
Japan	260	—	390	—
OTHER PRODUCTS				
Winston (RJR)	2200	2400	4600	—
RICHLAND/VICEROY (B&W)	1800	1000	3700	4400

TABLE 18

U.S.A. Marlboro Styles
Blend Components

	Tar	Style	Date	% ET	% Stem	% Total Light Recon	% Bandcast Recon	% Total Recon	% Total By-Products
Marlboro	FF	KS	1988–1992	8.2	3.3	18.0	5.9	23.9	27.2
Marlboro	FF	100	1988–1992	8.3	5.0	16.0	6.5	22.5	27.5
Marlboro	MD	KS	1988–1992	8.2	3.5	16.8	5.8	22.6	26.1
Marlboro	MD	100	1988–1992	7.0	2.0	18.0	8.0	26.0	28.0
Marlboro	LT	KS	1988–1992	8.1	3.8	15.8	6.3	22.1	25.9
Marlboro	LT	100	1988–1992	7.9	3.4	16.0	6.5	22.5	25.9
Marlboro	UL	KS	1988–1992	14.3	5.1	14.7	5.2	19.9	25.0
Marlboro	UL	100	1988–1992	10.6	4.6	15.1	5.8	20.9	25.5

TABLE 19

U.S.A. Marlboro Styles
Blend Chemistry

	Tar	Style	Date	Chlorogenic Acid	% Rutin	Ca/Rutin Ratio	% Nitrates	% Alkaloids
Marlboro	FF	KS	1988-1992	0.41	0.26	1.58	0.9	1.93
Marlboro	FF	100	1988-1992	0.40	0.26	1.54	1.1	1.92
Marlboro	MD	KS	1988-1992	0.44	0.27	1.63	1.0	1.86
Marlboro	MD	100	1988-1992					1.73
Marlboro	LT	KS	1988-1992	0.39	0.26	1.50	1.0	1.95
Marlboro	LT	100	1988-1992	0.39	0.26	1.50	1.0	1.95
Marlboro	UL	KS	1988-1992	0.39	0.25	1.56	1.0	2.04
Marlboro	UL	100	1988-1992	0.40	0.25	1.60	1.0	1.97

TABLE 20

U.S.A. Marlboro Styles
Total Blend Sugar/Ammonia Chemistry

	Tar	Style	Date	% Total Sugars	% Reducing Sugars	% Glucose	% Fructose	% Sucrose	% Phosphates	% Urea	% Ammonia
Marlboro	FF	KS	1988–1992	12.3	8.6	2.1	2.9	3.0	0.82	0.19	0.31
Marlboro	FF	100	1988–1992	12.4	9.0	2.1	2.4	3.3	0.84		0.32
Marlboro	MD	KS	1988–1992	12.1	8.4	2.2	2.9	1.8	1.00		0.33
Marlboro	MD	100	1988–1992	12.6	8.2	2.0	2.6	2.7	0.82		0.35
Marlboro	LT	KS	1988–1992	12.2	8.6	2.8	3.4	2.4	0.81	0.17	0.28
Marlboro	LT	100	1988–1992	12.1	8.4	2.1	2.4	2.6	0.80	0.18	0.32
Marlboro	UL	KS	1988–1992	11.3	7.8	2.0	2.7	2.1	0.85		0.28
Marlboro	UL	100	1988–1992	11.1	7.6	1.9	2.6	2.5	0.87		0.28

TABLE 21

U.S.A. Marlboro Styles
Total Blend Casing Chemistry

	Tar	Style	Date	% PG	% Glycerine	% Cocoa	% Licorice
Marlboro	FF	KS	1988-1992	2.0	2.3	0.4	0.8
Marlboro	FF	100	1988-1992	1.9	2.3	0.5	0.6
Marlboro	MD	KS	1988-1992	1.9	2.3	0.4	0.7
Marlboro	MD	100	1988-1992	2.0	2.3	0.5	0.6
Marlboro	LT	KS	1988-1992	1.9	2.3	0.5	0.8
Marlboro	LT	100	1988-1992	1.9	2.3	0.5	0.7
Marlboro	UL	KS	1988-1992	2.2	2.2		1.3
Marlboro	UL	100	1988-1992	2.1	2.1	0.6	1.2

TABLE 22

Marlboro FF Styles
DS Scan and Pyrolysis Results (Normalized Peak Areas)

Length	80	80	80	84	84	99	99
Pack	Box	Box	Box	SC	SC	SC	SC
MFG Location	VA	KY	NC	VA	KY	VA	NC
DS Scan							
Nicotine	1.83	1.81	1.85	1.86	1.89	1.80	1.94
PG	4.00	4.24	4.43	3.62	3.68	4.30	4.04
Glycerine	6.16	6.23	6.61	5.87	5.29	6.30	6.43
Phosphate	0.64	0.61	0.59	0.62	0.61	0.59	0.61
Sucrose	3.15	3.87	3.69	3.27	3.26	3.54	3.72
DF's	0.12	0.09	0.11	0.24	0.14	0.12	0.11
Fructose	2.30	2.12	2.34	2.30	2.19	2.37	2.38
Malic Acid	3.45	3.47	3.48	3.25	3.25	3.42	3.35
Pyrolysis							
Piperidin-en-one	0.89	0.88	0.86	0.92	0.94	0.93	0.91
Myosmine	0.71	0.77	0.76	0.75	0.70	0.77	0.75
Methylvaleric Acid	0.99	0.98	0.97	1.00	1.05	1.01	1.02

TABLE 23

U.S. Marlboro Styles
DS Scan Results (Normalzed Peak Areas)

			PG (1)	Glyc (9)	Nicotine (12)	Phosphate (8)	2,5/2,6 DP's (40+41)	2,5/2,6 P's (44+45)	Malic Acid (15)	Trihydroxy Butanic Acids (17+18)	Inositols (27+33)	Chlorogenic Acids (46+47)	Glucose (24+26+30)	Fructose (21+22+23)	Sucrose (39)
Marlboro	FF	KS	3.92	9.07	1.71	0.51	0.22	0.06	2.15	0.87	2.83	1.00	8.81	8.00	4.34
Marlboro	FF	100	3.96	8.70	1.76	0.60	0.25	0.10	2.08	0.74	2.41	0.94	8.57	7.82	3.30
Marlboro	MD	KS	3.58	8.39	1.67	0.60	0.24	0.11	2.09	0.67	2.30	0.81	9.19	8.08	2.32
Marlboro	MD	100	3.84	8.67	1.67	0.59	0.22	0.08	2.18	0.81	2.43	0.94	7.60	6.66	4.28
Marlboro	LT	KS	3.77	8.45	1.68	0.55	0.21	0.11	2.13	0.77	2.02	0.85	6.79	6.12	4.17
Marlboro	LT	100	3.91	8.65	1.73	0.62	0.23	0.08	2.21	0.83	2.45	0.89	7.55	6.76	3.46
Marlboro	UL	100	3.68	7.51	1.73	0.59	0.41	0.07	2.07	0.79	2.48	0.78	5.74	6.29	4.16

TABLE 24

Worldwide Marlboro
Comparison of FF vs. Lights

		% Ammonia	% Phosphates	% Sucrose	% Glucose	% Fructose	% Licorice	DF's (ppm)
U.S. Marlboro	FF	0.30	1.0	3.0	3.3	3.3	0.5	590
U.S. Marlboro	LTS	0.30	1.1	2.5	3.0	3.8	0.6	940
U.S. Export Marlboro	FF	0.24	1.0	2.4	2.8	3.8	0.5	1310
U.S. Export Marlboro	LTS	0.26	1.0	2.3	2.3	3.2	0.5	1410
France Marlboro	FF	0.28	0.9	3.7	3.2	3.7	1.4	640
France Marlboro	LTS	0.24	0.9	3.1	3.1	3.6	1.2	700
German Marlboro	FF	0.17	0.8	3.8	4.2	4.2	1.1	660
German Marlboro	LTS	0.16	0.7	3.1	3.5	4.3	1.1	370

TABLE 25

PM Bandcast Recon (From U.S. Marlboro KS Cigarettes)

	% Alkaloids	% Ammonia	% Nitrates	% Phosphates	% Total Sugars	% Reducing Sugars	% Glucose	% Sucrose	% PG	% Glycerine	% Cocoa	% Licorice
1970		0.61		4.7								
1971												
1972												
1973	2.60	0.91	2.7	4.7								
1974					3.6	1.5						
1975	2.60	0.70	3.0	4.7	3.8	2.0						
1976	2.50	0.67	3.2		3.7	2.1						
1977	2.60	0.48	3.0		3.9	2.3						
1978												
1979												
1980												
1981												
1982												
1983	3.30	0.85	1.4	4.8								
1984					6.7	4.1						0.7
1985	3.30	0.55	1.3	5.0	6.5	2.9	0.4	1.1				
1986	3.10	0.59	1.2	5.0	7.0	4.0	0.4	2.8	0.5	1.7	0.8	1.2
1987	3.00	0.72	1.0	4.7	6.4	3.0	0.6	2.3	1.2	2.1	0.9	1.1
1988											0.8	1.4
1989												
1990												
1991											0.9	1.0

TABLE 26

Comparison of Bandcast Recons

	% Alkaloids	% Ammonia	% Nitrates	% Phosphates	% Total Sugars	% Reducing Sugars	% Glucose	% Fructose	% Sucrose	% Urea	% PG	% Glycerine	% Cocoa	% Licorice
"As-Is"														
Marlboro – U.S. 1974	0.65	2.10	3.6	4.1	2.0	1.0						3.0	1.0	
1986	0.88	2.10	1.0	5.7	2.0	0.8								
1991 *	0.84		1.0	5.5	5.3	3.2	0.4	0.0	1.6	0.00	2.3 **	4.0 **	0.9	0.7
CPCL (B&W) 1987-1991	0.85	2.50	2.4	7.2	5.1	3.7	0.6	0.2	0.8	0.00	0.2	4.5	0.1	0.1
"Ex-Cigarettes"														
Marlboro – U.S.	3.20	0.68	1.2	4.9	6.7	3.5	0.5	1.1	2.1	0.06	0.8	1.9	0.8	1.2
CPCL (B&W)	3.50	0.71	2.0	5.8	5.4	3.2	0.5	0.6	0.9	0.00	0.9	2.0	0.2	0.2

* Material Prior to Casing During Primary Processing

** Estimated From DS Scan

TABLE 27

PM Paper Recon (From U.S. Marlboro KS Cigarettes)

	% Alkaloids	% Ammonia	% Nitrates	% Phosphates	% Total Sugars	% Reducing Sugars	% Glucose	% Sucrose	% Urea	% PG	% Glycerine	% Cocoa	% Licorice
1970													
1971													
1972													
1973													
1974	0.90	0.16	5.3	0.7	9.3	4.1							
1975	0.80	0.11	4.3	0.5									
1976	0.70	0.11	3.9		6.3	3.7							
1977	0.70	0.05	3.6	0.2	8.7	4.2							
1978													
1979													
1980													
1981													
1982													
1983	1.00	0.15	1.5	1.3									
1984	1.00		1.7	1.1	6.9	5.3	1.2	1.1	0.5			0.3	0.5
1985	1.20	0.19	1.7	1.7	6.1	4.4			1.4				
1986	1.30	0.13	1.7	1.7	5.8	4.3							
1987	1.30	0.24	1.6	1.6	6.8	5.3	1.1	0.8	0.7	1.0	2.0	0.4	0.0
1988												0.4	0.4
1989	1.40		1.6	1.7					0.2				
1990													
1991	1.30		1.6	1.8								0.3	0.0
1992	1.70	0.27	1.5	1.5			1.8	1.4					

Note: These are mixtures of high and low phosphate recons. Our easliest measurement of high versus low phosphate paper recon was from 1987; actual date of introduction is unknown.

812 98590

TABLE 28

Comparison of Paper Recon Materials for Marlboro KS

	% Alkaloids	% Ammonia	% Nitrates	% Phosphates	% Total Sugars	% Reducing Sugars	% Glucose	% Fructose	% Sucrose	% Urea	% PG	% Glycerine	% Cocoa	% Licorice
"As-Is"														
Marlboro - U.S. 1991	0.67		1.4	2.6	5.7	5.1	1.3	1.4	0.3	1.4	1.6	2.1	0.1	0.0
EBR (B&W)	0.56		1.5	3.3	8.7	6.6	1.9	2.1	1.9	0.0	0.0	2.7	0.1	0.1
E-50 (B&W)	0.53		1.0	2.7	10.0	6.8	2.1	2.6	2.8	1.4	0.1			0.1
"Ex-Cigarettes"														
Marlboro - U.S. 1975	0.80	0.11	4.3	0.4	8.4	4.0								
1987-1992	1.40	0.26	1.6	1.7	6.8	5.2	1.5	1.9	1.1	0.5	1.0	2.0	0.3	0.1
Marlboro - U.S. Export 1992	1.50	0.20	1.4	1.5			1.9	2.4	1.2					
Marlboro - Euro 1992	1.50	0.25	1.5	1.3			1.5	2.0	1.1					
Marlboro - Germany	2.00	0.23		1.7						1.3				
Marlboro - Spain 1992	3.20	0.38	2.5	0.9			1.2	1.2	0.5					
EBR (B&W)	2.00	0.40	1.7	2.5	9.0	6.6	1.8	2.2	1.7	0.0	0.7	1.9	0.2	0.3
Winston U.S. 1987	1.30	0.20	2.2	0.6	5.3	4.6	1.4	1.9	0.5	0.0	0.5	2.3	0.9	0.6

*Estimated Based on DS Scan Area Counts

TABLE 29

Comparison of Paper Recons (Ex–Cigarette) for Marlboro Styles

	FF KS U.S.	LTS KS U.S.	FF KS U.S.–Export	LTS KS U.S.–Export	FF KS Germany	LTS KS Germany	FF KS Japan	LTS KS Japan
Alkaloids (%)	1.70		1.50		1.80		3.20	
Ammonia (%)	0.27	0.29	0.20	0.24	0.21	0.18	0.38	0.09
Phosphate (%)	1.50	1.50	1.50	1.40	1.60	1.20	0.90	0.70
Glucose (%)	1.80	1.50	1.90	1.40	1.20	1.50	1.20	2.90
Fructose (%)	2.50	2.60	2.40	2.40	1.70	2.40	1.20	4.40
Sucrose (%)	1.40	1.00	1.20	1.10	1.00	1.10	0.50	2.00
Nitrates (%)	1.50		1.40		1.50		2.50	
DF's (ppm)	860	1140	1390	1610	2780	2040	390	230

TABLE 30

Ammonia Chemistry Results of Blend Components (Ex-Cigarette)
Expressed as Relative Peak Areas for Marlboro KS

PAPER RECONS

	Marlboro U.S.	Marlboro Germany	B&W HBR
Phosphate	0.97	1.05	2.37
2,5DF	0.12	0.27	0.25
2,6DF	0.13	0.24	0.17
2,5F	0.06	0.06	0.05
2,6F	0.03	0.03	0.02
Glycerine	6.15	5.04	8.55
6-D-Glucose	1.07	0.65	2.21
Sucrose	1.20	1.17	1.94
Fructose	2.28	1.76	3.40
Nicotine	1.50	1.86	2.37

BANDCAST RECONS

	Marlboro U.S.	B&W CPCL
Phosphate	4.44	8.75
2,5DF	0.44	0.57
2,6DF	0.46	0.56
2,5F	0.56	0.30
2,6F	0.21	0.14
Glycerine	8.03	7.32
PG	3.44	2.46
6-D-Glucose	0.79	0.97
Sucrose	4.59	2.47
Fructose	1.39	1.70
Nicotine	4.98	4.17

TABLE 31

Comparison of Recons (As-Is) by DS Scan (Relative Peak Areas)

PAPER RECONS

	PM	EBR	E-50
Propylene Glycol	2.37	0.13	0.21
Glycerine	6.58	7.69	9.42
Nicotine	0.55	0.44	0.44
Phosphate	0.24	1.85	0.79
Malic Acie	1.56	1.77	2.13
Trihydroxy Butanoic Acids*	0.63	0.68	0.80
Fructose*	1.98	2.89	3.98
Glucose*	2.19	3.56	4.74
Sucrose	0.30	1.07	3.17
Deoxyfructosazines*	0.19	0.29	0.13
Fructosazines*	0.11	0.00	0.00

CAST RECONS

	PM/USA	PM/RCB	CPCL
Propylene Glycol	4.56	1.92	0.43
Glycerine	13.73	0.03	14.71
Nicotine	0.77	0.53	0.58
Phosphate	2.69	2.93	3.88
Malic Acie	2.93	4.16	3.45
Trihydroxy Butanoic Acids*	0.84	1.08	1.03
Fructose*	0.37	0.04	0.50
Glucose*	1.43	0.12	1.62
Sucrose	3.25	2.51	1.12
Deoxyfructosazines*	1.42	0.74	0.74
Fructosazines*	1.16	0.87	0.43

*Sum of Multiple Peaks

TABLE 32

DS Scan Results for Recons (Ex-Cigarettes) for U.S. Marlboro Styles (Normalized Peak Areas)

PAPER RECONS

	FF KS	FF 100	MD KS	MD 100	LTS KS	LTS 100	ULT 100
Nicotine	1.06	1.13	0.96	1.12	1.00	1.04	1.02
Phosphate	0.59	0.63	0.49	0.56	0.50	0.42	0.52
Urea	0.15	0.20	0.16	0.16	0.21	0.17	0.11
DF's	0.19	0.20	0.18	0.32	0.21	0.16	0.26
Fructose	2.94	2.91	3.02	2.60	2.99	3.08	3.22
Glucose	3.02	3.12	3.20	2.69	3.31	3.32	1.86
Sucrose	1.02	0.91	0.66	1.27	0.77	0.99	0.91

BANDCAST RECONS

	FF KS	FF 100	MD KS	MD 100	LTS KS	LTS 100	ULT 100
Nicotine	2.61	3.60	2.56	3.86	3.72	2.80	2.49
Phosphate	1.63	3.04	2.01	3.19	3.41	1.82	1.41
Urea	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DF's	0.47	0.98	0.78	0.86	0.91	0.48	0.35
Fructose	1.85	2.82	1.50	2.24	2.75	2.79	1.55
Glucose	2.51	3.74	2.20	3.43	3.96	2.61	1.58
Sucrose	3.34	4.89	2.97	4.42	3.85	2.66	1.98

*Sum of Multiple Peaks.

TABLE 33

PM ET and Stem Chemistry

EXPANDED TOBACCO

		% Alkaloids	% Ammonia	% Nitrates	% Phosphates	% Chlorogenic Acid	% Rutin
Marlboro	ACET	1.40	0.26	0.5	0.6	0.86	0.25
	DIET	1.63	0.17	0.4	0.6	0.68	0.40
Winston	G13 to 1985	1.95	0.24	1.5	0.6	0.22	0.15
	G13 1987	1.90	0.29	1.0	0.5	0.47	0.27
B&W	DIET 1987	1.60	0.29	1.3	0.7	0.50	0.23

STEM

		% Alkaloids	% Ammonia	% Nitrates	% Phosphates
Marlboro	1977	0.80	0.10	1.2	0.2
	1987	0.80	0.04	1.1	0.9

TABLE 34

PM ET and Stem Chemistry

EXPANDED TOBACCO

			% PG	% Glycerine	Total Sugars	% Reducing Sugars	% Cocoa	% Licorice	% Fructose	% Glucose	% Sucrose
Marlboro U.S.	ACET		1.2	1.7	5.0	3.6	0.0	0.0	0.1	1.0	0.3
	DIET	1984	0.4	1.6	11.2	8.1	0.2	0.7	2.6	1.4	0.5
		1987	1.2	1.8	9.7	7.9	0.0	0.0	2.6	1.3	0.5
Winston U.S.	G13	1985	0.2	2.4	10.3	7.8	2.2	1.0	1.8	1.7	1.3
		1987	0.6	2.0	8.9	7.3	0.5	0.6			
B&W	DIET	1987	0.9	1.5	7.4	5.7	0.1	0.0	1.8	0.7	0

STEM

		% PG	% Glycerine	Total Sugars	% Reducing Sugars	% Cocoa	% Licorice	% Fructose	% Glucose	% Sucrose
Marlboro U.S.				11.9	9.0					

TABLE 35

Comparison of Ammonia Chemistry in Paper Recons by Manufacturer
For U.S. Products Expressed as Relative Peak Areas

		DF's	F's	P04
PM	Marlboro KS	356	71	837
	PM Ammoniated Brands	543	162	1011
	New PM Nonammoniated Menthol Brands	164	0	316
RJR	Ammoniated Brands	474	432	339
	Nonammoniated Brands	199	0	322
B&W	Ammoniated Brands	1259	143	1694
	Nonammoniated Brands	257	0	408
L&M	Nonammoniated Brands	287	0	365
LOR	Ammoniated Brands	909	67	1396
	Nonammoniated Brands	394	0	556
AM	Ammoniated Brands	2309	405	2584
	Nonammoniated Brands	402	0	407

TABLE 36

CIGARETTE CONSTRUCTION
U.S. MARLBORO KS

Year	Dry Density (mg/cc)	Circumference (mm)	Tobacco Weight (mg) @13.5 % MC	Non-Tobacco Weight (mg)	Ventilation (%)	Paper Porosity (c)	Paper Citrate (%)
1970			830	230	0.0	25	0.8
1971							
1972							
1973							
1974		25.00					
1975		25.00					
1976		25.10	770				0.8
1977	210		760	240	0.0	29	0.7
1978			758	241	0.0	34	0.9
1979	209	24.94	753	241	9.7	32	0.9
1980	207	24.91	740	241	9.4	26	0.9
1981	211	24.98	757	240	9.0	33	0.8
1982	209	25.03	759	236	9.4	27	0.7
1983	211	24.96	761	231	10.5	31	0.7
1984	213	24.83	757	220	10.2	30	0.6
1985	212	24.80	760	221	9.5	40	0.5
1986	213	24.83	762	219	10.3	31	0.5
1987	212	24.80	767	217	8.3	26	0.5
1988	211	24.90	768	217	9.4	30	0.5
1989	213	24.83	774	216	11.1	32	0.5
1990	211	24.86	768	217	12.3	34	0.5
1991	210	24.82	757	216	12.6	36	0.5
1992	213	24.85	756	216	12.9	41	0.6

TABLE 37

Worldwide Marlboro KS
Cigarette Construction and Pressure Drop

Country	Date	Dry Density	% Vent	Open Cigarette Press Drop	Sealed Cigarette Press Drop	Filter Press Drop	Tobacco Section Press Drop	% Filter Triacetin	% Filter Efficiency	Paper Porosity	% Paper Additive
U.S.A.	1991–1992	213	12.6	4.5	4.9	2.8	2.1	7.2	39.8	35	0.49
U.S.A.–Export	1989–1992	213	12.9	4.4	4.8	2.8	2.0	7.1	38.3	35	0.50
Germany	1989–1992	217	16.5	4.1	4.7	2.6	2.1	7.2	37.4	49	0.88
Switzerland	1990–1992	212	13.7	4.4	4.8	2.8	2.0	7.3	38.6	35	0.66
Belgium	1992	211	11.1	4.4	4.8	2.9	1.9	7.3	38.4	45	0.80
Holland	1989–1991	211	12.4	4.3	4.7	2.8	1.9	6.9	36.7	38	0.50
UK	1986–1991		19.0	4.2	5.0	3.1	1.9	5.5		42	0.54
Italy	1991	207	10.9	4.5	4.8	2.7	2.1	6.5	39.4	36	0.60
Greece	1990–1992	210	14.3	4.3	4.9	2.7	2.2	7.7	36.3	41	0.65
Spain	1989–1991	223	0.0	4.7	4.7	2.8	1.9	8.1	38.1	37	0.63
"Average Europe"		212	11.6	4.4	4.8	2.8	2.0	7.0	37.9	39	0.63
Brazil	1986–1991	220	0.0	4.9	4.9	2.7	2.2	6.3		44	0.59
Argentina	1986–1992	219	0.0	4.9	4.9	2.7	2.2	7.2	33.2	29	1.49
Venezuela	1991	210	0.0	4.3	4.3	2.7	1.6			35	0.40
Panama	1991–1992	214	0.0	4.4	4.4	2.7	1.7	7.7	39.0	26	0.42
Japan	1991–1992	218	16.0	4.4	5.0	3.0	2.0	3.4		35	0.00
Australia	1986–1991	211	13.1	4.1	4.6	2.2	2.4	4.5		30	0.42
Malaysia–1	1990–1991	215	8.2	5.0	5.3	2.9	2.4	9.4	39.3	46	0.50
Malaysia–2	1992	217	10.4	4.4	4.8	3.1	1.7	7.2		0	0.60

TABLE 38

CIGARETTE DELIVERIES
U.S. MARLBORO KS

Year	Tar mg/cig	Nic mg/cig	Puffs per/cig	TAR / PUFF	NIC / PUFF	% Filter Efficiency	Ventilation %	TAR / NIC	PH	Ammonia ug/cig	Acetaldehyde ug/cig	Acrolein ug/cig
1970	19.0	1.36					0.0	13.97	6.0		766	26
1971												
1972												
1973												
1974									6.2	65		
1975	21.0	1.20	6.9					17.50	5.7	60		46
1976	17.5	1.21	8.6	2.03	0.141			14.46		70		
1977	16.8	1.10	7.8	2.15	0.141	40.7	0.0	15.27				
1978	16.3	1.10	7.8	2.09	0.141	41.9	0.0	14.82			630	
1979	15.6	1.15	8.2	1.90	0.140	41.8	9.7	13.57				
1980	15.7	1.14	8.2	1.91	0.139	41.5	9.4	13.77				
1981	15.4	1.14	8.0	1.93	0.143	41.2	9.0	13.51				
1982	16.6	1.26	8.5	1.95	0.148	42.2	9.4	13.17			620	
1983	16.2	1.12	8.8	1.84	0.127	41.9	10.5	14.46				
1984	16.7	1.10	8.9	1.88	0.124	40.7	10.2	15.18	6.2			
1985	16.7	1.15	8.9	1.88	0.129	40.6	9.5	14.52				
1986	16.8	1.15	9.0	1.87	0.128	38.7	10.3	14.61		64	715	69
1987	16.9	1.16	8.7	1.94	0.133	38.7	8.3	14.57	5.5	68	617	121
1988	17.0	1.23	8.8	1.93	0.140	38.5	9.4	13.82				
1989	16.4	1.22	8.7	1.89	0.140	39.4	11.1	13.44		70		
1990	16.3	1.15	8.5	1.92	0.135	38.1	12.3	14.17				
1991	16.3	1.10	8.7	1.87	0.126	38.9	12.6	14.82	5.9	21	870	
1992	16.5	1.16	8.8	1.88	0.132	39.7	12.9	14.20	5.9	31		

TABLE 39

Recent Analysis of Smoke Chemistry for Marlboro KS

	Tar (mg/cig)	Smoke Ammonia (ug/cig)	Smoke HCN (ug/cig)	Smoke Acetaldehyde (mg/cig)	Smoke pH
U.S.	17.5	17	206	0.87	5.9
Suisse	14.8	21	200	0.72	5.8
Germany	14.1	21	203	0.69	5.8
Brazil	14.9	8	216	0.91	6.4

TABLE 40

Marlboro KS Worldwide Deliveries

Country	Date	Tar	Nicotine	Puffs	Tar/Nic	Tar/Puff	Nic/Puff
U.S.A.	1991–1992	16.3	1.14	8.9	14.3	1.83	0.128
U.S.A.-Export	1989–1992	15.9	1.14	8.4	13.9	1.89	0.136
Germany	1989–1992	13.4	0.99	8.3	13.5	1.61	0.119
Switzerland	1990–1992	14.8	1.05	8.7	14.1	1.70	0.121
Belgium	1992	15.4	1.07	8.2	14.4	1.88	0.130
Holland	1989–1991	14.8	1.03	8.3	14.4	1.78	0.124
UK	1986–1991	13.0	1.06	8.7	12.3	0.49	0.122
France	1986–1991	14.8	1.05	8.8	14.1	1.68	0.119
Italy	1980–1991	15.2	1.01	7.9	15.0	1.92	0.128
Greece	1990–1992	15.3	1.10	8.5	13.9	1.80	0.129
Spain	1989–1991	16.0	1.18	8.1	13.6	1.98	0.146
Austria	1980	13.2	0.91	8.9	14.5	1.48	0.102
Yugoslavia	1989–1990	17.4	1.27	9.9	13.7	1.76	0.128
Denmark	1980	14.8	1.10	9.0	13.3	1.64	0.123
Sweden	1980–1982	14.6	1.07	8.8	13.6	1.66	0.122
Norway	1980–1982	16.1	1.14	9.1	14.1	1.77	0.125
Average Europe		15.0	1.08	8.7	13.9	1.73	0.125
Brazil	1986–1991	15.1	1.36	7.7	11.1	1.96	0.177
Argentina	1986–1992	15.3	1.09	7.9	14.0	1.94	0.138
Venezuela	1991	16.3	1.11	7.7	14.7	2.12	0.144
Panama	1991–1992	15.6	0.95	7.2	16.4	2.17	0.132
Japan	1991–1992	15.1	1.18	8.3	12.8	1.82	0.142
Australia	1986–1991	13.6	1.25	8.2	10.9	1.66	0.152

TABLE 41

Cigarette Physical Properties
U.S. Marlboro KS

	Dry Density	Vent	Pack Moisture	Conditioned Moisture	Open Cig. Press Drop	Sealed Cig. Press Drop	Tob. Sect. Press Drop	Hardness at 13.5% MC	End Stability	Coal Retention	Puffs
1970		0.0			4.5	4.5	2.0				
1971		0.0									
1972		0.0									
1973		0.0									
1974		0.0			4.4	4.4	1.7				
1977	210	0.0	13.2	13.5	4.5	4.5	1.8	1.92	15	87	7.8
1978		0.0	12.9		4.6	4.6	1.8		18	80	7.8
1979	209	9.7	13.3	13.4	4.5	4.7	2.0	2.04	26	78	8.2
1980	207	9.4	13.1		4.6	4.9	1.9	2.00	18	92	8.2
1981	211	9.0	13.0	13.1	4.6	5.0	2.2	2.00	10	99	8.0
1982	209	9.4	13.2	13.7	4.7	5.0	2.1	2.07	17	96	8.5
1983	211	10.5	13.0	13.4	4.7	5.1	2.2	2.03	11	94	8.8
1984	213	10.2	13.3	13.2	4.7	4.8	2.2	1.96	8	98	8.9
1985	212	9.5	13.6	14.3	4.7	5.0	2.1	1.74	9	100	8.9
1086	213	10.3	13.6	13.9	4.7	5.1	2.2	1.79	8	99	9.0
1987	212	8.3	13.7	14.6	4.8	5.1	2.2	1.63	7	99	8.7
1988	211	9.4	13.6	14.5	4.8	5.1	2.2	1.76	7	98	8.7
1989	213	11.1	13.5	15.2	4.5	4.9	2.1	1.80	7	98	8.7
1990	211	12.3	13.6	14.9	4.5	4.9	2.2	1.99	6	99	8.5
1991	210	12.6	13.1	14.1	4.6	5.0	2.2		6	99	8.7
1992	213	12.9	13.3	13.5	4.5	4.9	2.1	2.01	4	98	8.8

TABLE 42

Worldwide Marlboro Cigarette Physical Properties

	Dry Density	End Stability	Coal Retention	Hardness @13.5% M.C.	Tobacco Section Pressure Drop	Puff Number
U.S.A.	212	6	99	1.93	2.2	8.7
U.S.–Export	213	5	99	1.94	2.0	8.4
Germany	217	7	100	2.13	2.1	8.3
Greece	210	4	100	2.04	2.2	8.5
Holland	211	5	99	2.20	1.9	8.3
Switzerland	212	5	100	2.11	2.0	8.7
Italy	207	7	97	1.96	2.1	7.9
Spain	223	9	100	1.87	1.9	8.1
Japan	218	7	100	2.46	2.0	8.3
Brazil	220	7			2.0	7.7
Argentina	219	4	97	1.90	2.2	7.9
Venezuela	210	6	97	1.90	1.6	7.7
Panama	214	9	97	2.18	1.7	7.2
Malaysia (RJR)	217	18	100	2.18	1.7	

TABLE 43

U.S. Marlboro Styles Cigarette Construction

	Tar	Style	Dry Density	% Vent	Open Cigarette Press Drop	Sealed Cigarette Press Drop	Filter Press Drop	Tobacco Section Press Drop	% Filter Triacetin	% Filter Efficiency	Paper Porosity	% Paper Additive	Conditioned Moisture %
Marlboro	FF	KS	211	12.0	4.6	5.0	2.8	2.2	7.9	38.8	35.0	0.49	14.4
Marlboro	FF	100	212	14.9	4.8	5.5	3.1	2.5	7.8	40.3	38.0	0.49	14.5
Marlboro	MD	KS	213	18.7	4.6	5.3	3.2	2.1	7.9	42.8	31.0	0.52	15.2
Marlboro	LT	KS	213	22.5	4.9	5.9	3.9	2.0	7.5	47.3	39.0	0.47	14.3
Marlboro	LT	100	214	34.7	4.8	6.6	4.2	2.5	7.4	51.5	32.0	0.45	14.4
Marlboro	UL	KS	190	42.9	4.4	6.3	4.6	1.7		57.7	44.0	1.10	13.9
Marlboro	UL	100	187	48.6	4.3	6.7	4.5	2.1		63.0	46.0	2.85	14.0

TABLE 44

U.S. Marlboro Styles Deliveries

	Tar	Style	Tar	Nicotine	Puffs	Tar/Nic	Tar/Puff	Nic/Puff
Marlboro	FF	KS	16.2	1.14	8.8	14.2	1.84	0.130
Marlboro	FF	100	15.9	1.18	9.9	13.5	1.61	0.119
Marlboro	MD	KS	12.6	0.88	7.8	14.3	1.62	0.113
Marlboro	LT	KS	10.6	0.82	8.0	12.9	1.33	0.103
Marlboro	LT	100	10.4	0.82	9.7	12.7	1.07	0.085
Marlboro	UL	KS	6.0	0.51	6.8	11.8	0.88	0.075
Marlboro	UL	100	6.0	0.51	8.3	11.8	0.72	0.061

TABLE 45

Approximate Elasticity Values (Relative to Marlboro FF KS = 100)

Tar	Elasticity (Per Puff)
FF KS	100
MD KS	95
LT KS	107
LT 100	109
UL KS	100

TABLE 46

PM Casing Technology – 1976 (1)

	Flue–Cured/ Oriental	Flue–Cured ET	Burley Casing	Burley Side Top Dressing	Blend (Pre–Cutter)	Stem(2)
Casing Weight Gain %:	6.1	6.1	19.7	2.5	0	7.9
Possible Ingredients:	– Invert Sugar – PG –Glycerine	– Invert Sugar – PG – Glycerine	– Sucrose – Cocoa – Licorice (Block) – Chocolate Liquor (High Butterfat) – White Noncrystaline Powder – Synthetic Honey	– PG – Glycerine – Invert Sugar – St.John's Bread – Flavors (Chocolate/Maple)	– Steam – PG	– PG – Glycerine

(1) Suspected casing use in circa 1976. More recent information makes the addition point of traditional burley casing (e.g., sucrose, licorice) questionable. Some or all may now be at the top dressing step.

(2) No chemical evidence of stem casing has been determined.

TABLE 47

Marlboro Flavor Technology

FLAVOR

- Addition Rate is 2.4% Total of Which 0.8% is Solids Content
- Possible Ingredients
  - . Indication of Sugar/NH3 Reaction Products and Sugar Caramel Products Dominating the Flavor. (Possibility of PM's Practice of Their Patent 4,236,606 of 9/1/81 – Sugar/NH3 RXN with Fatty Acids.)
  - . Synthetic Honey Flavor
  - . Chocolate Flavor
  - . Coumarin Substitute
  - . Anise Oil
  - . Valerian Root Extract
  - . Coriander Oil
  - . Oil of Sweet Birch
  - . Rum, Sherry or Cognac
  - . Menthol/Peppermint Oil
- Pack Aroma
  - . Fruity
  - . Winey
  - . Vinegar (Acetic Acid)
  - . Chocolate

CONFIDENTIAL MINNESOTA TOBACCO LITIGATION

TABLE 48

U.S. Domestic Marlboro KS Changes Over Time

	Leaf	Paper Recon	Bandcast Recon	Stem	Total By-Products		Casing/Flavoring Recipe	Cigarette Design & Processing
1974		First Added	Lowered Level					
1975		Increased Level	Lowered Level					
1976		Increased Level	Lowered Level					Lower Tar
1977		Increased Level	Lowered Level		Increased			Increased Filter PD
1978		Increased Level	Lowered Level	Lowered Level	Increased	Increased Level		
1979		Increased Level	Lowered Level	Lowered Level		First Diet		Added Vent
1980		Increased Level	Lowered Level	Lowered Level		Increased Level		
1981		Increased Level	Lowered Level	Lowered Level		Increased Level		Increased Tob. Sec. PD
1982		Added DAP/Lowered Nitrates/Added Urea	Lowered Level	Lowered Level				
1983			Lowered Nitrates	Lowered Level			Increased Sugars (PC Casing)	Lowered Circ./Lowered Nontobacco/Wgt
1984		Increased Level		Lowered Level				Lowered Citrate
1985				Lowered Level	Increased			
1986			Lowered Level	Lowered Level				Lowered Filter Efficiency
1987		Added 2nd Non-DAP Paper (?)						
1988						Last Acct	Increased PG & Glycerine	
1989	Eliminated Off-Shore Tob.					Lowered Level		
1990		Increased Level	Lowered Level			Lowered Level		Increased Vent
1991			Lowered Level			Lowered Level		

TABLE 49

Summary of KOOL KS Changes

	Blend	Casing/Flavoring	Design
1974		Casing Changed: PG Reduction Flavor Change: Synthos Elimination Alcohol Reduction	Plasticizer Reduced
1975			
1976			
1977		Synthetic Menthol Used	
1978	PJS Replaced PCL Oriental Increased Off-Shore Burley Added		
1979			
1980			
1981	ET-1 Added (4%)	Casing Change Menthol Level Reduced	Density Reduced Plasticizer Changed Paper Changed
1982	ET Increased (8%)		Density Reduced
1983	MET Replaced G-13		
1984			
1985	Changed to New Blend	Changed to New Casing/Flavor/Menthol .40%	Changed to New Design
1986			
1987			
1988		Menthol to .425%	Paper Porosity Increased Paper Citrate Reduced Reduced Circumference
1989			
1990			
1991			

TABLE 50

U.S. Marlboro KS Changes vs. Constants

	What's Changed?	What's Reasonably Constant?
BLEND	Paper Recon UP Bandcast Recon Down Second Paper Recon Added ET Level ET Type (ACET —> DIET) Stem Level Down Off–Shore Tobacco Level	Total By–Product Inclusion Oriental Level Oriental Type Flue/Burley Ratio
CASING/FLAVOR	PG Up Glycerine Up Flue–Cured Casing/Sugar Level Up	Burley Casing Flavor
COMPONENTS	Paper Recon DAP Added Paper Recon Urea Added Propyl Praben Added	Band Cast Recon DAP
DESIGN/PHYSICALS	Density Up Circumference Down NTW Down Paper Citrate Down Vent Added Puffs Up Filter Efficiency Down Pressure Drop Down Tobacco Section Pressure Drop	Tobacco Weight Paper Porosity Tar/Puff Filter Pressure Drop

LEGEND FOR ATTACHED FIGURES

A	Australia
B	Brazil
C	Greece
E	Average Europe
F	Finland
G	Germany
H	Holland
I	Italy
J	Japan
K	UK
L	Belgium
M	Malaysia (RJR)
N	Spain
O	Lucky Strike Export
P	Panama
R	RICHLAND (B&W)
S	Switzerland
T	Argentina
U	USA
V	Venezuela
W	Winston (US)
X	US - Export
VIC	VICEROY KS
CAM	Camel Filter KS
WIN	Winston KS
MAR	Marlboro KS
FK	FF KS
FL	FF 100
MK	Med KS
LK	Lts KS
LL	Lts 100
UK	Ult KS
UL	Ult 100

UF	US Marlboro FF
UM	US Marlboro Medium
UU	US Marlboro Ultra
DF	German Marlboro FF
DL	German Marlboro Lts
MUB	Marlboro US Blend
MGB	Marlboro German Blend
RBB	RICHLAND B&W Blend
WRB	Winston RJR Blend
MBB	Marlboro Brazil Blend
MAC	Marlboro ACET
MDT	Marlboro DIET
BDT	B&W DIET
WG7	Winston G13 Pre '87
WG8	Winston G13 Post '88
UFK	Marlboro FF KS US
UFL	Marlboro FF 100 US
UMK	Marlboro MD KS US
ULK	Marlboro LT KS US
ULL	Marlboro LT 100 US
UUK	Marlboro UL KS US
UUL	Marlboro UL 100 US
GFK	Marlboro FF KS Germany
GFL	Marlboro FF 100 Germany
GLK	Marlboro LT KS Germany
GLL	Marlboro LT 100 Germany

FIGURE 1

BLEND CONSTRUCTION/EXPANDED TOBACCO

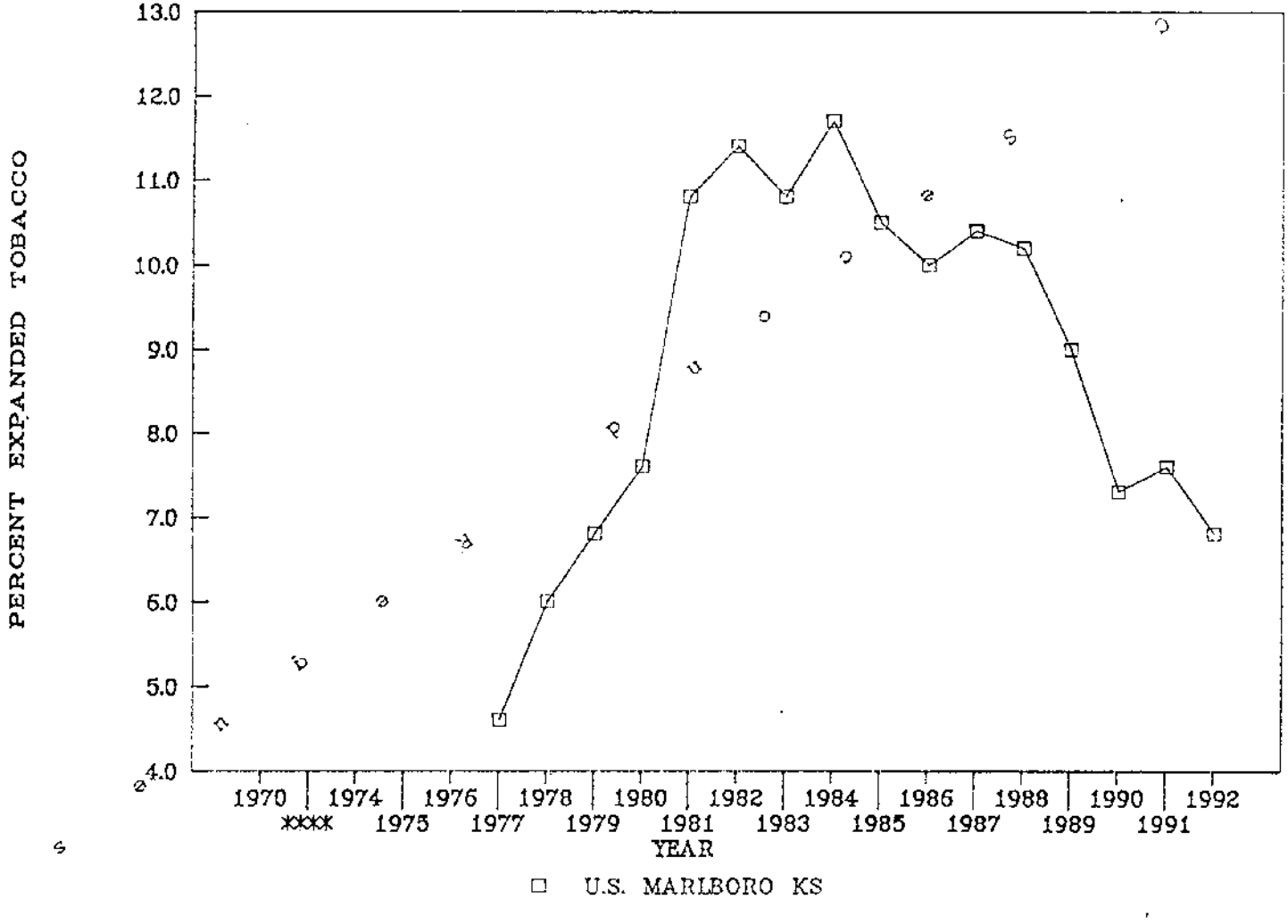


FIGURE 2

BLEND CONSTRUCTION/STEM LEVEL

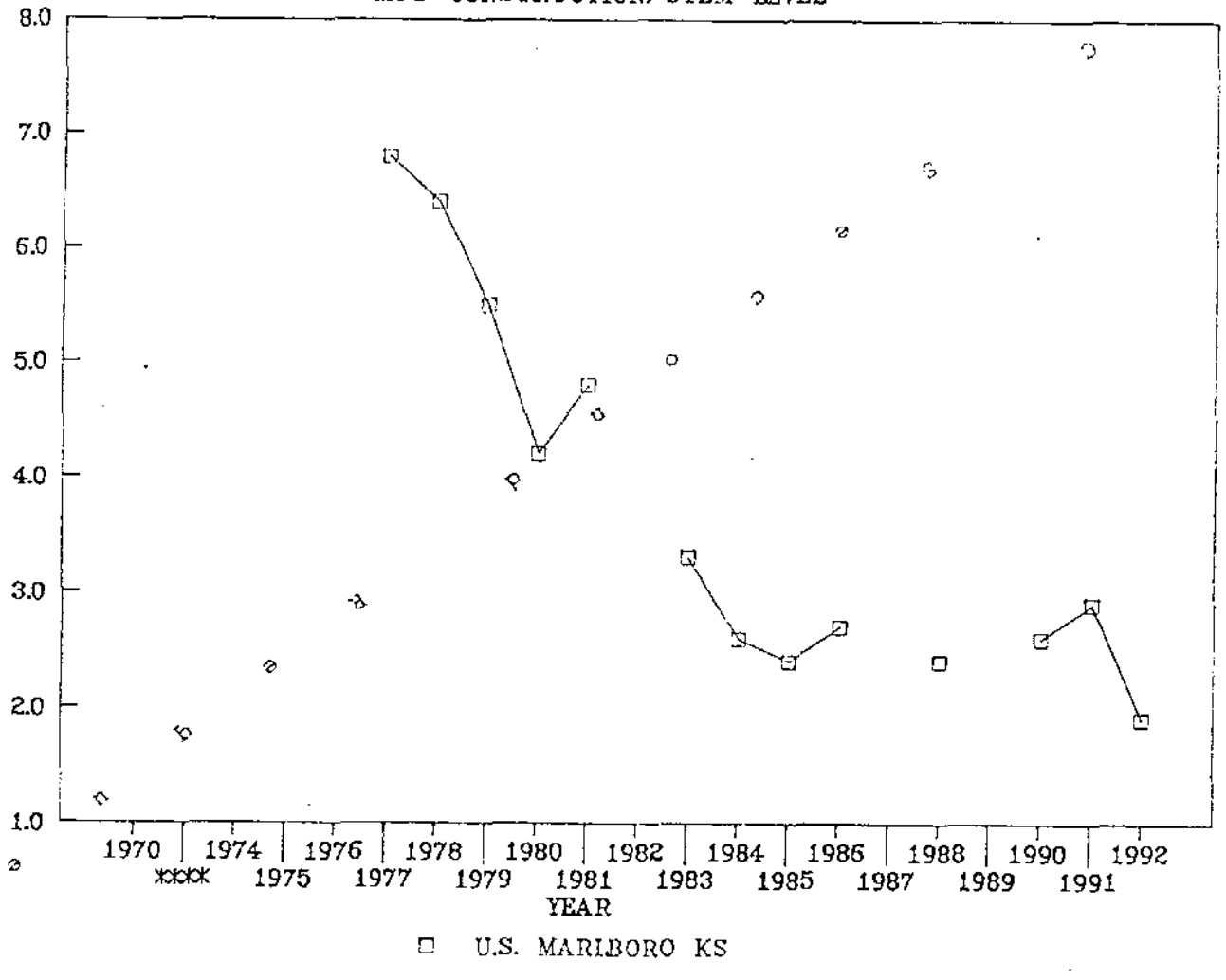


FIGURE 3

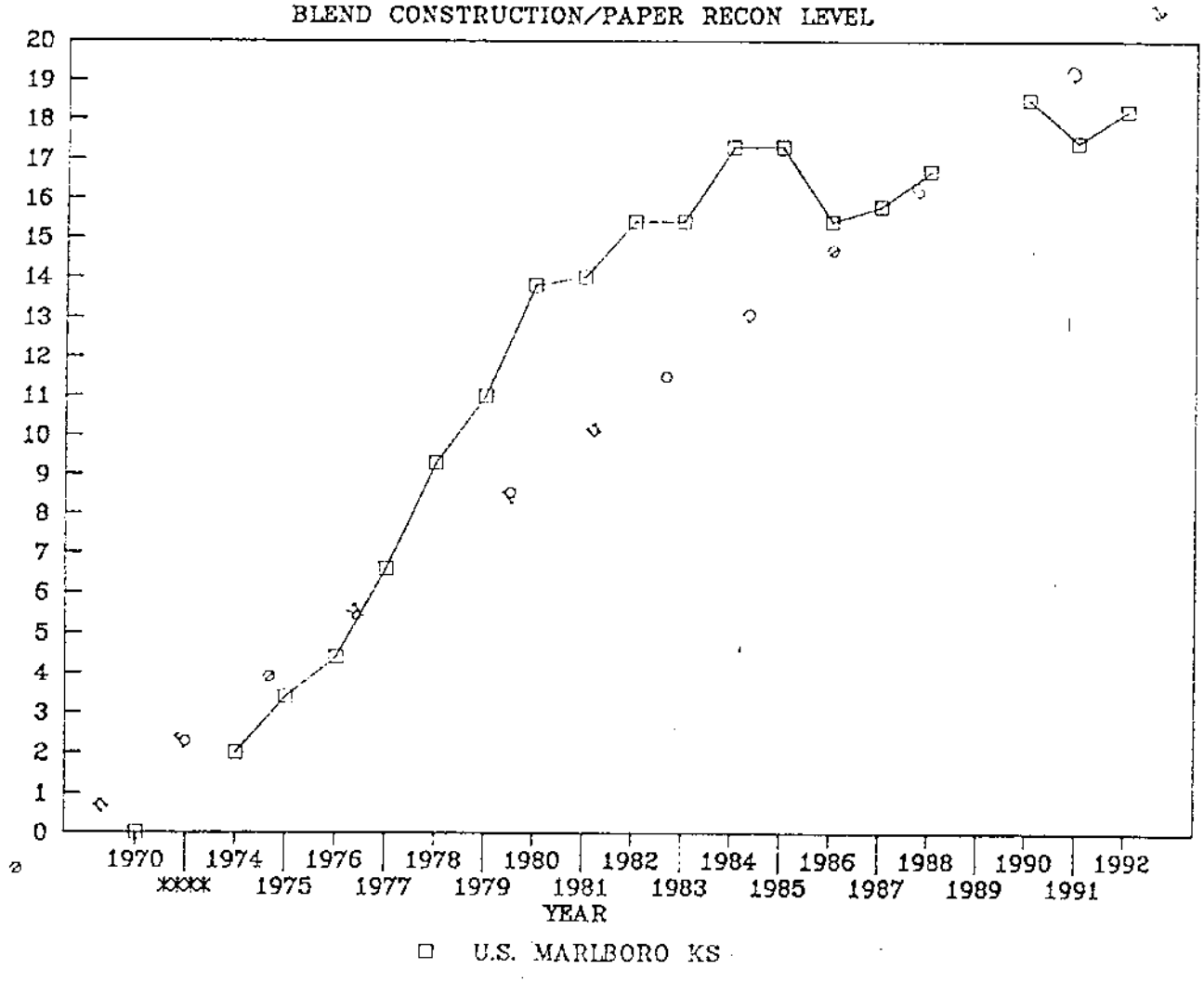
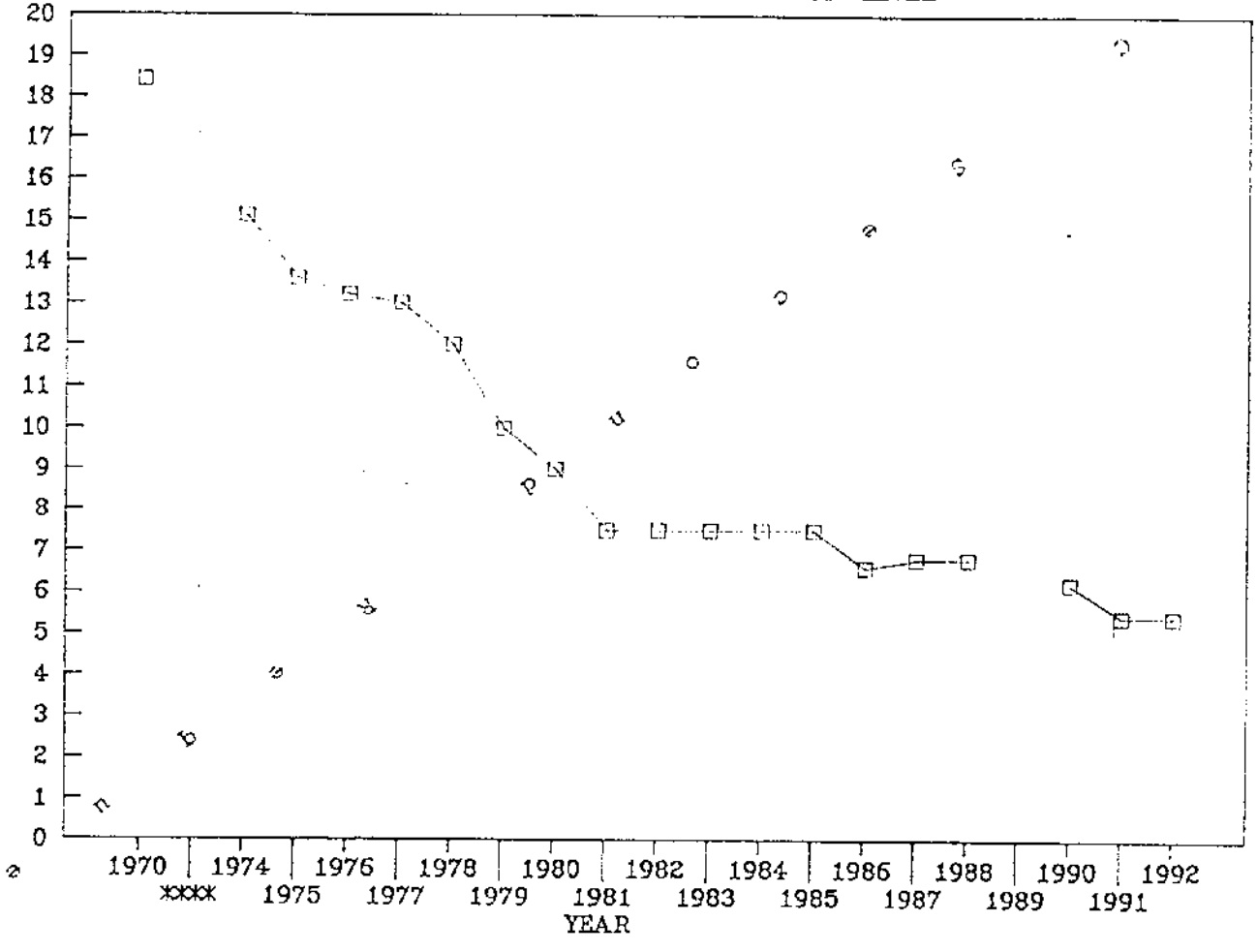


FIGURE 4

BLEND CONSTRUCTION/BANDCAST RECON LEVEL



B12 500181

FIGURE 5

CHLOROGENIC ACID VS NITRATES

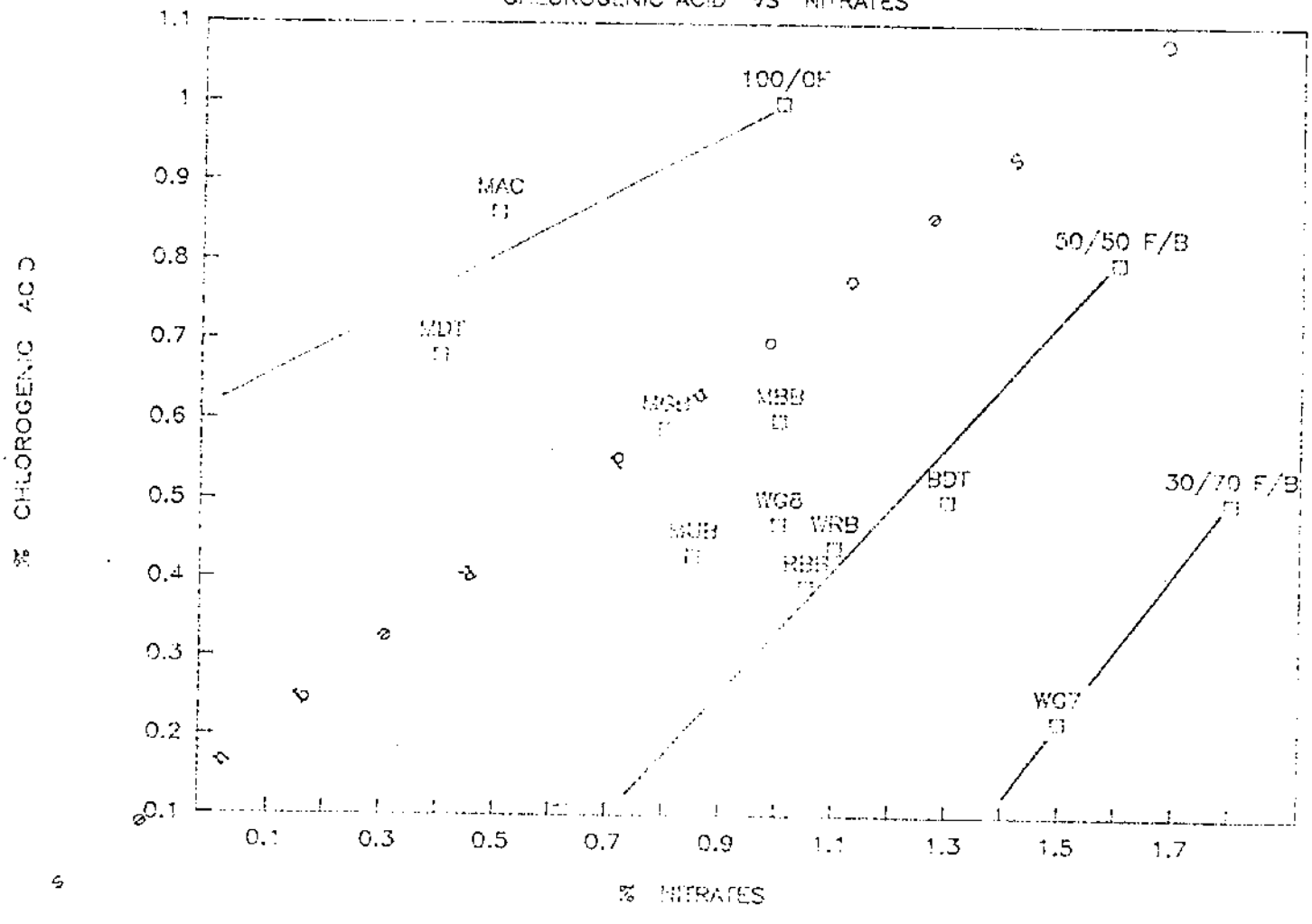


FIGURE 6

AMMONIA VS PHOSPHATES

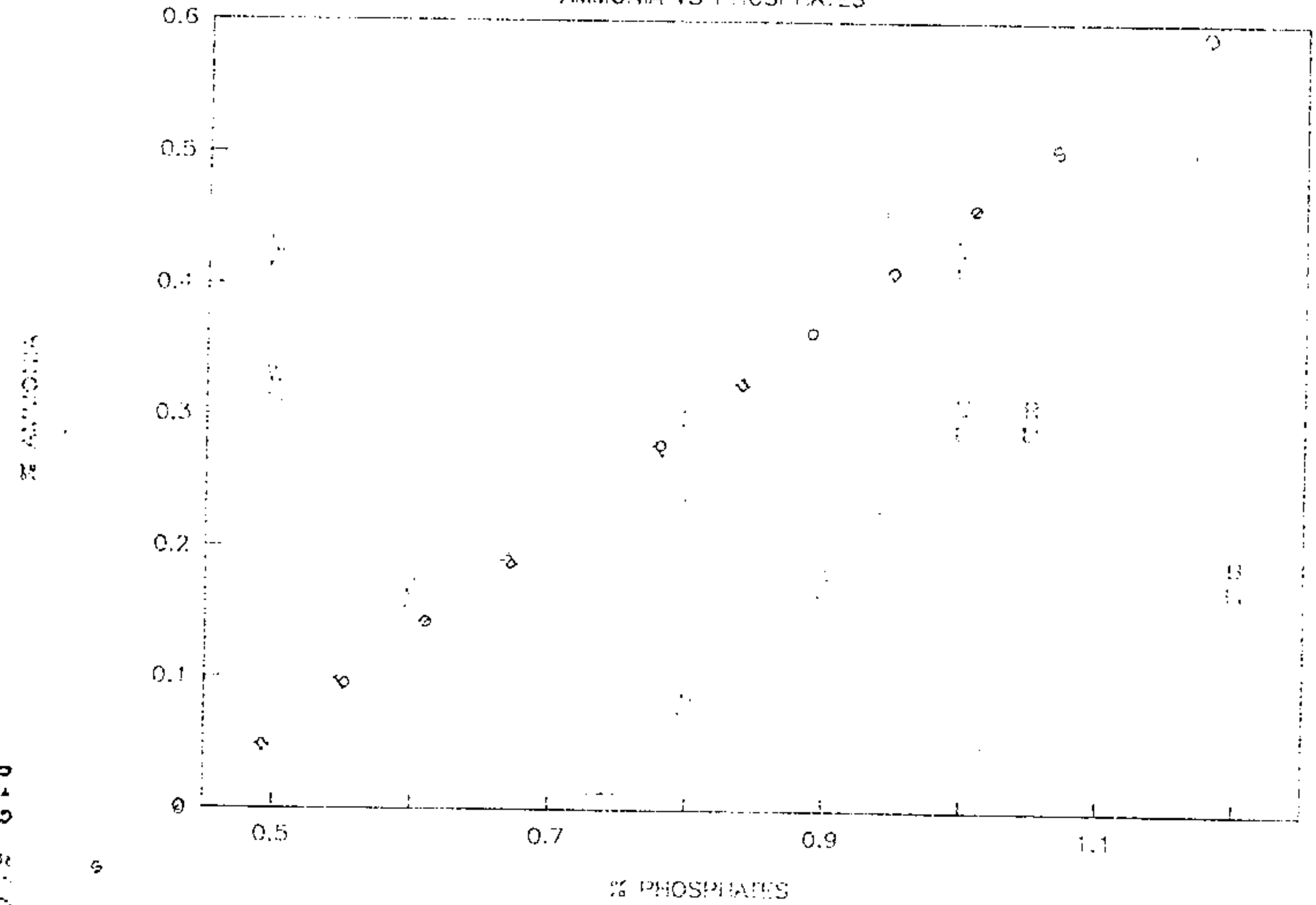
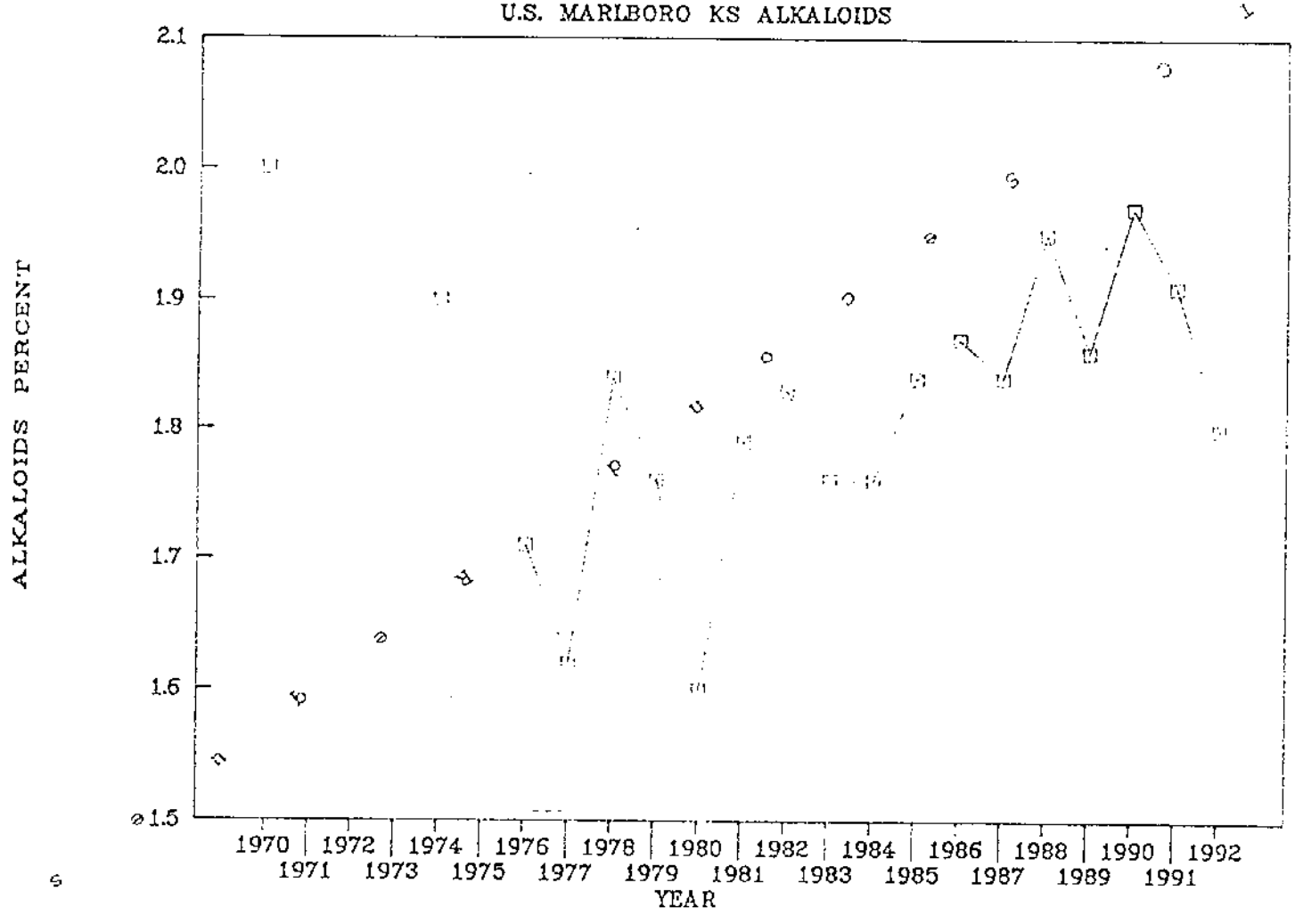


FIGURE 7



812 50021

FIGURE 8

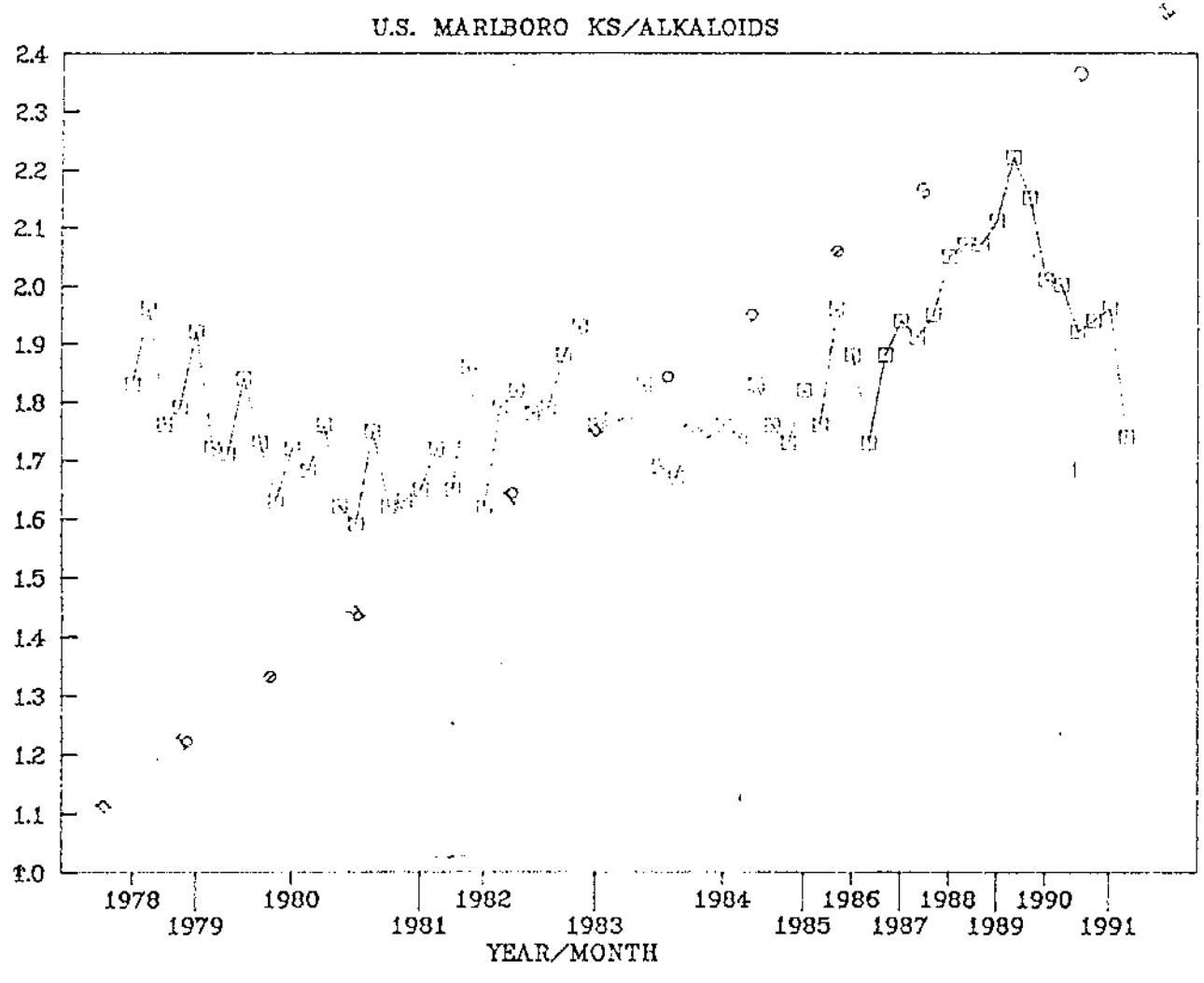
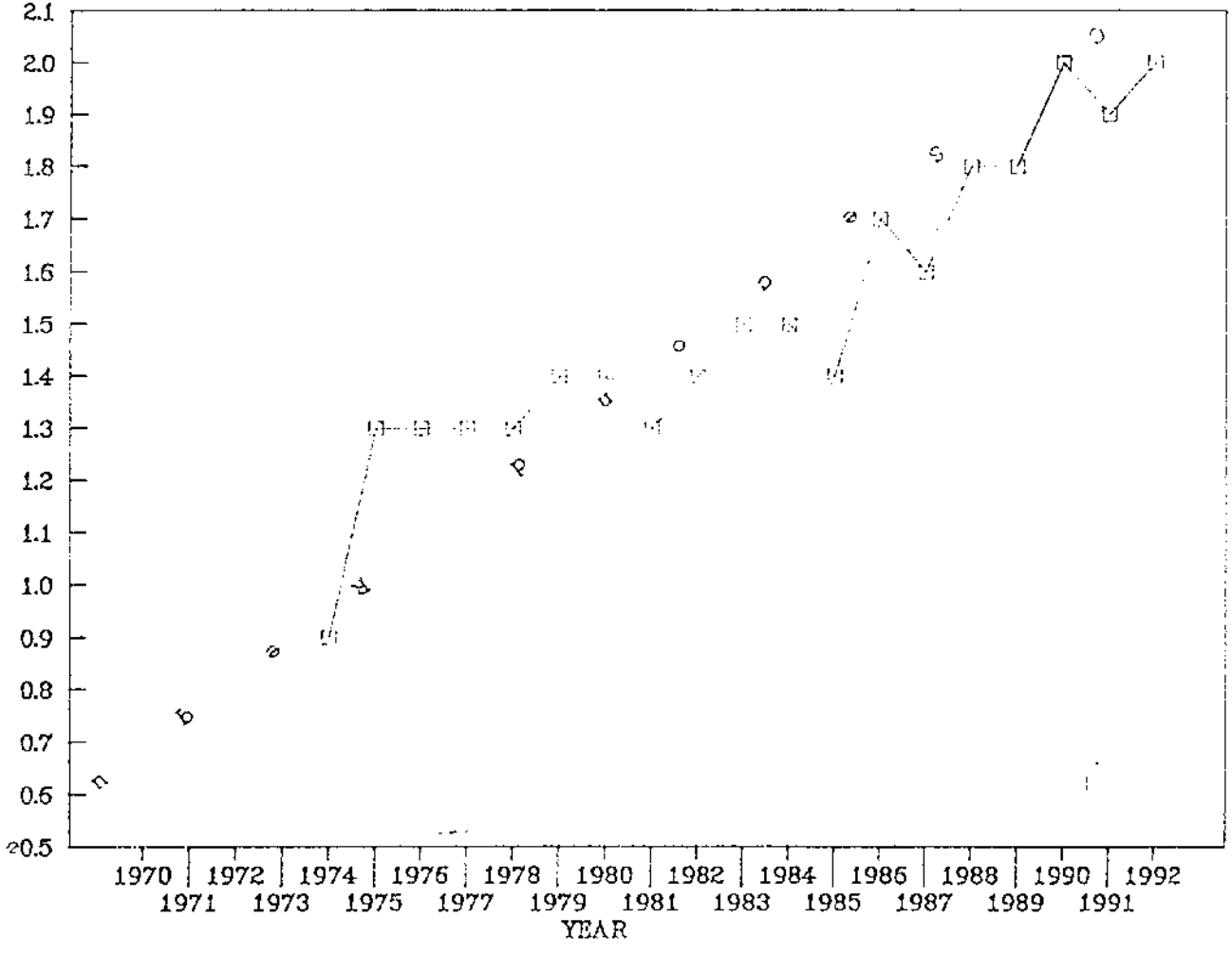


FIGURE 9

PG CONTENT OF U.S. MARLBORO KS



812 56623

FIGURE 10

GLYCERINE CONTENT OF U.S. MARLBORO KS

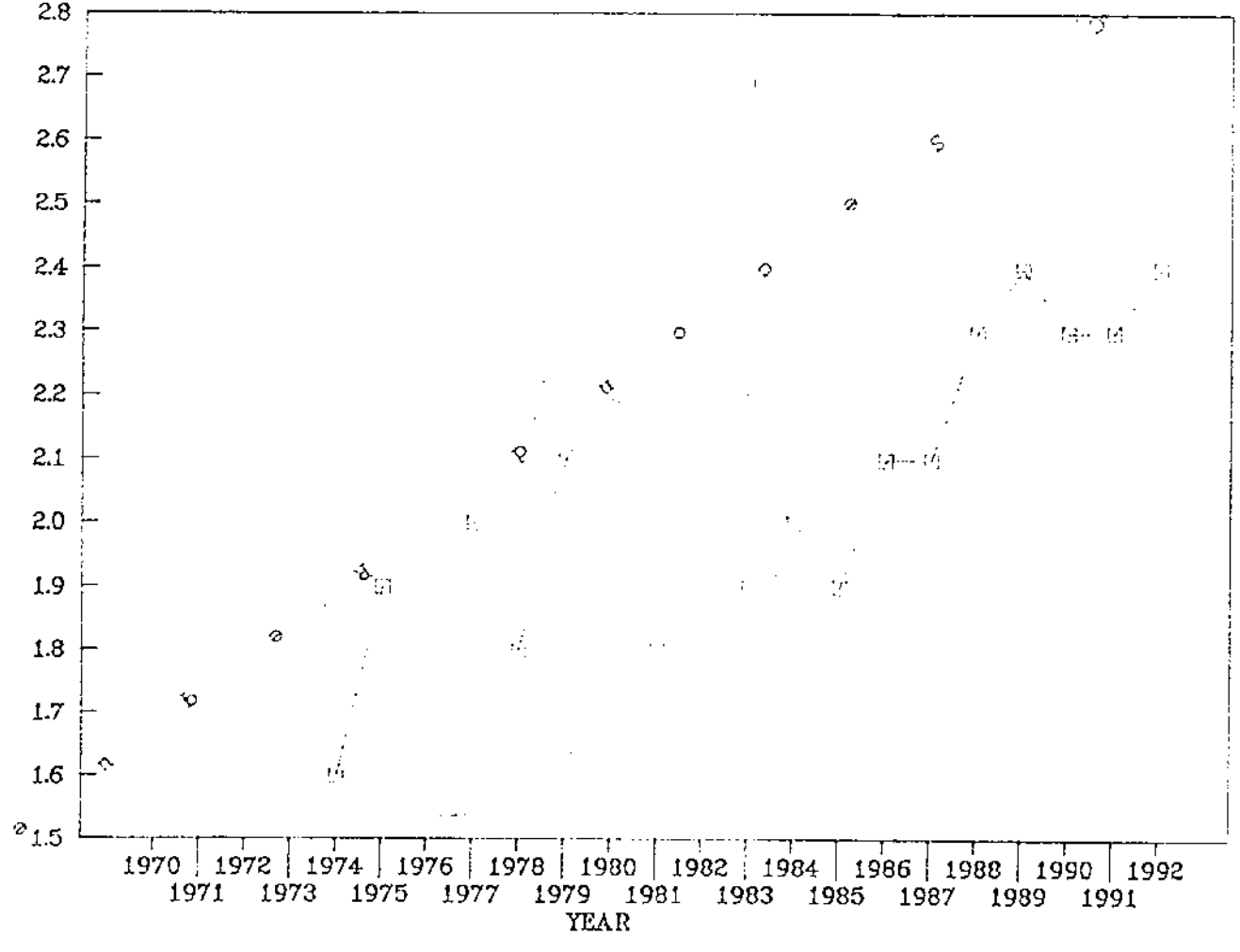
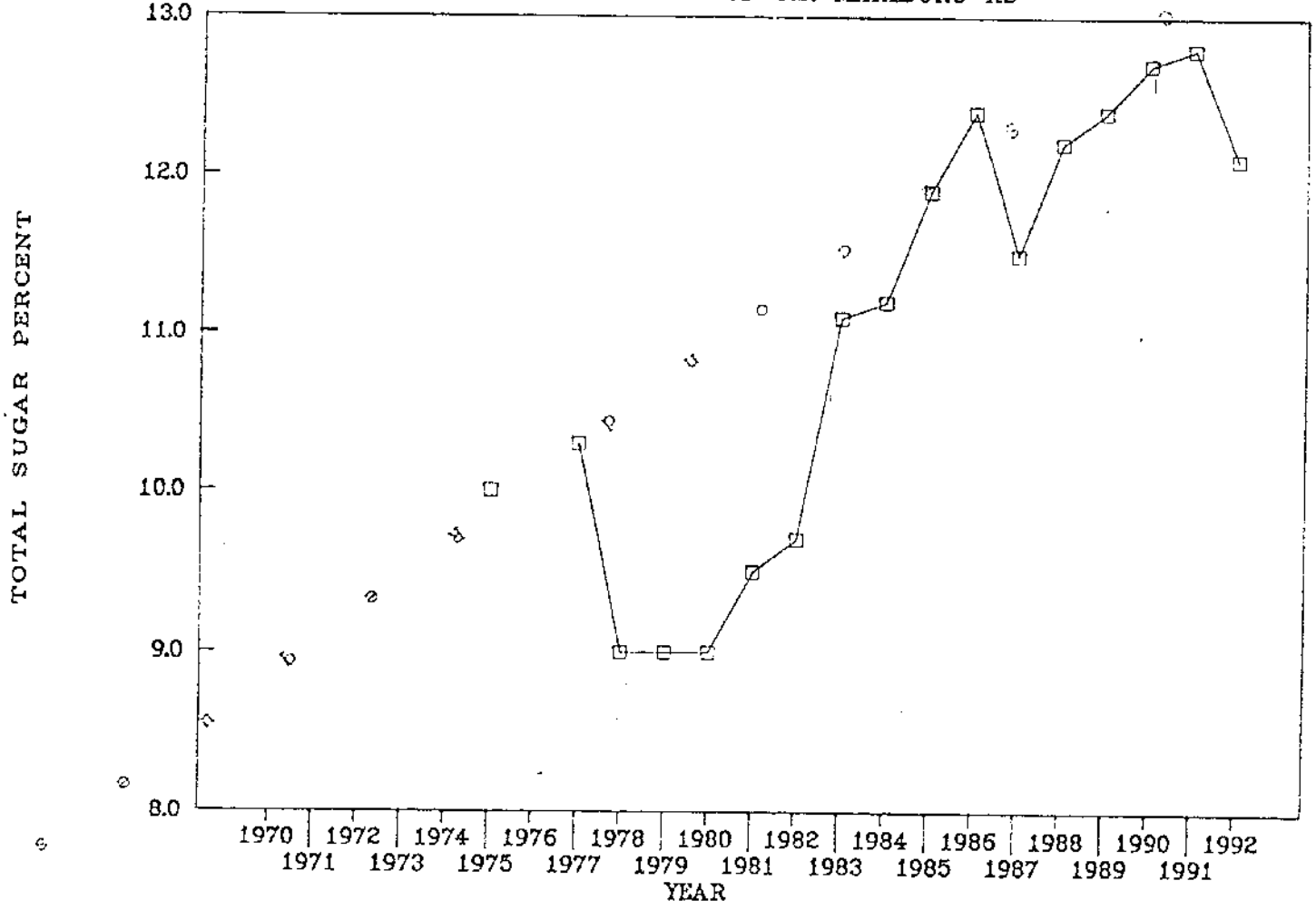


FIGURE 11

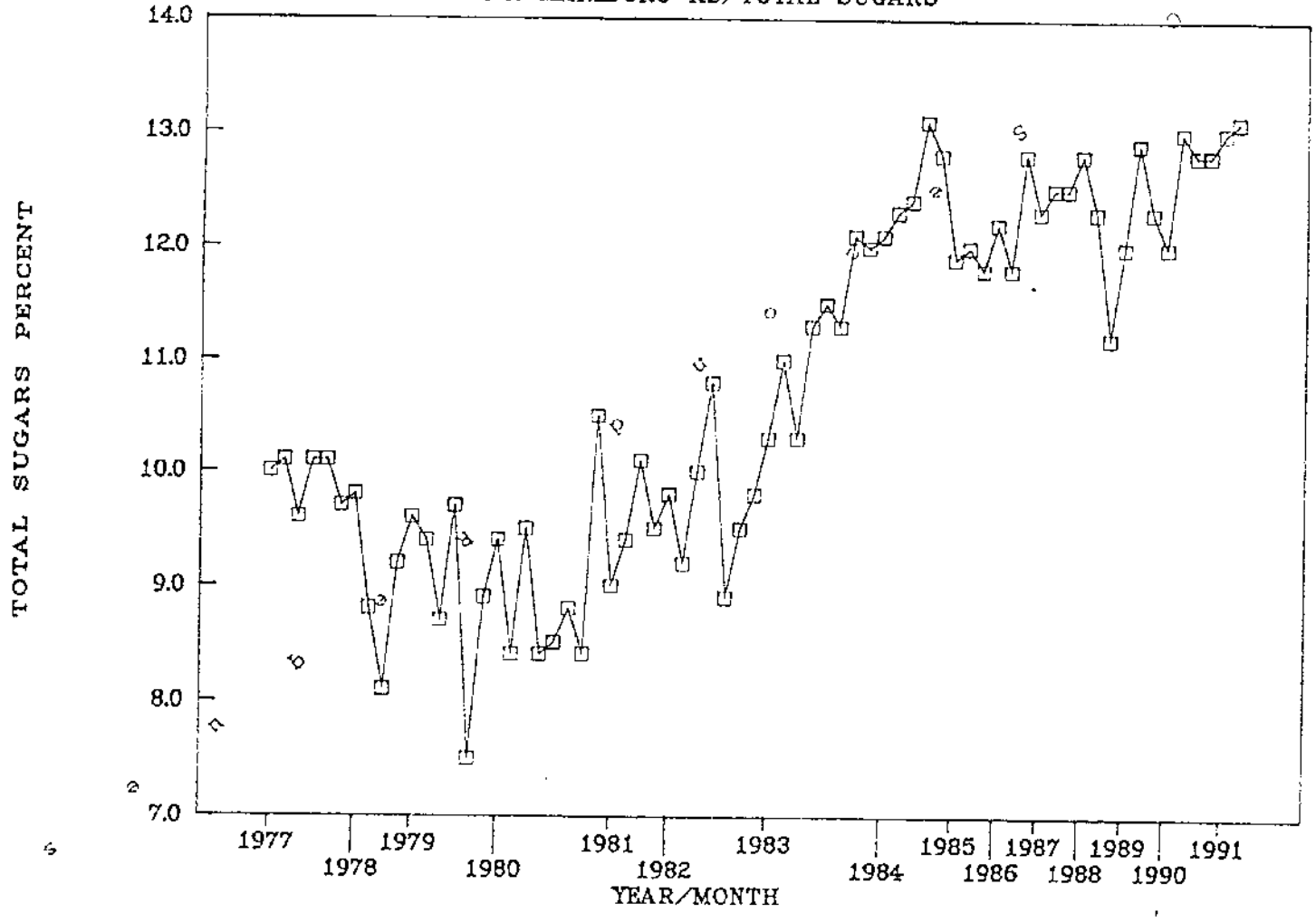
TOTAL SUGAR CONTENT OF U.S. MARLBORO KS



B12 056025

FIGURE 12

U.S. MARLBORO KS/TOTAL SUGARS



812 00626

FIGURE 13

REDUCING SUGAR CONTENT/U.S. MARLBORO KS

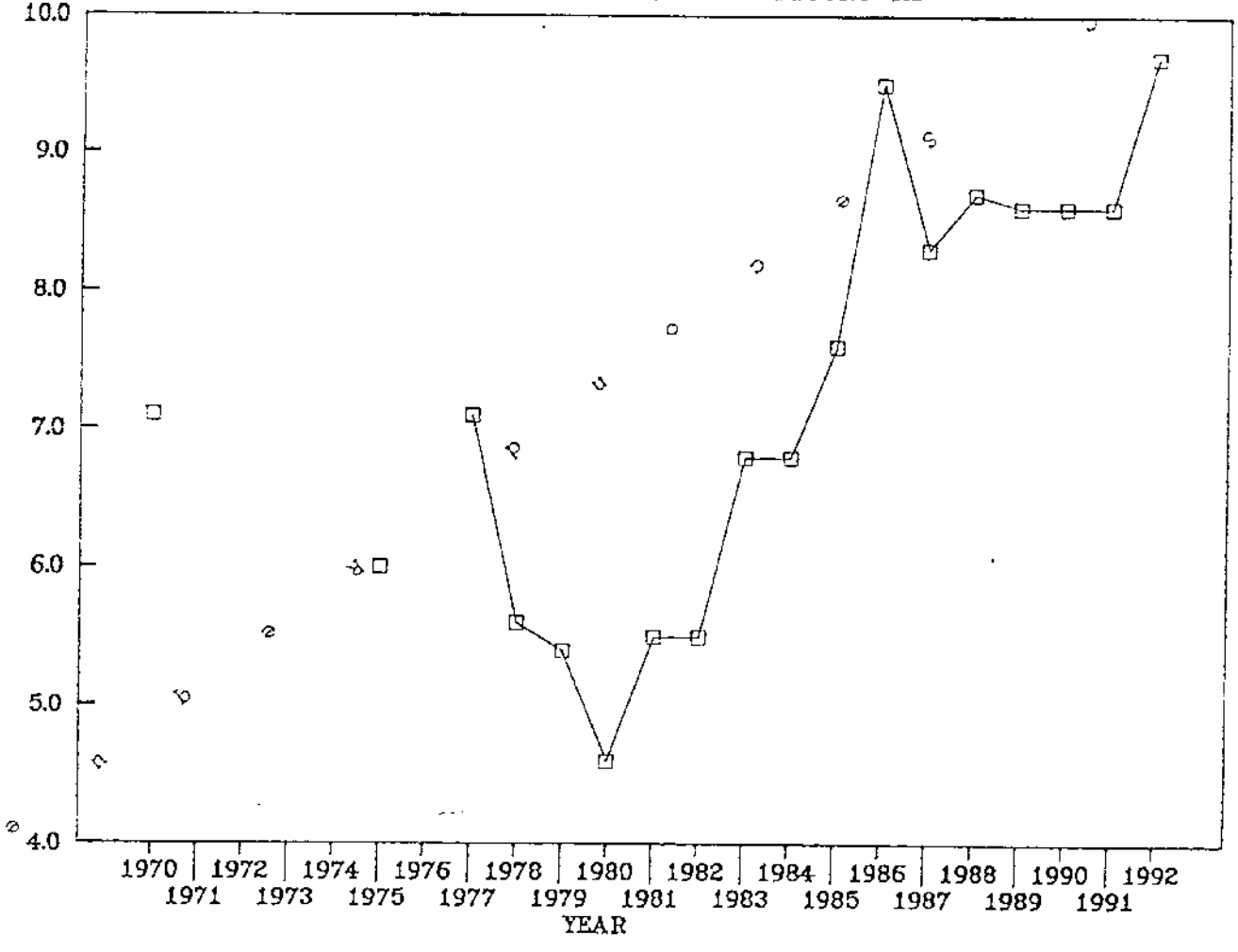


FIGURE 14

U.S. MARLBORO KS/REDUCING SUGARS

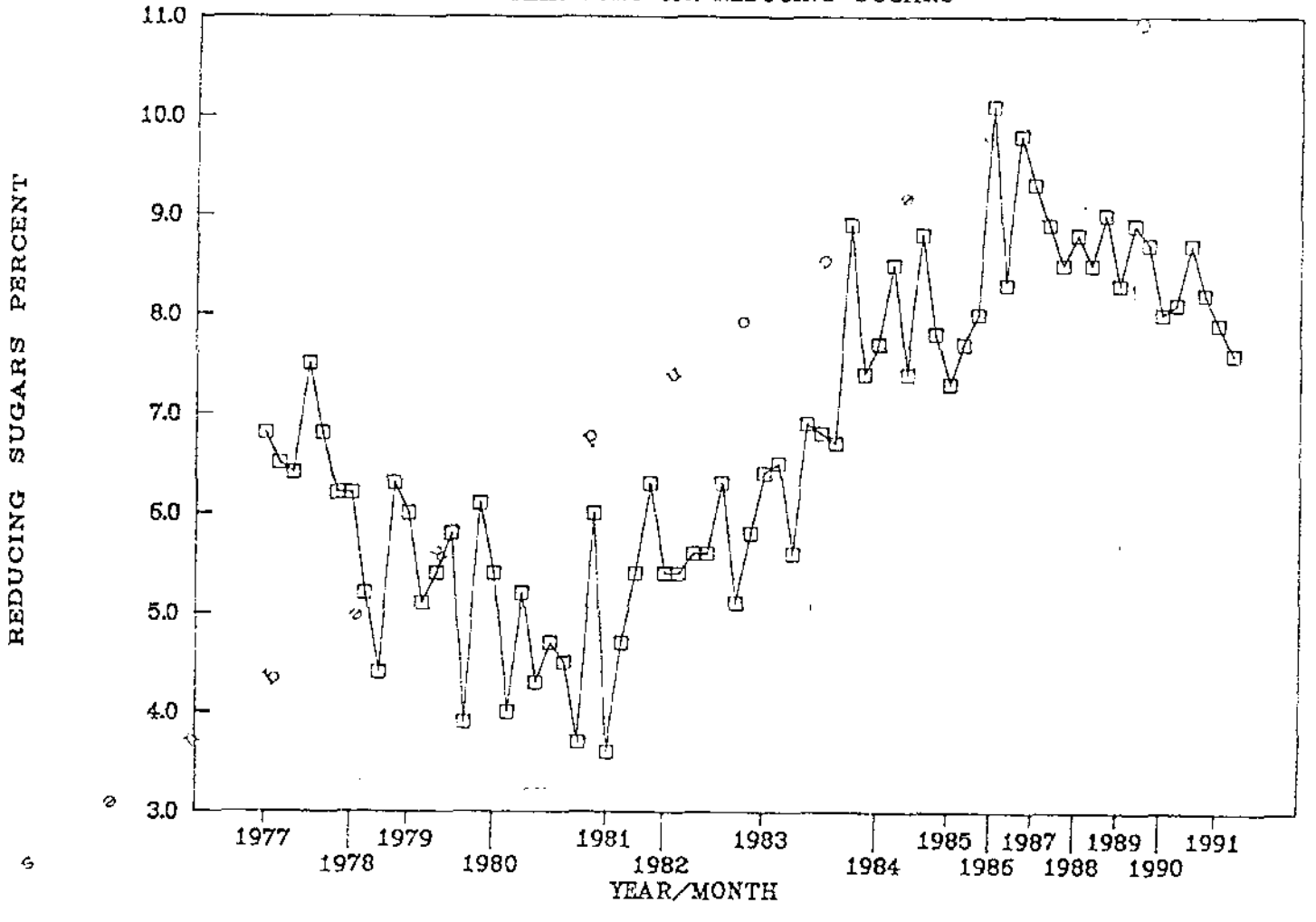
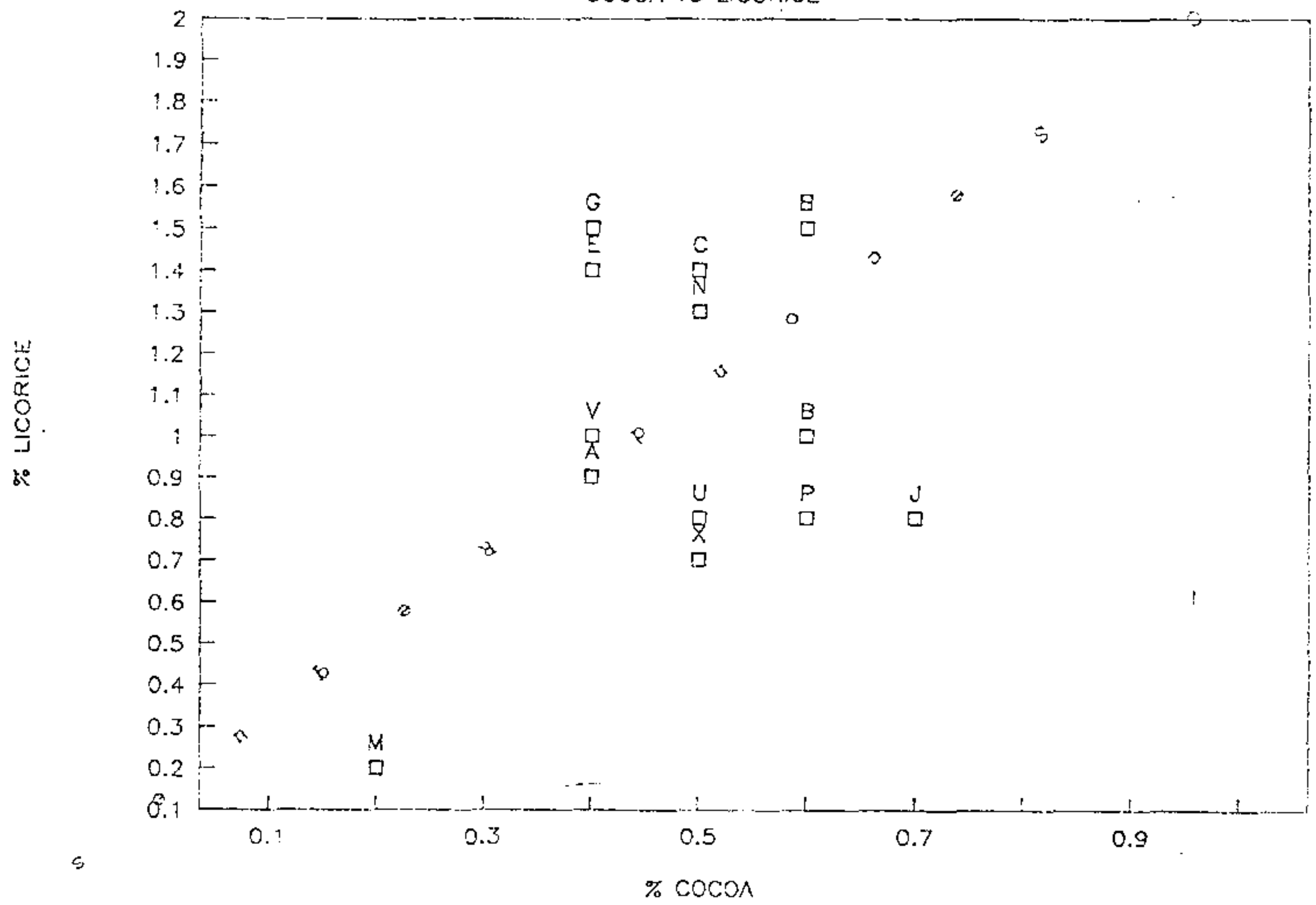


FIGURE 15

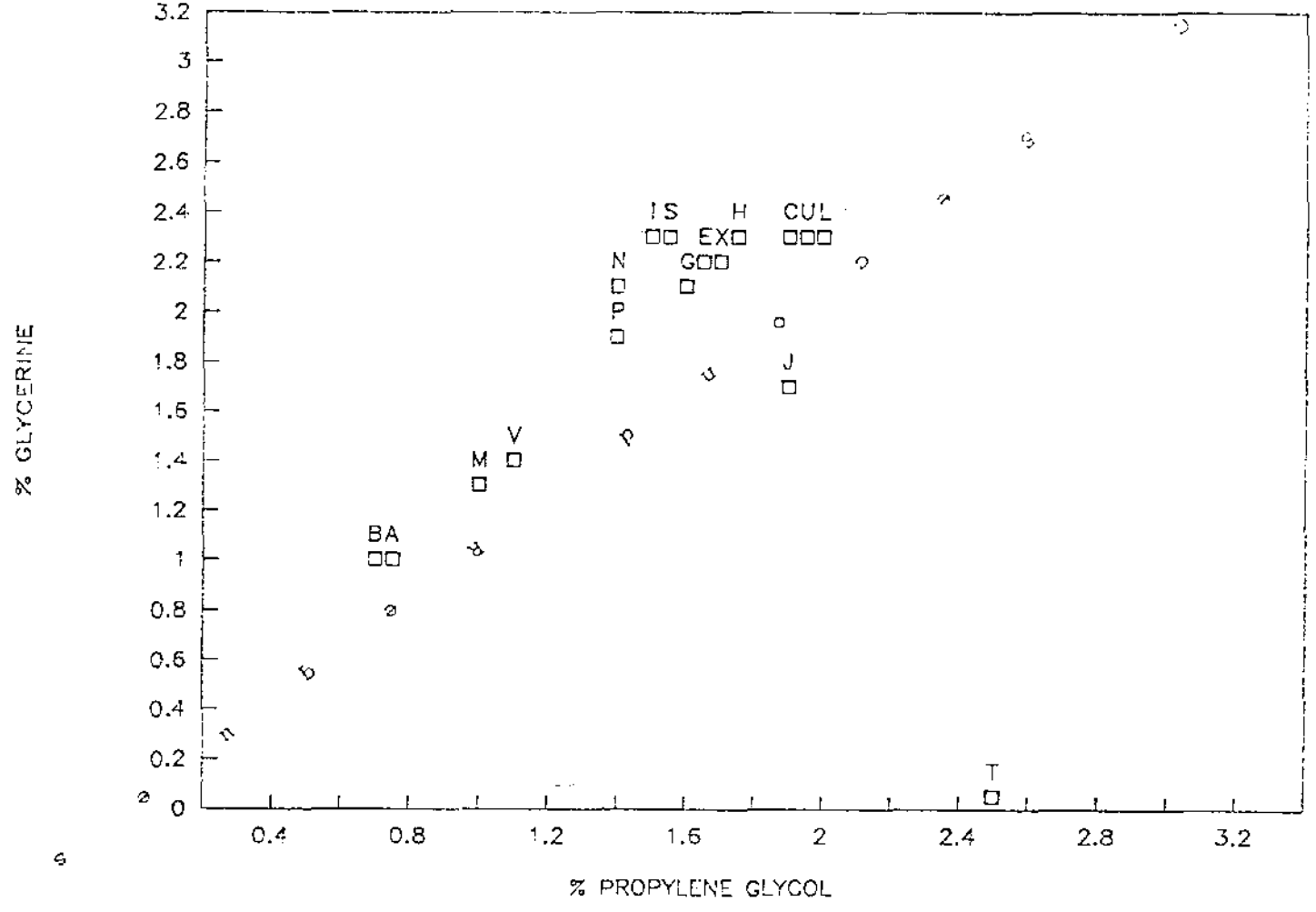
COCOA VS LICORICE



812 58629

FIGURE 16

PG VS GLYCERIN



812 59630

FIGURE 17

AMMONIA CHEMISTRY (DS SCAN)

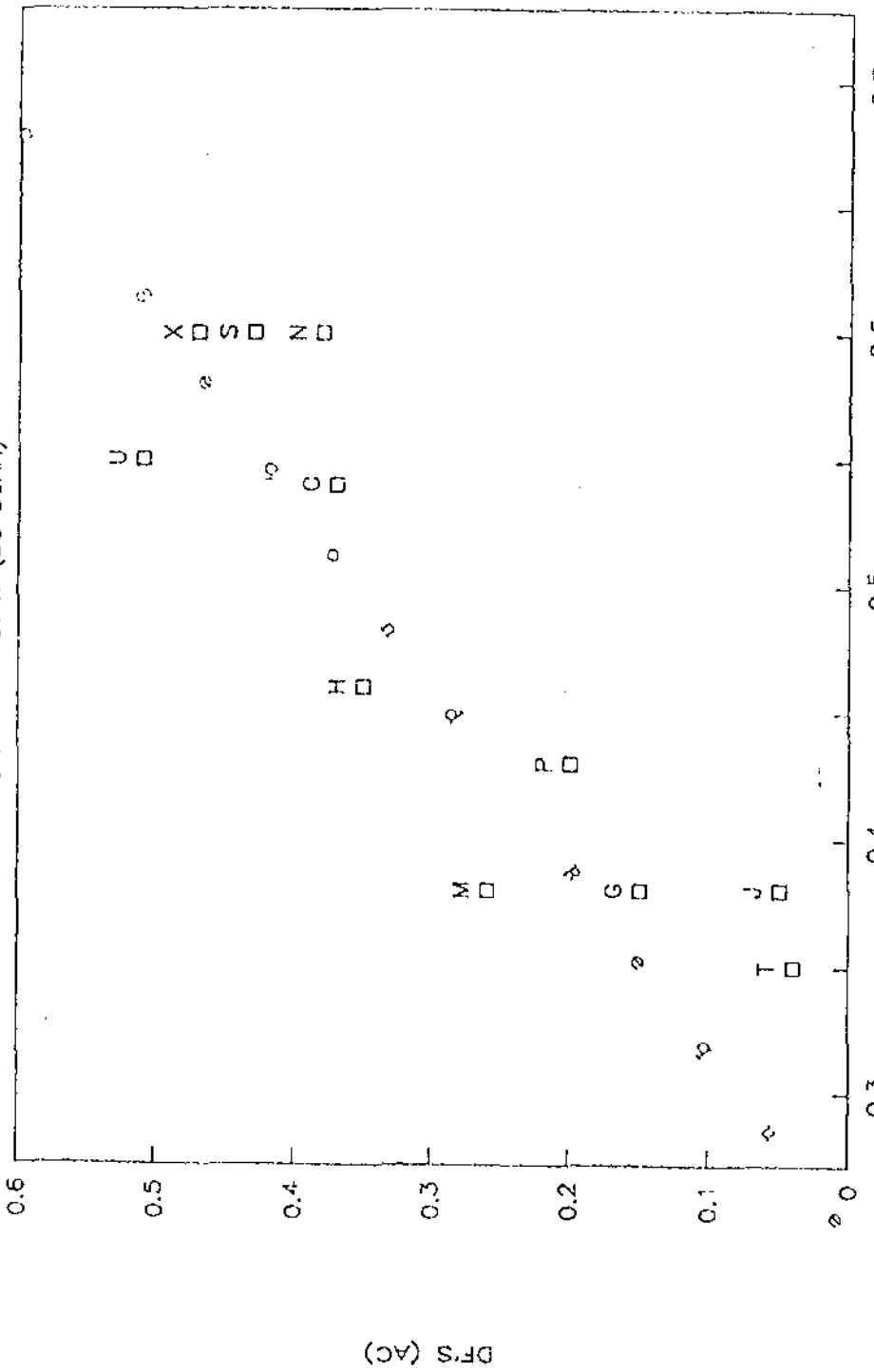
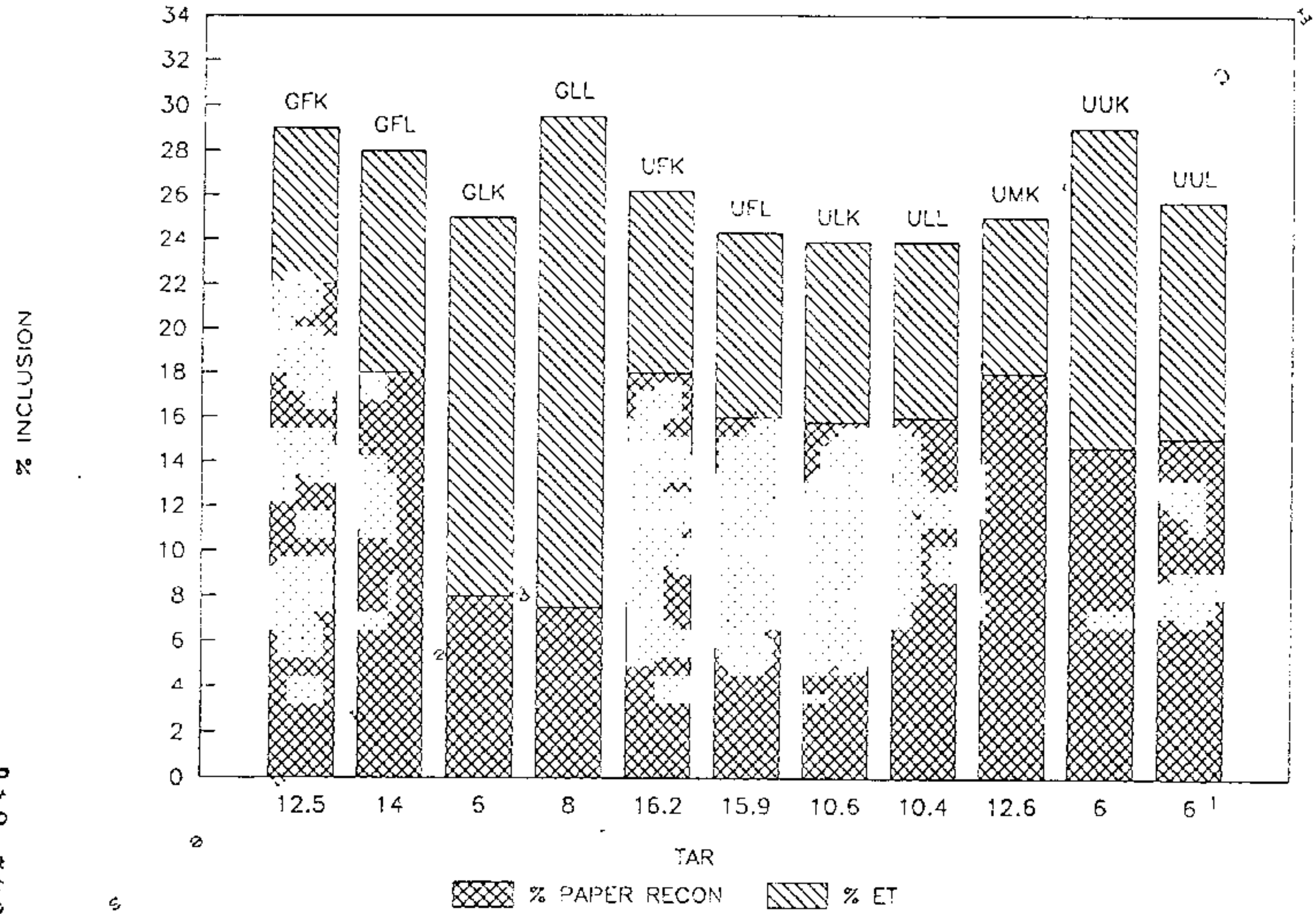


FIGURE 18

BLEND CONSTRUCTION VS TAR



812 56632

FIGURE 19

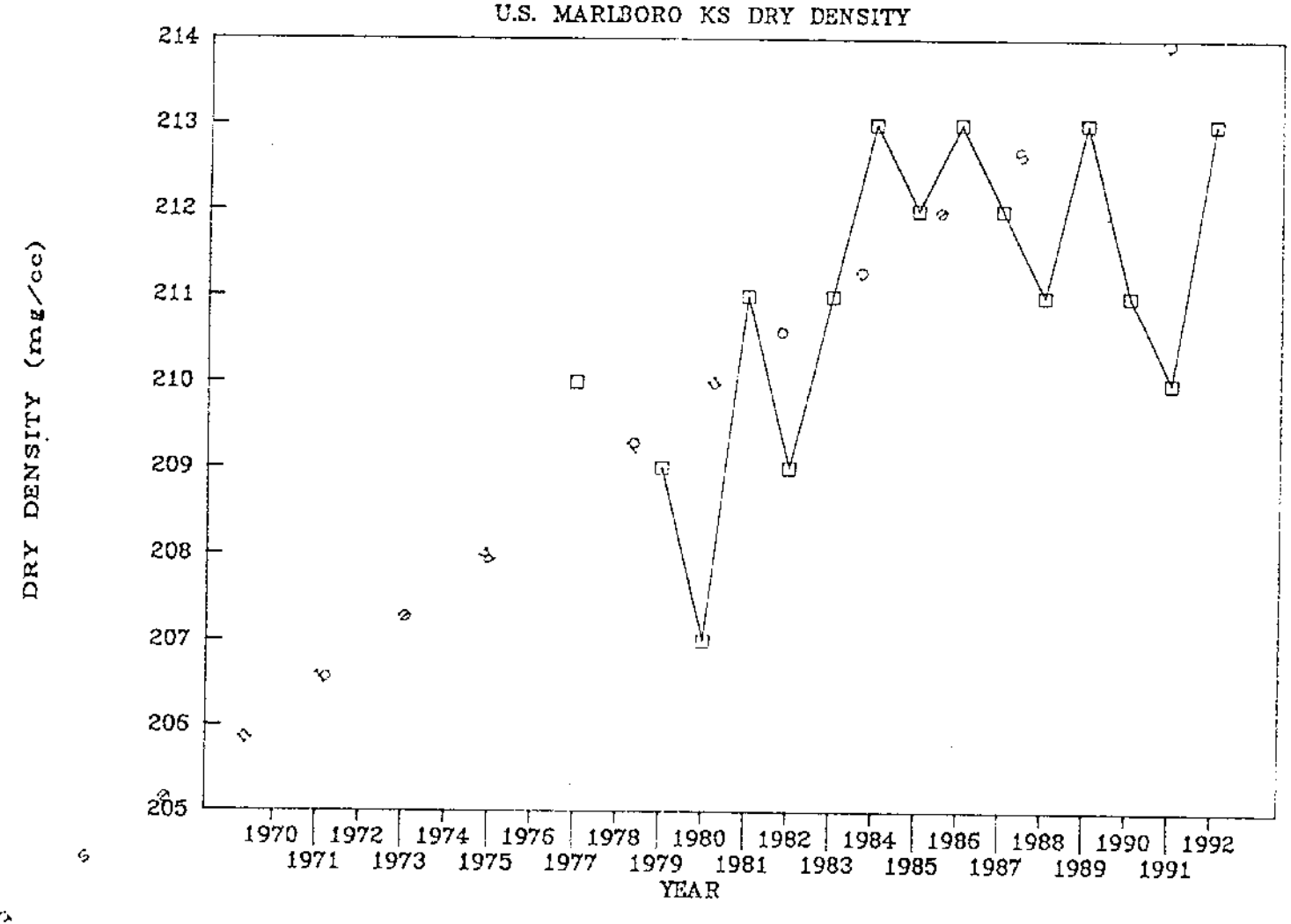
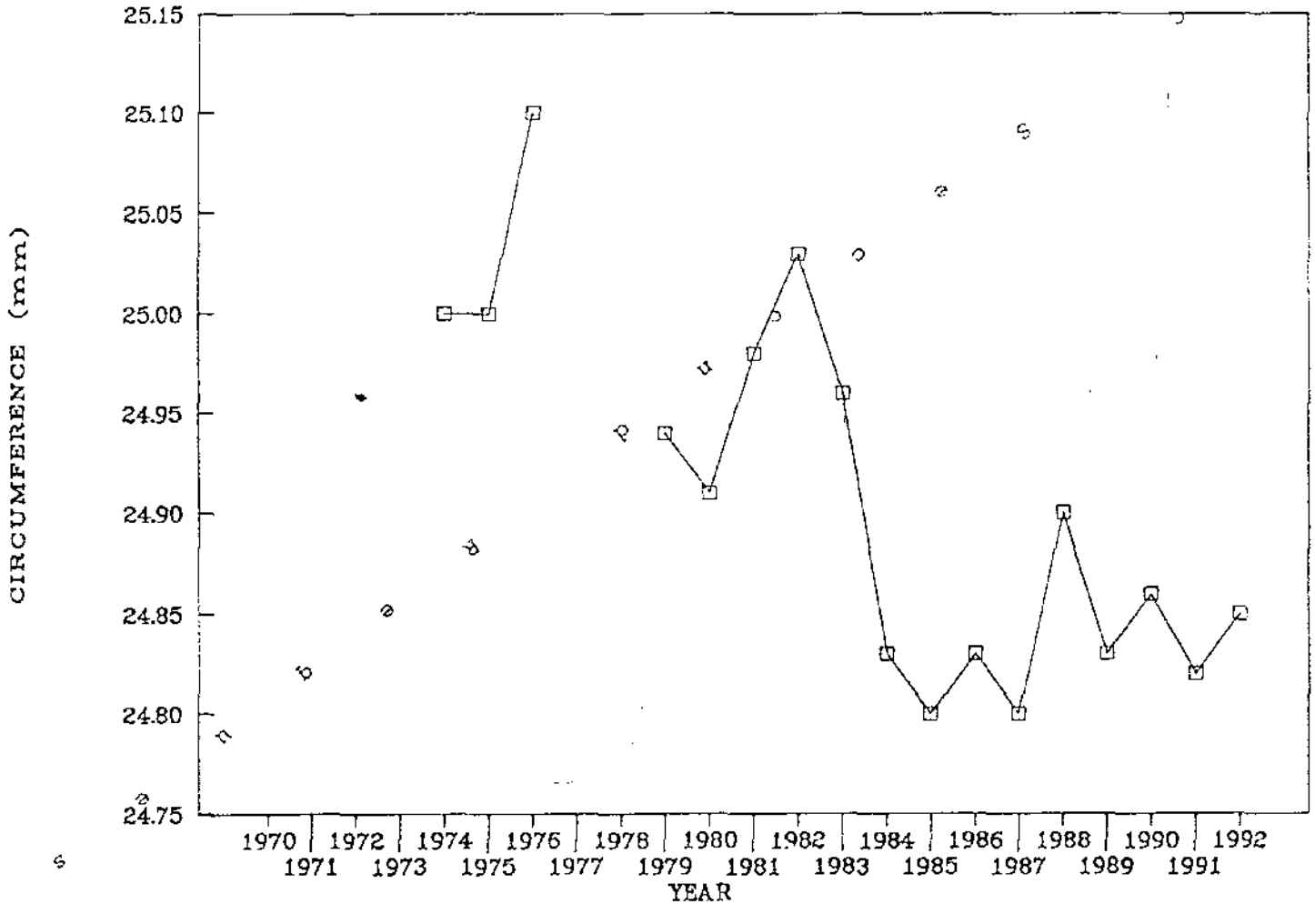


FIGURE 20

U.S. MARLBORO KS CIRCUMFERENCE



812 50634

FIGURE 21

U.S. MARLBORO KS TOBACCO WEIGHT

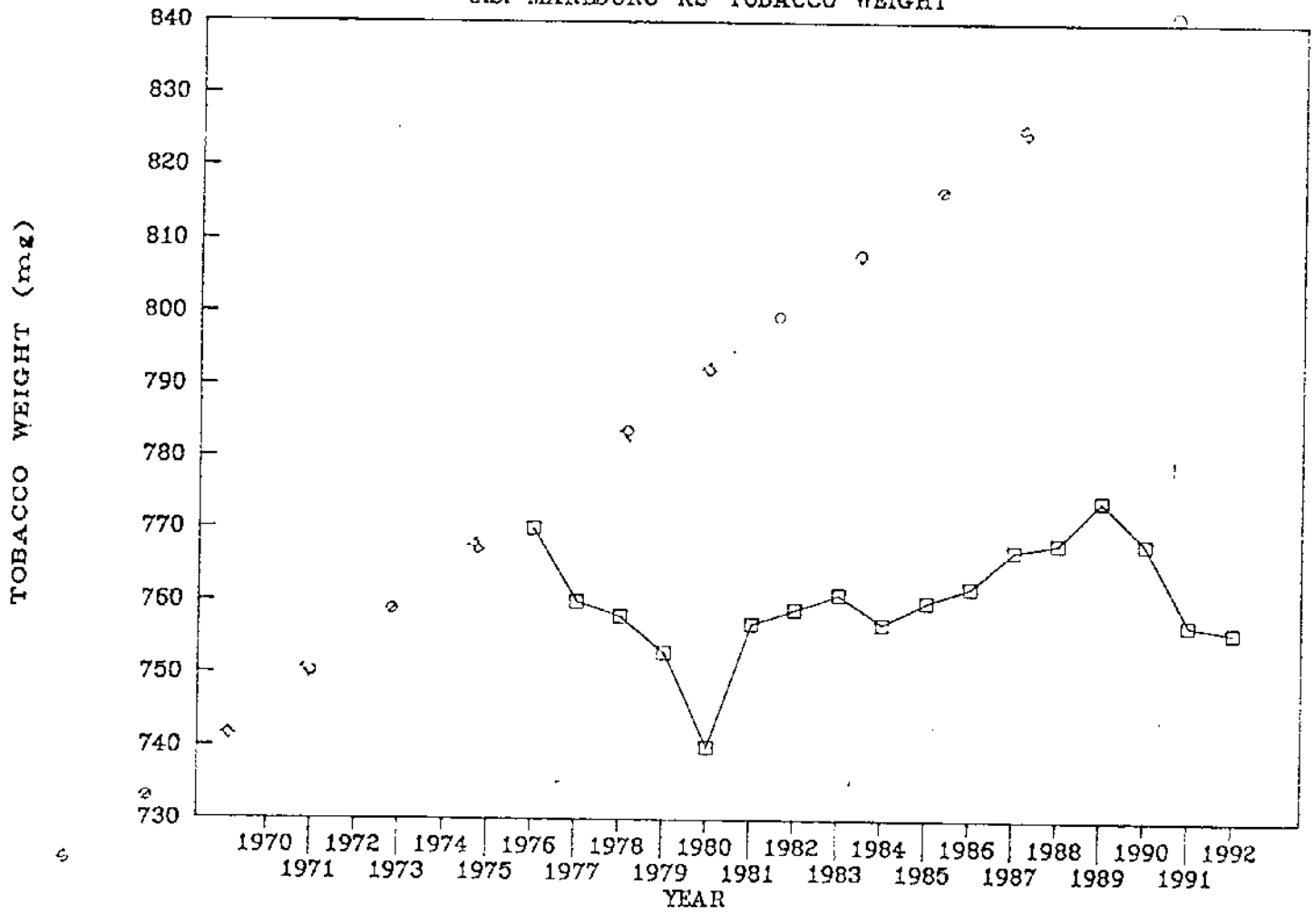


FIGURE 22

U.S. MARLBORO KS/TOBACCO WEIGHT

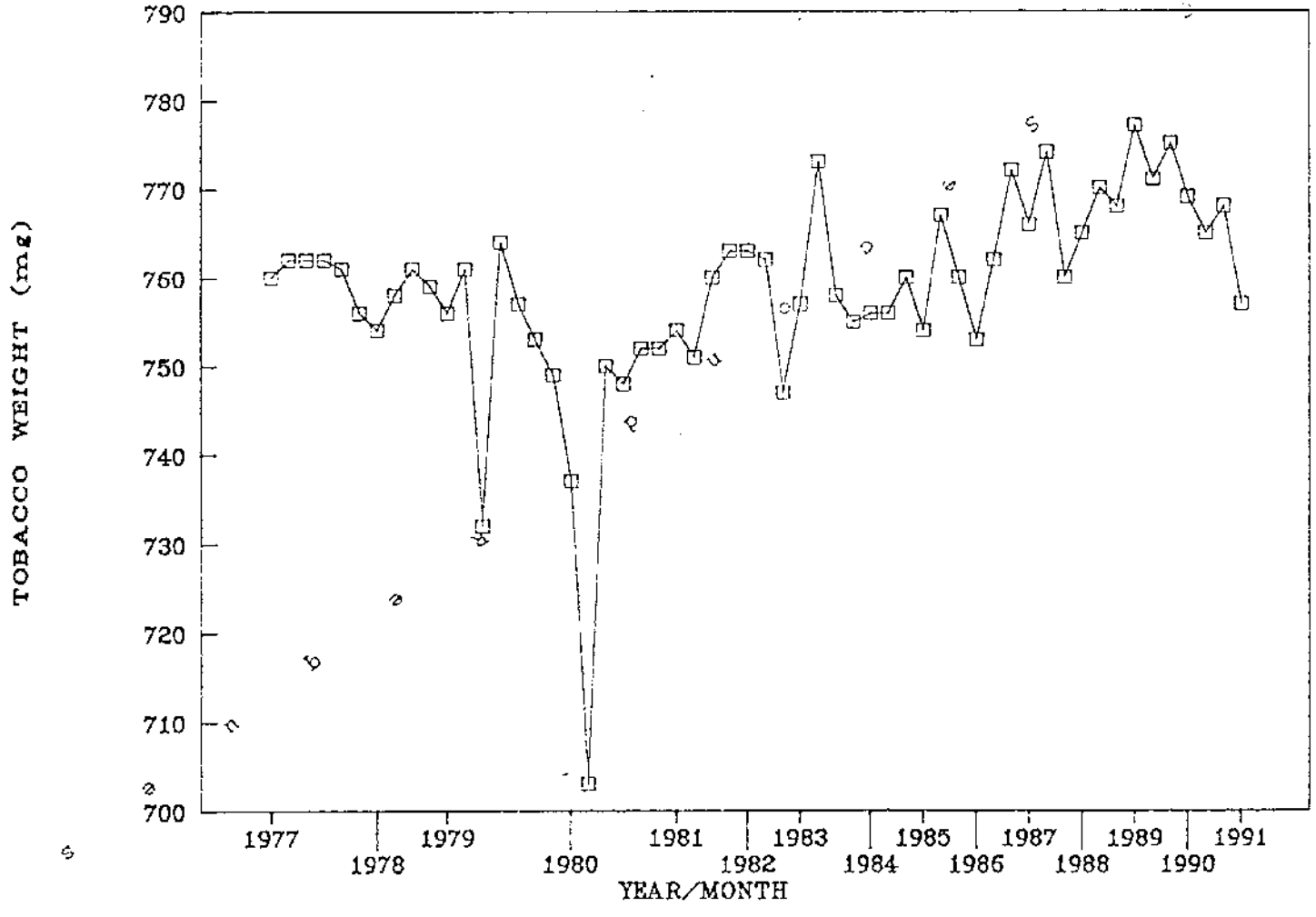


FIGURE 23

U.S. MARLBORO KS NON-TOBACCO WEIGHT

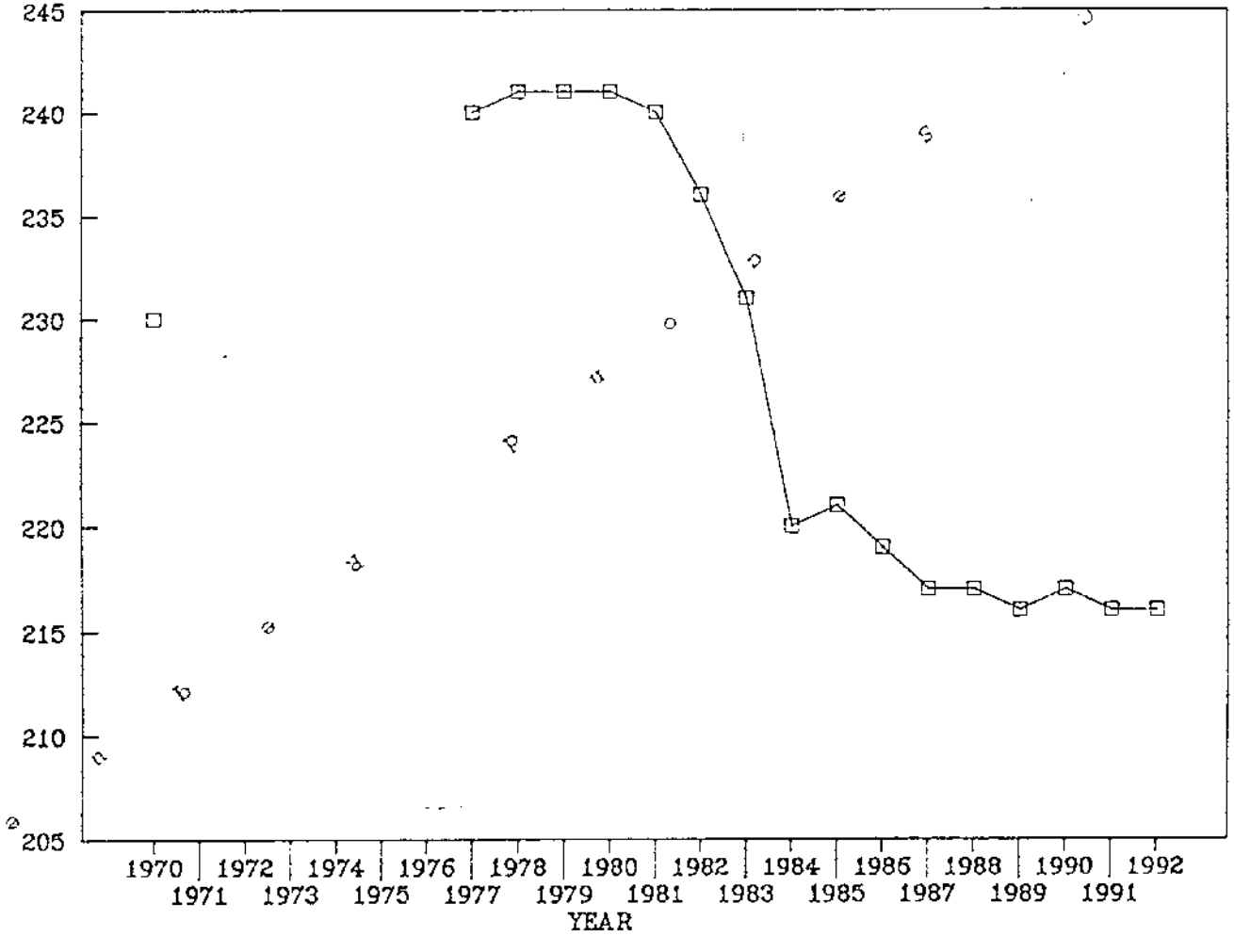
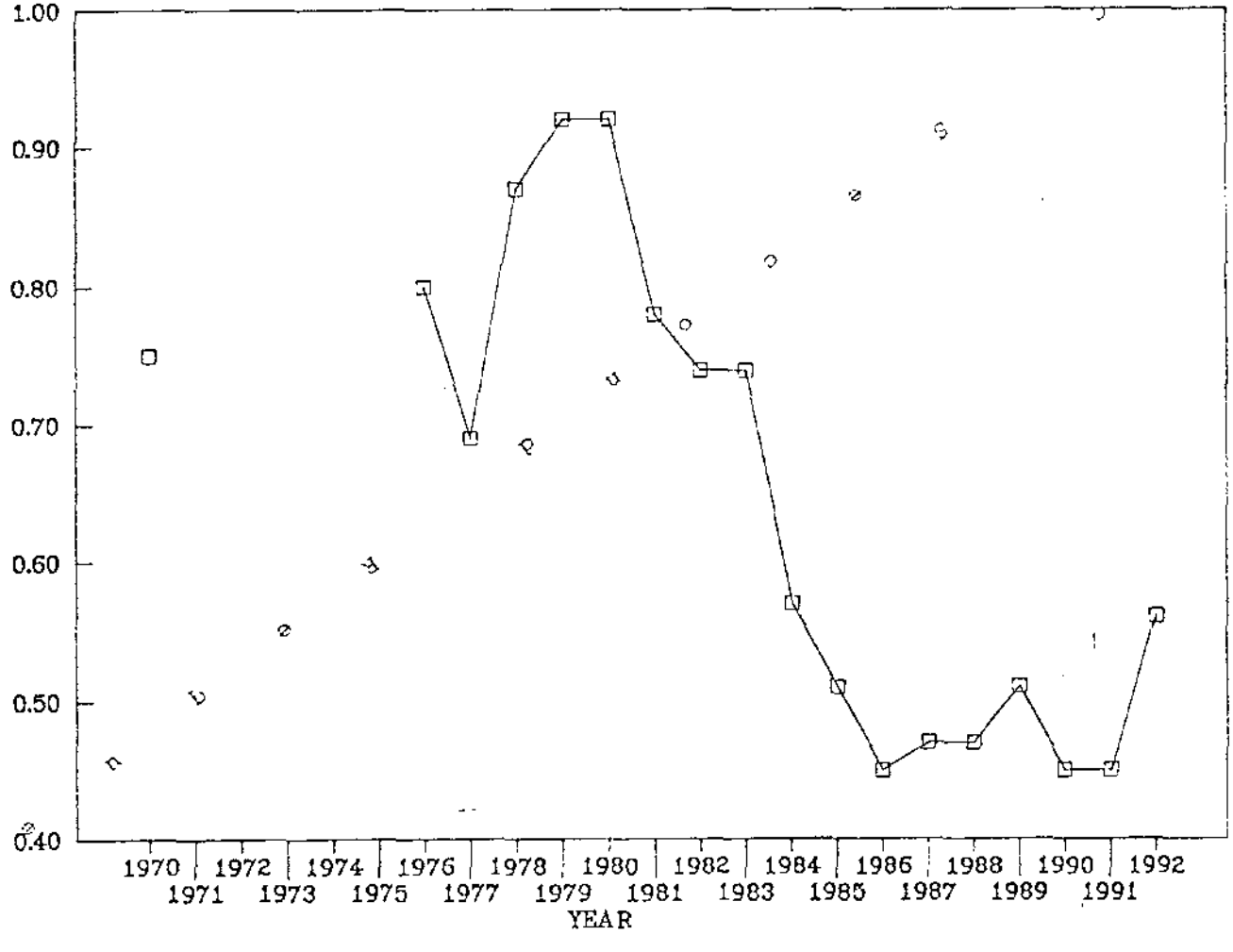


FIGURE 24

U.S. MARLBORO KS PAPER CITRATE



812 36638

FIGURE 25

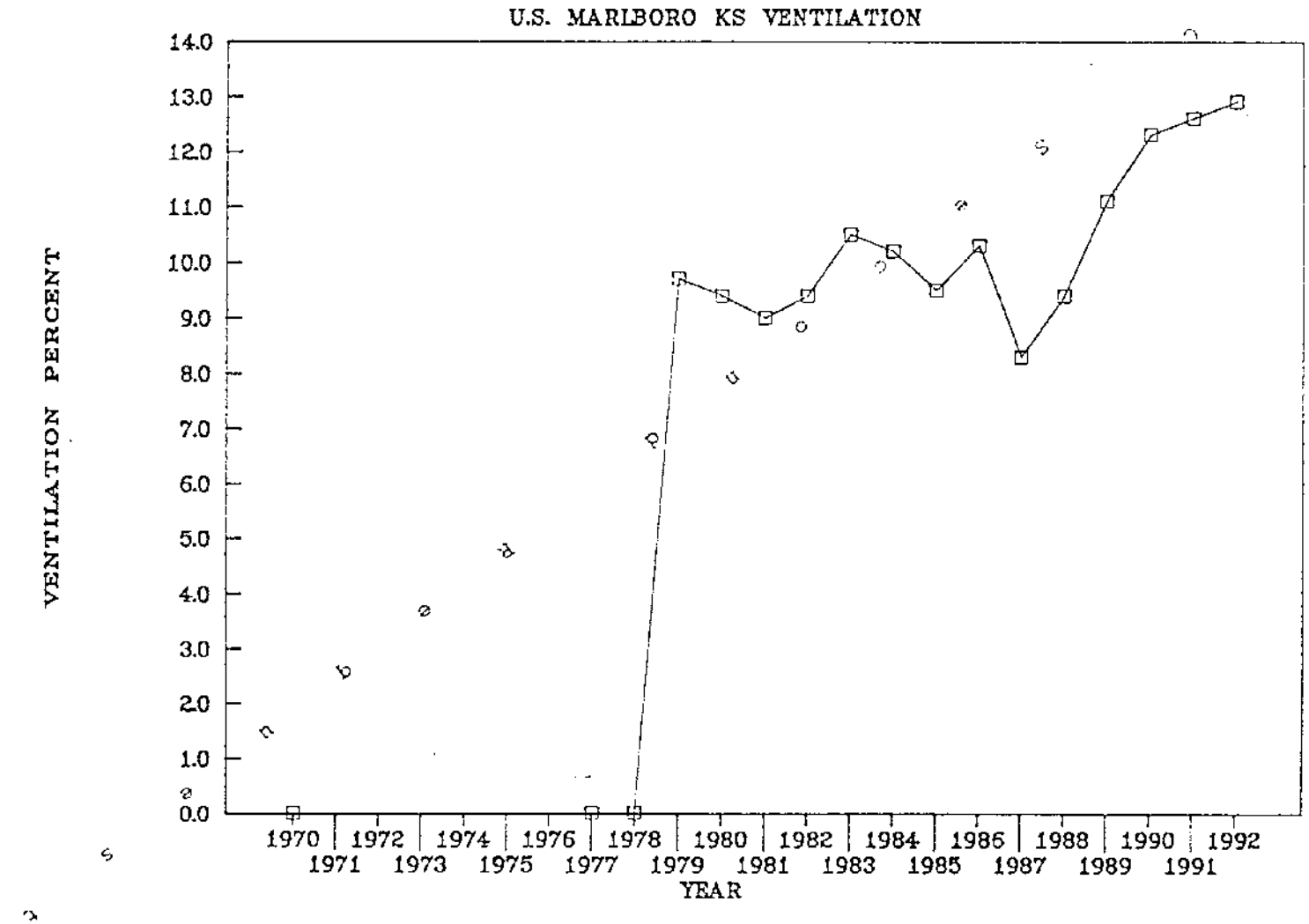
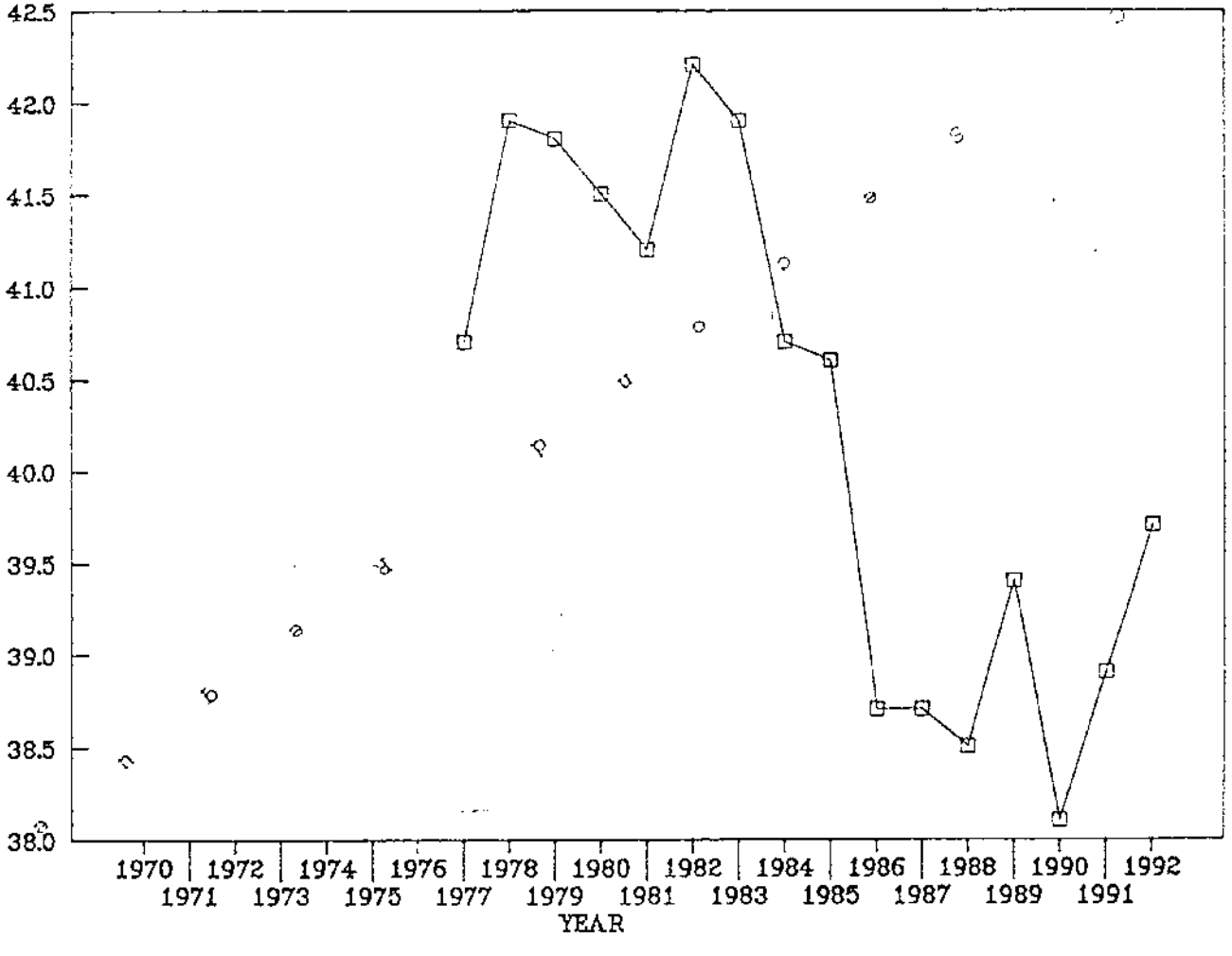


FIGURE 26

U.S. MARLBORO KS FILTER EFFICIENCY



812 23640

FIGURE 27

WORLDWIDE MARLBORO KS

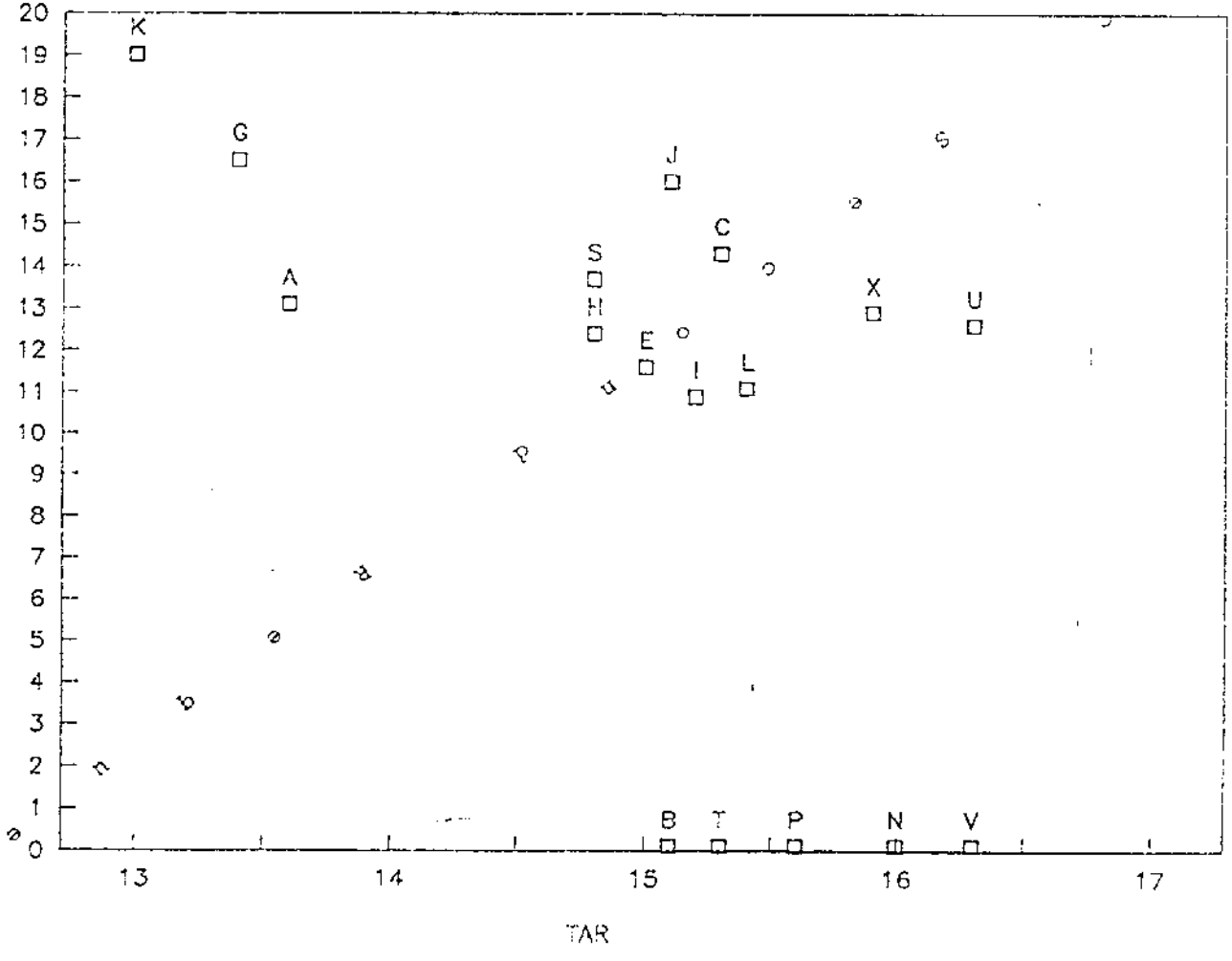


FIGURE 28

WORLDWIDE MARLBORO KS

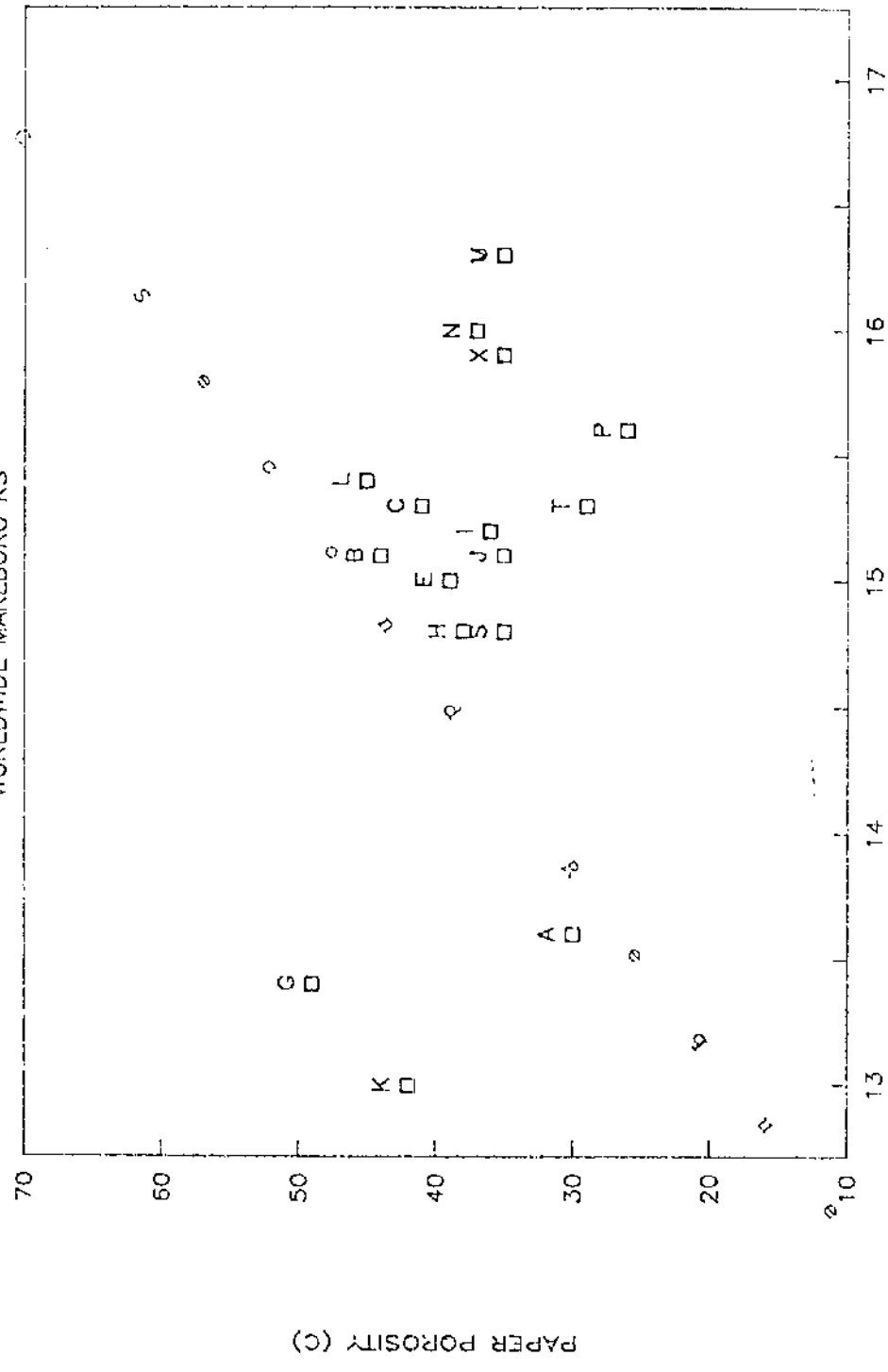


FIGURE 29

WORLDWIDE MARLBORO KS

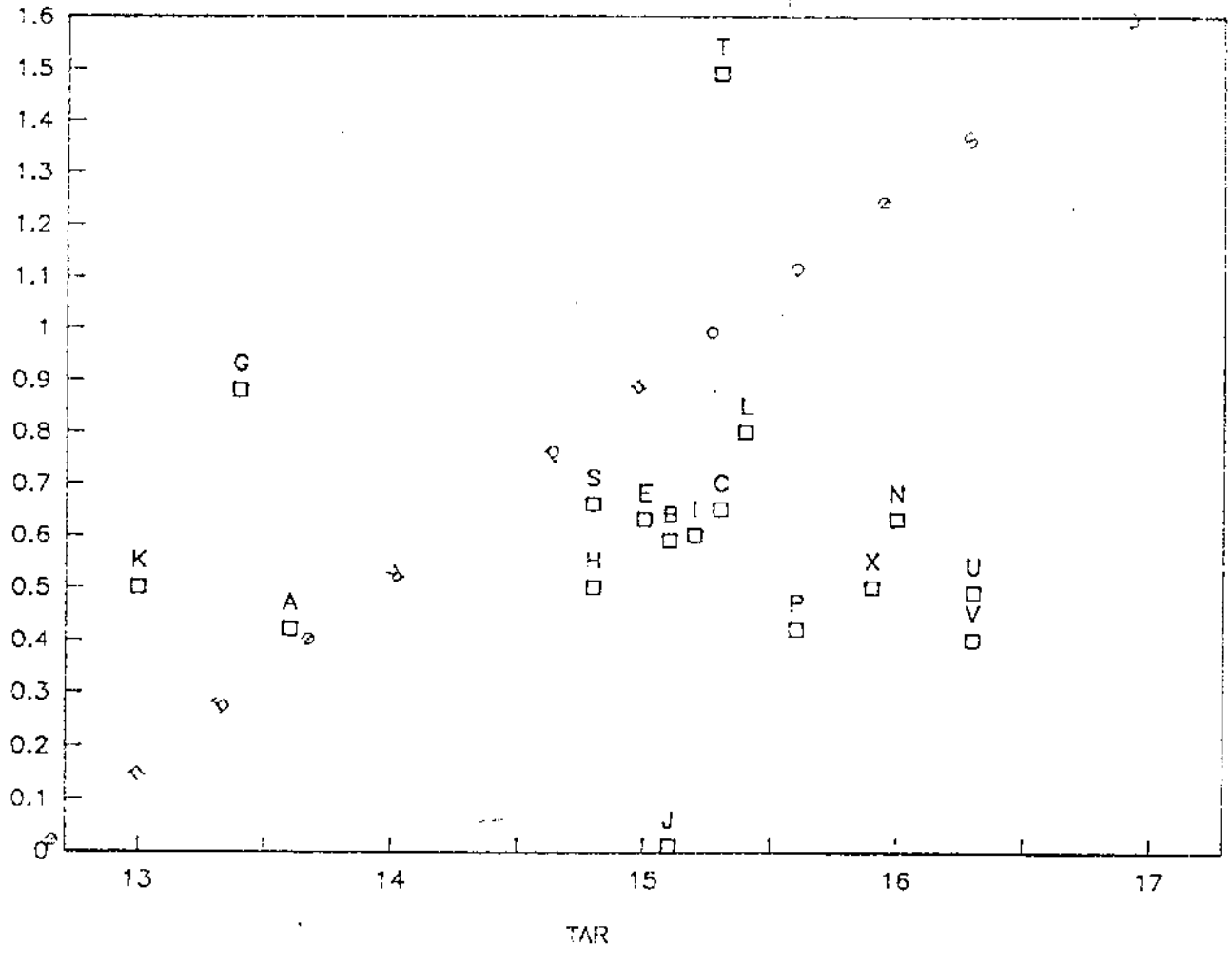
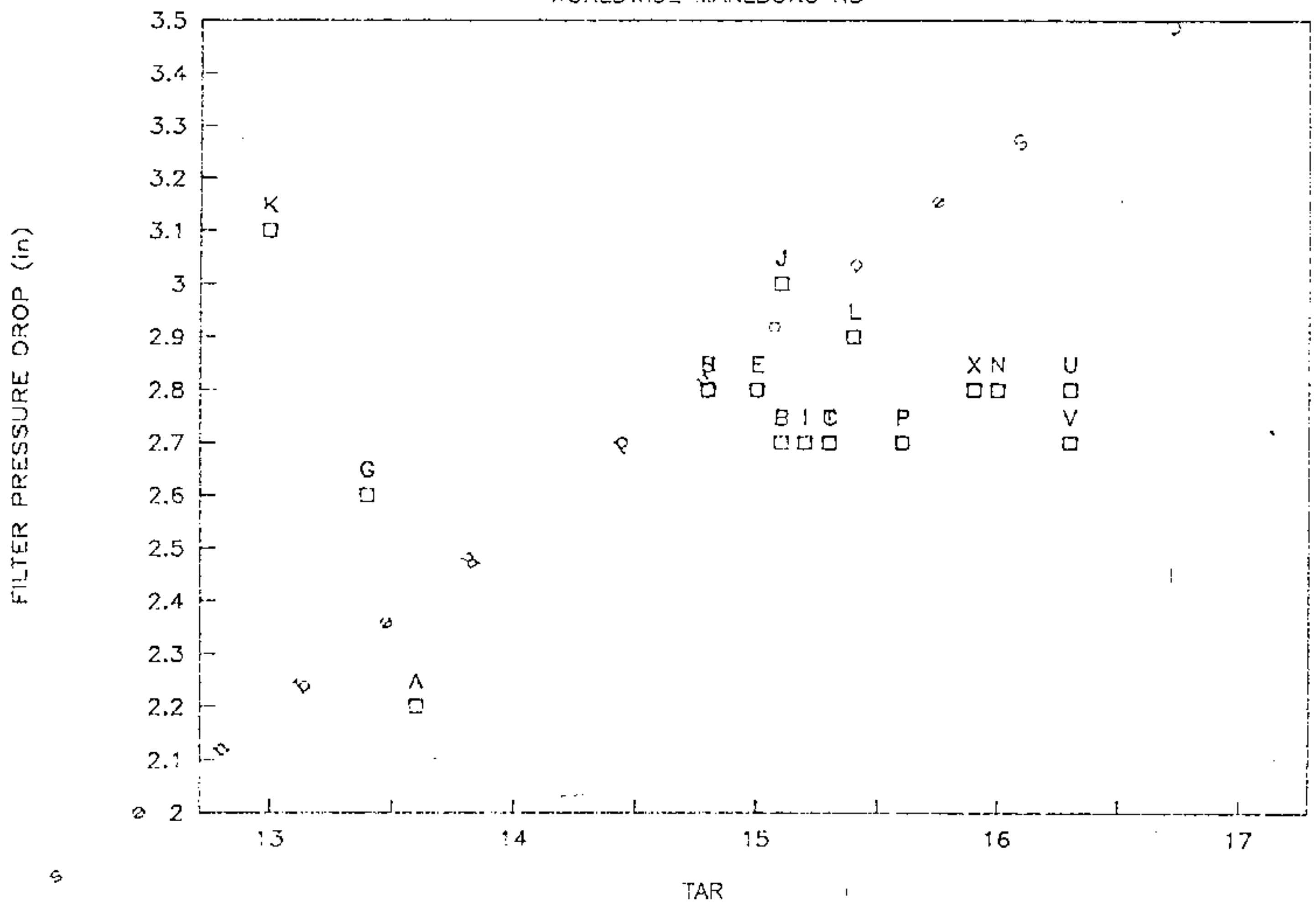


FIGURE 30

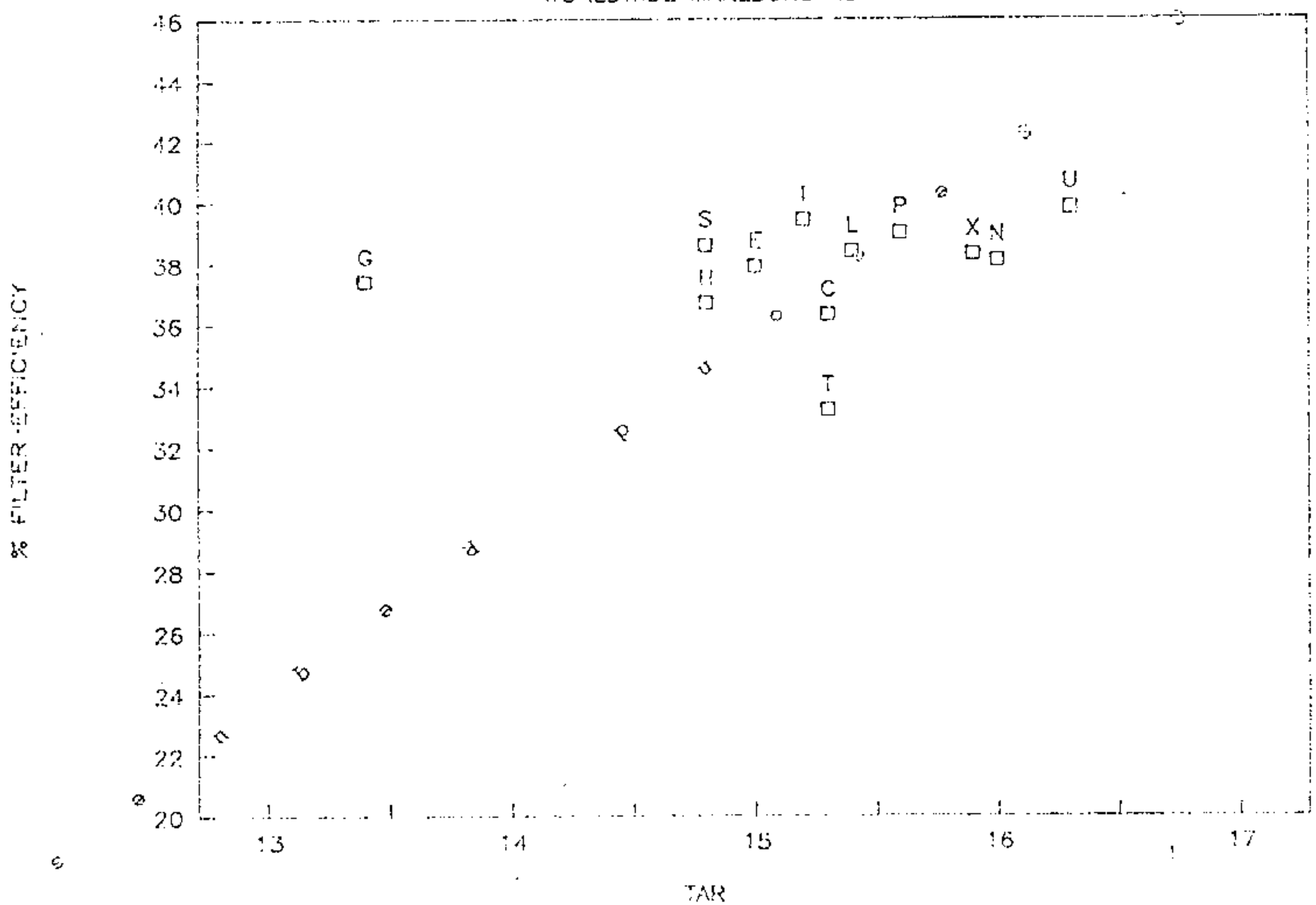
WORLDWIDE MARLBORO KS



B12 55644

FIGURE 31

WORLDWIDE MARLBORO KS



B12 56645

FIGURE 32

U.S. MARLBORO KS TAR DELIVERY

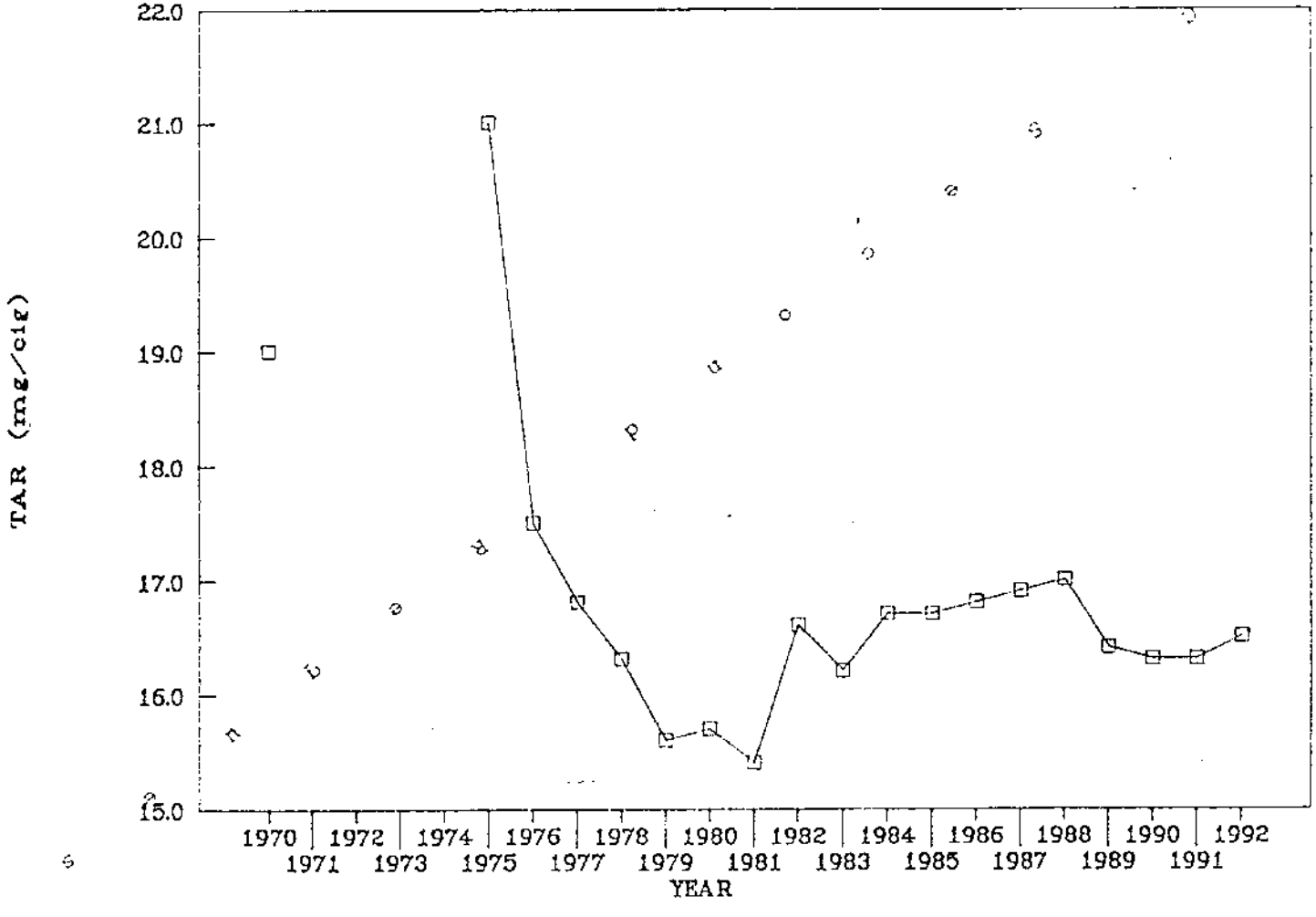


FIGURE 33

U.S. MARLBORO KS TAR PER PUFF

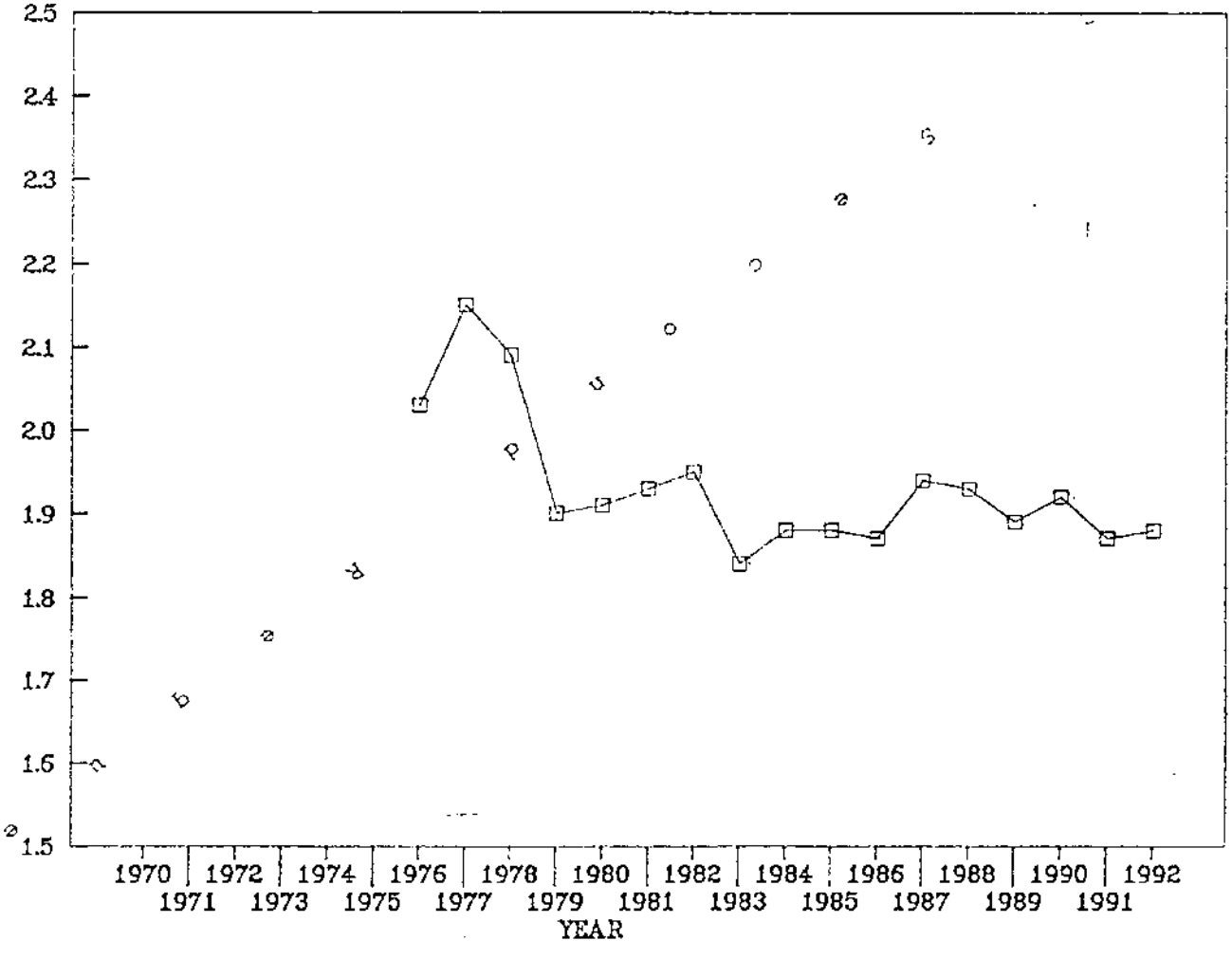


FIGURE 34

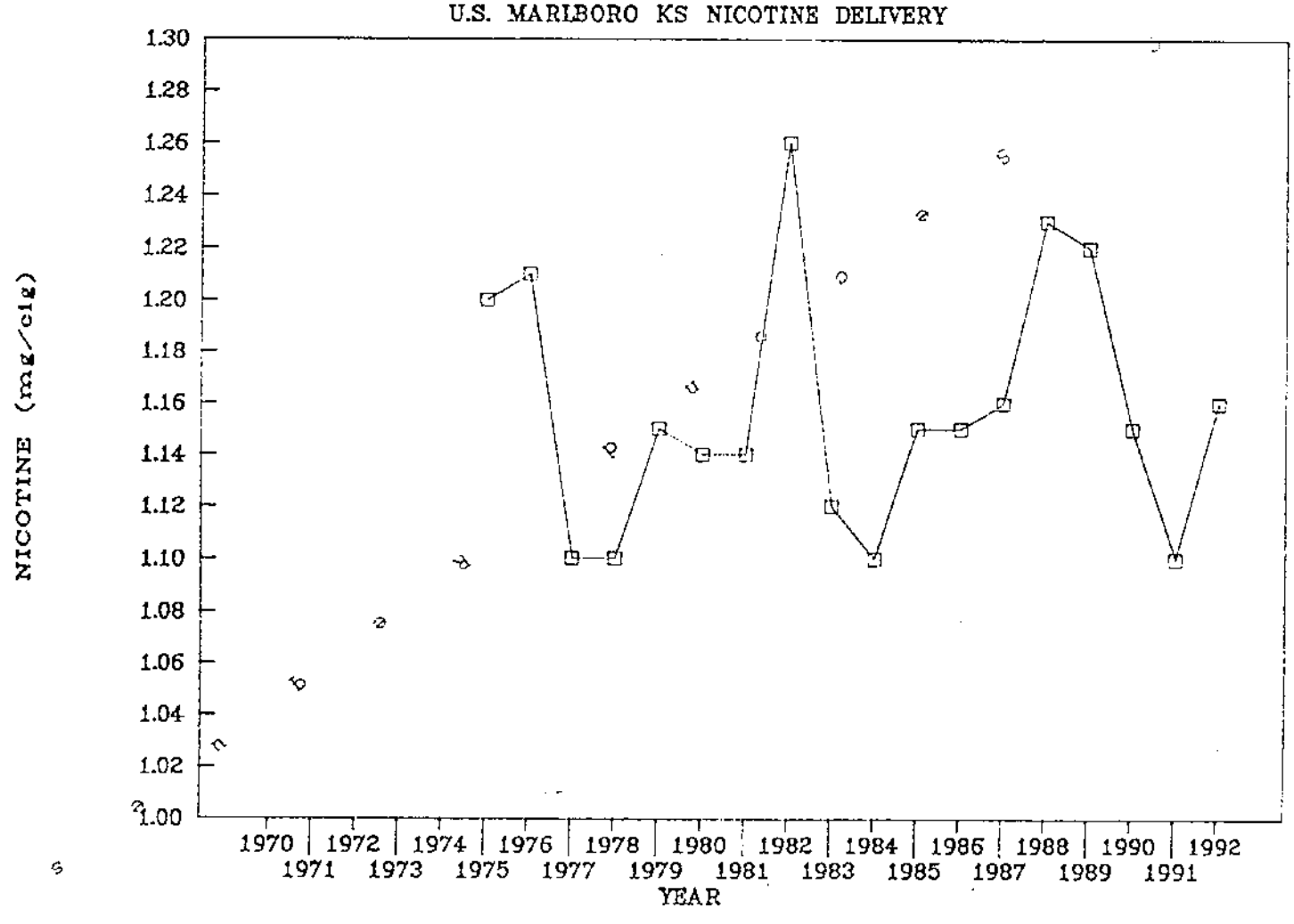


FIGURE 35

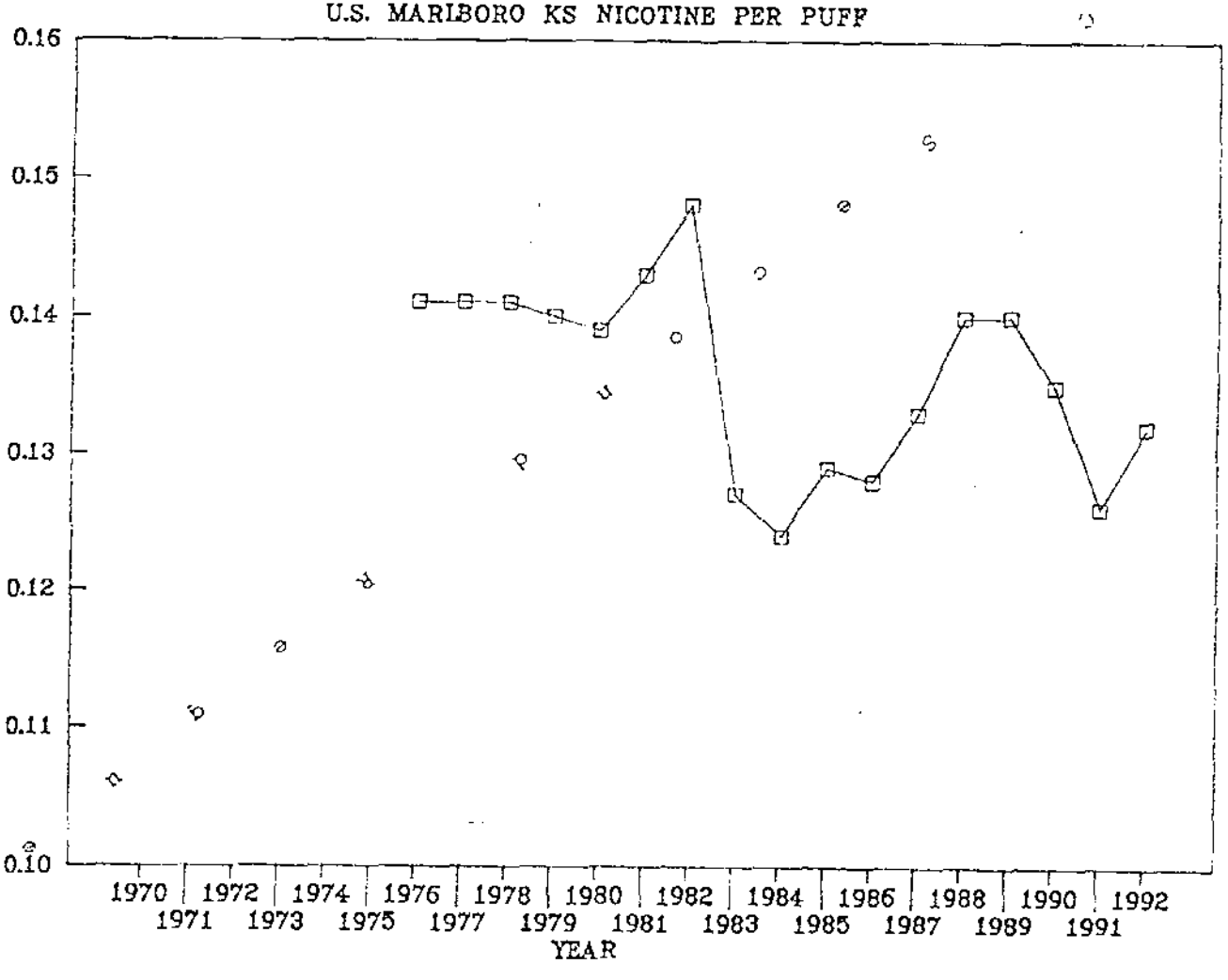
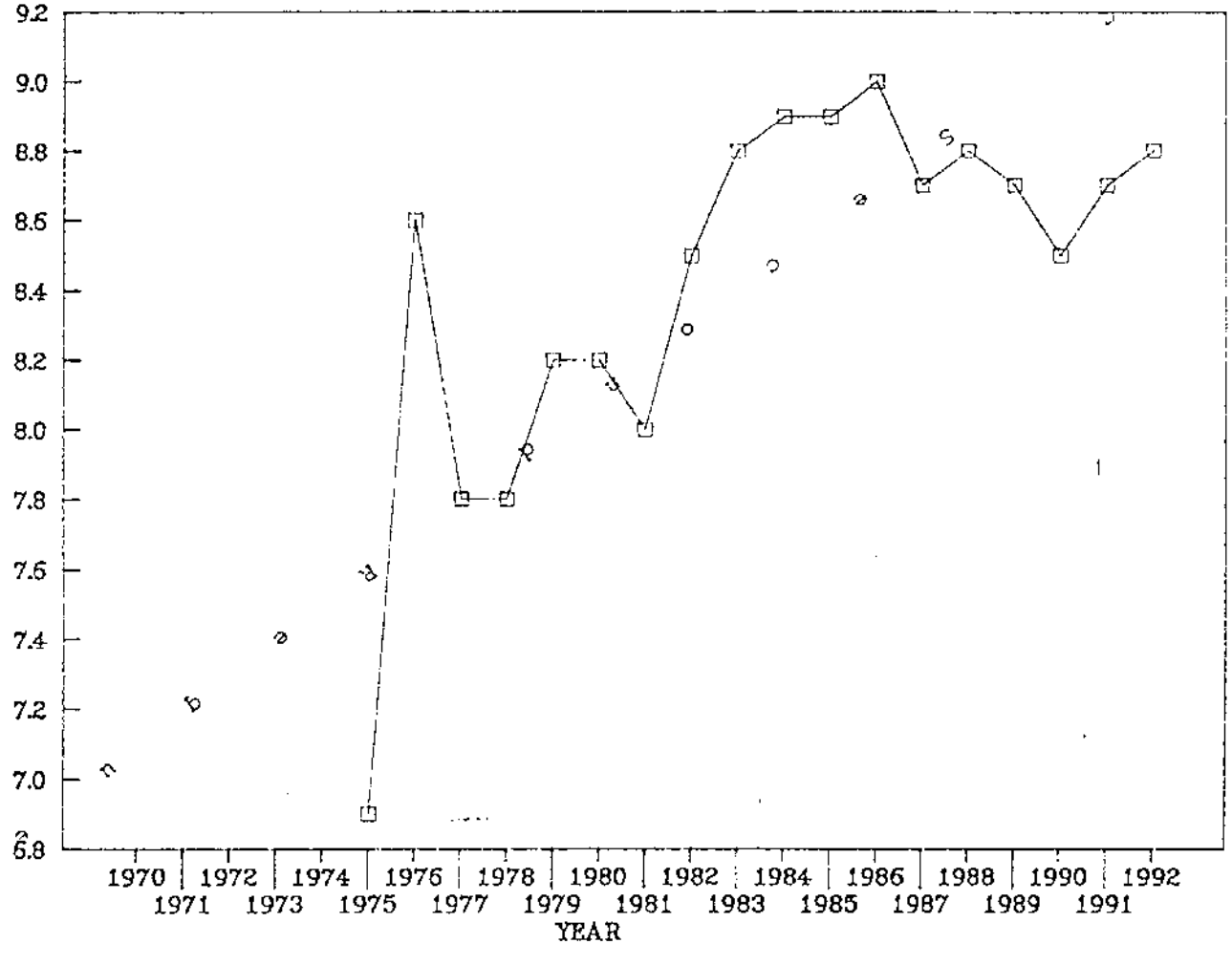


FIGURE 36

U.S. MARLBORO KS/PUFF NUMBER



812 56650

FIGURE 37

WORLDWIDE MARLBORO KS

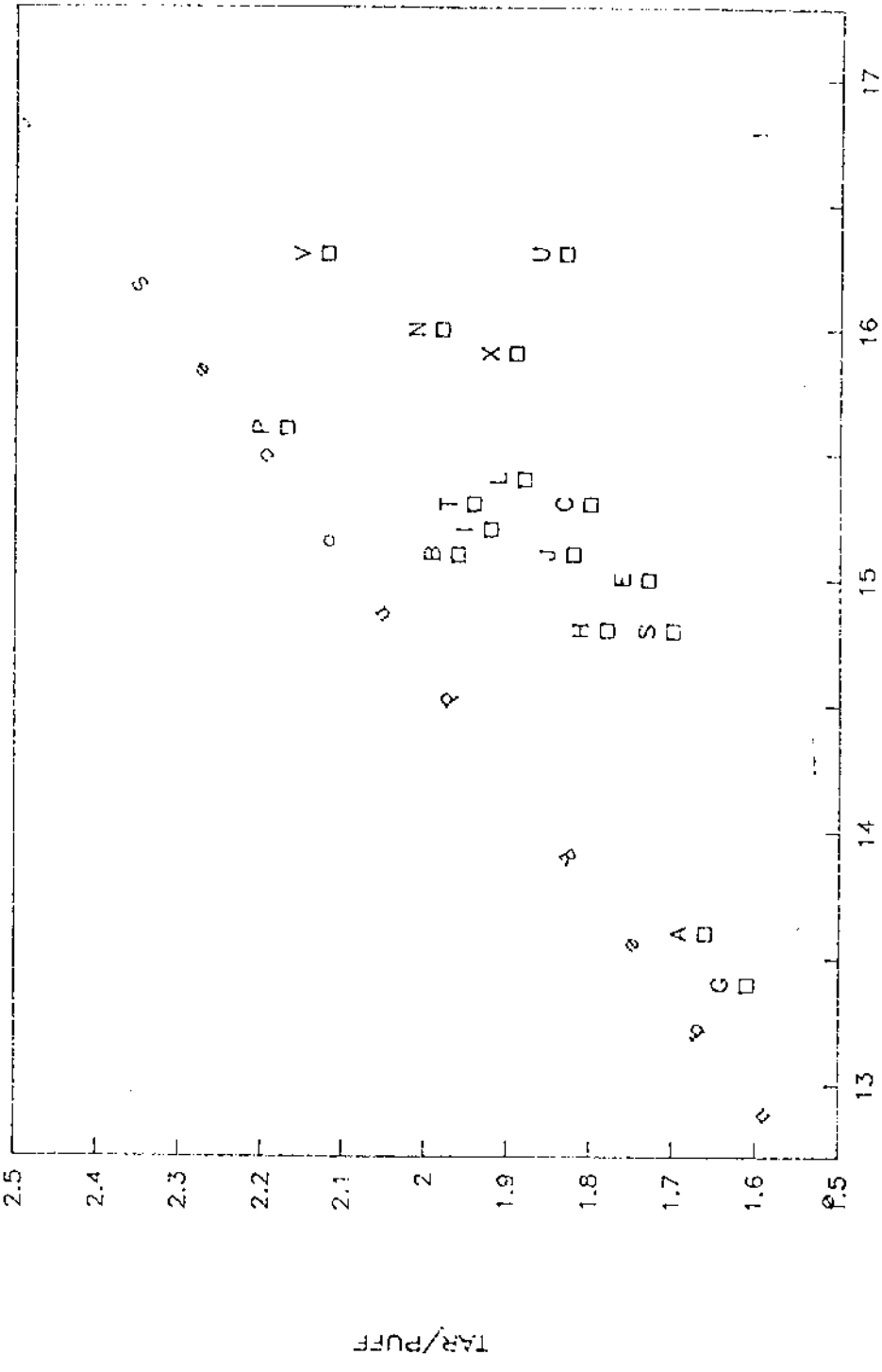


FIGURE 38

WORLDWIDE MARLBORO (TAR/PUFF)

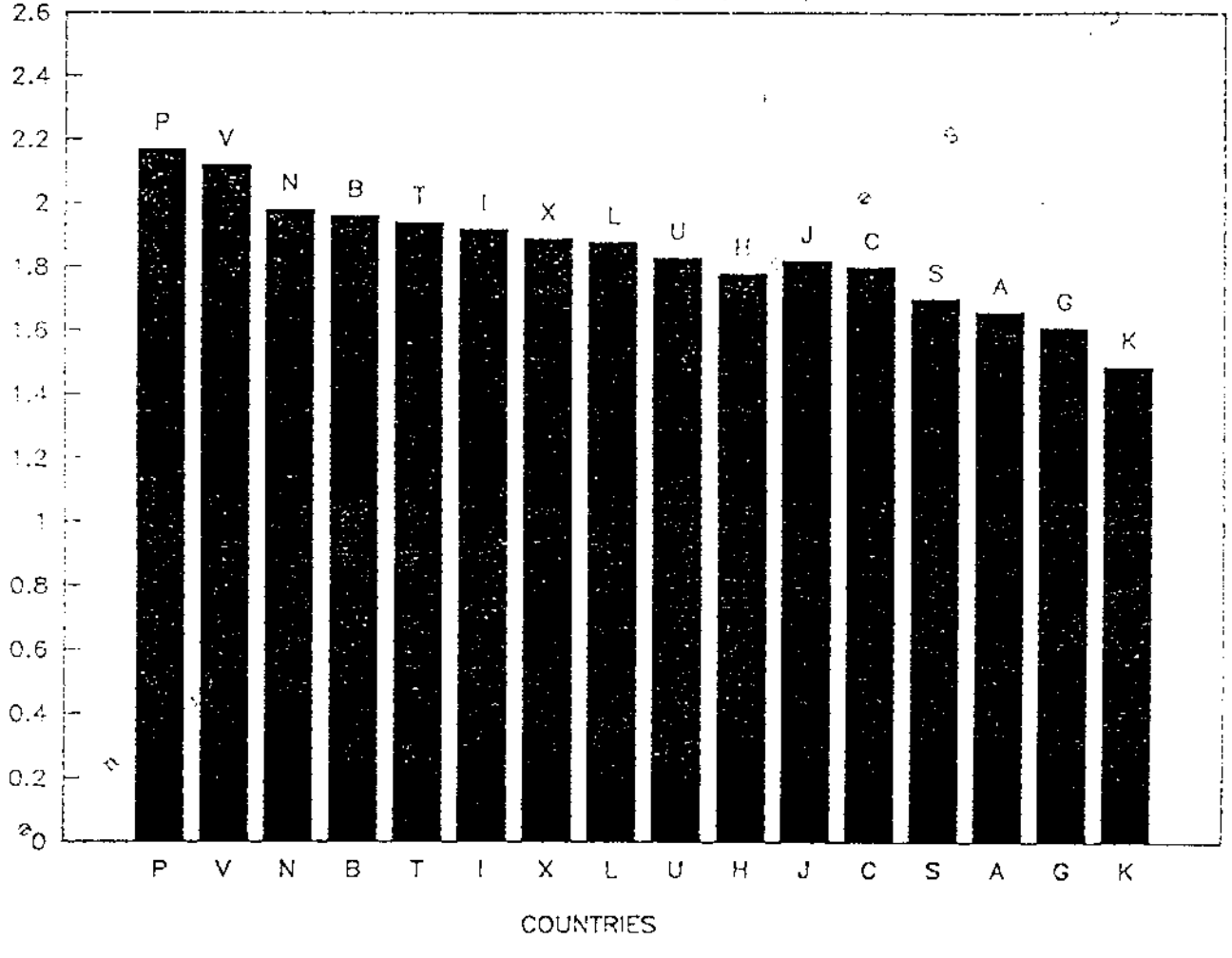
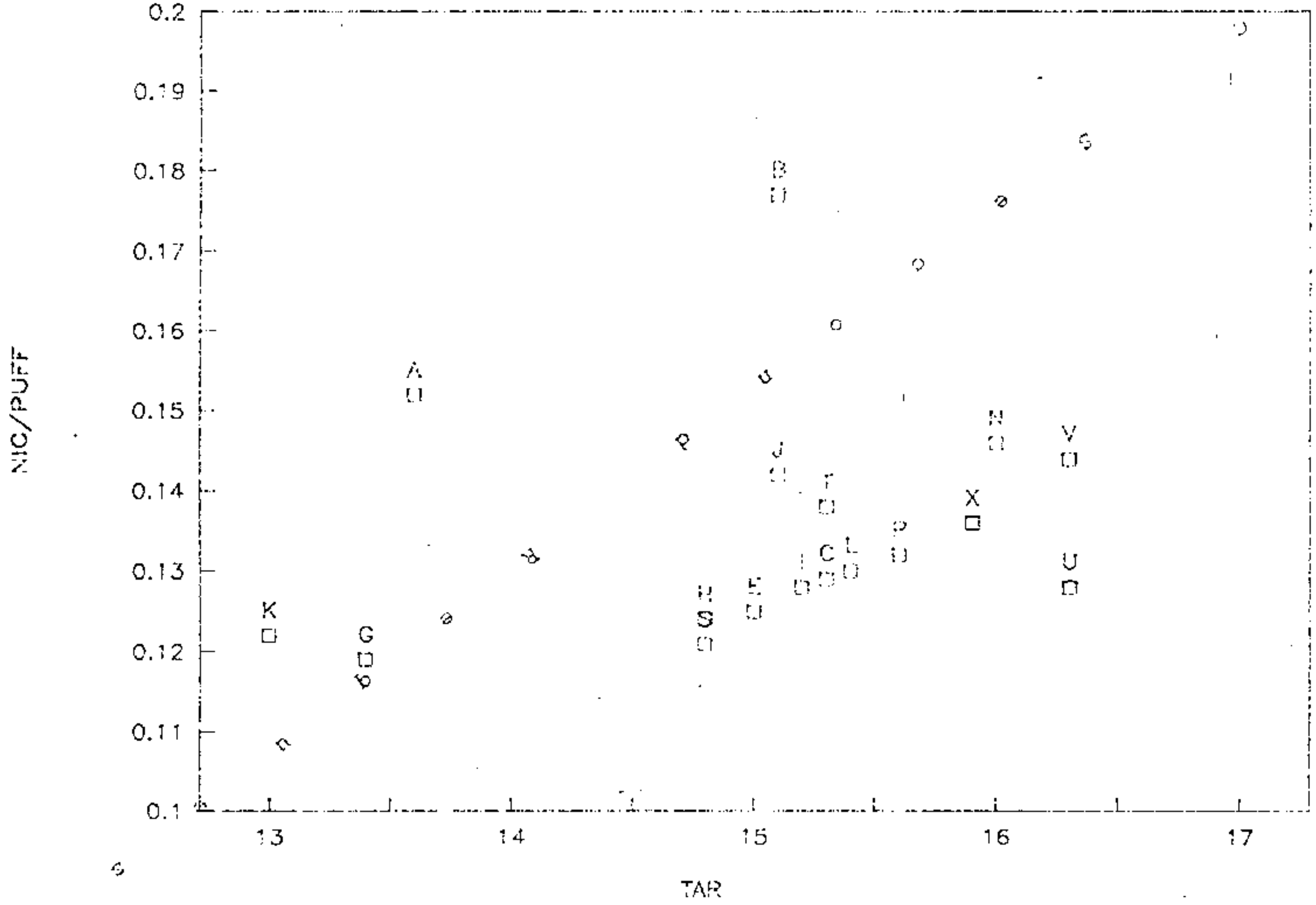


FIGURE 39

WORLDWIDE MARLBORO KS



812 56653

FIGURE 40

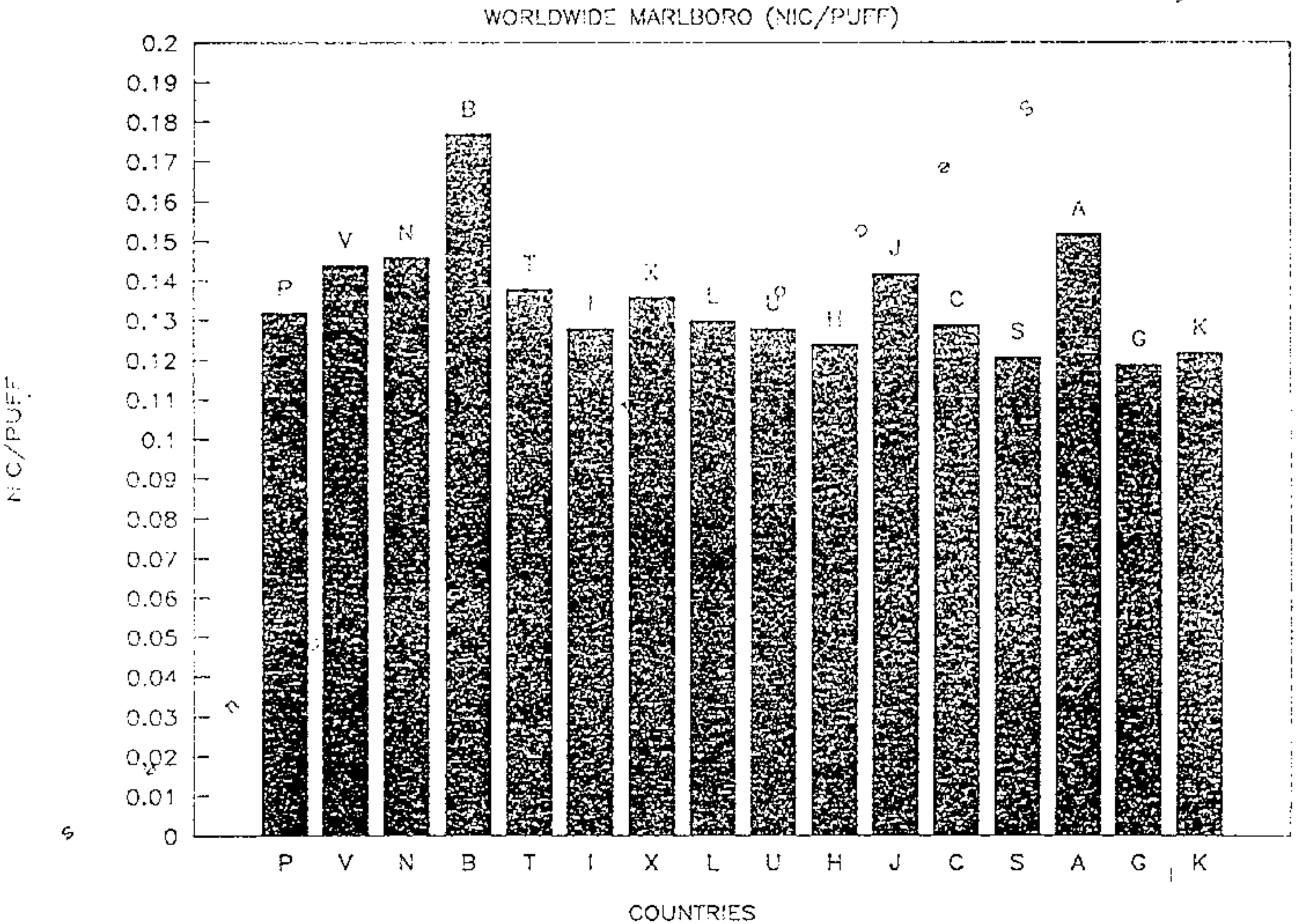


FIGURE 41

BLEND NICOTINE VS SMOKE NICOTINE

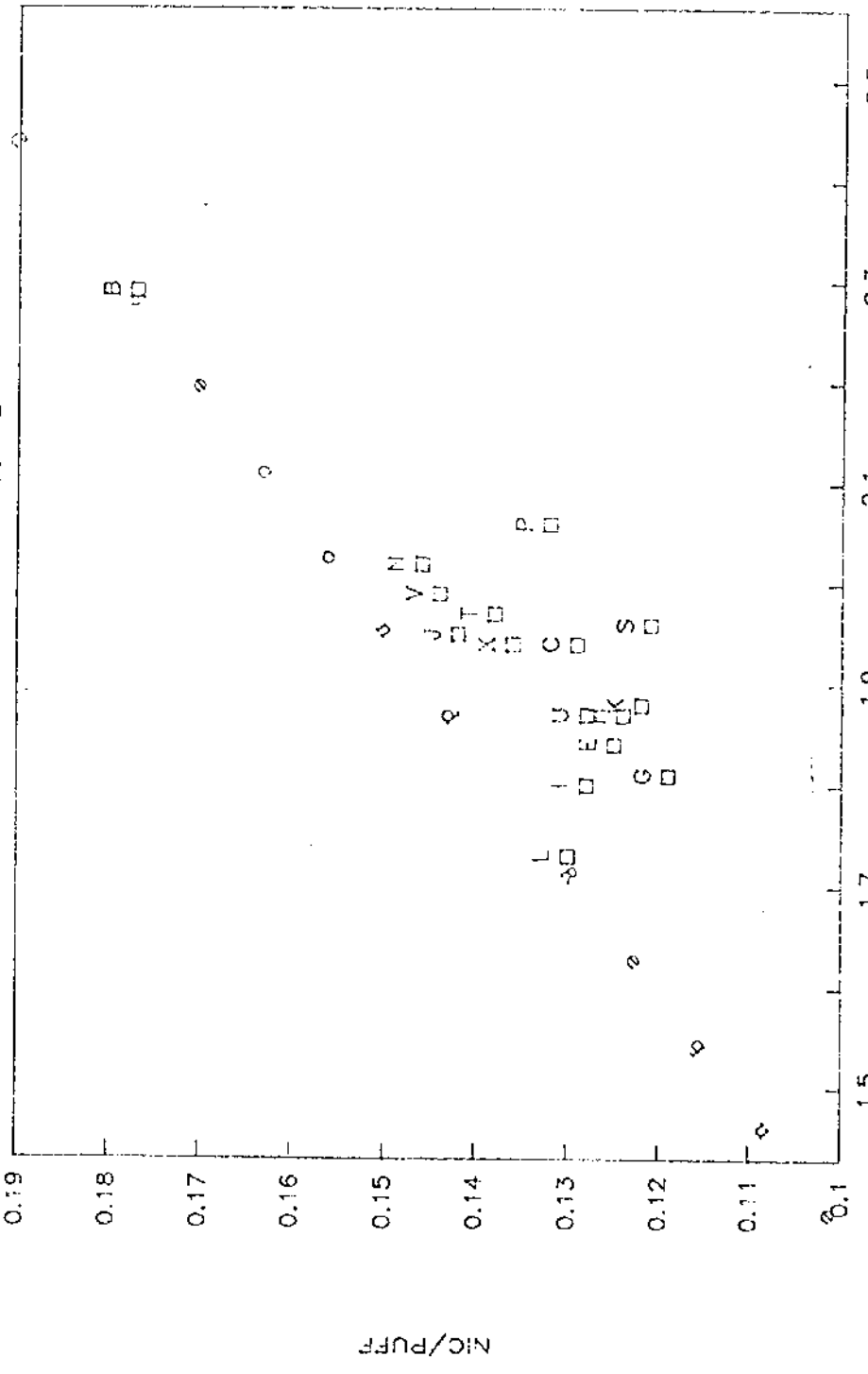


FIGURE 42

WORLDWIDE MARLBORO KS

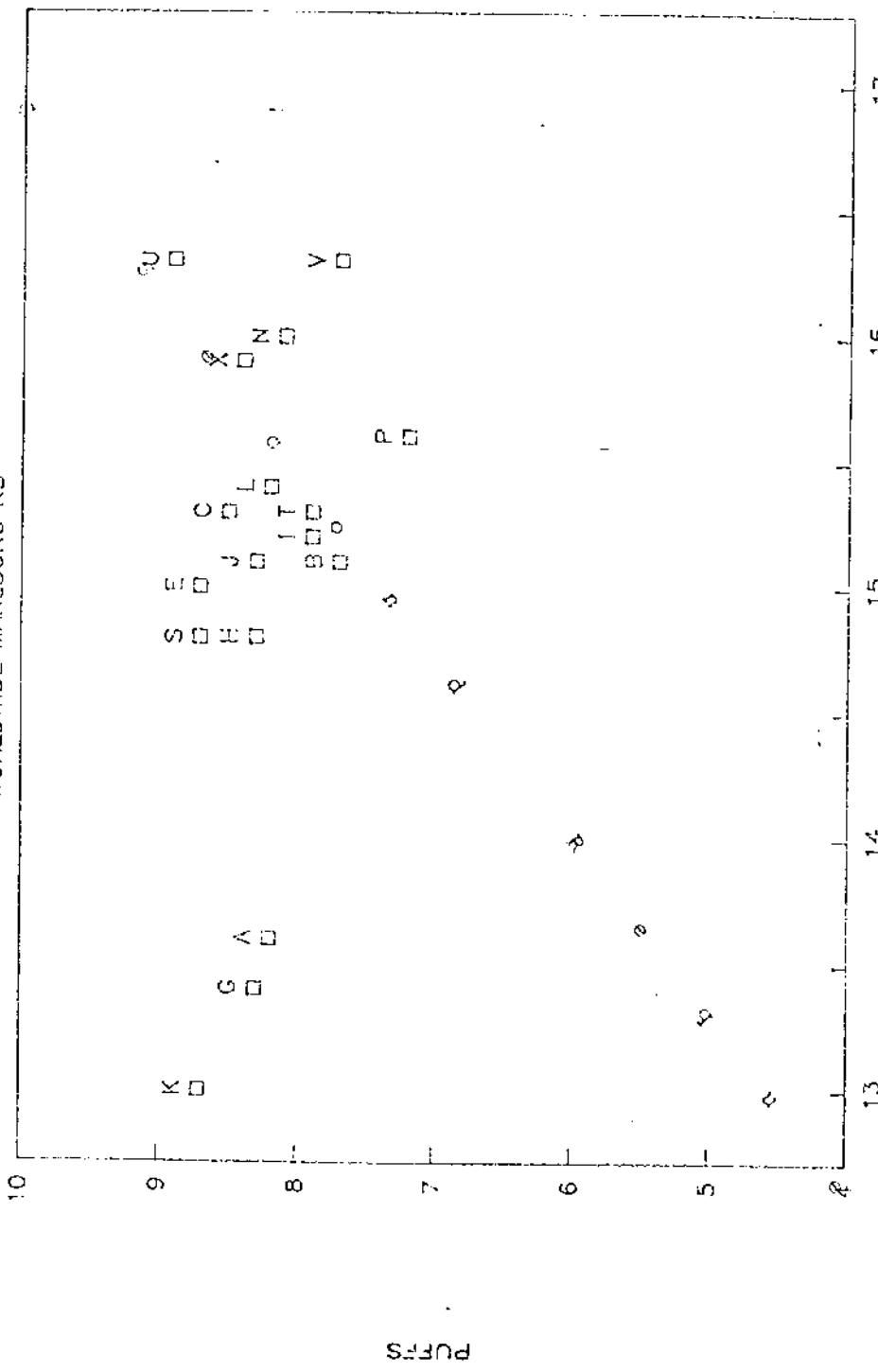


FIGURE 43

WORLDWIDE MARLBORO KS

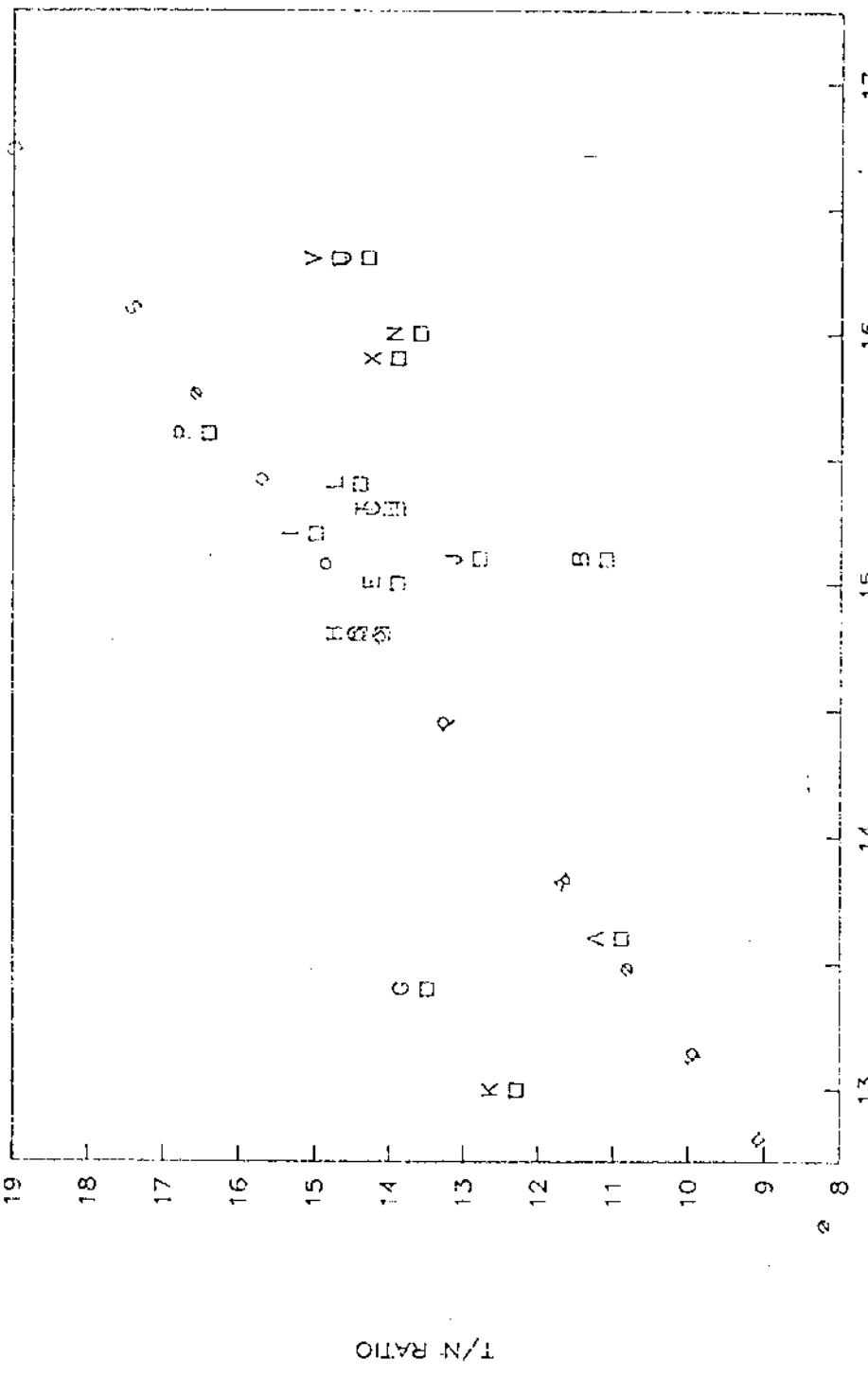
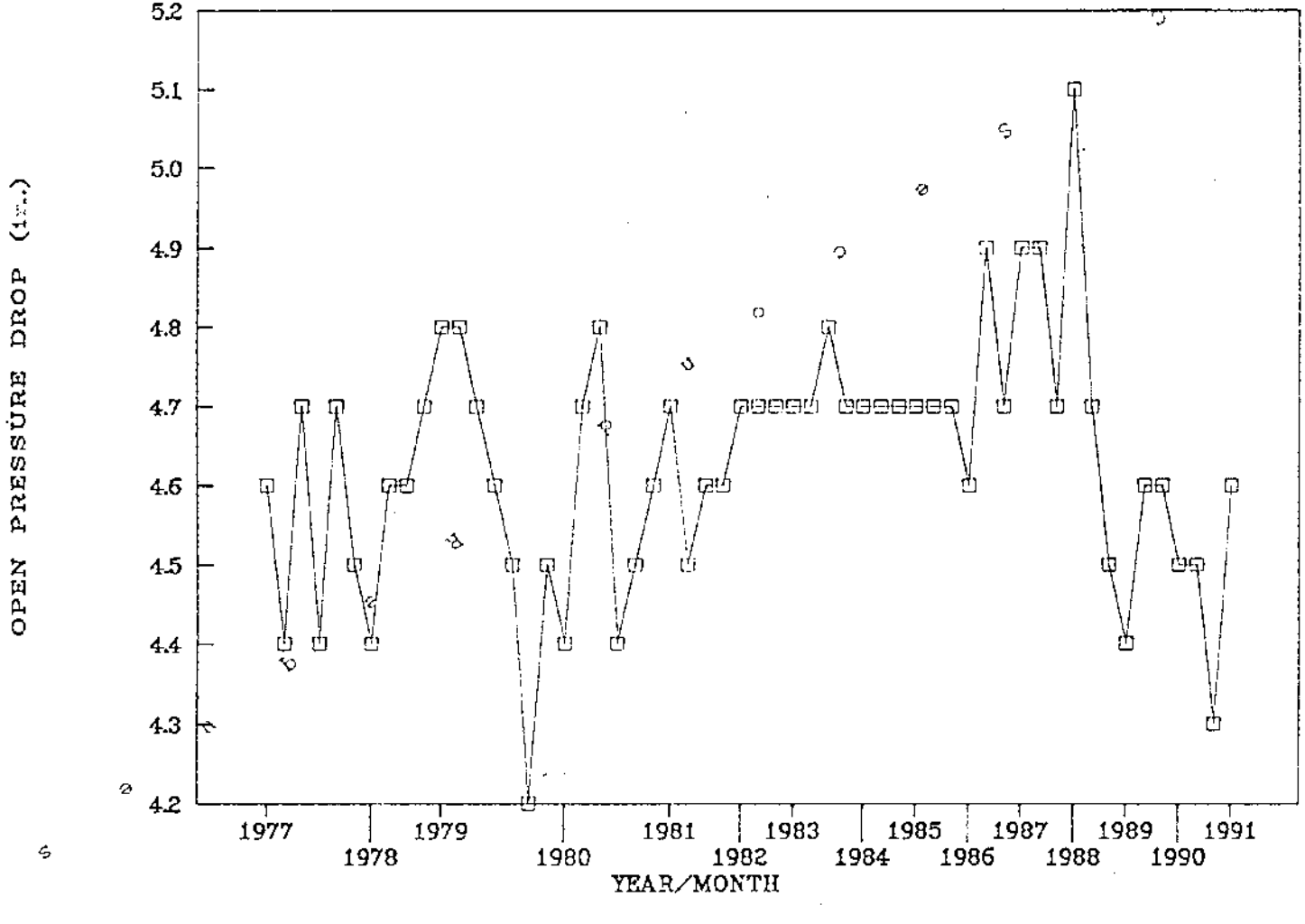


FIGURE 44

U.S. MARLBORO KS/OPEN PRESSURE DROP



812 50658

FIGURE 4.5

US MARLBORO STYLES

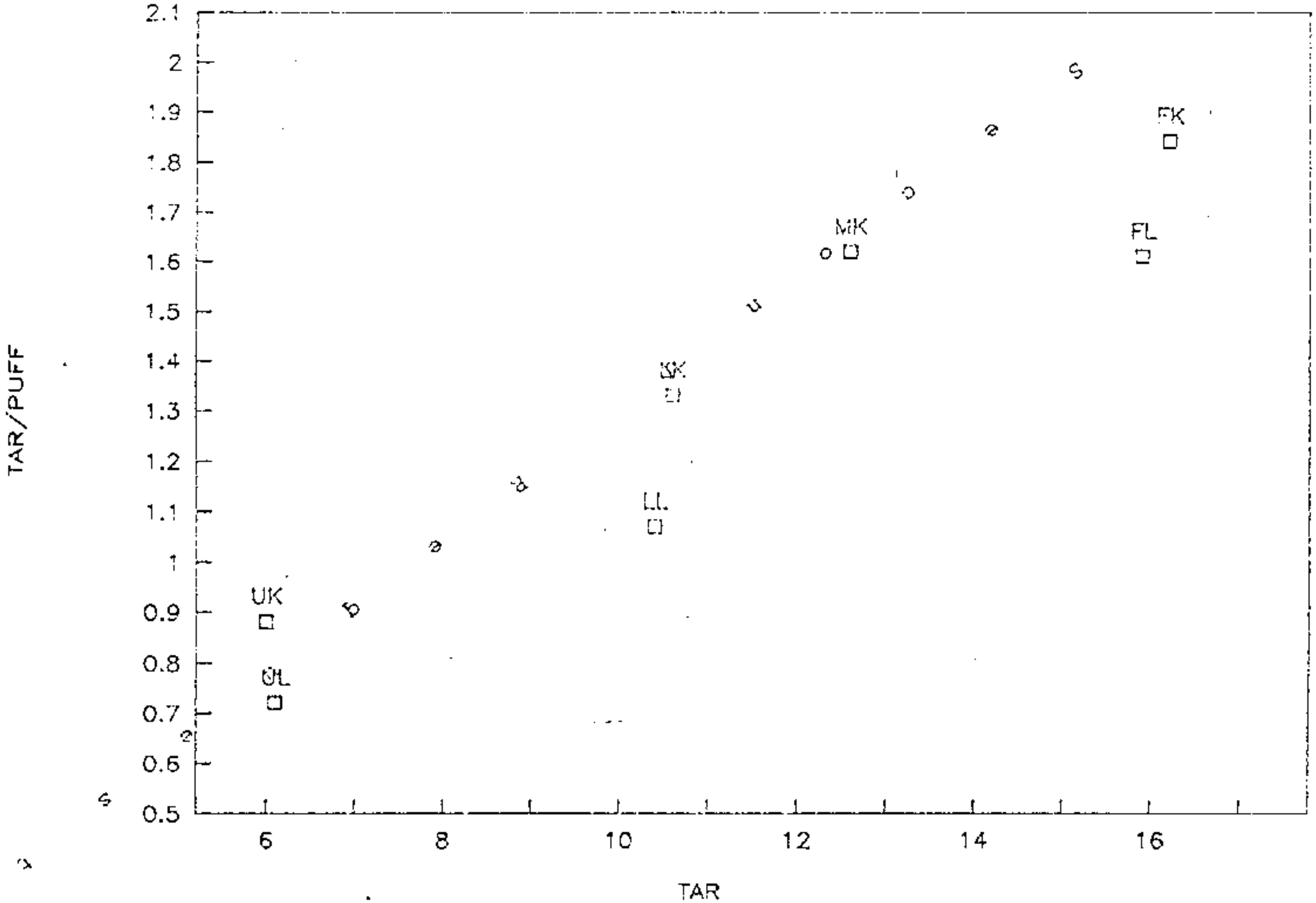


FIGURE 46

US MARLBORO STYLES

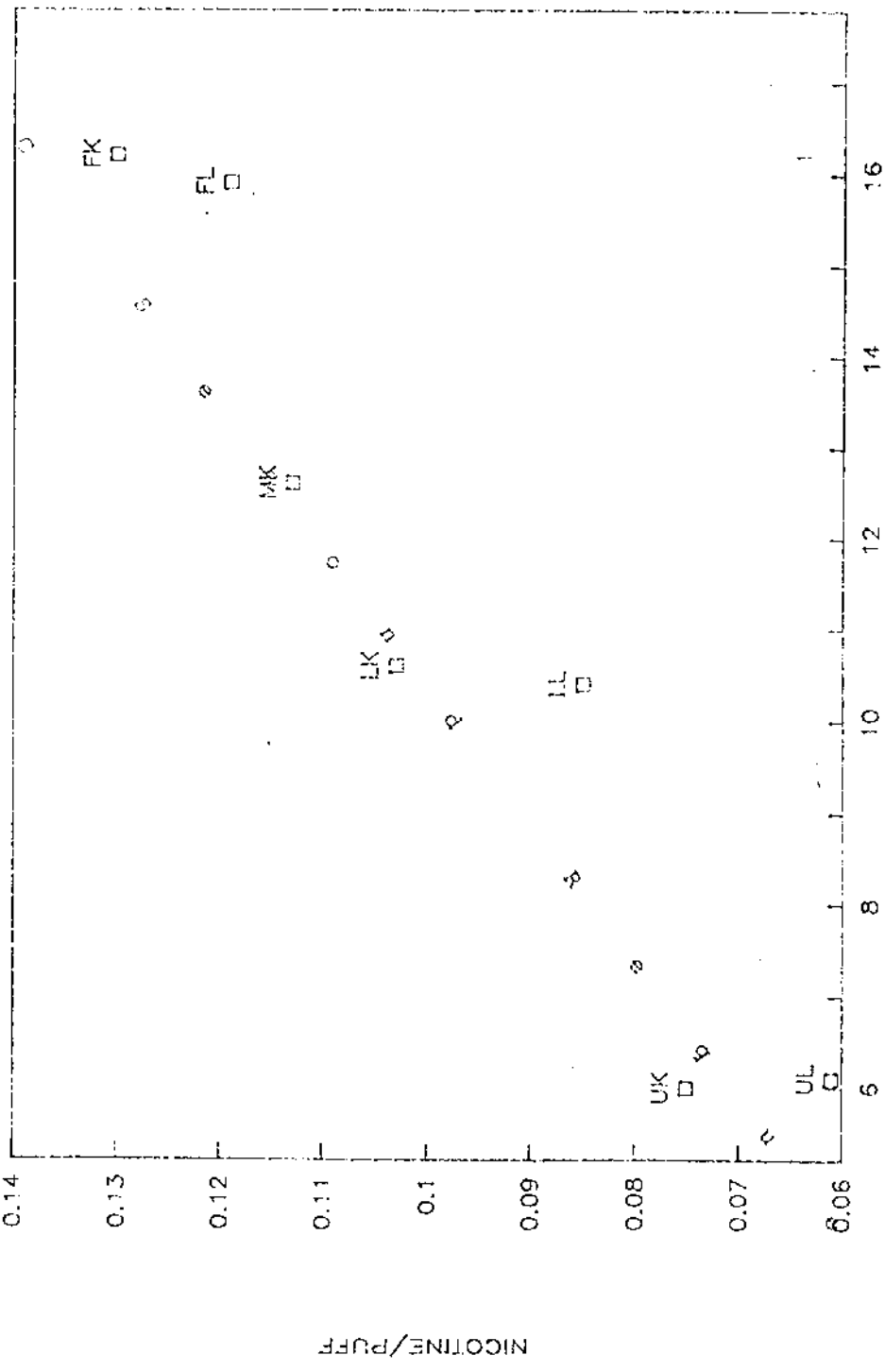


FIGURE 47

US MARLBORO STYLES

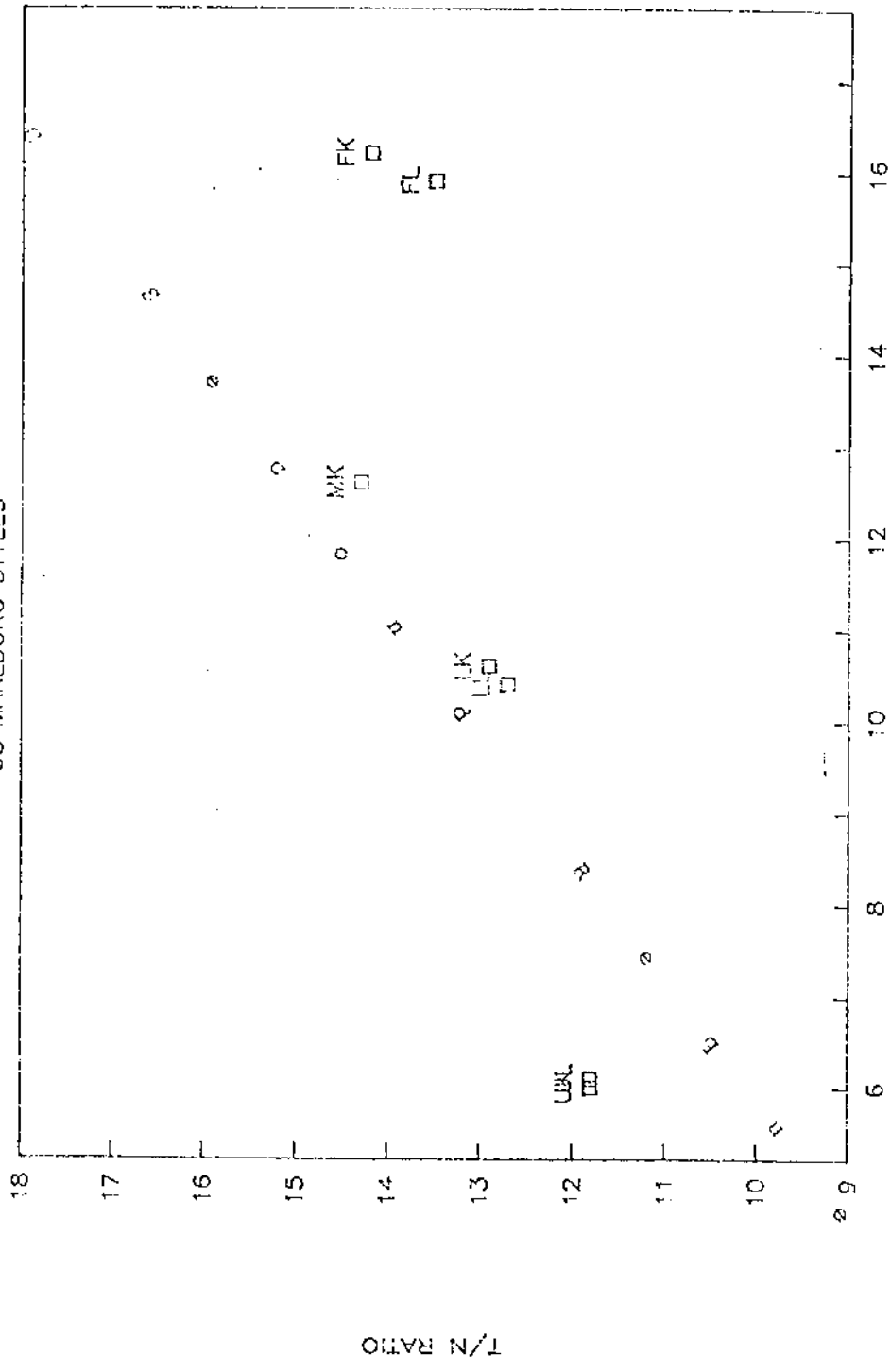
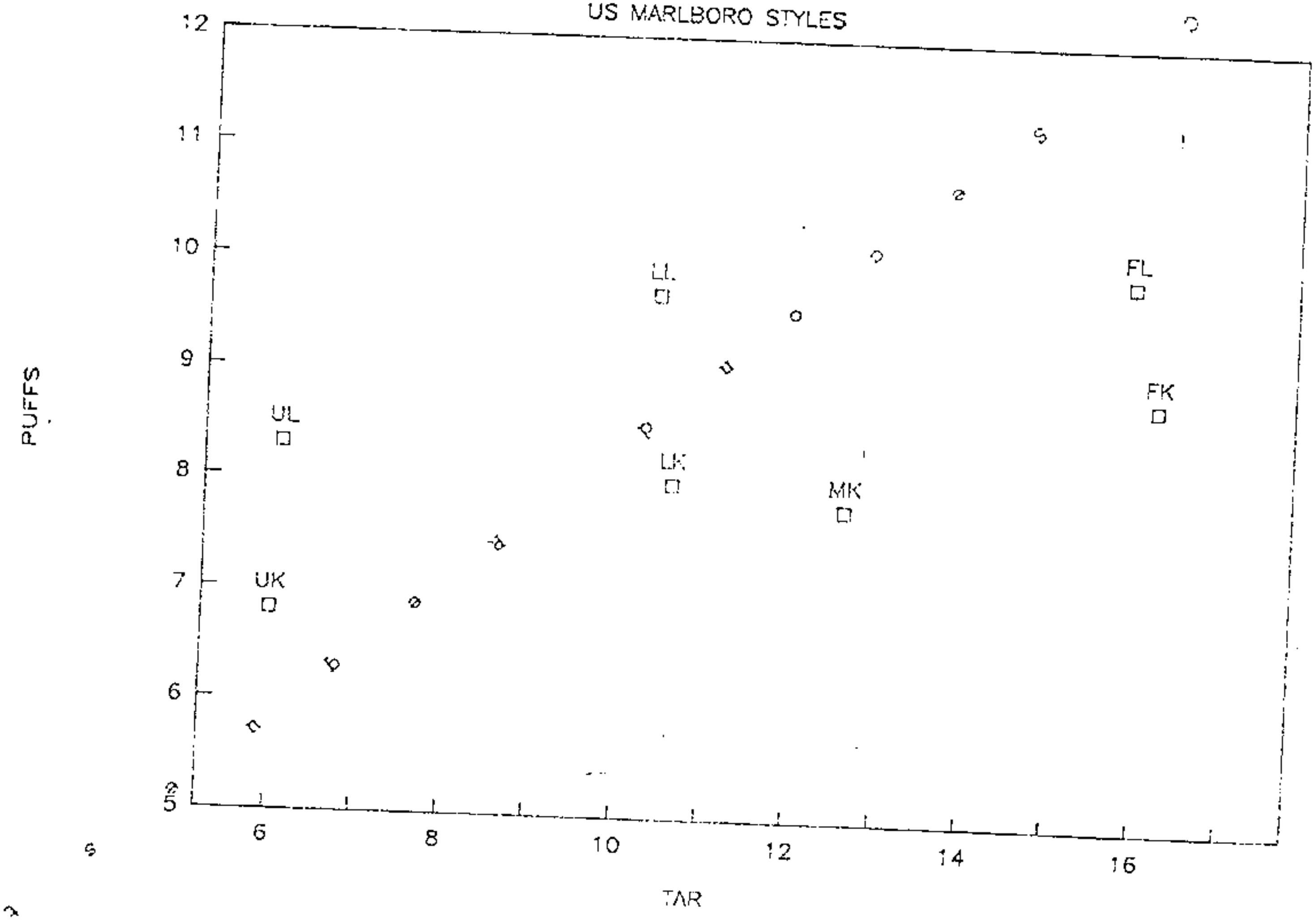
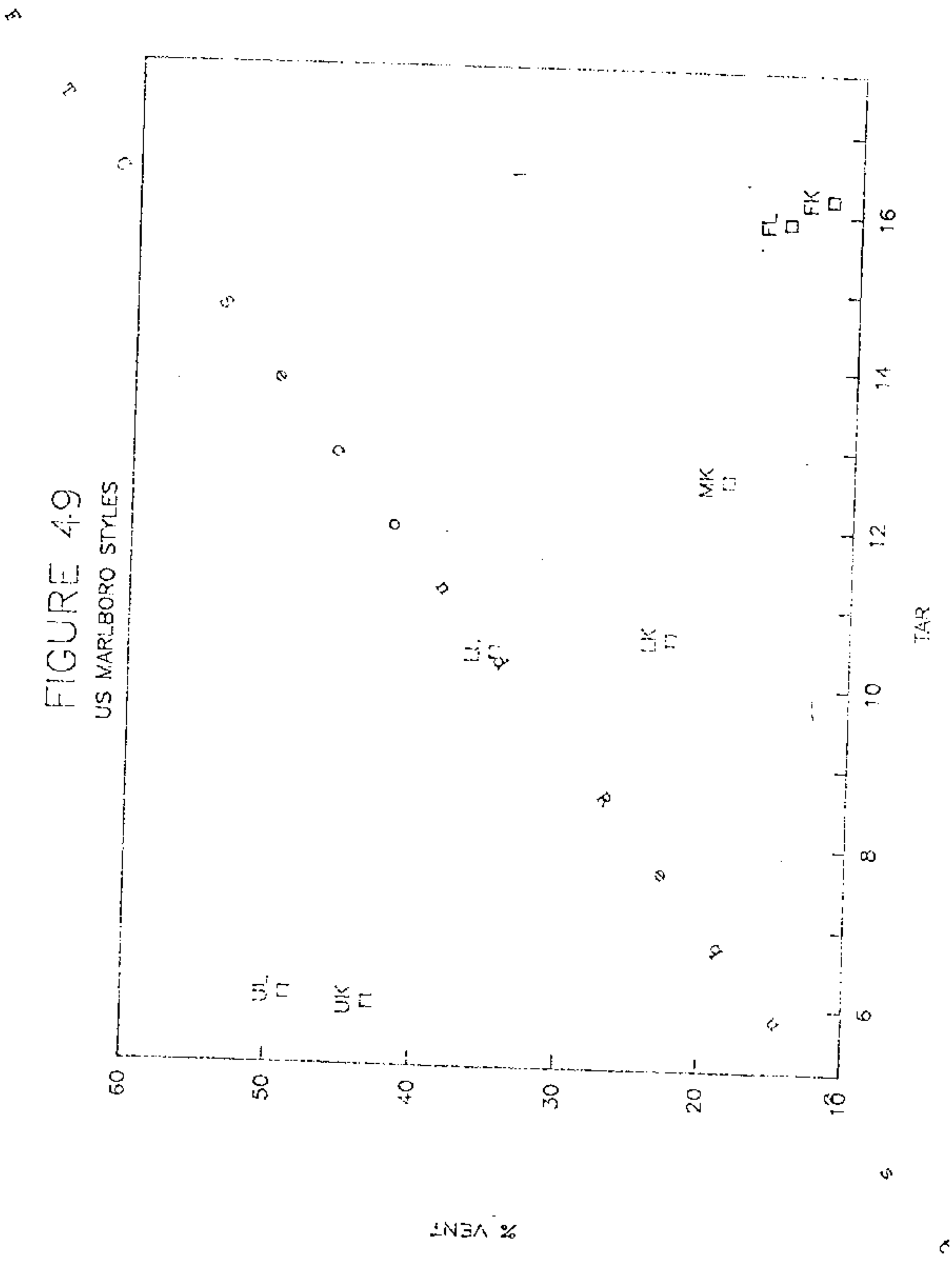


FIGURE 48

US MARLBORO STYLES



B12 56662



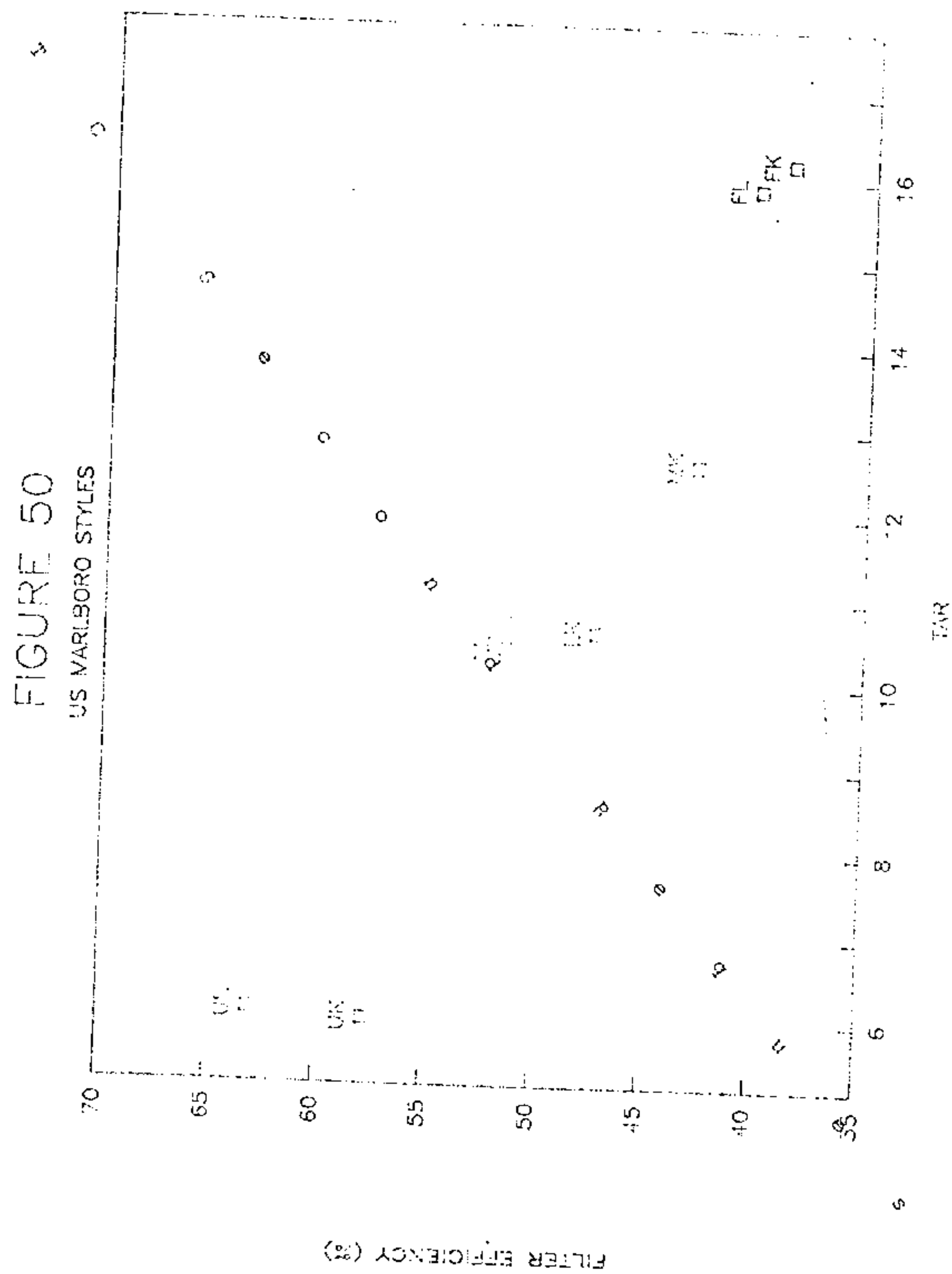
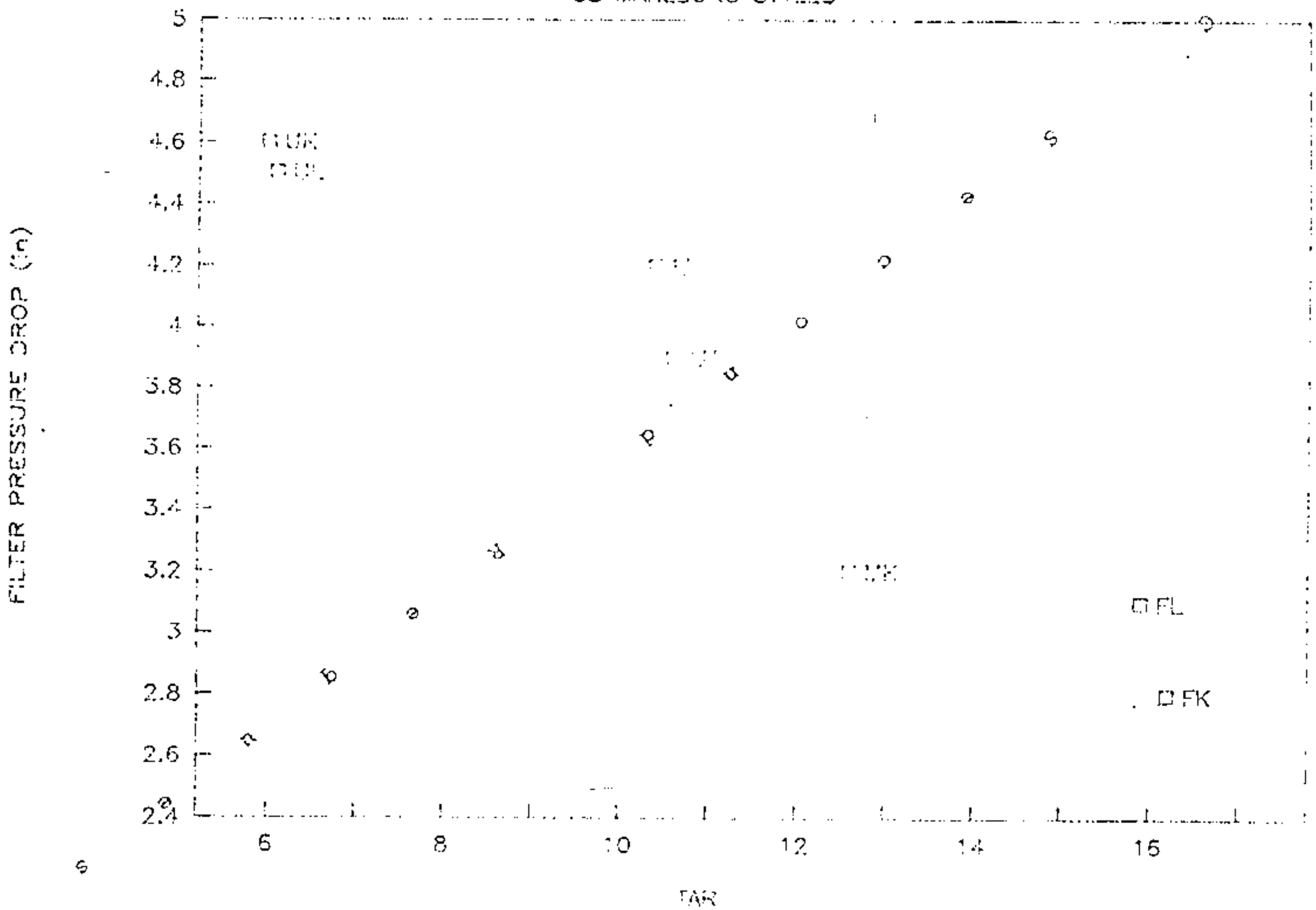


FIGURE 51

US MARLBORO STYLES



012 58065

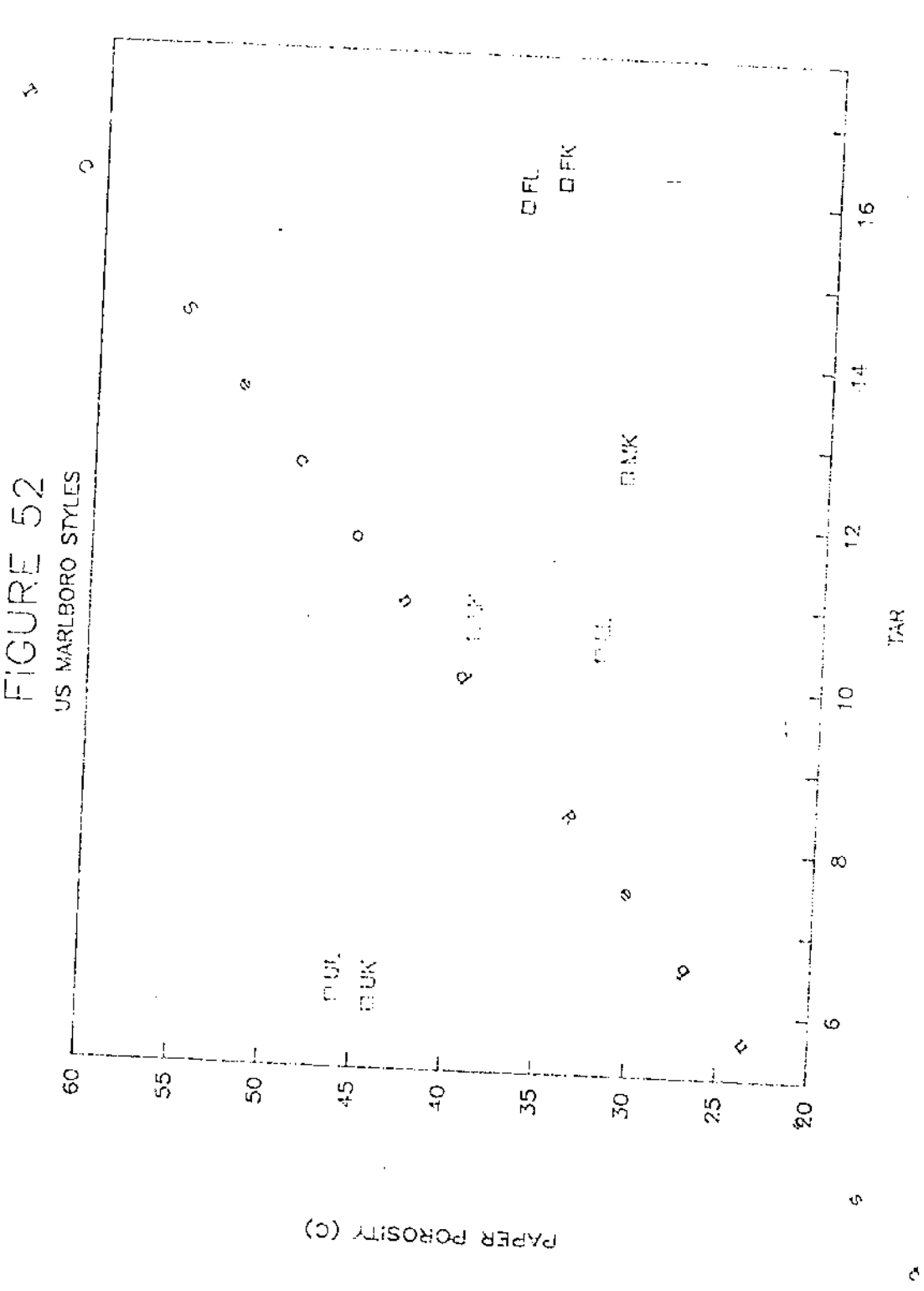
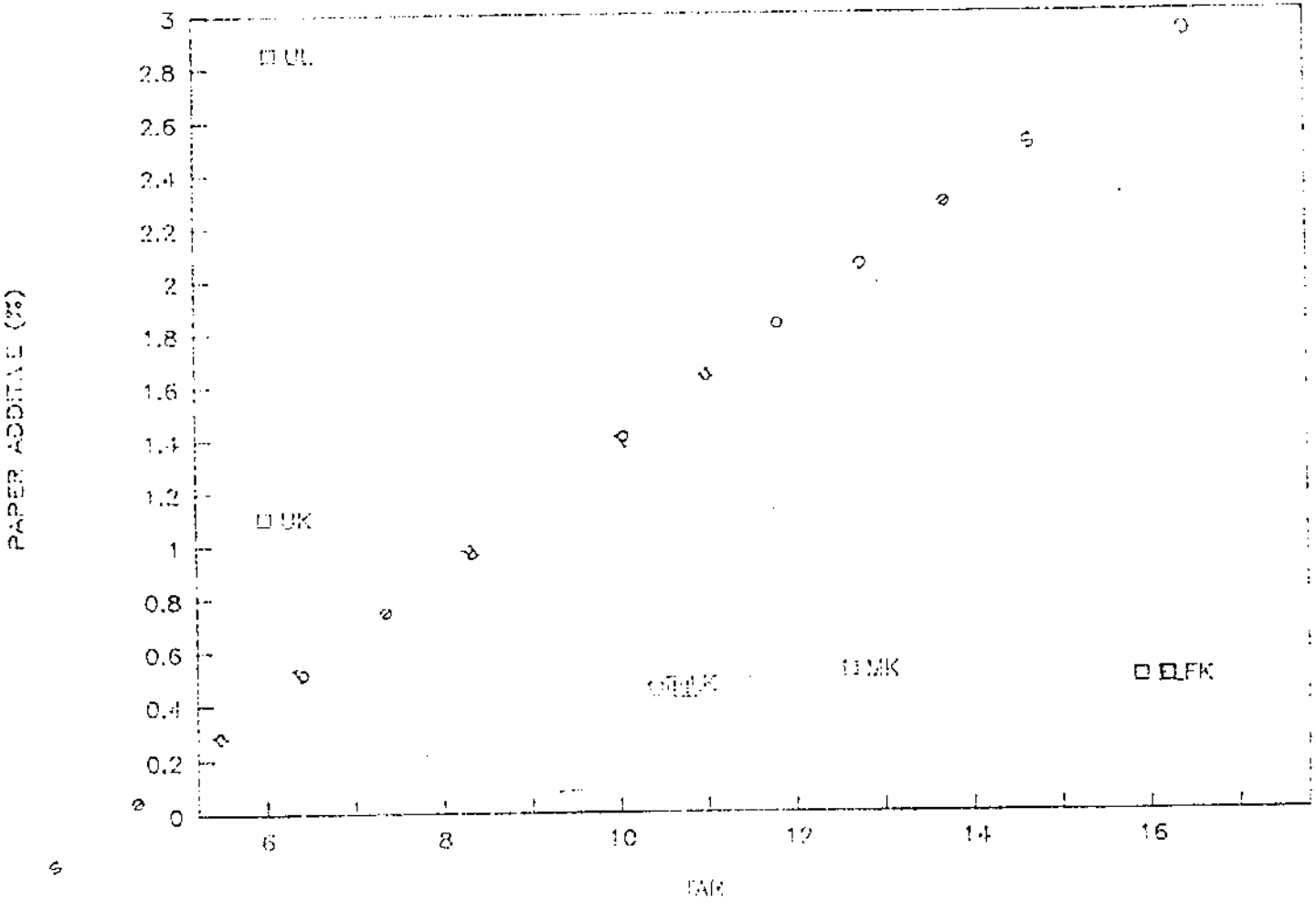


FIGURE 53

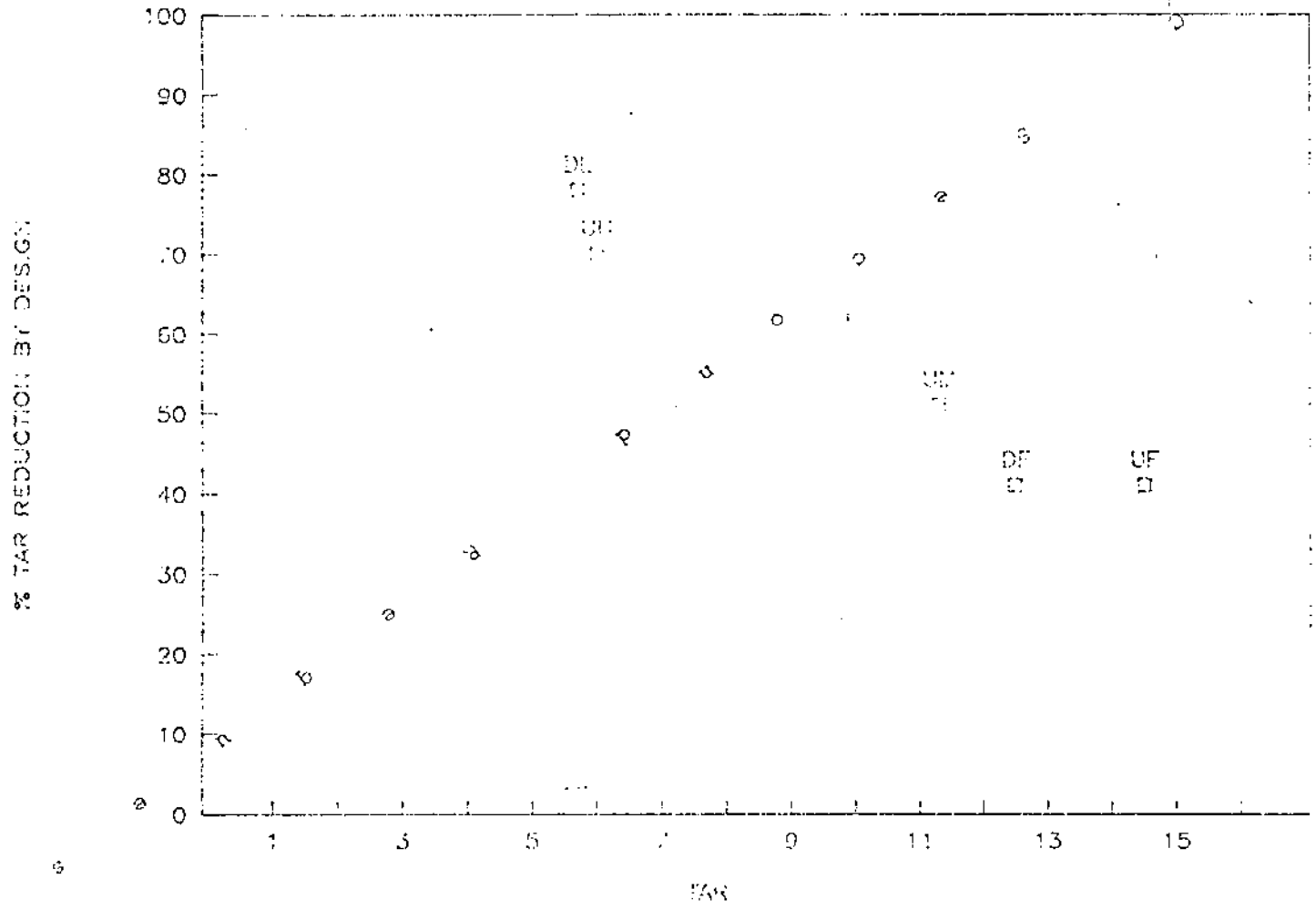
US MARLBORO STYLES



CONFIDENTIAL MINNESOTA TOBACCO LITIGATION

FIGURE 54

TAR REDUCTION BY DESIGN



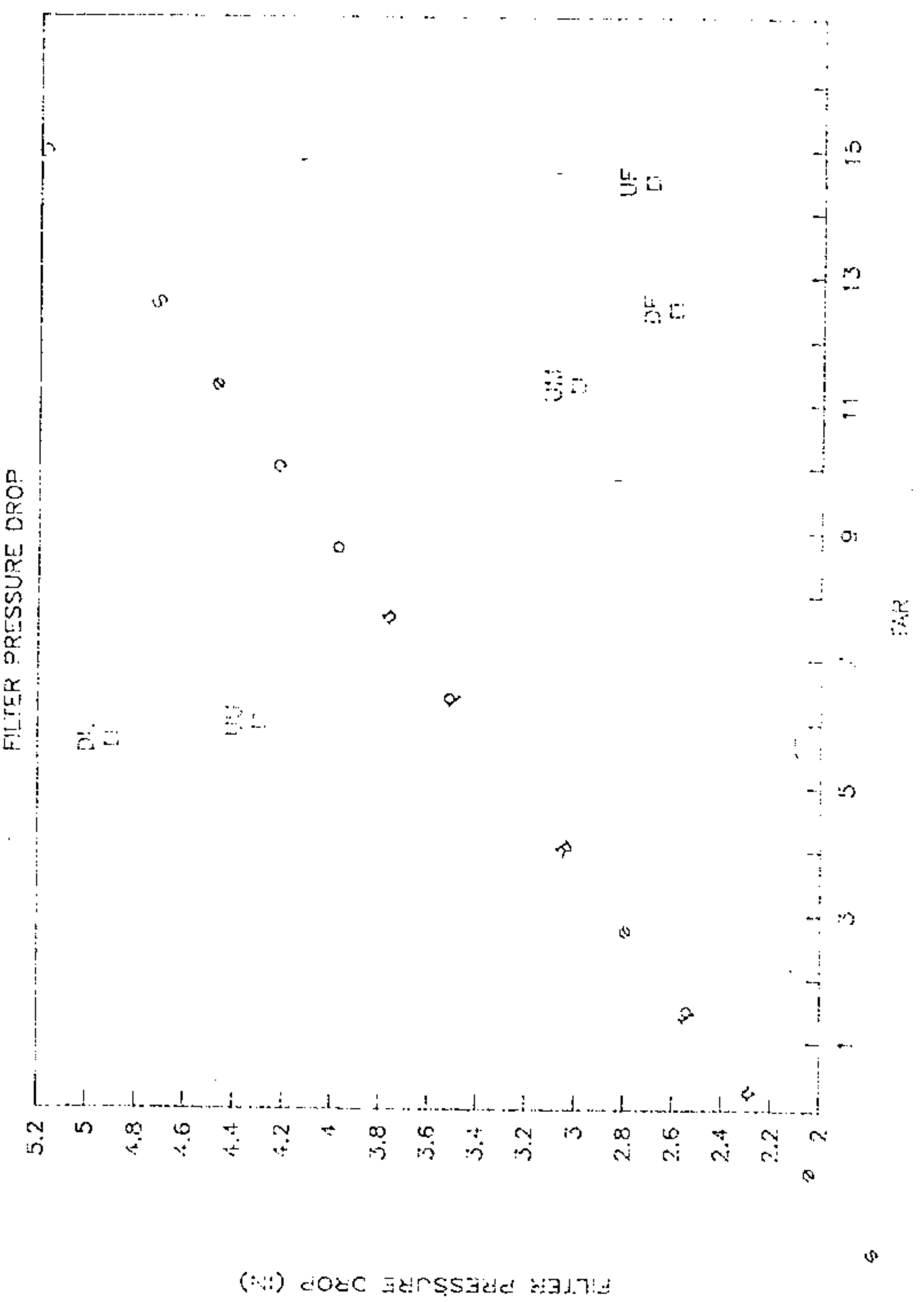
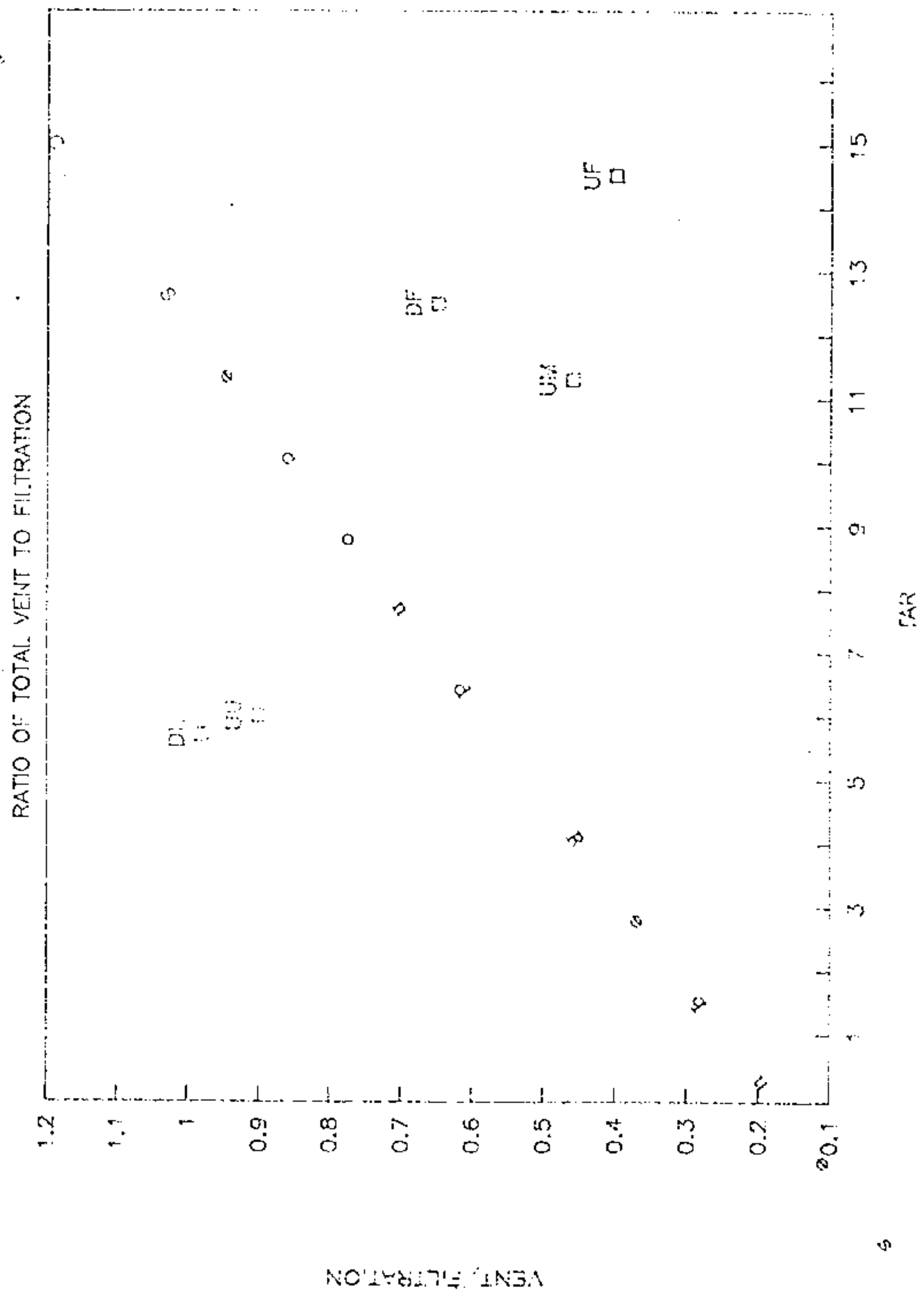


FIGURE 55
FILTER PRESSURE DROP

812 58609

FIGURE 56

RATIO OF TOTAL VENT TO FILTRATION



812 58670

FIGURE 57

Generalized PM Process Flow

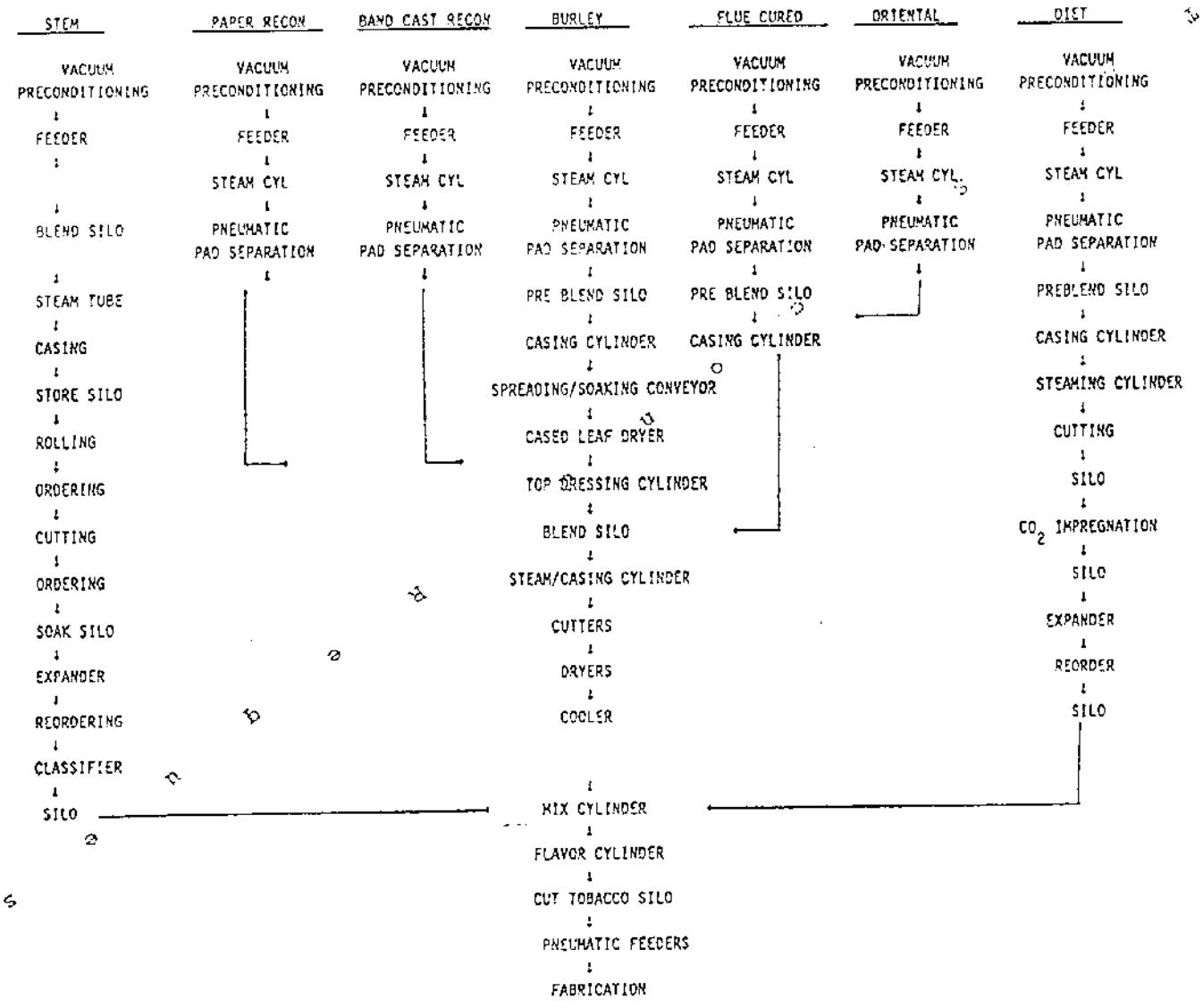
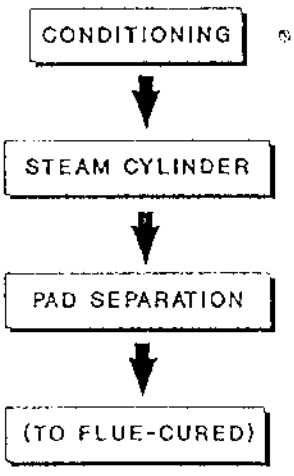


FIGURE 58
ORIENTAL PROCESS



PROCESS FLOW	OPERATING CONDITIONS	OTHER COMMENTS
CONDITIONING		DCC
STEAM CYLINDER	16% MOISTURE MAX TEMP 140-145 ° F	TEMP ALSO GIVEN AS 125° F
PAD SEPARATION	18.5% MOISTURE 120 ° F	RANGE ALSO GIVEN AS 17-18%
(TO FLUE-CURED)	18% MOISTURE 80 ° F	

FIGURE 59
FLUE-CURED PROCESSING

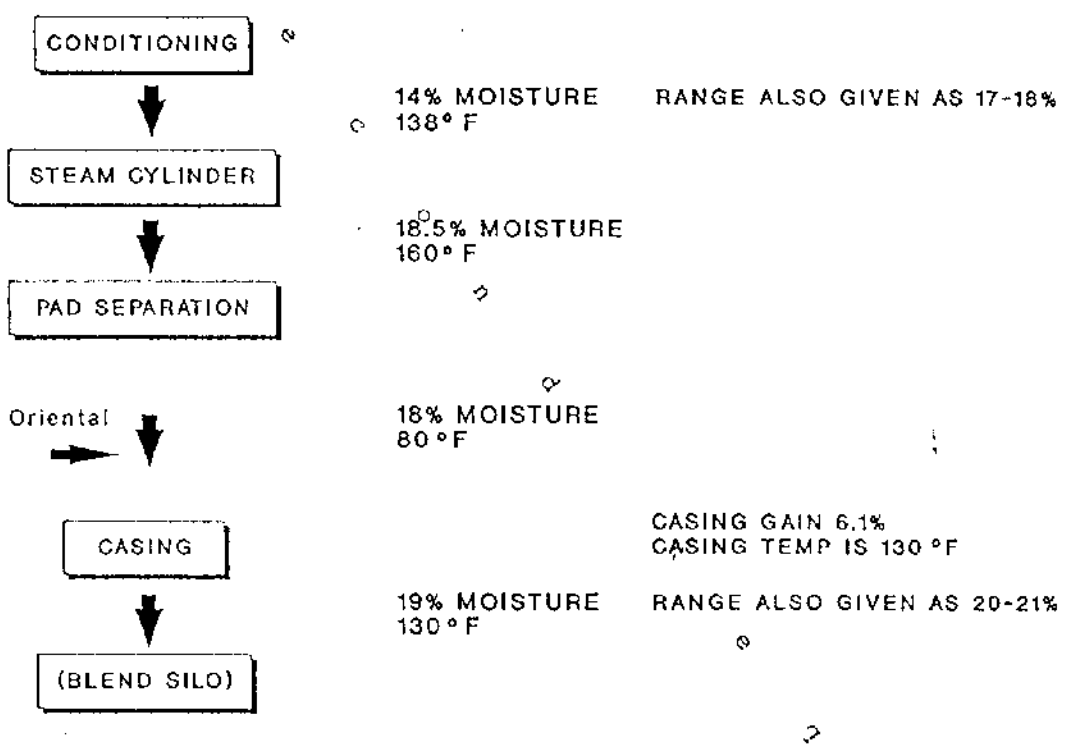


FIGURE 60
BURLEY PROCESSING

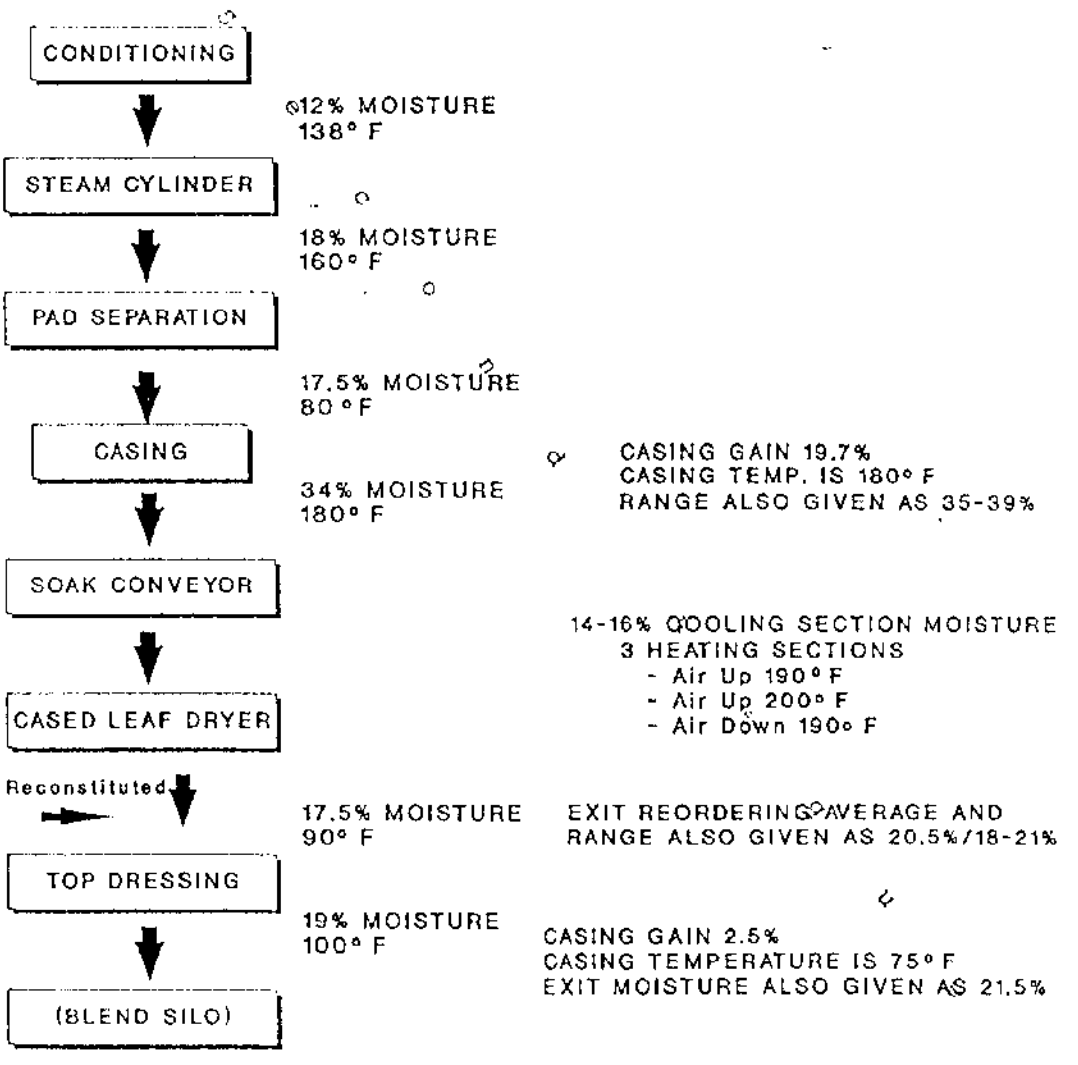


FIGURE 61
CUT TOBACCO PROCESSING

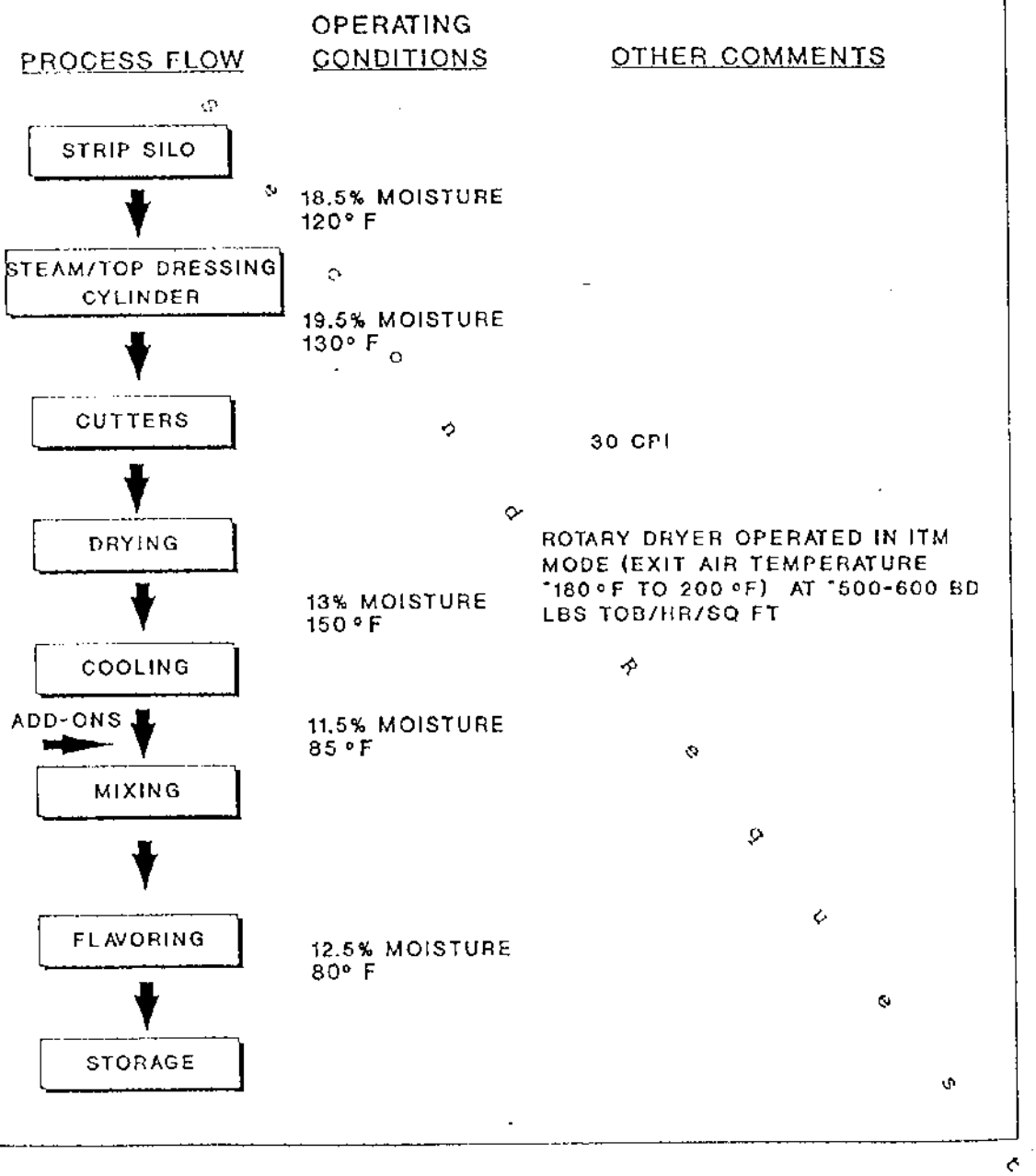


FIGURE 62
STEM PROCESS OPERATION

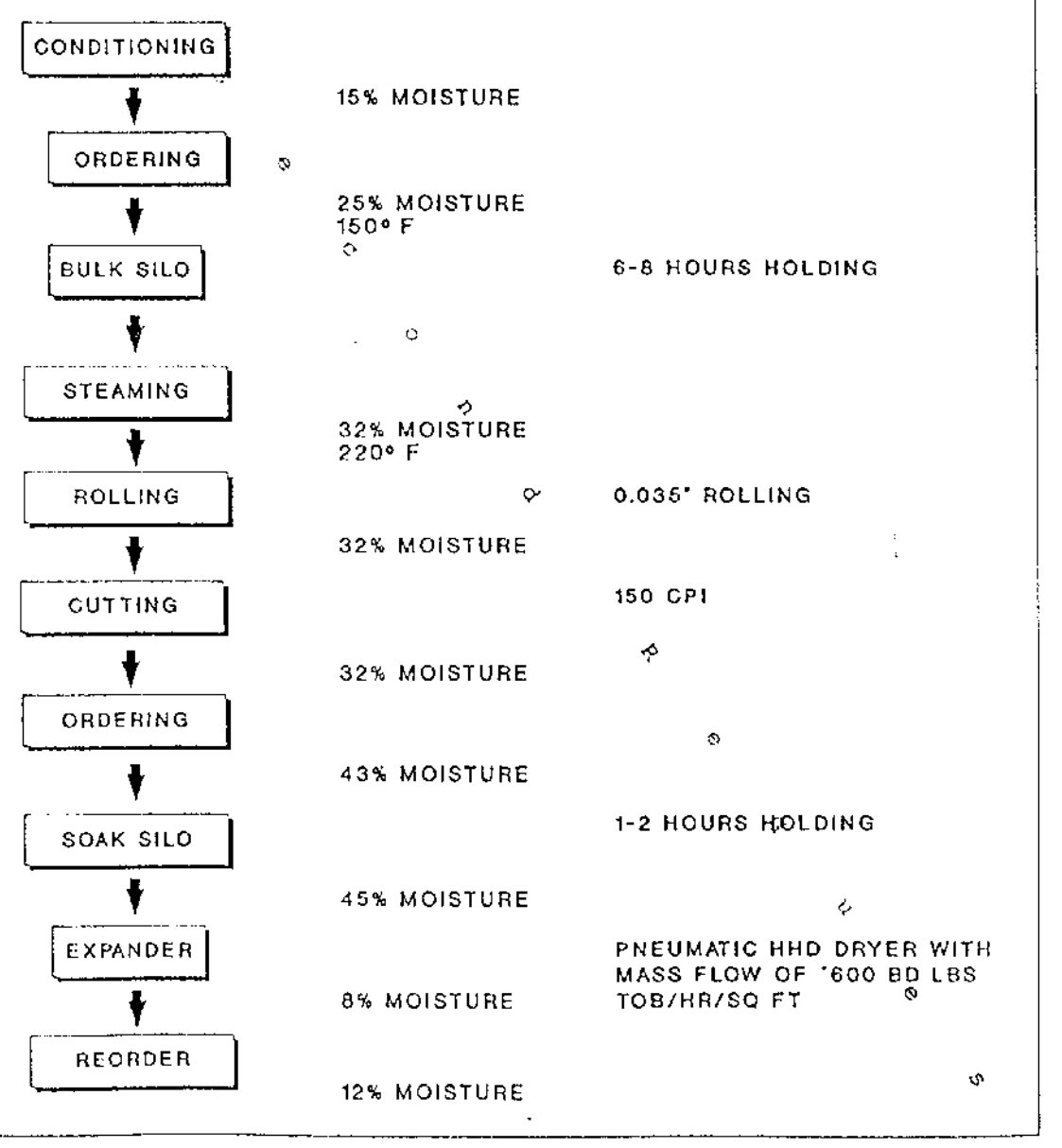


FIGURE 63
Schematic of PM's CLD Process

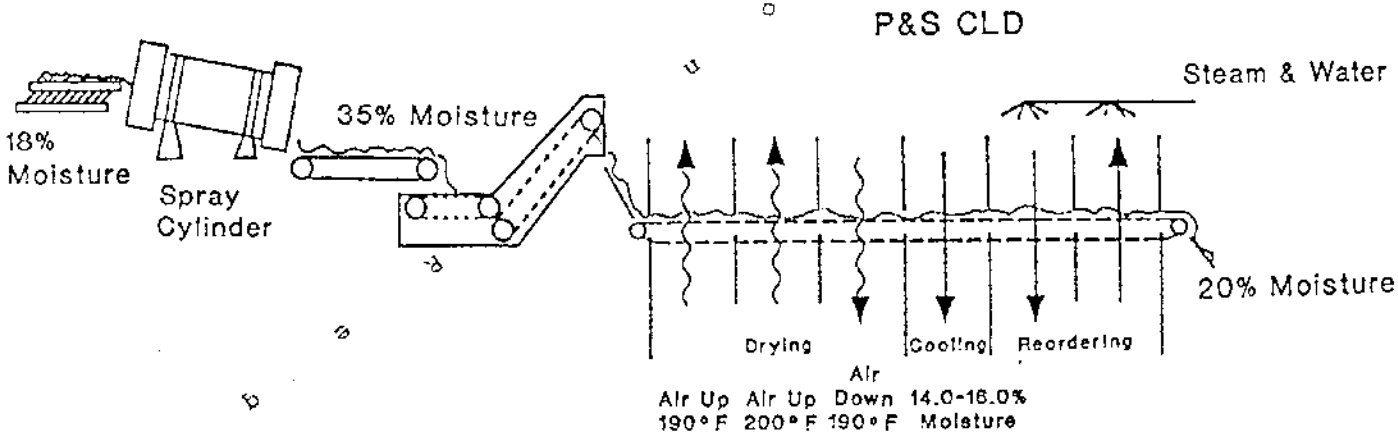


FIGURE 64
Schematic of PM's Cut Rag Drying Process

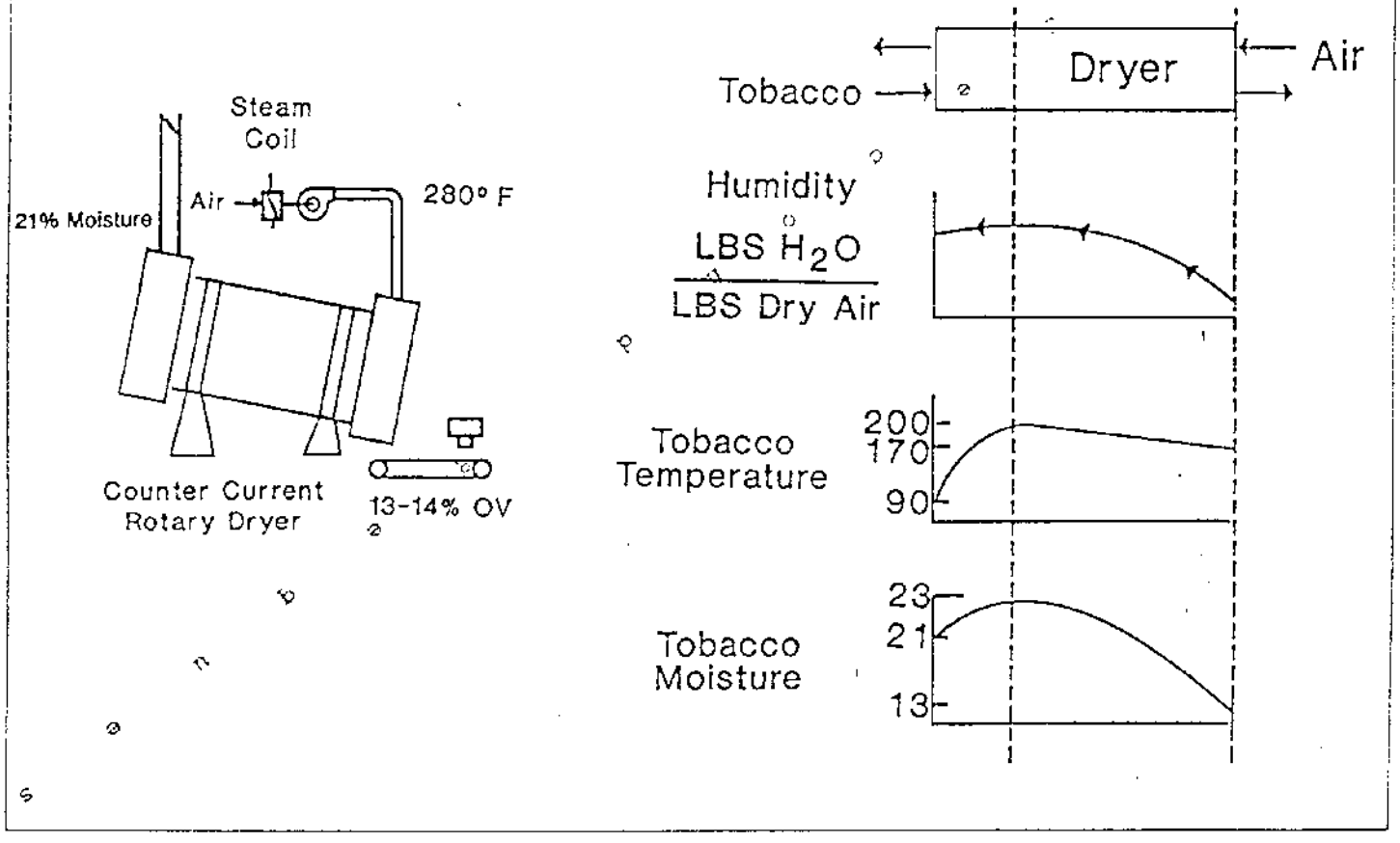


FIGURE 65

US PRODUCTS SENSORY MAP 1983–1984

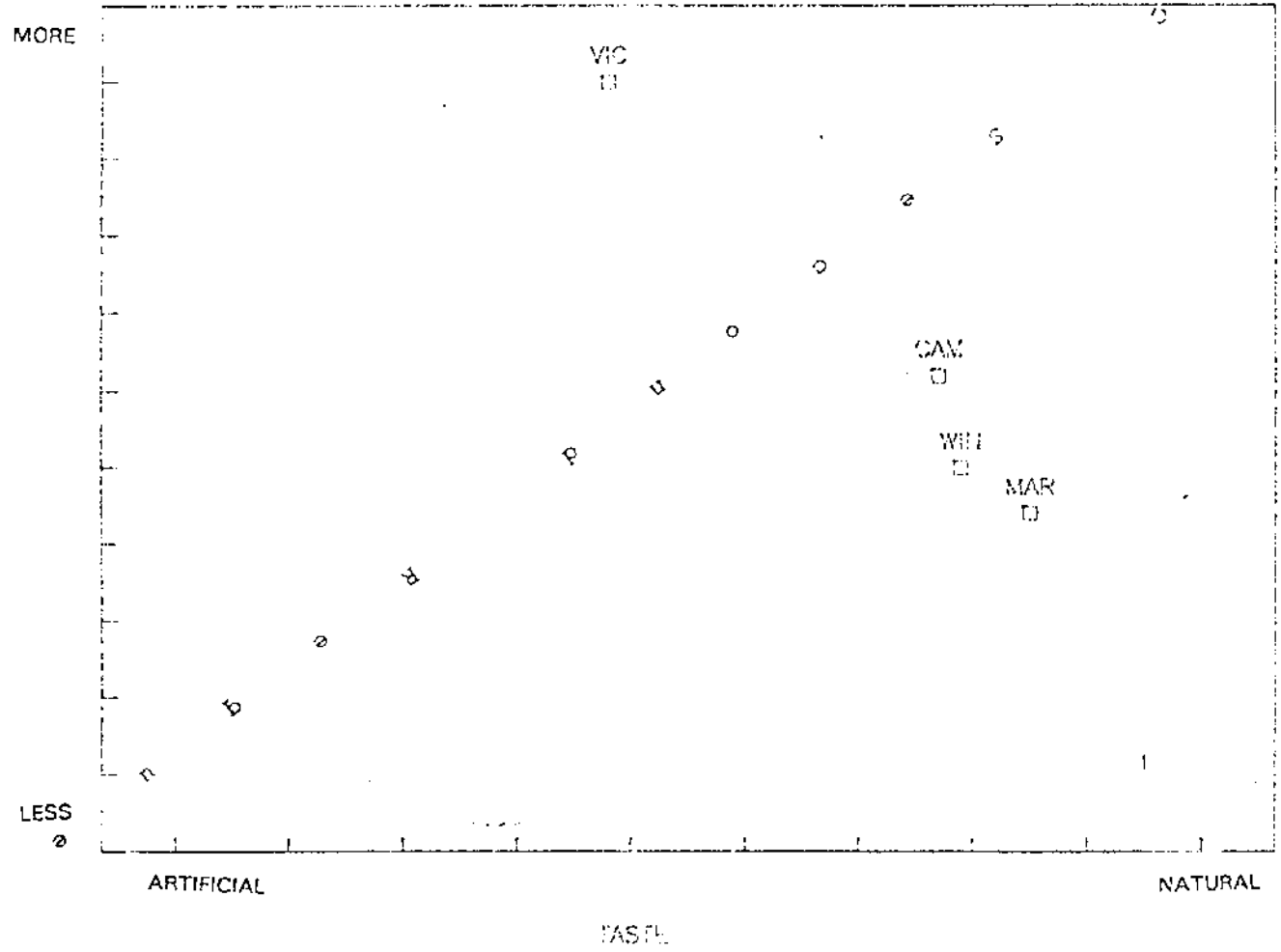


FIGURE 66

SENSORY MAP 1986 / (PROJECT GLOBE)

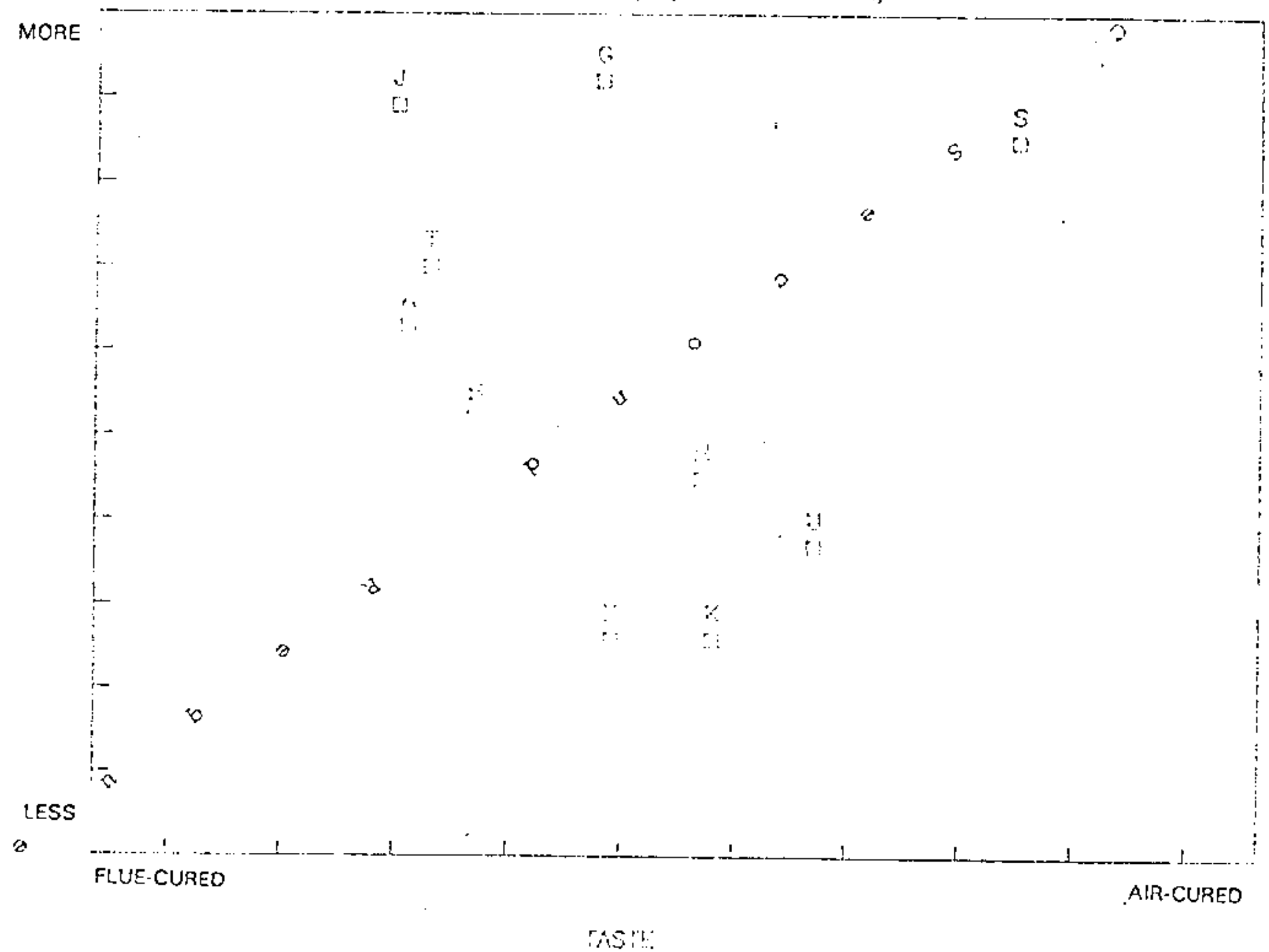


FIGURE 67

US SENSORY RESULTS 1989

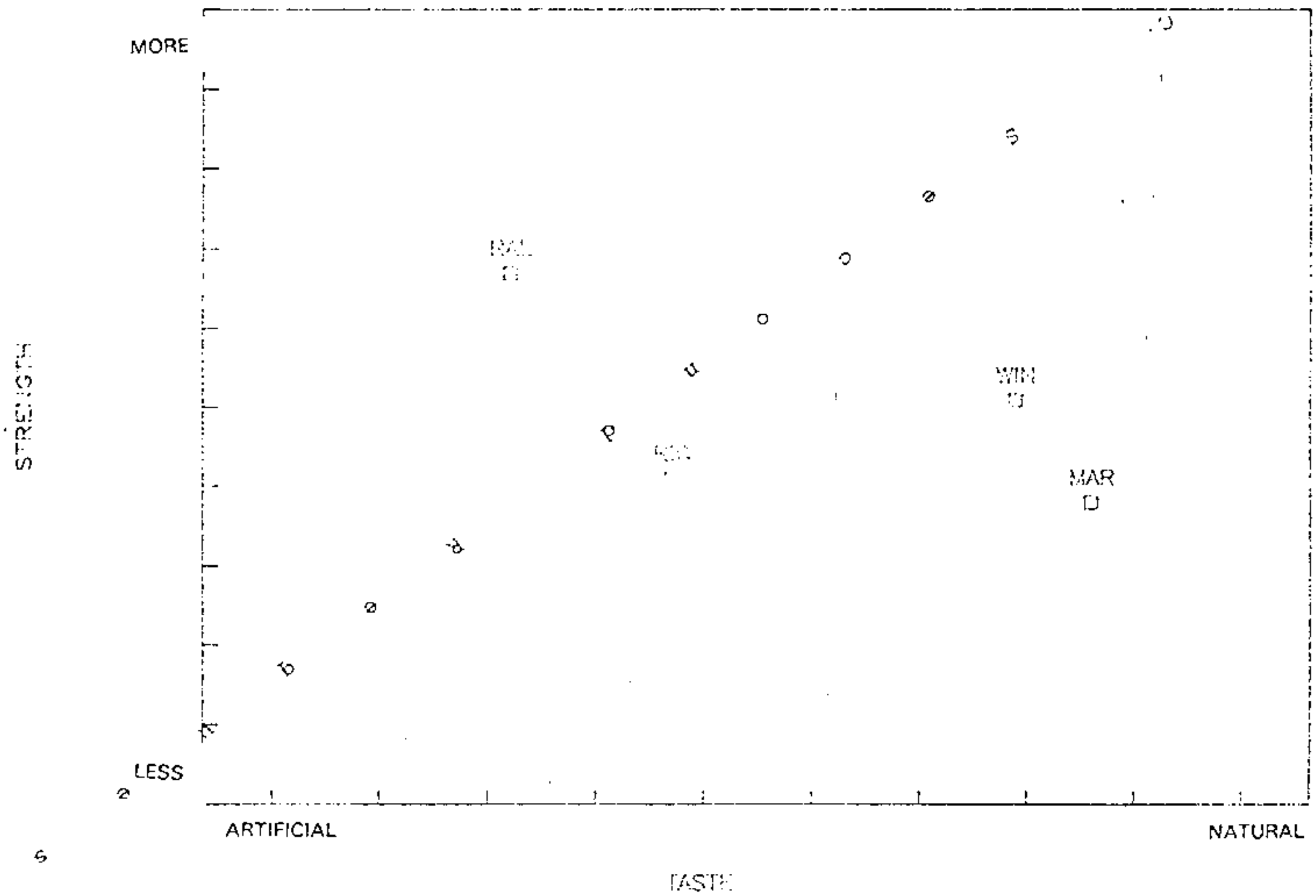
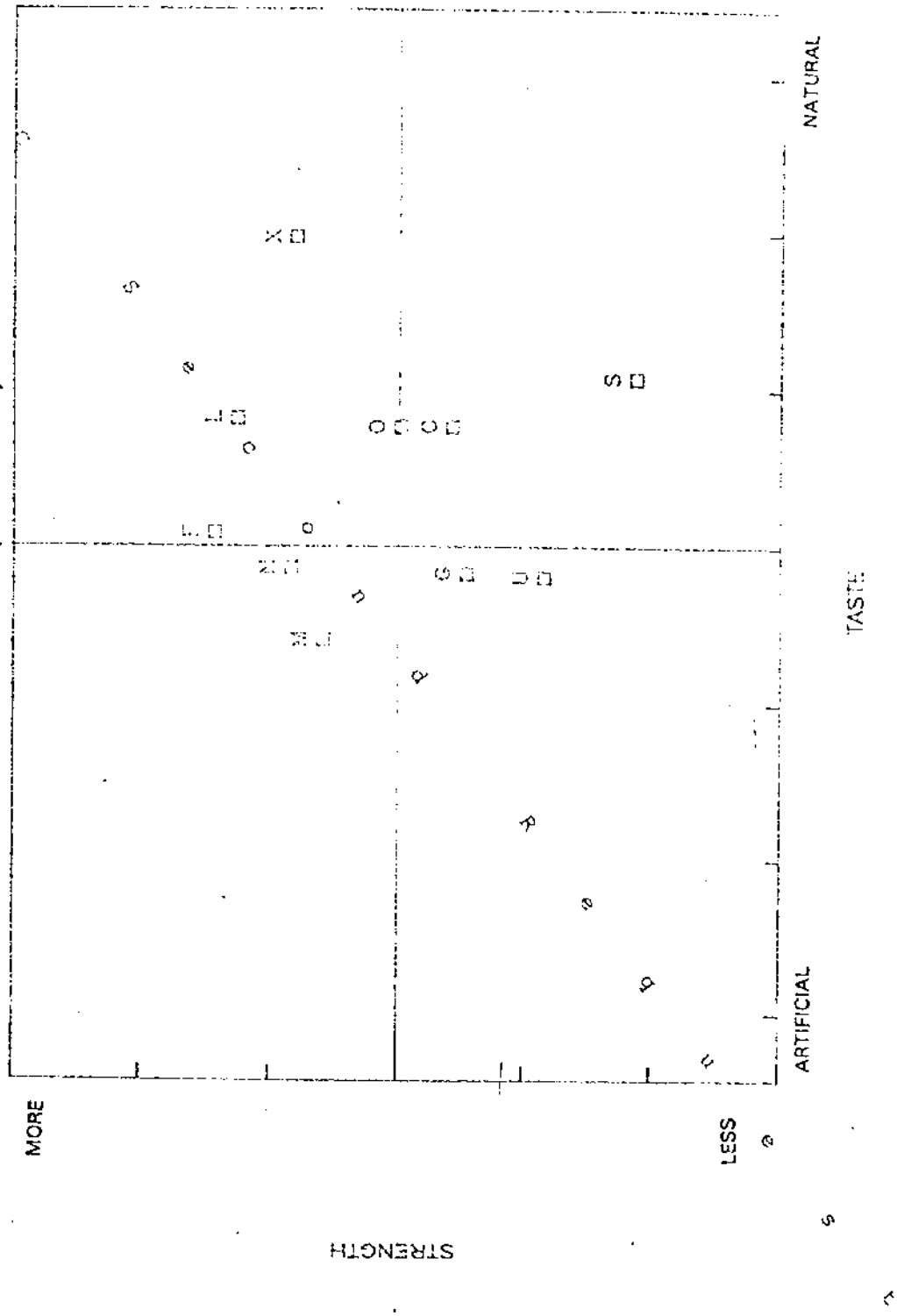


FIGURE 68

SENSORY MAP 1990 (US SMOKERS)



BIBLIOGRAPHY

1. BRN-B016-70; Swift/E. A., Heitkamp, N. D.; Oil - Water Partitioning of Cigarette Smoke
2. BRN-B027-71; Johnson, R. R.; Effect of Tobacco Moisture Content on Smoke Character and Chemistry of Raleigh Plain
3. BRN-B042-76; Deines, W. H./Brotzge, R. F./Holmes, D. M./Crain, W. O.; Consumer Differentiation of Viceroy, Winston and Marlboro Using Similarity Judgments
4. BRN-B050-74; Holmes, D. M./Riehl, T. F.; Smoke Character Effects of Oil/Water Partition Components
5. BRN-B052-74; Davis, W. E.; A Gas Chromatograph Method for Determining Cocoa in Tobacco
6. BRN-B081-77; Deines, W. H./Brotzge, R. F./Crain, W. O.; Consumer Similarity Judgments and Preference Ranking of Full Flavor Cigarettes on the Basis of Organoleptic and/or Physical Properties
7. BRN-B087-75; Davis, W. E.; A Gas Chromatographic Method for Determining Licorice on Tobacco
8. BRN-B095-75; Deines, W. H.; Consumer Differentiation of Full-Flavor Cigarettes
9. GRY-B041-70; Riehl, T. F./Aulbach, P. L.; A Study of Marlboro
10. GRY-B048-68; Philpot, K. E.; Competitive Brand Defects
11. GRY-B053-68; Philpot, K. E.; Competitive Brand Defects
12. GRY-B053-69; Philpot, K. E.; Competitive Brand Defects
13. GRY-B055-68; Philpot, K. E.; Competitive Brand Defects
14. GRY-B065-76; Merker, S. L.; Firmness/Density Profiles of Selected B&W and Competitive Brands
15. GRY-B073-76; Johnson, R. R.; Competitive Brand Blend Components
16. GRY-B074-78; Ems, J. L.; January 1978 Competitive Brand Report
17. GRY-B076-66; Philpot, K. E.; Evaluation of Marlboro Cigarettes
18. GRY-B079-71; Johnson, R. R.; Smoke Panel Procedures for Nonmenthol Cigarettes: Smoke Sensations
19. GRY-B087-76; Gregory, C. F.; Quantities of Microflora Recovered from Brown & Williamson and Competitive Cigarette Brands Spring, 1976
20. GRY-B087-78; Ems, J. L.; May 1978 Competitive Brand Report
21. GRY-B090-78; Ems, J. L.; July 1978 Competitive Brand Report
22. GRY-B094-71; Gravely, L. E.; Microbiological Examination of Brown and Williamson and Competitive Cigarette Brands

23. GRY-B096-77; Merker, S. L.; A Study of Individual Blend Components of Selected B&W and Competitive Cigarettes

24. GRY-B125-72; Johnson, R. R.; Comparisons of Normal and Dry Cigarettes: Viceroy, Winston, Marlboro and Humectant Levels on Viceroy

25. GRY-B125-73; Deines, W. H.; Subjective Smoke Quality Description - A Laboratory Technique

26. GRY-B137-77; Swift, E. A.; OWP Survey of Low Tar Cigarettes

27. R&D-L008-58; Hughes, I. W.; Weyman, U. A.; Project Number 2-Second Interim Report

28. R&D-L016-85; Crellin, R. A.; Project Ship (Examination of Branded and Experimental Products From the USA)

29. R&D-B009-86; Walquist, R. W.; Redryer Studies

30. R&D-B026-86; Johnson, R. R.; Lin, O. C.; Key Bands Analysis For Reverse Engineering

31. PGS-B025-86; Denier, R. F.; SAT Versus ADH - A Process Comparison

32. PGS-B050-85; Denier, R. F.; Ammonia Wet Heat Processing of Tobacco

33. PGS-B077-85; Denier, R. F.; A Feasibility Study of Ammonia Dry Heat Processing as a Means of Harshness Reduction

34. R&D-L047-76; Crellin, R. A.; An Examination of Philip Morris Brands

35. R&D-L057-77; Crellin, R. A.; Alkylpyrazine Levels in Philip Morris Brands

36. PGS-B030-85; Johnson, R. R.; Rio KS and Rio 100's: New Brands by Philip Morris

37. BRN-B046-74; Deines, W. H.; Effects of Cigarette Design on Oil/Water Partition Profiles Part III-WTS/PCL, Ammonium Phosphates, Density/Cuts Per Inch and Filter Plasticizer

38. BRN-B058-74; Riehl, T. F.; Alford, E. D.; Identification of Flavors on Competitive Cigarettes

39. R&D-B097-82; Walker, K. M.; February 1982 Competitive Brand Report

40. MEM-L095-83; Few, G. A./Flebelkorn, R. T.; A Comparison of the Smoke From Coded Products 280322, 280323 and 280324 With That From Camel Plain, Marlboro KS and Marlboro Lights KS: Fourier Transform Infrared Spectroscopy

41. R&D-L059-73; Cousins, A. R.; Examination of Marlboro and OK Filter From the Lebanon

42. R&D-L015-73; Horsewell, H. G., Cousins, A. R.; Reexamination of Swiss Muratti Ambassador and Marlboro

43. BRN-B102-73; Johnson, R. R.; The Chemical Composition of Marlboro Blend Components of Long Strand Length

44. CMP-B091-84; Domestic Competitive Analysis 1984 Update

45. R&D-L019-76; Brooks, G. O./Jenkins, C. R.; Comparison of Marlboro and Merit / Merit Menthol

46. R&D-L059-74; Ayers, C. W./Conway, D. E./Cousins, A. R.; An Examination of Marlboro Part 1 - Nine Brands

47. MEM-L002-85; Kinnard, P. J./Whitton, T. A./Few, G. A.; A Comparison of the Smoke from Gemini Cigarettes with that From Aries, Camel Plain, Marlboro KS and Marlboro Lights KS using Fourier Transform Infrared Spectroscopy

48. MEM-L096-83; Few, G. A./King, T. A.; A Comparison of the Smoke From Coded Products 280322, 280323 and 280324 with that from Camel Plain, Marlboro KS and Marlboro Lights KS : Oil/Water Partition Analysis

49. PGS-B036-86; Denler, R. F.; Ammonia Gas Substitutes in the ADH process

50. GRY-B122-72; Nall, J. F.; Evaluations of Marlboro 100, Winston 100 and Viceroy 99

51. MEM-B001-74; Johnson, R. R.; Redford: A Lorillard Approach to a Full Flavor KSFT Cigarette

52. MEM-B005-76; Johnson, R. R.; Nonroutine Evaluations of Merit and Merit Menthol

53. MEM-B005-80; Chakraborty, B. B.; Development of Lucky Strike KS

54. MEM-B006-83; Hilton, D. C.; Marlboro KS Menthol by Philip Morris

55. MEM-B009-77; Marquess, T. D.; Moisture Aging Study of Viceroy 84 / 99, Raleigh 84 / 99, Raleigh 84 / 99 and Select Competitive Brands Purchased at Retail Outlets in Phoenix, Arizona

56. MEM-B011-78; Johnson, R. R.; CPT Samples by R. J. Reynolds

57. MEM-B012-73; Johnson, R. R.; Nicotine Content of Philip Morris Reconstituted Tobacco

58. MEM-B013-75; Merker, S. L.; Coal Retention Probability (CRP) and End Densing

59. MEM-B013-77; Johnson, R. R.; Evaluations of R. J. Reynolds CPT Samples

60. MEM-B023-78; Johnson, R. R.; 5-12-78 CPT Samples by R. J. Reynolds

61. MEM-B025-73; Ernst, J. W.; Relationships Between Philip Morris' Leaf Purchases and Their High Nicotine Reconstituted Tobacco

62. MEM-B027-77; Marquess, T. D.; Moisture Aging Study of Viceroy 84 / 99, Raleigh 84 / 99 and Selective Competitive Brands Purchased at Retail Outlets in Phoenix, Arizona

63. MEM-B034-74; Nall, J. F.; Moisture Content of Selected B&W and Competitive Brands on Sale in Retail Outlets

64. MEM-B035-80; Aulbach, P. L.; Survey of USA Type Competitive Brands Outside the USA

65. MEM-B037-77; Johnson, R. R.; Seam Paste Adhesives Used on Competitive Brands

66. MEM-B037-78; Burge, R. A.; Carbon Monoxide Deliveries of B&W and Select Competitive Brands

67. MEM-B051-73; Alford, E. D.; A Comparison of Results From the Nitrogen OWP Analysis of Burley / PJS and Virginia / Turkish Cigarettes

68. MEM-B052-78; Ems, J. L.; Particulate and Gas Phase Deliveries of Select B&W Competitive Brands

69. MEM-B055-73; Alford, E. D.; Volatile Nitrogen Constituents of Smoke With Particular Reference to Pyrazines

70. MEM-B082-80; Deines, W. H./Brotzge, R. F.; Dupont Evaluation of Experimental Filter Ventilated Parent Brands

71. MEM-B082-82; Gonterman, R. A.; Menthol in Nonmenthol KS Competitive Brands

72. MEM-B102-82; Brawner, J. M.; Puff by Puff Pressure Drops of Selected Cigarette Brands

73. MEM-B132-82; Brawner, J. M.; Puff by Puff Pressure Drops of Selected Cigarette Brands

74. MEM-B136-79; Litzinger, E. F./Reynolds, M. L.; Should We Ventilate Kool, Viceroy and Raleigh Parent Products?

75. MEM-B145-81; Roth, D. S.; Cigarette Spotting Overseas Markets Pickup

76. PGS-B058-83; Deines, W. H.; Dupont Acceptability Rating of Lamark CPT Candidates G & H

77. PGS-B065-83; Johnson, R. R.; Examination of Prince KS Varieties Ex Denmark

78. PGS-B069-83; Johnson, R. R.; Current Knowledge of the Marlboro KS Design

79. PGS-B076-83; Brawner, J. M.; Oil / Water Partition Analyses of Lamark XLF-565 Samples

80. PGS-B079-83; Alford, E. D., Hsieh, T. C.; Tip Volatiles Analysis of Philip Morris Brands

81. PGS-B100-83; Johnson, R. R.; Philip Morris CPT of a Lights Menthol Product

82. PGS-B101-83; Johnson, R. R.; Philip Morris CPT of Two Marlboro Lights KS Products

83. R&D-B001-82; Walker, K. M.; August 1981 Competitive Brand Report

84. R&D-B004-80; Conway, W. R.; September (1979) Competitive Brand Report

85. R&D-B005-81; Walker, K. M.; September 1980 Competitive Brand Report

86. R&D-B017-82; Walker, K. M.; September 1981 Competitive Brand Report

87. R&D-B018-82; Walker, K. M.; October 1981 Competitive Brand Report

88. R&D-B019-81; Walker, K. M.; October 1980 Competitive Brand Report

89. R&D-B027-80; Conway, W. R.; October (1979) Competitive Brand Report

90. R&D-B033-81; Walker, K. M.; November 1980 Competitive Brand Report

91. R&D-B043-82; Walker, K. M.; November 1981 Competitive Brand Report

92. R&D-B045-80; Conway, W. R.; November (1979) Competitive Brand Report

93. R&D-B062-80; Conway, W. R.; December (1979) Competitive Brand Report

94. R&D-B070-82; Walker, K. M.; December 1981 Competitive Brand Report II
95. R&D-B074-80; Conway, W. R.; January (1980) Competitive Brand Report
96. R&D-B074-81; Walker, K. M.; December 1980 Competitive Brand Report
97. R&D-B080-81; Walker, K. M.; January 1981 Competitive Brand report
98. R&D-B081-82; Walker, K. M.; January 1982 Competitive Brand Report
99. R&D-B089-80; Conway, W. R.; February (1980) Competitive Brand Report
100. R&D-B095-80; Conway, W. R.; March (1980) Competitive Brand Report
101. R&D-B096-81; Walker, K. M.; March 1981 Competitive Brand Report
102. R&D-B100-80; Walker, K. M.; April (1980) Competitive Brand Report
103. R&D-B106-81; Walker, K. M.; February 1981 Competitive Brand Report
104. R&D-B113-80; Walker, K. M.; May (1980) Competitive Brand Report
105. R&D-B120-80; Walker, K. M.; June (1980) Competitive Brand Report
106. R&D-B125-80; Walker, K. M.; July (1980) Competitive Brand Report
107. R&D-B129-82; Walker, K. M.; March 1982 Competitive Brand Report
108. R&D-B130-82; Walker, K. M.; April 1982 Competitive Brand Report
109. R&D-B137-80; Walker, K. M.; August (1980) Competitive Brand Report
110. R&D-B140-79; Conway, W. R.; July (1979) Competitive Brand Report
111. R&D-B141-81; Walker, K. M.; April 1981 Competitive Brand Report
112. R&D-B144-79; Conway, W. R.; August (1979) Competitive Brand Report
113. R&D-B148-81; Walker, K. M.; May 1981 Competitive Brand Report
114. R&D-B154-81; Walker, K. M.; June 1981 Competitive Brand Report
115. R&D-B162-81; Walker, K. M.; July 1982 Competitive Brand Report
116. R&D-L007-79; Hirji, T./Few, G. A./Shillabeer, P. K./Brooks, G. O.; The Laboratory Comparison of Oil / Water Partition / GC Scans Test I
117. R&D-L008-76; Crellin, R. A.; An Examination of Marlboro (Brazil) Phase II
118. R&D-L011-80; Few, G. A.; An Examination of Recently Marketed Philip Morris Brands
119. R&D-L043-77; Hedge, R. W.,; Examination of a Philip Morris RTS
120. R&D-L045-78; Crellin, R. A.; An Examination of Philip Morris Brands From Canada
121. R&D-L050-78; Crellin, R. A.; Examination of Kent Prior to BAT Acquisition
122. R&D-L057-75; Conway, D. E./Crellin, R. A./Brooks, G. O.; An Examination of Marlboro (Brazil)

123. R&D-L061-77; Brooks, G. O.; Examination of Real

124. R&D-L065-74; Foster, N.; An Investigation of the Light Fastness of Print on Some International Cigarette Brands

125. R&D-L065-77; Ayers, C. W./Crellin, R. A./Hook, R. G.; OWP Evaluation of a Philip Morris RTS

126. R&D-L088-76; Crellin, R. A.; Project Fleece-An Examination of R. J. Reynolds Brands

127. R&D-L107-76; Brooks, G. O.; Oil/Water Partition Comparison of Marlboro (Holland) and Prince (Denmark)

128. R&D-L122-76; Crellin, R. A./Jenkins, C. R.; Evaluation of an Experimental "Marlboro" Type Product Form

129. R&D-G009-80; Kausch, E.; The Marlboro on Offer to the Market in Continental Europe: Analysis, Assessment, Strategy

130. RES-G012-82; Kausch, E./Todter, F.; The European Marlboro Offer 1982 Analysis, Evaluation, Product Trends

131. PGS-B010-85; Jenkins, C. B.; Nicotine Transfer Study

132. PGS-B027-84; Hilton, D. C.; Marlboro Lights 100's Box by Philip Morris

133. PGS-B036-84; Geiss, V. L.; Cigarette Spotting Analysis

134. PGS-B043-84; Chao, L. C./Bryant, H. G.; The Measurement of Smoke Yields as Function of Puff Parameters for B&W and Comparable Competitive Brands

135. PGS-B047-84; Deines, W. H.; Hong Kong Consumer Panel Evaluation of Kent KS Improvement Candidates

136. PGS-B053-84; Lauterbach, J. H./Lin, O. C.; A Study of Thirty-Five USA Commercial Blends Using X Ray Fluorescence Spectroscopy

137. PGS-B057-84; Denler, R. F.; Pressure/Time Effects on Ammonia Impregnated Tobacco

138. PGS-B072-84; Denler, R. F.; PET Processing of Ammonium Hydroxide Treated Tobacco

139. PGS-B077-84; Crain, W. O.; Marlboro 25's KS and Marlboro 25's Lights KS

140. PGS-B094-84; Deines, W. H.; Hong Kong Consumer Panel Evaluation

141. PGS-B129-83; Walker, K. M.; Analysis of Sugar/Ammonia Reaction Products

142. PGS-B130-83; Alford, E. D./Hsieh, T. C.; A Major Sugar/Ammonia Reaction Product In Marlboro 85's

143. PGS-B134-83; Maynor, H. W.; Determination of Ammonium Ions In Smoke by Ion Chromatography

144. R&D-B015-85; Johnson R. R.; Integration of 1983 and 1984 Nonmenthol Brand Survey Results

145. R&D-B016-84;Johnson, R. R.; The Unique Differences of Philip Morris Cigarette Brands

146. R&D-B020-84; Hilton, D. C.; September 1983 Competitive Brand Report

147. R&D-B024-84; Hilton, D. C.; October 1983 Competitive Brand Report

148. R&D-B040-84; Gordon, D. L.; Project Benmac: Associate Process Comparison

149. R&D-B042-84; Ems, J. L.; December, 1983 Competitive Brand Report

150. R&D-B050-84; Ems, J. L.; January, 1984 Competitive Brand Report

151. R&D-B123-83; Hilton, D. C.; April 1983 Competitive Brand Report

152. MEM-L024-85; Kinnard, P. J./Few, G. A.; The Amelia Launch: Mapping of Amelia Against its Competitors in USA and Hong Kong Markets

153. R&D-L072-83; Irwin, W. D. E; Sidestream Emission Levels From Leading Competitor Brands Selected from Eleven Markets

154. MIS-B108-83; Chakraborty, B. B./Gordon, D. L.; Trip Report - To Scandinavian Tobacco Company

155. R&D-B060-86; Walquist, R. W.; Redryer Simulation on the BATUKE R&D Tobacco Processing Cylinder

156. PGS-B061-86; Alford, E. D.; Comparison of Pmasis, RCB and CPCL's

157. R&D-B002-79;Ems, J. L; October, 1978 Competitive Brand Report

158. R&D-B015-79; Conway, W. R.; January, 1979 Competitive Brand Report

159. R&D-B025-79; Conway, W. R.; March, 1979 Competitive Brand Report

160. R&D-B027-79: Conway, W. R.; April, 1979 Competitive Brand Report

161. R&D-B033-79: Conway, W. R.; May, 1979 Competitive Brand Report

162. R&D-B038-79; Conway, W. R.; June, 1979 Competitive Brand Report

163. SMA-B156-84; Maynor, H. W., Lin, O. C.; Automated Ion Chromatography Method for Determining Ammonium Ions in Cigarette Smoke (Reissued April 14, 1987)

164. PGS-B015-87; Chao, L. C.; Determination of Urea in Cigarette Tobacco Blends

165. PGS-B019-87; Johnson, R. R.; 1985 Key Brand Study: Analysis of Blend Components

166. PGS-B018-87; Johnson, R. R.; Richland Blend Changes in February, 1986: Analytical Changes Versus Ell Cutter and Marlboro

167. MEM-B070-86; St. Charles, F. K.; Comparison of Viceroy and Marlboro KS Vapor Phase Added to Richland KS Smoke

168. MIS-L041-87; Crellin, R. A., Harding, B. C.; Product Development Review Number 17 Project Globe: Competitor Product Strategy Part 1: Marlboro

169. PGS-B049-87; Johnson, R. R.; Casings Analysis of Burley and Flue-Cured Tobaccos from Marlboro KS and Winston KS.

170. PGS-B062-87; Johnson, R. R.; Reformulated Marlboro Menthol KS by Philip Morris

171. PGS-B063-87; Johnson, R. R.; Marlboro Lights Menthol KS and 100's by Philip Morris

172. PGS-B067-87; Johnson, R. R.; Cambridge Full Flavor KS and 100's by Philip Morris

173. R&D-B023-79; Conway, W. R.; February, 1979 Competitive Brand Report

174. RES-G006-87; Hass, W./Heemann, V./Koene, H. C./Kopke, U.; Taste Modifier NR. 6, PM's Flexible Strategy of International Blend Management

175. RES-G008-87; Hass, W./Heemann, V./Koene, H. C./Kopke, U.; Taste modifier NR. 5, Recon and Nicotine Scavenging

176. PGS-B084-87; Johnson, R. R.; Ten Years of Tracking Marlboro KS

177. PGS-B085-87; Johnson, R. R.; Tobacco Chemistry of Marlboro and Richland Blend Components

178. MIS-L063-87;Crellin, R. A./Harding, B. C.; Product Development Review 18 Project Globe: Competitor Product Strategy Part 2: B&H Special Filter

179. MIS-L009-88; Harding, B. C.; Product Development Review 19 Project Globe: Competitor Product Strategy Part 2: Camel

180. R&D-B015-88; Gordon, D. L.; The Secret of Marlboro

181. MIS-L049-88; Harding, B. C.; Product Development Review 24 Project Globe: Competitor Product Strategy Part 5: Dunhill King Size

182. PGS-B039-88; Goodman, P. A.; Marlboro Lights KS and 100's Box Menthol

183. PGS-B040-88; Moldoveanu, S. C./Wang, M.; The Role of the Anion in the Sugar-Ammonium Salt Reaction

184. PGS-B041-88; Walker, K. M.; The Urea Content of Marlboro KS Reconstituted Tobaccos 1987-1988 Product Manufacture

185. RES-G004-88; Hass, W./Heemann, V./Koene, H. C./Kopke, U.; Taste modifier No. 7, Nicotine Scavenging - A Consequence of Ammonia Release

186. MEM-B027-89; Walker, K. M./Jenkins, C. B.; Determination of Urea in Experimental Paper Reconstituted Tobaccos

187. PGS-B009-89; Ems, J. L.; Alpine Full Flavor and Lights Styles from Philip Morris

188. PGS-B025-89; Ems, J. L.; Marlboro Ultra Lights KS and 100's Indiana and Oregon Test Market Test Market Products

189. MEM-B026-89; Maynor, H. W.; Quantitative Determination of 2,5/2,6 Deoxyfructosazines In Marlboro KS, Eli Cutter, B&W PM Blend Simulation, Winston KS and Doral KS

190. PGS-B003-89; Ems, J. L.; Marlboro KS Menthol-Recent Findings

191. MEM-B009-89; Gordon, D. L.; Changes In Winston KS

192. MIS-L059-88; Harding, B. C.; Project Globe: Competitor Product Strategy, Part 6: Silk Cut

193. MIS-L060-88; Crellin, R. A./Harding, B. C.; Project Globe: Competitor Product Strategy, Part 7: Marlboro Lights

194. MIS-L067-88: Crellin, R. A./Harding, B. C.; Project Globe: Competitor Product Strategy, Part 8: Kent

195. MIS-L068-88; Crellin, R. A./Harding, B. C.; Project Globe: Competitor Product Strategy, Part 9: Cartier

196. MIS-L062-88; Crellin, R. A./Harding, B. C.; Project Globe: Competitor Product Strategy, Part 10: John Player Special

197. MEM-B036-89; Agyei-Aye, K.; Analysis for Possible Presence of Binders on Paper Recon from Marlboro KS (4/88)

198. MEM-B038-89; Walker, K. M.; Purge-and-Trap Analysis of Marlboro KS, Winston KS, Doral KS and B&W Blends

199. PGS-B031-89; Moldoveanu, S. C./Chakraborty, B. B./Colby, D. A./Wang, M.; Pyrolysis GC-MS of the Polymeric Materials from the Sugar-DAP Reactions

200. R&D-B032-89; Johnson, R. R.; Ammonia Technology Conference Minutes, Louisville, KY May18-19, 1989

201. PGS-B040-89; Moldoveanu, S. C./Johnson, R. R.; Use of PY-GC-MS to Estimate Strip Blends

202. PGS-B041-89; Colby, D. A./Johnson, R. R.; Routine and Semi-Routing Tobacco Chemistry Measures on Adverb Samples

203. MIS-H003-89; Product Specialists Meeting Book II Leaf and Process

204. 6FLN-B050-89; Alford, E. D./Hashimoto, S./Johnson, R. R.; Factor Analysis of DS Scan Data

205. FLN-B057-89; Colby, D. A./Johnson, R. R.; Adverb Cigarette and Smoke Chemistry Evaluations

206. FLN-B059-89; Moldoveanu, S. C./Alford, E. D./Johnson, R. R.; Pyrolysis Comparison of the Dark Recons From Marlboro KS and Ell Cutter

207. FLN-B055-89; Riley, K. A.; Smoke Quality of XEBR Formulations For Project Adverb: Internal and Dupont Assessments

208. R&D-B053-89; Lauterbach, J. H./Johnson, R. R.; The Project Adverb Study of Marlboro KS

209. FLN-B070-89; Alford, E. D./Johnson, R. R.; A DS Scan Study of Competitive Paper Reconstituted Tobaccos

210. FLN-B007-90; Johnson, R. R.; Tobacco Particles Sizes and Weights in Marlboro KS and In Adverb Samples

211. FLN-B012-90; Johnson, R. R.; Second Series of Adverb Cigarettes: PSD's of Blend Components

212. R&D-M002-90; Rodrigues, A. A. S.; Study on Pyrazine Precursors

213. FLN-B083-85; Honeycutt, R. H.; Comparisons of Viceroy, Marlboro, and Winston KS Smoked Through Charcoal Filters

214. FLN-B082-85; Honeycutt, R. H.; Comparisons of Viceroy, Marlboro, and Winston KS Smoked Through a Cambridge Pad

215. R&D-B031-90, Johnson, R. R.; Second Annual Ammonia Technology Conference: Commercialization of Ammonia Technology Louisville, Kentucky, June 11-13, 1990

216. FLN-B006-91; Burch, T. H./Moldoveanu, S. C./Johnson, R. R.; Paper Reconstituted Breakup Is Not Due to Factors That Are Analyzed by the D's Scan Method

217. PGS-B002-91; Houpt, S. T.; Evaluation of Commercial Low Sidestream Papers

218. FLN-B061-90; Johnson, R. R.; Thickness of Marlboro and Richland Recon Strands

219. FLN-B069-90; Burch, T. H./Moldoveanu, S. C./Johnson, R. R.; DS Scan Study of Paper Reconstituted Tobacco in Marlboro

220. PGS-B049-90; Alford, E. D./Matiella, J. E.; Development of Detailed Smoke Analysis Scans

221. FLN-B024-91; Moldoveanu, S. C./Johnson, R. R.; Routine Analysis on Best CPT2 and Several Marlboro Versions

222. FLN-B021-91; Burch, T. H./Moldoveanu, S. C./Johnson, R. R.; DS Scan Studies of Band-Cast Recons: Richland Vs. Marlboro

223. PGS-B032-91; Moldoveanu, S. C./Walker, K. M./Burch, T. H./Rouse, C. A.; Analytical Results Regarding CPT-2 Review Questions

224. CMP-B055-91; Olges, T.; Competitive Strategic Assessment Updates

225. Alford, E. D.; DS Analysis of Stems Used in Marlboro

226. Alford, E. D.; Paper Recon from Marlboro KS and Marlboro Menthol Lights 100's

227. Alford, E. D.; Paper Recons from Austrian and German DP Marlboro KS

228. Alford, E. D.; RJR Paper Recons

229. PGS-B068-89; Thompson, B. T./Hashimoto, S.; Blend Differentiation by Near Infrared Spectroscopy

230. Filho, I. V.; World-Wide Best Project Reports No. 4 (SC)

231. Moldoveanu, S. C./Kulshreshtha, N. P.; Comparison of Marlboro KS and Winston KS from Russia with Those Marketed in U.S.A.

232. Moldoveanu, S. C./Kulshreshtha, N. P.; DS Scan Identification of Several Sugar-Ammonia Chemistry Compounds in Dark Recon

233. PGS-B008-92; Moldoveanu, S. C./Conway, W. R./Kulshreshtha, N. P.; Analytical Data on Several Dark Recons

234. PGS-B007-92; Moldoveanu, S. C./Conway, W. R./Kulshreshtha, N. P.; Analytical Data on Several Paper Recon Materials

235. PGS-B009-92; Moldoveanu, S. C./Kulshreshtha, N. P./Agyel-Aye, K.; DS Scan and Other Analytical Results on Single Strand Paper Recons from Marlboro KS

236. PGS-B017-92; Moldoveanu, S. C./Kulshreshtha, N. P./Frank, D. M./Gordon, D. L.; DS Scan Comparison of Marlboro KS from Different Countries

237. Gordon, D. L.; Meetings with Dr. Kausch (October 1-2, 1991)

238. Gordon, D. L.; WWB Product Development Meeting (January 1992)

239. Hollweg, Dr./Edelbuettel-Einhaus, Dr.; Marlboro Europe

240. Harris, I. R./Stotesbury, S. J.; The Analysis of Room Temperature Volatile Compounds

241. Irwin, W. D. E./Crellin, R. A.; Marlboro Brands from U.S.A. and Germany

242. R&D-L026-91; Irwin, W. D. E.; Marlboro KS and Two Competitor Brands in Five Markets

243. Schneider, W./Bartels, J./Hass, W./Heemann, V.; WWB PM Products

TABLE A-1
MARLBORO SALES VOLUMES

COUNTRY	MANUFACTURE LOCATION	DATE	MARLBORO MKT SHARE	TOTAL MARKET	MARLBORO STICKS (MILLION)	
USA	USA	1991	26.2	509100	133384	
USA EXPORT TOTAL	USA	1991			108600	TOTAL PM EXPORT
HONG KONG	USA	1989	36.8	7150	2631	
KOREA	USA	1989		91700		
SINGAPORE	USA	1991	22.9	3600	824	
UK	"E"	1990	2.4	99600	2390	
BELGIUM	"E"	1991	18.1	17600	3186	
HOLLAND	"E"	1991	20.0	17200	3440	
FRANCE	"E"	1991	19.6	97100	19032	
DENMARK	"E"	1990	0.5	6600	33	
GREECE	"E"	1990	3.7	29000	1073	
SWITZERLAND	"E"	1991	22.3	16100	3590	
NORWAY	"E"	1990	12.8	2900	371	
FINLAND	"E"	1991	31.2	7200	2246	
AUSTRIA	AUSTRIA	1990	9.7	14400	1397	
ITALY	"E"/ITALY	1990	18.4	94600	17406	
SPAIN	"E"	1991	12.4	84500	10478	
CANARY IS	"E"	1990	17.2	4800	826	
SWEDEN	"E"	1990	6.2	10800	670	
		TOTAL			66138	
GERMANY	GERMANY	1990	23.6	121500	28674	
JAPAN	JAPAN	1990	1.3	270900	3522	
AUSTRALIA	AUSTRALIA	1990	1.9	34600	657	
MALAYSIA	MALAYSIA	1989	3.4	17800	605	SHARE IS PM TOTAL
VENEZUALA	VENEZUALA	1990	3.7	19700	729	
BRAZIL	BRAZIL	1991	2.1	155700	3270	
ARGENTINA	ARGENTINA	1991	12.1	34900	4223	
GUATAMALA	GUATAMALA	1990	2.4	1800	43	
PANAMA	PANAMA	1991	15.5	729	113	

TABLE A-2
MARLBORO KS
BLEND COMPOSITION

COUNTRY	MANUFACTURE LOCATION	DATE	% ET	% STEM	% TOTAL LIGHT RECON	% DARK RECON	% TOTAL RECON	% TOTAL BY-PRODUCTS
SAUDI	USA	1986	18.0	4.0	15.0	5.0	20.0	24.0
SAUDI	USA	1989	13.5	4.7	14.9	5.4	20.3	25.0
SAUDI	USA	1990	10.3	2.3	17.4	5.8	23.2	25.5
AVERAGE			13.9	3.7	15.8	5.4	21.2	24.8
THAILAND	USA	1991	8.2	2.1	15.6	4.3	19.9	22.0
THAILAND	USA	1991	8.4	1.8	14.3	7.8	22.1	23.9
THAILAND	USA	1992	9.0	2.2	14.5	6.8	21.3	23.5
TAIWAN	USA	1989	9.0	2.3	18.3	6.7	25.0	27.3
TAIWAN	USA	1991	8.4	1.6	13.4	7.1	20.5	22.1
TAIWAN	USA	1992	7.6	1.4	20.0	5.5	25.5	26.9
SINGAPORE	USA	1986	11.0	3.0	17.0	7.0	24.0	27.0
SINGAPORE	USA	1989	8.4	2.6	17.9	6.2	24.1	26.7
SINGAPORE	USA	1990	9.3	3.5	16.2	4.9	21.1	24.6
PARAGUAY	USA	1989	7.5	3.0	16.3	6.4	22.7	25.7
PARAGUAY	USA	1990	8.7	3.4	16.1	6.3	22.4	25.8
PARAGUAY	USA	1991	5.2	2.7	16.5	6.0	22.5	25.2
PARAGUAY	USA	1992	7.3	2.4	15.3	7.6	22.9	25.3
KOREA	USA	1991	7.7	1.0	18.5	5.2	23.7	24.7
ISRAEL	USA	1989	8.5	2.9	17.3	6.1	23.4	26.3
ISRAEL	USA	1990	10.1	2.9	15.8	6.6	22.4	25.3
ISRAEL	USA	1991	7.2	2.3	17.7	7.0	24.7	27.0
HONG KONG	USA	1986	11.0	3.0	16.0	5.0	21.0	24.0
HONG KONG	USA	1990	9.1	2.7	19.7	6.5	26.2	28.9
HONG KONG	USA	1990	6.9	2.1	20.3	6.2	26.5	28.6
HONG KONG	USA	1992	9.7	5.1	15.3	8.0	23.3	28.4
CHINA	USA	1991	7.8	2.2	18.1	7.1	25.2	27.4
CHINA	USA	1992	7.3	2.3	17.4	5.6	23.0	25.3
AVERAGE			8.4	2.5	16.8	6.3	23.2	25.7

TABLE A–2
MARLBORO KS
BLEND COMPOSITION

COUNTRY	MANUFACTURE LOCATION	DATE	% ET	% STEM	% TOTAL LIGHT RECON	% DARK RECON	% TOTAL RECON	% TOTAL BY-PRODUCTS
USA	USA	1970	0.0		0.0	18.4	18.4	18.4
USA	USA	1978	6.0	6.4	9.3	12.0	21.3	27.7
USA	USA	1981	10.8	4.8	14.0	7.5	21.5	26.3
USA	USA	1986	10.0	2.7	15.5	6.6	22.1	24.8
USA	USA	1991	7.6	2.9	17.4	5.4	22.8	25.7
USA	USA	1992	6.8	1.9	18.2	5.4	23.6	25.5
AVERAGE 91–92			7.2	2.4	17.8	5.4	23.2	25.6
VENEZUALA	VENEZUALA	1991	0.0	12.1	0.0	18.2	18.2	30.3
PANAMA	PANAMA/USA	1974	2.8	8.6	*	*	19.4	28.0
PANAMA	PANAMA	1991	0.0	9.9	9.2	0.0	9.2	19.1
PANAMA	PANAMA	1992	0.0	11.5	10.3	0.0	10.3	21.8
AVERAGE 91–92			0.0	10.7	9.8	0.0	9.8	20.5
BRAZIL	BRAZIL	1974	0.0	23.0	0.0	0.0	0.0	23.0
BRAZIL	BRAZIL	1975	0.0	17.0	0.0	0.0	0.0	17.0
BRAZIL	BRAZIL	1986	0.0	22.0	0.0	0.0	0.0	22.0
BRAZIL	BRAZIL	1991	0.0	20.0	0.0	0.0	0.0	20.0
AVERAGE			0.0	20.5	0.0	0.0	0.0	20.5
ARGENTINA	ARGENTINA	1986	0.0	22.0	0.0	0.0	0.0	22.0
ARGENTINA	ARGENTINA	1992	0.0	21.2	0.0	0.0	0.0	21.2
AVERAGE			0.0	21.6	0.0	0.0	0.0	21.6
GERMANY	GERMANY	1974	0.0	19.3	6.6	0.0	6.6	25.9
GERMANY	GERMANY	1980	0.0	10.0	10.0	0.0	10.0	20.0
GERMANY	GERMANY	1986	7.0	5.0	19.0	0.0	19.0	24.0
GERMANY	GERMANY	1989	5.1	4.2	21.7	0.0	21.7	25.9
GERMANY	GERMANY	1990	6.2	6.3	24.4	0.0	24.4	30.7
GERMANY	GERMANY	1991	6.1	3.0	20.3	0.0	20.3	23.3

TABLE A-2
MARLBORO KS
BLEND COMPOSITION

COUNTRY	MANUFACTURE LOCATION	DATE	% ET	% STEM	% TOTAL LIGHT RECON	% DARK RECON	% TOTAL RECON	% TOTAL BY-PRODUCTS
GERMANY	GERMANY	1992	4.6	11.0	27.1	0.0	27.1	38.1
GERMANY	GERMANY	1992	15.0	11.0	18.0	0.0	18.0	29.0
GERMANY	GERMANY	1992			22.0			
AVERAGE			7.4	7.1	22.3	0.0	22.3	29.4
INDONESIA	INDONESIA/USA	1992	8.3	3.2	15.0	3.7	18.7	21.9
MALAYSIA	MALAYSIA	1986	8.0	2.0	11.0	4.0	15.0	17.0
MALAYSIA	MALAYSIA	1990	6.4	9.7	5.5	0.0	5.5	15.2
MALAYSIA	MALAYSIA	1991	7.9	9.6	2.9	5.7	8.6	18.2
MALAYSIA	MALAYSIA	1991	7.6	6.2	0.0	8.1	8.1	14.3
MALAYSIA	MALAYSIA(RJR)	1992	0.0	10.0	17.2	0.0	17.2	27.2
AVERAGE 86-91			7.5	6.9	4.9	4.5	9.3	16.2
JAPAN	JAPAN	1986	0.0	8.0	12.0	0.0	12.0	20.0
JAPAN	JAPAN	1992	0.0	0.0	15.0	0.0	15.0	15.0
AUSTRALIA	AUSTRALIA	1974	0.0	13.2	8.8	0.0	8.8	22.0
AUSTRALIA	AUSTRALIA	1986	15.0	13.0	0.0	0.0	0.0	13.0
UK	BELGIUM/"C"	1974	0.0	11.1	10.5	0.0	10.5	21.6
UK	BELGIUM/"C"	1986	11.0	4.0	10.0	4.0	14.0	18.0
UK	BELGIUM/"C"	1991	13.0		16.3			
YUGOSLAVIA	YUGOSLAVIA	1989	0.0	0.0	13.1	5.7	18.8	18.8
YUGOSLAVIA	YUGOSLAVIA	1990	0.0	0.0	13.6	3.0	16.6	16.6
SWITZERLAND	SWITZERLAND	1973	0.0	11.0	0.0	7.0	7.0	18.0
SWITZERLAND	SWITZERLAND	1974	0.0	8.5	*	*	7.8	16.3
SWITZERLAND	SWITZERLAND	1980	0.0	10.0	10.0	2.0	12.0	22.0
SWITZERLAND	SWITZERLAND	1986	10.0	2.0	16.0	6.0	22.0	24.0
SWITZERLAND	SWITZERLAND	1989	6.3	3.5	16.3	7.0	23.3	26.8
SWITZERLAND	SWITZERLAND	1990	10.5	2.7	18.2	4.7	22.9	25.6

TABLE A-2
MARLBORO KS
BLEND COMPOSITION

COUNTRY	MANUFACTURE LOCATION	DATE	% ET	% STEM	% TOTAL LIGHT RECON	% DARK RECON	% TOTAL RECON	% TOTAL BY-PRODUCTS
SWITZERLAND	SWITZERLAND	1991	11.0	2.9	18.0	4.1	22.1	25.0
SWITZERLAND	SWITZERLAND	1992	8.7	4.2	22.1	4.7	26.8	31.0
SWEDEN	"C"	1980	0.0	6.0	7.0	5.0	12.0	18.0
SPAIN	USA	1980	8.7	0.0	9.5	2.5	12.0	12.0
SPAIN	SPAIN	1989	7.2	3.3	12.8	7.4	20.2	23.5
SPAIN	SPAIN	1990	9.5	4.1	11.9	5.9	17.8	21.9
SPAIN	SPAIN	1991	7.9	3.5	14.0	6.3	20.3	23.8
ITALY	"C"	1991	8.7	2.8	18.5	3.4	21.9	24.7
HOLLAND	"C"	1980		4.0	10.0	4.0	14.0	18.0
HOLLAND	"C"	1989	8.6	2.5	19.3	5.3	24.6	27.1
HOLLAND	"C"	1990	7.8	3.2	19.3	5.6	24.9	28.1
HOLLAND	"C"	1991	7.8	1.9	21.0	5.3	26.3	28.2
GREECE	"C"	1990	7.8	4.4	21.9	4.5	26.4	30.8
GREECE	"C"	1991	13.2	1.1	16.8	6.7	23.5	24.6
GREECE	"C"	1992	9.4	3.7	23.5	4.5	28.0	31.7
FRANCE	"C"	1980	0.0	4.0	9.0	4.0	13.0	17.0
FRANCE	"C"	1991	11.6					
FINLAND	FINLAND	1974	0.0	14.7	*	*	6.3	21.0
FINLAND	FINLAND	1980	0.0	13.0	5.0	3.0	8.0	21.0
FINLAND	FINLAND	1991			17.5	7.5	25.0	
DENMARK	SWITZERLAND/"C"	1980	0.0	3.0	10.0	6.0	16.0	19.0
BELGIUM	BELGIUM/"C"	1980	0.0	9.0	6.0	5.0	11.0	20.0
BELGIUM	BELGIUM/"C"	1992	7.5	3.0	19.4	5.8	25.2	28.2
AUSTRIA	AUSTRIA	1980	0.0	11.0	8.0	3.0	11.0	22.0
AVERAGE 86-92			8.5	2.6	17.1	5.4	22.5	24.4

* QUALITATIVE NOT QUANTITATIVE

TABLE A-3
MARLBORO KS
AMMONIA CHEMISTRY

COUNTRY	MANUFACTURE LOCATION		DATE	% ALKALOIDS	% AMMONIA	% PHOSPHATES	% UREA
SAUDI	USA	UES	1986	2.00	0.19		
SAUDI	USA	UES	1989	1.97		0.7	
SAUDI	USA	UES	1990	2.17		0.8	
SAUDI	USA	UES	1991		0.22	0.9	
	AVERAGE			2.05	0.21	0.8	
CHINA	USA	UE	1991	1.82		0.7	
CHINA	USA	UE	1992	1.87	0.31	0.9	
HONG KONG	USA	UE	1986	1.89	0.26		
HONG KONG	USA	UE	1990	1.95		0.7	
HONG KONG	USA	UE	1990	2.04			
HONG KONG	USA	UE	1991		0.25	1.0	
HONG KONG	USA	UE	1992	1.84	0.30	0.8	
IRAN	USA	UE	1992	1.53	0.16	0.9	
ISRAEL	USA	UE	1991	2.00	0.32	0.8	
ISRAEL	USA	UE	1989	2.09		0.8	
ISRAEL	USA	UE	1990	2.02		0.8	
KOREA	USA	UE	1991	1.76	0.31	0.7	
PARAGUAY	USA	UE	1989	1.98		0.9	
PARAGUAY	USA	UE	1990	2.07		0.7	
PARAGUAY	USA	UE	1991	1.90		0.8	
PARAGUAY	USA	UE	1992	1.98	0.25	0.9	
RUSSIA	USA	UE	1992	1.88		0.7	
SINGAPORE	USA	UE	1986	2.00	0.20		
SINGAPORE	USA	UE	1989	2.15		0.8	
SINGAPORE	USA	UE	1990	2.03		0.8	
TAIWAN	USA	UE	1989	2.13		0.8	
TAIWAN	USA	UE	1991	1.92		0.8	
TAIWAN	USA	UE	1991		0.24	1.0	
TAIWAN	USA	UE	1992	1.96	0.31	0.8	
THAILAND	USA	UE	1991	1.97	0.24	0.9	

TABLE A-3
MARLBORO KS
AMMONIA CHEMISTRY

COUNTRY	MANUFACTURE LOCATION		DATE	% ALKALOIDS	% AMMONIA	% PHOSPHATES	% UREA
THAILAND	USA	UE	1991	1.92	0.41	1.0	
THAILAND	USA	UE	1992	1.74	0.37	0.6	
	AVERAGE			1.94	0.28	0.8	
USA	USA	U	1970	2.00	0.46	1.1	
USA	USA	U	1974	1.90	0.38	1.1	
USA	USA	U	1981	1.79	0.34		
USA	USA	U	1985	1.87	0.25	1.1	0.09
USA	USA	U	1986	1.90	0.27		
USA	USA	U	1991	1.91	0.28	0.9	0.18
USA	USA	U	1991	1.88	0.24	1.2	
USA	USA	U	1992	1.78	0.29	1.2	
USA	USA	U	1992	1.81	0.35	0.8	0.19
	AVERAGE			1.87	0.32	1.1	0.15
VENEZUALA	VENEZUALA	SV	1991	1.99	0.41	1.0	
PANAMA	PANAMA/USA	SSP	1974	1.81	0.38	1.6	
PANAMA	PANAMA	SSP	1991	2.03	0.17	0.5	
PANAMA	PANAMA	SSP	1992	2.08	0.18	0.5	
	AVERAGE 91-92			2.06	0.18	0.5	
GUATAMALA	GUATAMALA	SSG	1991	1.56		0.6	
BRAZIL	BRAZIL	SB	1974	1.00	0.11	0.7	
BRAZIL	BRAZIL	SB	1975	1.31	0.11	0.7	
BRAZIL	BRAZIL	SB	1986	2.11	0.13		
BRAZIL	BRAZIL	SB	1991	2.37	0.15	1.2	
BRAZIL	BRAZIL	SB	1991	2.40	0.23	1.2	
	AVERAGE 74-			1.16	0.11	0.7	
	AV					1.2	

TABLE A-3
MARLBORO KS
AMMONIA CHEMISTRY

COUNTRY	MANUFACTURE LOCATION		DATE	% ALKALOIDS	% AMMONIA	% PHOSPHATES	% UREA
ARGENTINA	ARGENTINA	SA	1986	1.93	0.10		
ARGENTINA	ARGENTINA	SA	1992	2.01		0.5	
GERMANY	GERMANY	G	1974	1.72	0.13	0.9	
GERMANY	GERMANY	G	1980	1.56	0.15	0.3	
GERMANY	GERMANY	G	1986	1.91	0.12		
GERMANY	GERMANY	G	1987	1.50	0.18	1.4	
GERMANY	GERMANY	G	1989	2.09		0.8	
GERMANY	GERMANY	G	1990	1.88		0.8	
GERMANY	GERMANY	G	1991	1.82		0.6	
GERMANY	GERMANY	G	1991	1.70	0.11	1.0	
GERMANY	GERMANY	G	1991		0.17	0.8	
GERMANY	GERMANY	G	1992	1.85	0.17	0.7	
GERMANY	GERMANY	G	1992	1.83	0.16	1.0	
	AVERAGE 74-86			1.73	0.13	0.6	
	AVERAGE 87-92			1.81	0.15	0.9	
MALAYSIA	MALAYSIA	FEM	1986	1.81	0.21		
MALAYSIA	MALAYSIA	FEM	1990	2.02		0.7	
MALAYSIA	MALAYSIA	FEM	1991	1.81	0.13	1.3	
MALAYSIA	MALAYSIA	FEM	1991	2.07		0.7	
MALAYSIA	MALAYSIA	FEM	1991	1.90		0.8	
MALAYSIA	MALAYSIA(RJR)	FEM	1992	1.91	0.42	0.5	
	AVERAGE 86-91			1.92	0.17	0.9	
	AVERAGE			1.91	0.42	0.5	
JAPAN	JAPAN	FEJ	1986	1.96	0.11		
JAPAN	JAPAN	FEJ	1991		0.15	0.7	
JAPAN	JAPAN	FEJ	1992	1.95	0.15	0.5	

TABLE A-3
MARLBORO KS
AMMONIA CHEMISTRY

COUNTRY	MANUFACTURE LOCATION		DATE	% ALKALOIDS	% AMMONIA	% PHOSPHATES	% UREA
INDONESIA	INDONESIA/USA	FEI	1992	1.71	0.32	0.6	
AUSTRALIA	AUSTRALIA	FEA	1974	1.86	0.06	0.9	
AUSTRALIA	AUSTRALIA	FEA	1986	2.14	0.14		
AUSTRALIA	AUSTRALIA	FEA	1991		0.07	0.8	
UK	BELGIUM/"C"	E	1974	1.85	0.00	0.7	
UK	BELGIUM/"C"	E	1982	2.06	0.12		
UK	BELGIUM/"C"	E	1986	1.88	0.24		
UK	BELGIUM/"C"	E	1991		0.26		
AUSTRIA	AUSTRIA	E	1980	1.51	0.21	0.6	
AUSTRIA	AUSTRIA	E	1982	1.61	0.19		
BELGIUM	BELGIUM/"C"	E	1980	1.80	0.30	0.6	
BELGIUM	BELGIUM/"C"	E	1982	1.68	0.28		
BELGIUM	BELGIUM/"C"	E	1992	1.73	0.32	0.7	
CANARY IS	USA	E	1980	1.78	0.35	0.8	
DENMARK	SWITZERLAND/"C"	E	1980	1.77	0.32	0.6	
DENMARK	SWITZERLAND/"C"	E	1982	1.77	0.25		
FINLAND	FINLAND	E	1974	1.78	0.18	1.0	
FINLAND	FINLAND	E	1980	1.50	0.18	0.5	
FINLAND	FINLAND	E	1982	1.80	0.16		
FRANCE	"C"	E	1980	1.79	0.32	0.6	
FRANCE	"C"	E	1982	1.78	0.27		
FRANCE	"C"	E	1991		0.28	0.9	
GREECE	"C"	E	1990	1.99		0.7	
GREECE	"C"	E	1991	1.84		0.8	
GREECE	"C"	E	1992	2.00	0.28	0.8	
HOLLAND	"C"	E	1980	1.89	0.31	0.6	
HOLLAND	"C"	E	1982	1.80	0.28		
HOLLAND	"C"	E	1989	1.83		0.8	
HOLLAND	"C"	E	1990	1.98		0.7	

TABLE A-3
MARLBORO KS
AMMONIA CHEMISTRY

COUNTRY	MANUFACTURE LOCATION		DATE	% ALKALOIDS	% AMMONIA	% PHOSPHATES	% UREA
HOLLAND	"C"	E	1991	1.79		0.9	
ITALY	"C"	E	1980	1.81			
ITALY	"C"	E	1991	1.80	0.28	0.9	
NORWAY	SWITZERLAND	E	1980	1.83	0.29	0.6	
NORWAY	SWITZERLAND	E	1982	1.72	0.28		
POLAND	POLAND	E	1980	1.68			
SPAIN	USA	E	1980	1.80	0.35	0.7	
SPAIN	SPAIN	E	1982	2.02	0.21		
SPAIN	SPAIN	E	1989	2.00		0.8	
SPAIN	SPAIN	E	1990	2.02		0.8	
SPAIN	SPAIN	E	1991	2.03		0.9	
SWEDEN	"C"	E	1980	1.82	0.29	0.6	
SWEDEN	"C"	E	1982	1.75	0.28		
SWITZERLAND	SWITZERLAND	E	1973	1.96			
SWITZERLAND	SWITZERLAND	E	1974	1.91	0.25	1.3	
SWITZERLAND	SWITZERLAND	E	1980	1.87	0.31	0.6	
SWITZERLAND	SWITZERLAND	E	1980	1.81	0.40	1.0	
SWITZERLAND	SWITZERLAND	E	1982	1.77	0.28		
SWITZERLAND	SWITZERLAND	E	1986	1.84	0.25		
SWITZERLAND	SWITZERLAND	E	1989	1.85		0.6	
SWITZERLAND	SWITZERLAND	E	1990	2.06		0.8	
SWITZERLAND	SWITZERLAND	E	1991	1.73	0.23	1.1	
SWITZERLAND	SWITZERLAND	E	1991	2.29		0.9	
SWITZERLAND	SWITZERLAND	E	1992	1.76	0.32	0.6	
YUGOSLAVIA	YUGOSLAVIA	E	1989	1.89		0.7	
YUGOSLAVIA	YUGOSLAVIA	E	1990	2.16		0.8	
	AVERAGE			1.84	0.27	0.8	

TABLE A-4
MARLBORO KS
CASING CHEMISTRY

COUNTRY	MANUFACTURE LOCATION	DATE	% PG	% GLYCERINE	% COCOA	% LICORICE	% TOTAL SUGARS	% REDUCING SUGARS	% GLUCOSE	% FRUCTOSE	% SUCROSE	PG/GLYC RATIO	RED/TOT SUGAR RATIO	TOT-RED SUGARS
THAILAND	USA	1991	1.9	2.2	0.5	0.7	12.1	8.5				0.86	0.70	3.6
THAILAND	USA	1991	1.8	2.1	0.5	0.7	12.2	8.5				0.86	0.70	3.7
THAILAND	USA	1992	1.9	2.3	0.7	0.7	11.0	8.1				0.83	0.74	2.9
TAIWAN	USA	1989	1.8	2.3	0.5	0.7	12.4	8.9				0.78	0.72	3.5
TAIWAN	USA	1991	1.9	2.3	0.6	0.8	12.8	9.1				0.83	0.71	3.7
TAIWAN	USA	1991				0.5			2.7	3.7	2.7			
TAIWAN	USA	1992	1.9	2.4	0.6	0.8	12.1	9.6				0.79	0.79	2.5
SINGAPORE	USA	1986	0.7	1.7			11.3	8.4				0.41	0.74	2.9
SINGAPORE	USA	1989	1.6	2.0	0.5	0.6	12.1	8.8				0.80	0.73	3.3
SINGAPORE	USA	1990	1.6	2.0	0.6	0.7	11.3	8.3				0.80	0.73	3.0
SAUDI	USA	1986	0.5	1.7			10.8	8.2				0.29	0.76	2.6
SAUDI	USA	1989	1.5	2.0	0.4	0.8	11.5	7.2				0.75	0.63	4.3
SAUDI	USA	1990	1.5	1.9	0.7	0.8	12.3	8.4				0.79	0.68	3.9
SAUDI	USA	1991				0.5			2.4	3.6	2.7			
RUSSIA	USA	1992					11.5	7.6					0.66	3.9
PARAGUAY	USA	1989	1.6	2.2	0.5	0.8	12.0	7.1				0.73	0.59	4.9
PARAGUAY	USA	1990	1.6	2.2	0.5	0.7	10.4	6.6				0.73	0.63	3.8
PARAGUAY	USA	1991	2.0	2.3	0.7	0.7	12.3	8.3				0.87	0.67	4.0
PARAGUAY	USA	1992	1.0	2.7	0.5	0.6	11.1	7.6				0.37	0.68	3.5
KOREA	USA	1991	1.8	2.3	0.5	0.8	11.8	7.9				0.78	0.67	3.9
ISRAEL	USA	1989	1.6	2.2	0.5	0.9	11.9	8.4				0.73	0.71	3.5
ISRAEL	USA	1990	1.7	2.2	0.5	0.8	12.9	8.5				0.77	0.66	4.4
ISRAEL	USA	1991	1.8	2.3	0.3	0.7	13.8	9.0				0.78	0.65	4.8
IRAN	USA	1992	1.7	2.2			9.6	6.9				0.77	0.72	2.7
HONG KONG	USA	1986	0.8	1.7			11.4	7.8				0.47	0.68	3.6
HONG KONG	USA	1990	1.9	1.9	0.6	0.8	11.7	7.7				1.00	0.66	4.0
HONG KONG	USA	1991				0.5			2.9	3.8	2.1			
HONG KONG	USA	1992	2.2	2.8	0.6	0.8	11.7	8.2				0.79	0.70	3.5
CHINA	USA	1991	1.8	2.2	0.6	0.7	11.5	7.6				0.82	0.66	3.9
CHINA	USA	1992	1.9	2.3	0.5	0.8	12.4	8.5				0.83	0.69	3.9
			1.6	2.2	0.5	0.7	11.8	8.1	2.7	3.7	2.5	0.74	0.69	3.6

TABLE A-4
MARLBORO KS
CASING CHEMISTRY

COUNTRY	MANUFACTURE LOCATION	DATE	% PG	% GLYCERINE	% COCOA	% LICORICE	% TOTAL SUGARS	% REDUCING SUGARS	% GLUCOSE	% FRUCTOSE	% SUCROSE	PG/GLYC RATIO	RED/TOT SUGAR RATIO	TOT-RED SUGARS
USA	USA	1974	0.9	1.6	0.8	2.4	8.7	7.5			2.5	0.56	0.86	1.2
USA	USA	1981	1.3	1.8			9.5	5.5				0.72	0.58	4.0
USA	USA	1985	1.1	2.5			11.2	8.9				0.44	0.79	2.3
USA	USA	1986	1.7	2.1	0.6	0.9	12.4	9.5	1.8	2.8	3.9	0.81	0.77	2.9
USA	USA	1991	1.9	2.3	0.5	0.9	12.8	8.6	1.7	2.7	2.7	0.83	0.67	4.2
USA	USA	1991	1.8	2.5			10.7	8.3				0.72	0.78	2.4
USA	USA	1991				0.5			3.3	3.3	3.0			
USA	USA	1992	2.0	2.4	0.4	0.8	12.3	8.9				0.83	0.72	3.4
USA	USA	1992					11.8	10.5					0.89	1.3
			1.9	2.3	0.5	0.8	12.0	9.2	2.3	2.9	3.2	0.80	0.77	2.8
VENEZUALA	VENEZUALA	1991	1.1	1.4	0.4	1.0	12.7	8.9				0.79	0.70	3.8
PANAMA	PANAMA/USA	1974	1.2	1.7	0.8	2.0	9.9	7.0				0.71	0.71	2.9
PANAMA	PANAMA	1991	1.2	1.7	0.5	0.7	10.5	6.4				0.71	0.61	4.1
PANAMA	PANAMA	1992	1.5	2.0	0.6	0.8	11.2	6.0				0.75	0.54	5.2
			1.4	1.9	0.6	0.8	10.9	6.2				0.73	0.58	4.7
BRAZIL	BRAZIL	1974	0.8	1.1	0.5	0.8	16.4	10.6				0.73	0.65	5.8
BRAZIL	BRAZIL	1975	0.7	1.7	0.5	1.2	13.5	10.5			3.6	0.41	0.78	3.0
BRAZIL	BRAZIL	1986	0.9	0.9			9.1	8.5				1.00	0.93	0.6
BRAZIL	BRAZIL	1991	0.4	0.9	0.6	1.0	6.8	5.7				0.44	0.84	1.1
BRAZIL	BRAZIL	1991	0.6	1.0			7.5	6.7				0.60	0.89	0.8
			0.7	1.1	0.5	1.0	10.7	8.4			3.6	0.64	0.82	2.3
ARGENTINA	ARGENTINA	1986	2.1	0.1			13.8	9.4					0.68	4.4
ARGENTINA	ARGENTINA	1992	2.8				14.6	8.5					0.58	6.1
GERMANY	GERMANY	1974	0.0	4.0	0.7	1.6	13.6	11.5				0.00	0.85	2.1

TABLE A-4
MARLBORO KS
CASING CHEMISTRY

COUNTRY	MANUFACTURE LOCATION	DATE	% PG	% GLYCERINE	% COCOA	% LICORICE	% TOTAL SUGARS	% REDUCING SUGARS	% GLUCOSE	% FRUCTOSE	% SUCROSE	PG/GLYC RATIO	RED/TOT SUGAR RATIO	TOT-RED SUGARS
GERMANY	GERMANY	1978						10.7						
GERMANY	GERMANY	1979						11.5						
GERMANY	GERMANY	1980	0.1	0.1	0.5	0.7	18.2	12.5				1.00	0.69	5.7
GERMANY	GERMANY	1980						12.5						
GERMANY	GERMANY	1981						12.8						
GERMANY	GERMANY	1982						12.2						
GERMANY	GERMANY	1983						10.4						
GERMANY	GERMANY	1984						10.0						
GERMANY	GERMANY	1985						10.1						
GERMANY	GERMANY	1986	1.6	2.3			15.2	11.6				0.70	0.76	3.6
GERMANY	GERMANY	1986						10.7						
GERMANY	GERMANY	1987						10.2						
GERMANY	GERMANY	1987					8.2	6.0					0.73	2.2
GERMANY	GERMANY	1988						9.8						
GERMANY	GERMANY	1989						10.1						
GERMANY	GERMANY	1989	1.7	2.0	0.3	1.3	14.0	10.0				0.85	0.71	4.0
GERMANY	GERMANY	1990						9.7						
GERMANY	GERMANY	1990	1.7	2.1	0.5	1.5	14.2	8.5				0.81	0.60	5.7
GERMANY	GERMANY	1991	1.5	2.1	0.5	1.8	14.5	9.6				0.71	0.66	4.9
GERMANY	GERMANY	1991	1.5	2.1			14.2	9.9				0.71	0.70	4.3
GERMANY	GERMANY	1991				1.1		9.8	4.2	4.2	3.8			
GERMANY	GERMANY	1992	1.8	2.1	0.5	1.3	14.2	9.7				0.86	0.68	4.5
GERMANY	GERMANY	1992					15.6	12.7					0.81	2.9
			1.4	1.8	0.4	1.2	13.8	9.9	4.2	4.2	3.8	0.77	0.71	4.0
MALAYSIA	MALAYSIA	1986	0.7	1.4			11.3	8.8				0.50	0.78	2.5
MALAYSIA	MALAYSIA	1990	1.1	1.3	0.5	0.7	11.8	8.6				0.85	0.73	3.2
MALAYSIA	MALAYSIA	1991	1.0	1.3	0.5	0.8	11.0	7.2				0.77	0.65	3.8
MALAYSIA	MALAYSIA	1991	1.0	1.3	0.5	1.1	12.6	8.0				0.77	0.63	4.6
MALAYSIA	MALAYSIA	1991	0.8	1.4			11.6	7.0				0.57	0.60	4.6
MALAYSIA	MALAYSIA(RJR)	1992	1.0	1.3	0.2	0.2	8.4	7.0				0.77	0.83	1.4

TABLE A–4
MARLBORO KS
CASING CHEMISTRY

COUNTRY	MANUFACTURE LOCATION	DATE	% PG	% GLYCERINE	% COCOA	% LICORICE	% TOTAL SUGARS	% REDUCING SUGARS	% GLUCOSE	% FRUCTOSE	% SUCROSE	PG/GLYC RATIO	RED/TOT SUGAR RATIO	TOT-RED SUGARS
			0.9	1.3	0.4	0.7	11.1	7.8				0.70	0.71	3.4
JAPAN	JAPAN	1986	1.0	1.8			16.4	11.7				0.56	0.71	4.7
JAPAN	JAPAN	1991				0.5			3.6	4.4	3.0			
JAPAN	JAPAN	1992	1.9	1.7	0.7	1.0	12.6	7.6				1.12	0.60	5.0
INDONESIA	INDONESIA/USA	1992	2.1	2.1	0.7	0.6	9.6	6.0				1.00	0.63	3.6
AUSTRALIA	AUSTRALIA	1974	1.4	2.5	0.4	0.7	16.0	12.4				0.56	0.78	3.6
AUSTRALIA	AUSTRALIA	1986	0.7	1.0			13.0	9.3				0.70	0.72	3.7
AUSTRALIA	AUSTRALIA	1991				0.9			3.4	4.3	3.3			
UK	BELGIUM/"C"	1974	0.0	0.0	0.0	0.0	8.3	7.6				0.00	0.92	0.7
UK	BELGIUM/"C"	1982					13.2	9.5					0.72	3.7
UK	BELGIUM/"C"	1986	0.9	2.1			13.1	9.8				0.43	0.75	3.3
UK	BELGIUM/"C"	1991				1.4								
YUGOSLAVIA	YUGOSLAVIA	1989	1.8	2.3	0.2	1.0	15.0	10.7				0.78	0.71	4.3
YUGOSLAVIA	YUGOSLAVIA	1990	1.7	2.2	0.4	1.1	14.4	11.0				0.77	0.76	3.4
SWITZERLAND	SWITZERLAND	1973	1.2	1.9	0.8	0.8	12.0	8.3				0.63	0.69	3.7
SWITZERLAND	SWITZERLAND	1974	1.3	2.5	0.8	1.4	12.2	8.9				0.52	0.73	3.3
SWITZERLAND	SWITZERLAND	1980	2.1	3.0			11.5	8.7				0.70	0.76	2.8
SWITZERLAND	SWITZERLAND	1980	1.5	2.1	0.4	1.2	14.2	8.5				0.71	0.60	5.7
SWITZERLAND	SWITZERLAND	1982					12.4	7.3					0.59	5.1
SWITZERLAND	SWITZERLAND	1986	0.6	2.0			13.3	10.2				0.30	0.77	3.1
SWITZERLAND	SWITZERLAND	1989	1.9	1.5	1.6	1.3	13.6	9.3				1.27	0.68	4.3
SWITZERLAND	SWITZERLAND	1990	1.8	2.3	0.7	1.5	14.5	9.1				0.78	0.63	5.4
SWITZERLAND	SWITZERLAND	1991				1.1								
SWITZERLAND	SWITZERLAND	1991	1.4	2.4			11.2	8.4				0.58	0.75	2.8

TABLE A-4
MARLBORO KS
CASING CHEMISTRY

COUNTRY	MANUFACTURE LOCATION	DATE	% PG	% GLYCERINE	% COCOA	% LICORICE	% TOTAL SUGARS	% REDUCING SUGARS	% GLUCOSE	% FRUCTOSE	% SUCROSE	PG/GLYC RATIO	RED/TOT SUGAR RATIO	TOT-RED SUGARS
SWITZERLAND	SWITZERLAND	1991	1.5	2.4	0.5	1.5	16.8	11.9				0.63	0.71	4.9
SWITZERLAND	SWITZERLAND	1992	1.6	2.3			14.1	8.8				0.70	0.62	5.3
SWEDEN	"C"(?)	1980	1.2	2.1	0.4	1.1	13.8	7.8				0.57	0.57	6.0
SWEDEN	"C"(?)	1982					12.6	7.5					0.60	5.1
SPAIN	USA	1980	0.8	2.1	0.4	1.2	12.4	6.6				0.38	0.53	5.8
SPAIN	SPAIN	1982					11.0	6.6					0.60	4.4
SPAIN	SPAIN	1989	1.4	2.1	0.5	1.2	13.2	9.3				0.67	0.70	3.9
SPAIN	SPAIN	1990	1.5	2.2	0.5	1.2	13.2	8.9				0.68	0.67	4.3
SPAIN	SPAIN	1991				1.0								
SPAIN	SPAIN	1991	1.4	2.1	0.3	1.5	15.9	11.3				0.67	0.71	4.6
NORWAY	SWITZERLAND	1980					13.6	7.7					0.57	5.9
NORWAY	SWITZERLAND	1982					12.6	7.6					0.60	5.0
ITALY	"C"	1980					13.7	8.8					0.64	4.9
ITALY	"C"	1991	1.5	2.3			13.2	9.0				0.65	0.68	4.2
HOLLAND	"C"	1980	1.2	2.3	0.3	1.2	13.7	9.1				0.52	0.66	4.6
HOLLAND	"C"	1982					13.1	8.6					0.66	4.5
HOLLAND	"C"	1989	1.9	2.3	0.6	1.4	13.0	8.7				0.83	0.67	4.3
HOLLAND	"C"	1990	1.5	2.2	0.6	1.6	13.2	9.4				0.68	0.71	3.8
HOLLAND	"C"	1991	1.7	2.3	0.5	1.5	14.4	9.2				0.74	0.64	5.2
GREECE	"C"	1990	1.9	2.4	0.5	1.5	12.8	8.6				0.79	0.67	4.2
GREECE	"C"	1991	2.0	2.3			14.3	8.5				0.87	0.59	5.8
GREECE	"C"	1992	1.9	2.3	0.5	1.3	13.2	9.2				0.83	0.70	4.0
FRANCE	"C"	1980	1.2	2.2	0.3	0.9	14.0	8.9				0.55	0.64	5.1
FRANCE	"C"	1982					13.1	9.2					0.70	3.9
FRANCE	"C"	1991				1.4			3.2	3.7	3.7			
FINLAND	FINLAND	1974	1.1	2.1	0.5	1.1	13.0	10.3				0.52	0.79	2.7
FINLAND	FINLAND	1980	0.6	2.1	0.3	0.9	16.5	10.4				0.29	0.63	6.1
FINLAND	FINLAND	1982					13.8	8.7					0.63	5.1
DENMARK	SWITZERLAND/"C"	1980	1.3	2.1	0.4	1.1	13.0	8.8				0.62	0.68	4.2
DENMARK	SWITZERLAND/"C"	1982					12.8	7.9					0.62	4.9
CANARY IS	USA	1980					12.1	6.3					0.52	5.8

TABLE A-4
MARLBORO KS
CASING CHEMISTRY

COUNTRY	MANUFACTURE LOCATION	DATE	% PG	% GLYCERINE	% COCOA	% LICORICE	% TOTAL SUGARS	% REDUCING SUGARS	% GLUCOSE	% FRUCTOSE	% SUCROSE	PG/GLYC RATIO	RED/TOT SUGAR RATIO	TOT-RED SUGARS
BELGIUM	BELGIUM/"C"	1980	1.1	2.0	0.3	0.9	14.0	9.1				0.55	0.65	4.9
BELGIUM	BELGIUM/"C"	1982					12.7	8.0					0.63	4.7
BELGIUM	BELGIUM/"C"	1992	2.0	2.3			13.9	9.6				0.87	0.69	4.3
AUSTRIA	AUSTRIA	1980	0.8	2.7	0.4	1.0	15.3	10.0				0.30	0.65	5.3
AUSTRIA	AUSTRIA	1982					13.7	8.5					0.62	5.2
AUSTRIA	AUSTRIA	1991				1.1								
AVERAGE			1.4	2.2	0.5	1.2	13.3	8.9	3.2	3.7	3.7	0.63	0.67	4.5
AVERAGE 89-92			1.6	2.2	0.6	1.3	13.8	9.5	3.2	3.7	3.7	0.73	0.69	4.3

TABLE A-5
MARLBORO KS
CIGARETTE CONSTRUCTION

COUNTRY	MANUFACTURE LOCATION	DATE	CIRCUMFERENCE	TOBACCO WEIGHT	NON TOBACCO WEIGHT	DRY DENSITY	PAPER POROSITY	PAPER ADDITIVE	FILTER VENT	FILTER PZ	FILTER LENGTH
SAUDI	USA	1986	24.87			215	43	2.82	25.6	6.0	19
SAUDI	USA	1989	24.77	690	217	205	50	2.10	31.8	7.0	19
SAUDI	USA	1990	24.67	692	224	209	50	1.10	35.2	7.0	19
PARAGUAY	USA	1989	24.68	723	200	216	28	0.40	10.4	8.4	19
PARAGUAY	USA	1990	24.81	716	201	212	31	0.40	11.7	6.9	19
PARAGUAY	USA	1991	24.85	708	217	207	30	0.50	9.9	7.4	19
PARAGUAY	USA	1992	24.83	729	205	215	31	0.40	10.1	11.1	19
ISRAEL	USA	1989	24.76	729	202	216	30	0.45	10.1	6.1	19
ISRAEL	USA	1990	24.91	716	200	211	26	0.50	11.7	7.7	19
IRAN	USA	1992	24.93	714	203	209	34	0.20	20.1	7.2	19
THAILAND	USA	1991	24.96	757	217	210	29	0.50	12.5	6.3	21
THAILAND	USA	1991	24.88	763	213	214	34	0.50	13.1	7.1	21
THAILAND	USA	1992	24.92			214	42	0.50	13.1	7.5	21
TAIWAN	USA	1989	24.85	762	216	212	34	0.50	10.1	6.2	21
TAIWAN	USA	1991	24.67	733	227	211	32	0.50	6.5	7.6	21
TAIWAN	USA	1992	24.82	760	217	214	46	0.50	11.7	7.8	21
SINGAPORE	USA	1986	24.81			231	33	0.50	13.7	4.8	21
SINGAPORE	USA	1989	24.91	767	218	214	33	0.50	10.9	6.9	21
SINGAPORE	USA	1990	24.83	753	220	212	32	0.40	23.9	5.9	21
KOREA	USA	1991	24.83	746	220	212	45	0.50	25.0	6.8	21
ISRAEL	USA	1991	24.89	743	221	212	35	0.40	12.5	7.2	21
HONG KONG	USA	1986	24.85			236	43	0.38	10.5	5.4	21
HONG KONG	USA	1990	24.89	757	217	211	32	0.30	12.4	7.3	21
HONG KONG	USA	1990	24.86	756	219	211	30	1.00	8.9	7.2	21
HONG KONG	USA	1992	25.00	663	314	185	46	0.45	12.4	6.8	21
CHINA	USA	1991	24.77	766	216	216	35	0.50	14.8	8.2	21
CHINA	USA	1992	24.93	763	215	213	38	0.60	12.9	7.7	21
			24.85	739	218	213	35	0.47	12.9	7.1	20
USA	USA	1970		830	230		25	0.75	0.0		
USA	USA	1974	25.00			218	36				

TABLE A-5
MARLBORO KS
CIGARETTE CONSTRUCTION

COUNTRY	MANUFACTURE LOCATION	DATE	CIRCUMFERENCE	TOBACCO WEIGHT	NON TOBACCO WEIGHT	DRY DENSITY	PAPER POROSITY	PAPER ADDITIVE	FILTER VENT	FILTER PZ	FILTER LENGTH
USA	USA	1981	24.98	757	240	211	33	0.78	9.0		
USA	USA	1985	24.80	760	221	212	40	0.51	9.5		
USA	USA	1986	24.84			208	24	0.51	10.8	6.4	19
USA	USA	1986	24.83	762	219	213	31	0.45	10.3		
USA	USA	1991	24.82	757	216	210	36	0.45	12.6		
USA	USA	1991	24.91			217	31	0.41	12.0		21
USA	USA	1992	24.65			220	43	0.57	14.0		21
USA	USA	1992	24.85	756	216	213	39	0.54	11.7	8.0	21
			24.81	759	218	213	35	0.49	11.6	7.2	21
VENEZUALA	VENEZUALA	1991	25.00	717	298	210	35	0.40	0.0		21
PANAMA	PANAMA/USA	1974	25.00			231	27				
PANAMA	PANAMA	1991	24.48	693	202	214	29	0.55	0.0	8.7	20
PANAMA	PANAMA	1992					23	0.30	0.0	6.7	20
BRAZIL	BRAZIL	1974	24.90				34			3.7	
BRAZIL	BRAZIL	1975	24.60			244	31				20
BRAZIL	BRAZIL	1986	24.49			230	41	0.62	0.0	5.0	20
BRAZIL	BRAZIL	1991	24.54	704	209	217	42		0.0	7.6	20
BRAZIL	BRAZIL	1991	24.43			213	49	0.56	0.0		20
			24.49	704	209	220	44	0.59	0.0	6.3	20
ARGENTINA	ARGENTINA	1986	24.63			233	30	1.67	0.0	7.2	20
ARGENTINA	ARGENTINA	1990	24.65	769	206	216	28	1.30	0.0		20
ARGENTINA	ARGENTINA	1992	24.79	748	206	208					20
			24.69	759	206	219	29	1.49	0.0	7.2	20
GERMANY	GERMANY	1974	24.80			246	30				
GERMANY	GERMANY	1978					82		0.0		
GERMANY	GERMANY	1979					77		0.0		

TABLE A-5
MARLBORO KS
CIGARETTE CONSTRUCTION

COUNTRY	MANUFACTURE LOCATION	DATE	CIRCUMFERENCE	TOBACCO WEIGHT	NON TOBACCO WEIGHT	DRY DENSITY	PAPER POROSITY	PAPER ADDITIVE	FILTER VENT	FILTER PZ	FILTER LENGTH
GERMANY	GERMANY	1980					83		0.0		
GERMANY	GERMANY	1980					87		0.0		21
GERMANY	GERMANY	1981					82		0.0		
GERMANY	GERMANY	1982					82		0.0		
GERMANY	GERMANY	1983					82		17.4		
GERMANY	GERMANY	1984					52		16.6		
GERMANY	GERMANY	1985					43		16.6		
GERMANY	GERMANY	1986					43		16.1		
GERMANY	GERMANY	1986	24.66			217	43	0.50	18.2	5.7	21
GERMANY	GERMANY	1987					41		15.8		
GERMANY	GERMANY	1988					42		16.4		
GERMANY	GERMANY	1989					47		16.4		
GERMANY	GERMANY	1989	24.80	766	210	215	49		17.8	6.9	21
GERMANY	GERMANY	1990	24.75	753	211	214	52		17.8	8.0	21
GERMANY	GERMANY	1990					48		16.8		
GERMANY	GERMANY	1991					52		16.1		
GERMANY	GERMANY	1991	24.69	773	210	220	49		15.2	7.4	21
GERMANY	GERMANY	1991	24.80			220	49	0.88	18.0		21
GERMANY	GERMANY	1992	24.80	768	208	217	58		16.2	7.8	21
GERMANY	GERMANY	1992	24.78			217	44		14.0		21
			24.75	765	210	217	47	0.69	16.5	7.2	21
MALAYSIA	MALAYSIA	1986	24.54			228	26	0.34	11.0	7.2	21
MALAYSIA	MALAYSIA	1990	24.65	751	220	218	49	0.50	8.1	8.3	22
MALAYSIA	MALAYSIA	1991	24.61	744	228	216	51	0.40	9.6	9.7	22
MALAYSIA	MALAYSIA	1991	24.65			215	45	0.40	8.0		22
MALAYSIA	MALAYSIA	1991	24.63	729	230	211	41	0.60	7.0	10.0	22
MALAYSIA	MALAYSIA(RJR)	1992	24.86	777	221	217	0	0.60	10.4	7.2	21
			24.62	741	226	218	42	0.45	8.7	8.8	22
JAPAN	JAPAN	1986	25.13			226	23	0.12	0.0	3.5	20

TABLE A–5
MARLBORO KS
CIGARETTE CONSTRUCTION

COUNTRY	MANUFACTURE LOCATION	DATE	CIRCUMFERENCE	TOBACCO WEIGHT	NON TOBACCO WEIGHT	DRY DENSITY	PAPER POROSITY	PAPER ADDITIVE	FILTER VENT	FILTER PZ	FILTER LENGTH
JAPAN	JAPAN	1992	25.01	800	279	218	35	0.00	16.0	3.4	20
INDONESIA	INDONESIA/USA	1992	24.04			211	35	0.50	13.9	7.6	21
AUSTRALIA	AUSTRALIA	1974	24.40			244	49				
AUSTRALIA	AUSTRALIA	1986	24.51			211	30	0.42	13.1	4.5	20
YUGOSLAVIA	YUGOSLAVIA	1989	24.81	874	218	239	106	0.80	0.0	9.8	20
YUGOSLAVIA	YUGOSLAVIA	1990	24.62	856	216	237	104	0.60	0.0	6.6	21
UK	BELGIUM/"C"	1974	24.70				23				
UK	BELGIUM/"C"	1982					43		0.0		20
UK	BELGIUM/"C"	1986	24.93			224	42	0.54	16.8	5.5	20
UK	BELGIUM/"C"	1991							21.3		
SWITZERLAND	SWITZERLAND	1973	25.00				20				18
SWITZERLAND	SWITZERLAND	1974	25.00			240	21				
SWITZERLAND	SWITZERLAND	1980	25.13				25				18
SWITZERLAND	SWITZERLAND	1980					55		15.9		18
SWITZERLAND	SWITZERLAND	1982					47		22.9		18
SWITZERLAND	SWITZERLAND	1986	24.79			216	46	0.60	13.8	4.4	19
SWITZERLAND	SWITZERLAND	1989	24.78	754	220	212	41	0.50	11.9	6.9	21
SWITZERLAND	SWITZERLAND	1990	24.88	749	217	210	34	0.80	13.7	7.2	21
SWITZERLAND	SWITZERLAND	1991	24.79			213	34	0.63	14.0		21
SWITZERLAND	SWITZERLAND	1991	24.75	754	215	213	36	0.60	11.6	7.4	21
SWITZERLAND	SWITZERLAND	1992	24.90	754	215	211	37	0.60	15.4	7.4	21
SWEDEN	"C"(?)	1980					55		17.2		18
SWEDEN	"C"(?)	1982					61		16.1		18
SPAIN	USA	1980					30		0.0		19
SPAIN	SPAIN	1982					29		0.0		20
SPAIN	SPAIN	1989	24.84	734	198	220	34	0.65	0.0	8.3	20
SPAIN	SPAIN	1990	24.85	747	203	223	41	0.60	0.0	6.7	20
SPAIN	SPAIN	1991	24.72	752	205	227	35	0.60	0.0	9.3	20

TABLE A–5
MARLBORO KS
CIGARETTE CONSTRUCTION

COUNTRY	MANUFACTURE LOCATION	DATE	CIRCUMFERENCE	TOBACCO WEIGHT	NON TOBACCO WEIGHT	DRY DENSITY	PAPER POROSITY	PAPER ADDITIVE	FILTER VENT	FILTER PZ	FILTER LENGTH
POLAND	POLAND	1980									
NORWAY	SWITZERLAND	1980					42		0.0		18
NORWAY	SWITZERLAND	1982					43		18.4		20
ITALY	"C"	1980					41		0.0		18
ITALY	"C"	1991	24.90	744	220	207	36	0.60	10.9	6.5	21
HOLLAND	"C"	1980					39		15.4		18
HOLLAND	"C"	1982					37		18.0		18
HOLLAND	"C"	1989	24.83	759	211	212	41	0.50	11.5	6.4	21
HOLLAND	"C"	1990	24.88	756	211	211	38	0.70	12.6	6.7	21
HOLLAND	"C"	1991	25.06	761	216	209	36	0.20	13.1	7.5	21
GREECE	"C"	1980					43		0.0		15
GREECE	"C"	1982					42		0.0		20
GREECE	"C"	1990	24.85	753	206	207	44	0.65	14.6	7.8	20
GREECE	"C"	1991	24.84	781	209	215	43	0.70	10.9	8.1	20
GREECE	"C"	1992	24.83	759	203	209	36	0.60	17.5	7.1	20
FRANCE	"C"	1980					36		13.3		19
FRANCE	"C"	1982					43		17.8		19
FRANCE	"C"	1991									
FINLAND	FINLAND	1974	24.70			250	18				
FINLAND	FINLAND	1980									
FINLAND	FINLAND	1982									
DENMARK	SWITZERLAND/"C"	1980					35		17.5		18
DENMARK	SWITZERLAND/"C"	1982					43		13.4		20
CANARY IS	USA	1980					34		0.0		
BELGIUM	BELGIUM/"C"	1980					38		16.3		18
BELGIUM	BELGIUM/"C"	1982					40		15.3		18
BELGIUM	BELGIUM/"C"	1992	24.71	746	216	211	45	0.80	11.1	7.3	21
AUSTRIA	AUSTRIA	1980					51		21.5		20
AUSTRIA	AUSTRIA	1982					49		18.3		20
			24.84	767	212	219	42	0.61	10.9	7.2	19

TABLE A-6
MARLBORO KS
PRESSURE DROPS

COUNTRY	MANUFACTURE LOCATION		DATE	FILTER VENT	FILTER EFFIC	OPEN CIGARETTE PRESSURE DROP	SEALED CIGARETTE PRESSURE DROP	FILTER PRESSURE DROP	TOBACCO SECTION PRESSURE DROP
SAUDI	USA	UE	1986	25.6		4.0	4.7	2.7	2.0
SAUDI	USA	UE	1989	31.8	46.4	4.8	5.9	3.9	2.0
SAUDI	USA	UE	1990	35.2	46.0	4.8	6.1	4.1	2.0
THAILAND	USA	UE	1991	13.1	38.6	4.5	4.8	2.6	2.2
THAILAND	USA	UE	1991	12.5	38.4	4.4	4.6	2.6	2.0
THAILAND	USA	UE	1992	13.1	40.1	4.4	4.9	2.9	2.0
TAIWAN	USA	UE	1989	10.2	36.4	4.5	4.8	2.6	2.2
TAIWAN	USA	UE	1991	6.5	39.5	4.8	5.0	3.1	1.9
TAIWAN	USA	UE	1992	11.7	38.1	4.6	5.1	3.0	2.1
SINGAPORE	USA	UE	1986	13.7		4.3	4.7	2.6	2.1
SINGAPORE	USA	UE	1989	10.9	37.7	4.5	4.8	2.7	2.1
SINGAPORE	USA	UE	1990	23.9	38.9	4.3	5.1	3.0	2.1
PARAGUAY	USA	UE	1989	10.4	38.2	4.4	4.8	2.8	2.0
PARAGUAY	USA	UE	1990	11.7	37.0	3.9	4.3	2.7	1.6
PARAGUAY	USA	UE	1991	9.9	35.5	4.4	4.8	2.8	2.0
PARAGUAY	USA	UE	1992	10.1	39.0	4.4	4.8	2.8	2.0
KOREA	USA	UE	1991	25.0	39.0	4.2	5.1	3.0	2.1
ISRAEL	USA	UE	1989	10.1	37.6	4.6	5.0	3.0	2.0
ISRAEL	USA	UE	1990	11.7	39.5	4.4	4.7	2.9	1.8
ISRAEL	USA	UE	1991	12.5	40.3	4.5	4.9	2.9	2.0
IRAN	USA	UE	1992	20.1	37.4	4.2	4.8	2.9	1.9
HONG KONG	USA	UE	1986	10.5		4.4	4.4	2.8	1.6
HONG KONG	USA	UE	1990	8.9	38.6	4.9	5.3	2.9	2.4
HONG KONG	USA	UE	1990	12.4	37.6	4.3	4.7	2.7	2.0
HONG KONG	USA	UE	1992	11.9	39.1	4.4	4.8	2.8	2.0
CHINA	USA	UE	1991	14.8	37.2	4.5	5.0	2.6	2.4
CHINA	USA	UE	1992	12.9	39.9	4.6	5.0	2.9	2.1
	AVERAGE (EXCEPT SAUDI)			12.9	38.3	4.4	4.8	2.8	2.0
USA	USA	U	1970	0.0		4.5	4.5	2.5	2.0
USA	USA	U	1974	0.0		4.4	4.4	2.7	1.7

TABLE A–6
MARLBORO KS
PRESSURE DROPS

COUNTRY	MANUFACTURE LOCATION		DATE	FILTER VENT	FILTER EFFIC	OPEN CIGARETTE PRESSURE DROP	SEALED CIGARETTE PRESSURE DROP	FILTER PRESSURE DROP	TOBACCO SECTION PRESSURE DROP
USA	USA	U	1981	9.0	41.2	4.6	5.0	2.8	2.0
USA	USA	U	1985	9.5	40.6	4.7	5.0	2.9	2.1
USA	USA	U	1986	10.8		4.1	4.4	2.7	1.7
USA	USA	U	1986	10.3	38.7	4.7	5.1	2.9	2.2
USA	USA	U	1991	12.6	38.9	4.6	5.0	2.8	2.2
USA	USA	U	1991	12.0		4.5	5.0	2.6	2.4
USA	USA	U	1992	14.0		4.6		2.7	2.5
USA	USA	U	1992	11.7	39.7	4.5	4.9	2.9	2.0
	AVERAGE 85-92			11.2	39.8	4.5	4.9	2.8	2.1
VENEZUALA	VENEZUALA	SV	1991	0.0		4.3	4.3	2.7	1.6
PANAMA	PANAMA/USA	SSP	1974			4.3	4.3	2.6	1.7
PANAMA	PANAMA	SSP	1991	0.0	38.3	4.3	4.3	2.8	1.5
PANAMA	PANAMA	SSP	1992	0.0	39.7	4.4	4.4	2.7	1.7
GUATAMALA	GUATAMALA	SSG	1991						
BRAZIL	BRAZIL	SB	1974	0.0		4.9	4.9	2.7	1.9
BRAZIL	BRAZIL	SB	1975	0.0		4.5	4.5	2.3	2.2
BRAZIL	BRAZIL	SB	1979						
BRAZIL	BRAZIL	SB	1980						
BRAZIL	BRAZIL	SB	1986	0.0		5.2	5.2	2.8	2.4
BRAZIL	BRAZIL	SB	1991	0.0		4.6	4.6	2.6	2.1
BRAZIL	BRAZIL	SB	1991	0.0		4.9	4.9	2.7	1.9
	AVERAGE			0.0		4.8	4.8	2.6	2.1
ARGENTINA	ARGENTINA	SA	1986	0.0		4.5	4.5	2.5	2.1
ARGENTINA	ARGENTINA	SA	1990	0.0	33.2	5.1	5.1	2.7	2.4
ARGENTINA	ARGENTINA	SA	1992			4.6	4.6	2.6	2.0

TABLE A-6
MARLBORO KS
PRESSURE DROPS

COUNTRY	MANUFACTURE LOCATION		DATE	FILTER VENT	FILTER EFFIC	OPEN CIGARETTE PRESSURE DROP	SEALED CIGARETTE PRESSURE DROP	FILTER PRESSURE DROP	TOBACCO SECTION PRESSURE DROP
GERMANY	GERMANY	G	1974			4.1		2.5	1.5
GERMANY	GERMANY	G	1978	0.0		4.3			
GERMANY	GERMANY	G	1979	0.0		4.2		2.6	2.0
GERMANY	GERMANY	G	1980	0.0		4.3		2.7	2.1
GERMANY	GERMANY	G	1980	0.0		4.3			
GERMANY	GERMANY	G	1981	0.0		4.1		2.6	2.0
GERMANY	GERMANY	G	1982	0.0		4.2		2.6	2.1
GERMANY	GERMANY	G	1983	17.4		3.9		2.6	2.2
GERMANY	GERMANY	G	1984	16.6		3.7		2.3	2.0
GERMANY	GERMANY	G	1985	16.6		3.7		2.4	2.0
GERMANY	GERMANY	G	1986	16.1		3.7		2.4	2.0
GERMANY	GERMANY	G	1986	18.2		3.8	4.3	2.5	1.8
GERMANY	GERMANY	G	1987	15.8		3.9		2.5	2.1
GERMANY	GERMANY	G	1988	16.4		3.8		2.5	2.0
GERMANY	GERMANY	G	1989	16.4		3.9		2.6	2.1
GERMANY	GERMANY	G	1989	17.8	36.5	3.9	4.5	2.6	1.9
GERMANY	GERMANY	G	1990	17.8	37.3	4.2	4.7	2.6	2.1
GERMANY	GERMANY	G	1990	16.8		4.1		2.6	2.4
GERMANY	GERMANY	G	1991	16.1		3.9		2.6	2.1
GERMANY	GERMANY	G	1991	18.0		4.3	5.0	2.6	2.4
GERMANY	GERMANY	G	1991	15.2	36.5	4.4	5.0	2.8	2.2
GERMANY	GERMANY	G	1992	14.0		4.1		2.4	2.0
GERMANY	GERMANY	G	1992	16.2	39.1	4.0	4.4	2.6	1.8
	AVERAGE			12.1	37.4	4.0	4.7	2.5	2.0
MALAYSIA	MALAYSIA	FE	1986	11.0		4.4	4.8	2.8	2.0
MALAYSIA	MALAYSIA	FE	1990	8.1	38.5	4.8	5.0	2.7	2.3
MALAYSIA	MALAYSIA	FE	1991	8.0		5.1	5.5	2.8	2.7
MALAYSIA	MALAYSIA	FE	1991	7.0	38.1	5.2	5.5	3.0	2.5
MALAYSIA	MALAYSIA	FE	1991	9.6	41.2	4.9	5.3	3.1	2.2
MALAYSIA	MALAYSIA(RJR)	FE	1992			4.4	4.8	3.1	1.7

TABLE A-6
MARLBORO KS
PRESSURE DROPS

COUNTRY	MANUFACTURE LOCATION		DATE	FILTER VENT	FILTER EFFIC	OPEN CIGARETTE PRESSURE DROP	SEALED CIGARETTE PRESSURE DROP	FILTER PRESSURE DROP	TOBACCO SECTION PRESSURE DROP
	AVERAGE			8.7	39.3	4.8	5.1	2.9	2.2
JAPAN	JAPAN	FEJ	1986	0.0		4.0	4.0	2.4	1.7
JAPAN	JAPAN	FEJ	1992	16.0		4.4	5.0	3.0	2.0
INDONESIA	INDONESIA/USA	FEI	1992	13.9	39.8	4.4	4.9	3.0	1.9
AUSTRALIA	AUSTRALIA	FEA	1974			4.2	4.2	2.6	1.6
AUSTRALIA	AUSTRALIA	FEA	1986	13.1		4.1	4.6	2.2	2.4
YUGOSLAVIA	YUGOSLAVIA	E	1989	0.0	35.9	4.5	4.5	2.5	2.0
YUGOSLAVIA	YUGOSLAVIA	E	1990	0.0	36.6	4.9	4.9	2.7	2.2
YUGOSLAVIA	YUGOSLAVIA	E	1991	7.4	36.4	5.5	5.6	3.5	2.1
UK	BELGIUM/"C"	E	1974			4.4	4.4	2.4	2.0
UK	BELGIUM/"C"	E	1982	0.0		4.4			
UK	BELGIUM/"C"	E	1986	16.8		4.4	5.0	3.1	1.9
UK	BELGIUM/"C"	E	1991	21.3		3.9			
SWITZERLAND	SWITZERLAND	E	1973			4.0		2.4	
SWITZERLAND	SWITZERLAND	E	1974			4.2	4.2	2.4	1.7
SWITZERLAND	SWITZERLAND	E	1980			3.5		2.5	1.7
SWITZERLAND	SWITZERLAND	E	1980	15.9		3.6			
SWITZERLAND	SWITZERLAND	E	1982	22.9		3.8			
SWITZERLAND	SWITZERLAND	E	1986	13.8		3.6	3.8	2.4	1.4
SWITZERLAND	SWITZERLAND	E	1989	11.9	39.3	4.3	4.6	2.9	1.7
SWITZERLAND	SWITZERLAND	E	1990	13.7	37.7	4.3	4.8	2.9	1.9
SWITZERLAND	SWITZERLAND	E	1991	11.6	39.3	4.5	4.9	2.9	2.0
SWITZERLAND	SWITZERLAND	E	1991	14.0		4.4	4.8	2.6	2.2
SWITZERLAND	SWITZERLAND	E	1992	15.4	37.9	4.2	4.7	2.8	1.9
SWEDEN	"C"(?)	E	1980	17.2		3.5			
SWEDEN	"C"(?)	E	1982	16.1		3.8			
SPAIN	USA	E	1980	0.0		4.6			

TABLE A-6
MARLBORO KS
PRESSURE DROPS

COUNTRY	MANUFACTURE LOCATION		DATE	FILTER VENT	FILTER EFFIC	OPEN CIGARETTE PRESSURE DROP	SEALED CIGARETTE PRESSURE DROP	FILTER PRESSURE DROP	TOBACCO SECTION PRESSURE DROP
SPAIN	SPAIN	E	1982	0.0		4.0			
SPAIN	SPAIN	E	1989	0.0	36.0	4.4	4.4	2.7	1.7
SPAIN	SPAIN	E	1990	0.0	41.0	4.8	4.8	3.0	1.8
SPAIN	SPAIN	E	1991	0.0	37.4	5.0	5.0	3.0	2.0
NORWAY	SWITZERLAND	E	1980	0.0		4.0			
NORWAY	SWITZERLAND	E	1982	18.4		4.1			
ITALY	"C"	E	1980	0.0		4.5			
ITALY	"C"	E	1982	15.7		3.7			
ITALY	"C"	E	1991	10.9	39.4	4.5	4.8	2.7	2.1
HOLLAND	"C"	E	1980	15.4		3.7			
HOLLAND	"C"	E	1982	18.0		3.9			
HOLLAND	"C"	E	1989	11.5	38.3	4.5	4.9	2.9	2.0
HOLLAND	"C"	E	1990	12.6	33.0	4.2	4.6	2.7	1.9
HOLLAND	"C"	E	1991	13.1	38.8	4.1	4.6	2.8	1.8
GREECE	"C"	E	1980	0.0		4.6			
GREECE	"C"	E	1982	0.0		4.5			
GREECE	"C"	E	1990	14.6	35.4	4.3	4.8	2.7	2.1
GREECE	"C"	E	1991	10.9	37.1	4.6	5.0	2.7	2.3
GREECE	"C"	E	1992	17.5	36.4	4.2	4.8	2.6	2.2
FRANCE	"C"	E	1980	13.3		3.6			
FRANCE	"C"	E	1982	17.8		3.9			
FINLAND	FINLAND	E	1974			4.2	4.2	2.5	1.9
FINLAND	FINLAND	E	1980	0.0		4.1			
FINLAND	FINLAND	E	1982	0.0		4.1			
FINLAND	FINLAND	E	1991				4.3	2.4	1.9
DENMARK	SWITZERLAND/"C"	E	1980	17.5		3.9			
DENMARK	SWITZERLAND/"C"	E	1982	13.4		4.4			
CANARY'S	USA	E	1980	0.0		4.4			
BELGIUM	BELGIUM/"C"	E	1980	16.3		3.8			
BELGIUM	BELGIUM/"C"	E	1982	15.3		4.1			
BELGIUM	BELGIUM/"C"	E	1991				4.7	2.8	2.0

TABLE A–6
MARLBORO KS
PRESSURE DROPS

COUNTRY	MANUFACTURE LOCATION		DATE	FILTER VENT	FILTER EFFIC	OPEN CIGARETTE PRESSURE DROP	SEALED CIGARETTE PRESSURE DROP	FILTER PRESSURE DROP	TOBACCO SECTION PRESSURE DROP
BELGIUM	BELGIUM/"C"	E	1992	11.1	38.4	4.4	4.8	2.9	1.9
AUSTRIA	AUSTRIA	E	1980	21.5		3.5			
AUSTRIA	AUSTRIA	E	1982	18.3		3.9			
AUSTRIA	AUSTRIA	E	1991				4.6	2.7	1.9
	AVERAGE			10.4	37.5	4.2	4.7	2.7	1.9

TABLE A-7
MARLBORO KS
SMOKE DELIVERIES

COUNTRY	MANUFACTURE LOCATION	DATE	TAR	NICOTINE	PUFFS	TAR/NIC	TAR/PUFF	NIC/PUFF	FILTER VENT	FILTER EFFIC
SAUDI	USA	1986	11.9	0.95	6.9	12.5	1.72	0.138	25.6	
SAUDI	USA	1989	9.1	0.74	7.5	12.3	1.21	0.099	31.8	46.4
SAUDI	USA	1990	9.2	0.78	7.6	11.8	1.21	0.103	35.2	46.0
	AVERAGE		10.1	0.82	7.3	12.2	1.38	0.113	30.9	46.2
CHINA	USA	1991	16.4	1.12	8.8	14.6	1.86	0.127	14.8	37.2
CHINA	USA	1992	16.4	1.13	8.9	14.5	1.84	0.127	12.9	39.9
HONG KONG	USA	1986	16.8	1.30	9.0	12.9	1.87	0.144	10.5	
HONG KONG	USA	1990	16.6	1.15	8.5	14.4	1.95	0.135	8.9	38.6
HONG KONG	USA	1990	15.7	1.10	8.3	14.3	1.89	0.133	12.4	37.6
HONG KONG	USA	1992	16.0	1.11	8.6	14.4	1.86	0.129	11.9	39.1
IRAN	USA	1992	14.7	1.08	7.9	13.6	1.86	0.137	20.1	37.4
ISRAEL	USA	1991	15.9	1.11	8.5	14.3	1.87	0.131	12.5	40.3
ISRAEL	USA	1989	16.0	1.19	8.4	13.4	1.90	0.142	10.1	37.6
ISRAEL	USA	1990	15.6	1.17	8.1	13.3	1.93	0.144	11.7	39.5
KOREA	USA	1991	13.5	0.96	8.2	14.1	1.65	0.117	25.0	39.0
PARAGUAY	USA	1989	16.4	1.17	7.9	14.0	2.08	0.148	10.4	38.2
PARAGUAY	USA	1990	16.3	1.23	7.8	13.3	2.09	0.158	11.7	37.0
PARAGUAY	USA	1991	16.3	1.03	7.9	15.8	2.06	0.130	9.9	35.5
PARAGUAY	USA	1992	15.6	1.07	8.0	14.6	1.95	0.134	10.1	39.0
SINGAPORE	USA	1986	16.2	1.30	8.6	12.5	1.88	0.151	13.7	
SINGAPORE	USA	1989	16.1	1.23	8.9	13.1	1.81	0.138	10.9	37.7
SINGAPORE	USA	1990	14.6	1.12	8.7	13.0	1.68	0.129	23.9	38.9
TAIWAN	USA	1989	16.5	1.25	8.6	13.2	1.92	0.145	10.2	36.4
TAIWAN	USA	1991	15.8	1.08	8.4	14.6	1.88	0.129	6.5	39.5
TAIWAN	USA	1992	14.7	1.05	8.6	14.0	1.71	0.122	11.7	38.1
THAILAND	USA	1991	17.4	1.16	8.5	15.0	2.05	0.136	12.5	38.4
THAILAND	USA	1991	16.8	1.10	8.5	15.3	1.98	0.129	13.1	38.6
THAILAND	USA	1992	15.8	1.07	8.3	14.8	1.90	0.129	13.1	40.1
	AVERAGE		15.9	1.14	8.4	14.0	1.89	0.135	12.9	38.3
USA	USA	1970	19.0	1.36		14.0			0.0	
USA	USA	1974	21.0	1.20	6.9	17.5	3.04	0.174	0.0	
USA	USA	1981	15.4	1.14	8.0	13.5	1.93	0.143	9.0	41.2
USA	USA	1985	16.7	1.15	8.9	14.5	1.88	0.129	9.5	40.6
USA	USA	1986	16.2	1.21	8.6	13.4	1.88	0.141	10.8	

TABLE A-7
MARLBORO KS
SMOKE DELIVERIES

COUNTRY	MANUFACTURE LOCATION	DATE	TAR	NICOTINE	PUFFS	TAR/NIC	TAR/PUFF	NIC/PUFF	FILTER VENT	FILTER EFFIC
USA	USA	1986	16.8	1.15	9.0	14.6	1.87	0.128	10.3	38.7
USA	USA	1991	16.3	1.10	8.7	14.8	1.87	0.126	12.6	38.9
USA	USA	1991	17.5	1.25	9.7	14.0	1.80	0.129	12.0	
USA	USA	1992	14.6	0.98	9.1	14.9	1.60	0.108	14.0	
USA	USA	1992	16.5	1.16	8.8	14.2	1.87	0.132	11.7	39.7
	AVERAGE 81-92		16.3	1.14	8.9	14.2	1.84	0.129	11.2	39.8
VENEZUALA	VENEZUALA	1991	16.3	1.11	7.7	14.7	2.12	0.144	0.0	
PANAMA	PANAMA/USA	1974	24.0	1.20	8.1	20.0	2.96	0.148		
PANAMA	PANAMA	1991	16.5	1.00	7.2	16.5	2.29	0.139	0.0	38.3
PANAMA	PANAMA	1992	14.6	0.90	7.1	16.2	2.06	0.127	0.0	39.7
	AVERAGE 91-92		15.6	0.95	7.2	16.4	2.17	0.133	0.0	39.0
BRAZIL	BRAZIL	1974	22.0	0.96	9.3	22.9	2.37	0.103	0.0	
BRAZIL	BRAZIL	1975	22.1	1.00	9.7	22.1	2.28	0.103	0.0	
BRAZIL	BRAZIL	1979	19.0							
BRAZIL	BRAZIL	1980	15.0							
BRAZIL	BRAZIL	1986	14.2	1.38	7.7	10.3	1.84	0.179	0.0	
BRAZIL	BRAZIL	1991	14.9	1.32	7.7	11.3	1.94	0.171	0.0	
BRAZIL	BRAZIL	1991	16.1	1.38	7.8	11.7	2.06	0.177	0.0	
	AVERAGE 80-91		15.1	1.36	7.7	11.1	1.95	0.176	0.0	
ARGENTINA	ARGENTINA	1986	15.7	1.19	7.7	13.2	2.04	0.155	0.0	
ARGENTINA	ARGENTINA	1990	14.8	0.99	8.1	14.9	1.83	0.122	0.0	33.2
GERMANY	GERMANY	1974	22.0	1.20	8.8	18.3	2.50	0.136		
GERMANY	GERMANY	1978	12.9	0.84	8.4	15.4	1.54	0.100	0.0	
GERMANY	GERMANY	1979	13.5	0.84	8.6	16.1	1.57	0.098	0.0	
GERMANY	GERMANY	1980	14.0	0.87	8.7	16.1	1.61	0.100	0.0	
GERMANY	GERMANY	1980	14.0	0.82	8.8	17.1	1.59	0.093	0.0	
GERMANY	GERMANY	1981	14.5	0.88	8.4	16.5	1.73	0.105	0.0	
GERMANY	GERMANY	1982	14.2	0.83	8.6	17.1	1.65	0.097	0.0	
GERMANY	GERMANY	1983	11.6	0.85	8.2	13.6	1.41	0.104	17.4	
GERMANY	GERMANY	1984	12.6	0.89	8.0	14.2	1.58	0.111	16.6	
GERMANY	GERMANY	1985	12.9	0.85	8.1	15.2	1.59	0.105	16.6	

TABLE A-7
MARLBORO KS
SMOKE DELIVERIES

COUNTRY	MANUFACTURE LOCATION	DATE	TAR	NICOTINE	PUFFS	TAR/NIC	TAR/PUFF	NIC/PUFF	FILTER VENT	FILTER EFFIC
GERMANY	GERMANY	1986	12.9	0.90	8.3	14.3	1.55	0.108	16.1	
GERMANY	GERMANY	1986	13.4	0.98	8.6	13.7	1.56	0.114	18.2	
GERMANY	GERMANY	1987	12.6	0.97	8.3	13.0	1.52	0.117	15.8	
GERMANY	GERMANY	1988	13.0	1.00	8.2	13.0	1.59	0.122	16.4	
GERMANY	GERMANY	1989	12.4	0.95	8.2	13.1	1.51	0.116	16.4	
GERMANY	GERMANY	1989	13.9	1.03	8.1	13.5	1.72	0.127	17.8	36.5
GERMANY	GERMANY	1990	13.7	1.02	7.9	13.4	1.73	0.129	17.8	37.3
GERMANY	GERMANY	1990	12.4	0.96	8.5	12.9	1.46	0.113	16.8	
GERMANY	GERMANY	1991	12.2	0.97	8.3	12.6	1.47	0.117	16.1	
GERMANY	GERMANY	1991	14.1	0.97	8.7	14.5	1.62	0.111	18.0	
GERMANY	GERMANY	1991	13.7	0.96	8.6	14.3	1.59	0.112	15.2	36.5
GERMANY	GERMANY	1992	14.2	0.97	8.2	14.6	1.73	0.118	14.0	
GERMANY	GERMANY	1992	14.3	1.06	8.0	13.5	1.79	0.133	16.2	39.1
	AVERAGE 78-92		13.3	0.93	8.4	14.4	1.60	0.111	12.1	37.4
MALAYSIA	MALAYSIA	1986	15.4	1.18	8.5	13.1	1.81	0.139	11.0	
MALAYSIA	MALAYSIA	1990	15.6	1.08	8.4	14.4	1.86	0.129	8.1	38.5
MALAYSIA	MALAYSIA	1991	16.1	1.16	8.8	13.9	1.83	0.132	7.0	38.1
MALAYSIA	MALAYSIA	1991	15.8	1.12	8.4	14.1	1.88	0.133	9.6	41.2
MALAYSIA	MALAYSIA	1991	16.0	1.15	9.7	13.9	1.65	0.119	8.0	
	AVERAGE		15.8	1.14	8.8	13.9	1.81	0.130	8.7	39.3
JAPAN	JAPAN	1986	17.6	1.43	8.2	12.3	2.15	0.174	0.0	
JAPAN	JAPAN	1992	15.1	1.18	8.3	12.8	1.82	0.142	16.0	
INDONESIA	INDONESIA/USA	1992	15.2	1.04	8.4	14.6	1.81	0.124	13.9	39.8
AUSTRALIA	AUSTRALIA	1974	24.0	1.30	9.1	18.5	2.64	0.143		
AUSTRALIA	AUSTRALIA	1986	13.6	1.25	8.2	10.9	1.66	0.152	13.1	
AUSTRIA	AUSTRIA	1980	13.0	0.75	9.2	17.3	1.41	0.082	21.5	
AUSTRIA	AUSTRIA	1982	12.7	0.90	9.0	14.1	1.41	0.100	18.3	
AUSTRIA	AUSTRIA	1991	14.0	1.08	8.4	13.0	1.67	0.129		
BELGIUM	BELGIUM/"C"	1980	15.8	1.05	9.1	15.0	1.74	0.115	16.3	
BELGIUM	BELGIUM/"C"	1982	15.5	1.06	9.1	14.6	1.70	0.116	15.3	

TABLE A-7
MARLBORO KS
SMOKE DELIVERIES

COUNTRY	MANUFACTURE LOCATION	DATE	TAR	NICOTINE	PUFFS	TAR/NIC	TAR/PUFF	NIC/PUFF	FILTER VENT'D	FILTER EFFIC
BELGIUM	BELGIUM/"C"	1991		1.11	8.2			0.135		
BELGIUM	BELGIUM/"C"	1992	15.4	1.07	8.2	14.4	1.88	0.130	11.1	38.4
CANARY IS	USA	1980	14.9	0.95	7.8	15.7	1.91	0.122	0.0	
DENMARK	WITZERLAND/"C	1980	15.4	1.05	9.5	14.7	1.62	0.111	17.5	
DENMARK	WITZERLAND/"C	1982	14.9	1.15	9.0	13.0	1.66	0.128	13.4	
DENMARK	WITZERLAND/"C	1991	14.0	1.12	8.6	12.5	1.63	0.130		
FINLAND	FINLAND	1974	25.0	1.30	8.9	19.2	2.82	0.147		
FINLAND	FINLAND	1980	14.5	0.87	8.0	16.7	1.81	0.109	0.0	
FINLAND	FINLAND	1982	14.4	1.03	7.3	14.0	1.97	0.141	0.0	
FRANCE	"C"	1980	15.7	1.02	8.8	15.4	1.78	0.116	13.3	
FRANCE	"C"	1982	13.9	1.07	8.7	13.0	1.60	0.123	17.8	
GREECE	"C"	1980	17.7	1.11	9.5	15.9	1.86	0.117	0.0	
GREECE	"C"	1982	16.1	1.00	9.1	16.1	1.77	0.110	0.0	
GREECE	"C"	1990	15.5	1.11	8.3	14.0	1.87	0.134	14.6	35.4
GREECE	"C"	1991	16.7	1.13	8.8	14.8	1.90	0.128	10.9	37.1
GREECE	"C"	1992	13.7	1.06	8.3	12.9	1.65	0.128	17.5	36.4
HOLLAND	"C"	1980	15.3	1.04	9.1	14.7	1.68	0.114	15.4	
HOLLAND	"C"	1982	14.0	1.09	8.6	12.8	1.63	0.127	18.0	
HOLLAND	"C"	1989	14.4	1.03	8.2	14.0	1.76	0.126	11.5	38.3
HOLLAND	"C"	1990	15.1	1.07	8.3	14.1	1.82	0.129	12.6	33.0
HOLLAND	"C"	1991	14.9	0.98	8.3	15.2	1.80	0.118	13.1	38.8
ITALY	"C"	1980	19.2	1.05	9.6	18.3	2.00	0.109	0.0	
ITALY	"C"	1982	17.0	1.12	8.6	15.2	1.98	0.130	15.7	
ITALY	"C"	1991	15.2	1.01	7.9	15.0	1.92	0.128	10.9	39.4
NORWAY	SWITZERLAND	1980	16.7	1.09	7.9	15.3	2.11	0.138	0.0	
NORWAY	SWITZERLAND	1982	15.4	1.18	10.2	13.1	1.51	0.116	18.4	
SPAIN	USA	1980	15.6	0.99	8.1	15.8	1.93	0.122	0.0	

TABLE A-7
MARLBORO KS
SMOKE DELIVERIES

COUNTRY	MANUFACTURE LOCATION	DATE	TAR	NICOTINE	PUFFS	TAR/NIC	TAR/PUFF	NIC/PUFF	FILTER VENT	FILTER EFFIC
SPAIN	SPAIN	1982	15.9	1.24	8.8	12.8	1.81	0.141	0.0	
SPAIN	SPAIN	1989	16.4	1.17	8.1	14.0	2.02	0.144	0.0	36.0
SPAIN	SPAIN	1990	16.3	1.12	8.1	14.6	2.01	0.138	0.0	41.0
SPAIN	SPAIN	1991	14.9	1.27		11.7				
SPAIN	SPAIN	1991	16.6	1.15	8.2	14.4	2.02	0.140	0.0	37.4
SWEDEN	"C"(?)	1980	14.4	0.98	8.6	14.7	1.67	0.114	17.2	
SWEDEN	"C"(?)	1982	14.8	1.15	9.0	12.9	1.64	0.128	16.1	
SWITZERLAND	SWITZERLAND	1973	25.0	1.42	8.5	17.6	2.94	0.167		
SWITZERLAND	SWITZERLAND	1974	25.0	1.40	8.4	17.9	2.98	0.167		
SWITZERLAND	SWITZERLAND	1980	15.3	1.05	8.7	14.6	1.76	0.121	15.9	
SWITZERLAND	SWITZERLAND	1980	19.6	1.31	8.4	15.0	2.33	0.156		
SWITZERLAND	SWITZERLAND	1982	14.4	1.14	9.3	12.6	1.55	0.123	22.9	
SWITZERLAND	SWITZERLAND	1986	15.8	1.18	7.8	13.4	2.03	0.151	13.8	
SWITZERLAND	SWITZERLAND	1989	14.2	1.10	8.7	12.9	1.63	0.126	11.9	39.3
SWITZERLAND	SWITZERLAND	1990	14.7	1.09	8.5	13.5	1.73	0.128	13.7	37.7
SWITZERLAND	SWITZERLAND	1991	15.7	1.02	8.5	15.4	1.85	0.120	11.6	39.3
SWITZERLAND	SWITZERLAND	1991	14.8	1.04	9.2	14.2	1.61	0.113	14.0	
SWITZERLAND	SWITZERLAND	1992	13.9	1.04	8.3	13.4	1.67	0.125	15.4	37.9
UK	BELGIUM/"C"	1974	22.0	1.40	8.3	15.7	2.66	0.169		
UK	BELGIUM/"C"	1982	13.8	1.18	8.3	11.7	1.66	0.142	0.0	
UK	BELGIUM/"C"	1986	13.8	1.08	8.8	12.8	1.57	0.123	16.8	
UK	BELGIUM/"C"	1991	12.1	1.03	8.5	11.7	1.42	0.121	21.3	
YUGOSLAVIA	YUGOSLAVIA	1989	17.7	1.30	9.7	13.6	1.82	0.134	0.0	35.9
YUGOSLAVIA	YUGOSLAVIA	1990	17.9	1.38	10.0	13.0	1.79	0.138	0.0	36.6
YUGOSLAVIA	YUGOSLAVIA	1991	16.5	1.13	10.1	14.6	1.63	0.112	7.4	36.4
	AVERAGE		15.9	1.11	8.5	14.4	1.78	0.125	10.4	37.5

TABLE B-1
MARLBORO KS
SUMMARY TABLE
BLEND COMPOSITION

COUNTRY	DATE	% ET	% STEM	% TOTAL LIGHT RECON	% BANDCAST RECON	% TOTAL RECON	% TOTAL BY-PRODUCTS
USA	1991-1992	7.2	2.4	17.8	5.4	23.2	25.6
USA-EXPORT	1989-1992	8.4	2.5	16.8	6.3	23.1	25.6
GERMANY	1989-1992	7.4	7.1	22.3	0.0	22.3	29.4
SWITZERLAND	1990-1992	10.1	3.3	19.4	4.5	23.9	27.2
BELGIUM	1992	7.5	3.0	19.4	5.8	25.2	28.2
HOLLAND	1989-1991	8.1	2.5	19.9	5.4	25.3	27.8
UK	1986-1991	12.0	4.0	16.3	4.0	20.3	24.3
FRANCE	1980-1991				4.0		
ITALY	1991	8.7	2.8	18.5	3.4	21.9	24.7
GREECE	1990-1992	10.1	3.1	20.7	5.2	25.9	29.0
SPAIN	1989-1991	8.2	3.6	12.9	6.5	19.4	23.0
AUSTRIA	1980						
YUGOSLAVIA	1989-1990	0.0	0.0	13.4	4.4	17.8	17.8
DENMARK	1980						
FINLAND	1991			17.5	7.5	25.0	
SWEDEN	1980-1982						
NORWAY	1980-1982						
"AVERAGE EUROPE"		8.1	2.8	17.6	5.1	22.7	25.3
BRAZIL	1986-1991	0.0	21.0	0.0	0.0	0.0	21.0
ARGENTINA	1986-1992	0.0	21.6	0.0	0.0	0.0	21.6
VENEZUALA	1991	0.0	12.1	0.0	18.2	18.2	30.3
PANAMA	1991-1992	0.0	10.7	9.8	0.0	9.8	20.5
JAPAN	1991-1992	0.0	0.0	15.0	0.0	15.0	15.0
AUSTRALIA	1986-1991	15.0	13.0	0.0	0.0	0.0	13.0
MALAYSIA-1	1990-1991	7.4	8.5	2.8	4.6	7.4	15.9
MALAYSIA-2	1992	0.0	10.0	17.2	0.0	17.2	27.2

TABLE B-2
MARLBORO KS
SUMMARY TABLE
AMMONIA/BLEND CHEMISTRY

COUNTRY	DATE	% CHLORO-GENIC ACID	% RUTIN	CA/RUTIN RATIO	% NITRATES	% ALKALOIDS	% PHOSPHATES	% UREA	% AMMONIA
USA	1991-1992	0.44	0.26	1.69	0.8	1.87	1.0	0.19	0.29
USA-EXPORT	1989-1992					1.94	0.8		0.29
GERMANY	1989-1992	0.59	0.37	1.59	0.9	1.81	0.9		0.16
SWITZERLAND	1990-1992	0.55	0.34	1.62	0.8	1.96	0.9		0.28
BELGIUM	1992					1.73	0.7		0.32
HOLLAND	1989-1991					1.87	0.8		0.28
UK	1986-1991					1.88			0.25
FRANCE	1980-1991					1.79	0.8		0.29
ITALY	1991					1.80	0.9		0.28
GREECE	1990-1992					1.94	0.8		0.28
SPAIN	1989-1991					2.02	0.8		
AUSTRIA	1980					1.51	0.6		0.21
YUGOSLAVIA	1989-1990					2.03	0.8		
DENMARK	1980					1.77	0.6		0.32
FINLAND	1991								
SWEDEN	1980-1982					1.79	0.6		0.29
NORWAY	1980-1982					1.77	0.6		0.29
"AVERAGE EUROPE"		0.55	0.34	1.62	0.8	1.84	0.7		0.28
BRAZIL	1986-1991	0.60	0.43	1.40	1.0	2.29	1.2		0.17
ARGENTINA	1986-1992					1.97	0.5		0.10
VENEZUALA	1991					1.99	1.0		0.41
PANAMA	1991-1992					2.06	0.5		0.18
JAPAN	1991-1992					1.95	0.6		0.15
AUSTRALIA	1986-1991						0.8		0.07
MALAYSIA-1	1990-1991	0.59	0.27	2.19	0.8	1.92	0.9		0.17
MALAYSIA-2	1992					1.91	0.5		0.41

TABLE B-3
MARLBORO KS
SUMMARY TABLE
CASING CHEMISTRY

COUNTRY	DATE	% TOTAL SUGARS	% REDUCING SUGARS	% GLUCOSE	% FRUCTOSE	% SUCROSE	% PG	% GLYCERINE	% COCOA	% LICORICE	RATIO GLYC/PG	RATIO RED/TOT SUGARS
USA	1991-1992	12.0	9.2	2.3	2.9	3.2	1.9	2.3	0.5	0.8	1.21	0.77
USA-EXPORT	1989-1992	11.8	8.1	2.7	3.7	2.5	1.7	2.2	0.5	0.7	1.29	0.69
GERMANY	1989-1992	14.5	10.0	4.2	4.2	3.8	1.6	2.1	0.4	1.5	1.31	0.69
SWITZERLAND	1990-1992	14.2	9.6				1.6	2.3	0.6	1.5	1.44	0.68
BELGIUM	1992	13.9	9.6				2.0	2.3			1.15	0.69
HOLLAND	1989-1991	13.5	9.1				1.7	2.3	0.6	1.5	1.35	0.67
UK	1986-1991	13.1	9.8									0.75
FRANCE	1980-1991	13.6	9.1	3.2	3.7	3.7	1.2	2.2	0.3	1.2	1.83	0.67
ITALY	1991	13.2	9.0				1.5	2.3			1.53	0.68
GREECE	1990-1992	13.4	8.8				1.9	2.3	0.5	1.4	1.21	0.66
SPAIN	1989-1991	14.1	9.8				1.4	2.1	0.5	1.3	1.50	0.70
AUSTRIA	1980	15.3	10.0						0.4	1.0		0.65
YUGOSLAVIA	1989-1990	14.7	10.9				1.8	2.3	0.3	1.1	1.28	0.74
DENMARK	1980	13.0	8.8				1.3	2.1	0.4	1.1	1.62	0.68
FINLAND	1991											
SWEDEN	1980-1982	13.8	7.8				1.2	2.1	0.4	1.1	1.75	0.57
NORWAY	1980-1982	13.1	7.7									0.59
"AVERAGE EUROPE"		13.8	9.2	3.2	3.7	3.7	1.6	2.2	0.4	1.2	1.47	0.67
BRAZIL	1986-1991	7.8	7.0			3.6	0.7	1.0	0.6	1.0	1.43	0.90
ARGENTINA	1986-1992	14.2	9.0				2.5				0.00	0.63
VENEZUALA	1991	12.7	8.9				1.1	1.4	0.4	1.0	1.27	0.70
PANAMA	1991-1992	10.9	6.2				1.4	1.9	0.6	0.8	1.36	0.57
JAPAN	1991-1992	12.6	7.6	3.6	4.4	3.0	1.9	1.7	0.7	0.8	0.89	0.60
AUSTRALIA	1986-1991	13.0	9.3	3.4	4.3	3.3	0.7	1.0	0.4	0.9	1.43	0.72
MALAYSIA-1	1990-1991	11.8	7.7				1.0	1.3	0.5	0.9	1.30	0.65
MALAYSIA-2	1992	8.4	7.0				1.0	1.3	0.2	0.2	1.30	0.83

TABLE B–4
MARLBORO KS
SUMMARY TABLE
CIGARETTE CONSTRUCTION AND PRESSURE DROP

COUNTRY	DATE	DRY DENSITY	% VENT	OPEN CIGARETTE PRESS DROP	SEALED CIGARETTE PRESS DROP	FILTER PRESS DROP	TOBACCO SECTION PRESS DROP	% FILTER TRIACETIN	% FILTER EFFICIENCY	PAPER POROSITY	% PAPER ADDITIVE
USA	1991-1992	213	12.6	4.5	4.9	2.8	2.1	7.2	39.8	35	0.48
USA-EXPORT	1989-1992	213	12.9	4.4	4.8	2.8	2.0	7.1	38.3	35	0.56
GERMANY	1989-1992	217	16.5	4.1	4.7	2.6	2.1	7.2	37.4	49	0.88
SWITZERLAND	1990-1992	212	13.7	4.4	4.8	2.8	2.0	7.3	38.6	35	0.65
BELGIUM	1992	211	11.1	4.4	4.8	2.9	1.9	7.3	38.4	45	0.80
HOLLAND	1989-1991	211	12.4	4.3	4.7	2.8	1.9	6.9	36.7	38	0.58
UK	1986-1991		19.0	4.2	5.0	3.1	1.9	5.5		42	0.56
FRANCE	1980-1991		15.5							39	
ITALY	1991	207	10.9	4.5	4.8	2.7	2.1	6.5	39.4	36	0.60
GREECE	1990-1992	210	14.3	4.3	4.9	2.7	2.2	7.7	36.3	41	0.65
SPAIN	1989-1991	223	0.0	4.7	4.7	2.8	1.9	8.1	38.1	37	0.65
AUSTRIA	1980		19.9							50	
YUGOSLAVIA	1989-1990	238	0.0	4.7	4.7	2.6	2.1	8.2	36.3	105	0.70
DENMARK	1980		15.5							39	
FINLAND	1991				4.3	2.4	1.9				
SWEDEN	1980-1982		16.5							58	
NORWAY	1980-1982		18.4							43	
"AVERAGE EUROPE"		216	12.9	4.4	4.7	2.8	2.0	7.2	37.7	47	0.64
BRAZIL	1986-1991	220	0.0	4.9	4.9	2.7	2.2	6.3		44	0.59
ARGENTINA	1986-1992	219	0.0	4.9	4.9	2.7	2.2	7.2	33.2	29	1.49
VENEZUALA	1991	210	0.0	4.3	4.3	2.7	1.6			35	0.47
PANAMA	1991-1992	214	0.0	4.4	4.4	2.7	1.7	7.7	39.0	25	0.47
JAPAN	1991-1992	218	16.0	4.4	5.0	3.0	2.0	3.4		35	0.00
AUSTRALIA	1986-1991	211	13.1	4.1	4.6	2.2	2.4	4.5		30	0.47
MALAYSIA-1	1990-1991	215	8.2	5.0	5.3	2.9	2.4	9.4	39.3	46	0.56
MALAYSIA-2	1992	217	10.4	4.4	4.8	3.1	1.7	7.2		0	0.60

TABLE B-5
MARLBORO KS
SUMMARY TABLE
DELIVERIES

COUNTRY	DATE	TAR	NICOTINE	PUFFS	TAR/NIC	TAR/PUFF	NIC/PUFF
USA	1991-1992	16.3	1.14	8.9	14.3	1.83	0.128
USA-EXPORT	1989-1992	15.9	1.14	8.4	13.9	1.89	0.136
GERMANY	1989-1992	13.4	0.99	8.3	13.5	1.61	0.119
SWITZERLAND	1990-1992	14.8	1.05	8.7	14.1	1.70	0.121
BELGIUM	1992	15.4	1.07	8.2	14.4	1.88	0.130
HOLLAND	1989-1991	14.8	1.03	8.3	14.4	1.78	0.124
UK	1986-1991	13.0	1.06	8.7	12.3	1.49	0.122
FRANCE	1980-1991	14.8	1.05	8.8	14.1	1.68	0.119
ITALY	1991	15.2	1.01	7.9	15.0	1.92	0.128
GREECE	1990-1992	15.3	1.10	8.5	13.9	1.80	0.129
SPAIN	1989-1991	16.0	1.18	8.1	13.6	1.98	0.146
AUSTRIA	1980	13.2	0.91	8.9	14.5	1.48	0.102
YUGOSLAVIA	1989-1990	17.4	1.27	9.9	13.7	1.76	0.128
DENMARK	1980	14.8	1.11	9.0	13.3	1.64	0.123
FINLAND	1991						
SWEDEN	1980-1982	14.6	1.07	8.8	13.6	1.66	0.122
NORWAY	1980-1982	16.1	1.14	9.1	14.1	1.77	0.125
"AVERAGE EUROPE"		15.0	1.08	8.7	13.9	1.73	0.125
BRAZIL	1986-1991	15.1	1.36	7.7	11.1	1.96	0.177
ARGENTINA	1986-1992	15.3	1.09	7.9	14.0	1.94	0.138
VENEZUALA	1991	16.3	1.11	7.7	14.7	2.12	0.144
PANAMA	1991-1992	15.6	0.95	7.2	16.4	2.17	0.132
JAPAN	1991-1992	15.1	1.18	8.3	12.8	1.82	0.142
AUSTRALIA	1986-1991	13.6	1.25	8.2	10.9	1.66	0.152
MALAYSIA-1	1990-1991	15.8	1.14	8.8	13.9	1.80	0.130
MALAYSIA-2	1992						

TABLE C–1
MARLBORO KS
DS SCAN DATA FOR AMMONIA/CASING MARKERS (AREA COUNTS)

COUNTRY	MANUFACTURE LOCATION		DATE	NICOTINE (12)	PG (1)	UREA (5)	PHOSPHATE (9)	2,5+2,6 DF (40+41)	2,5+2,6 F (44+45)	FRUCTOSE (21+22+23)	GLUCOSE (24+26+30)	MALTOSE (42+43)	SUCROSE (39)
THAILAND	USA	UE	1992	1.68	3.77	0.09	0.62	0.26	0.04	6.82	6.10	0.08	3.14
THAILAND	USA	UE	1991	1.43	3.23	0.05	0.58	0.34	0.06	5.59	5.66	0.12	3.18
TAIWAN	USA	UE	1991	1.70	3.47	0.08	0.60	0.30	0.08	6.99	5.74	0.13	3.72
SAUDI	USA	UE	1990	1.56	2.16	0.00	0.65	0.72	0.07	5.13	3.77	0.15	3.93
RUSSIA	USA	UE	1992	1.52	3.29	0.05	0.58	0.34	0.08	5.70	5.84	0.13	3.78
PARAGUAY	USA	UE	1990	1.56	2.30	0.00	0.62	0.66	0.06	4.75	3.30	0.10	3.30
PARAGUAY	USA	UE	1991	1.66	3.07	0.00	0.58	0.55	0.08	6.08	5.12	0.13	3.71
KOREA	USA	UE	1991	1.49	3.05	0.03	0.56	0.45	0.08	6.22	5.39	0.12	3.63
ISRAEL	USA	UE	1990	1.63	3.05	0.08	0.57	0.52	0.07	6.25	5.12	0.11	4.21
IRAN	USA	UE	1992	1.43	2.56	0.00	0.63	0.86	0.10	4.54	2.89	0.19	2.08
HONG KONG	USA	UE	1992	1.46	3.48	0.11	0.60	0.27	0.07	7.71	7.50	0.11	3.34
CHINA	USA	UE	1991	1.60	3.43	0.11	0.59	0.26	0.06	6.75	7.42	0.16	3.73
CHINA	USA	UE	1991	1.49	2.44	0.00	0.58	0.72	0.07	5.83	4.36	0.14	1.43
CHINA	USA	UE	1991	1.65	3.51	0.06	0.64	0.36	0.07	6.42	6.09	0.15	4.15
	AVERAGE			1.57	3.06	0.05	0.60	0.47	0.07	6.06	5.31	0.13	3.38
USA	USA	U	1992	1.35	2.55	0.04	0.51	0.51	0.08	5.34	3.65	0.12	3.20
USA	USA	U	1992	1.63	3.33	0.03	0.59	0.50	0.06	5.51	4.88	0.09	3.89
	AVERAGE			1.49	2.94	0.04	0.55	0.51	0.07	5.43	4.27	0.11	3.55
VENEZUALA	VENEZUALA	SV	1991	1.55	1.78	0.00	0.58	0.09	0.08	4.91	5.81	0.11	7.05
PANAMA	PANAMA	SSP	1991	1.48	2.31	0.00	0.43	0.22	0.00	4.50	3.24	0.04	4.15
PANAMA	PANAMA	SSP	1992	1.55	2.83	0.00	0.43	0.18	0.00	5.79	5.12	0.02	4.76
	AVERAGE			1.52	2.57	0.00	0.43	0.20	0.00	5.15	4.18	0.03	4.46

CONFIDENTIAL MINNESOTA TOBACCO LITIGATION

TABLE C-1
MARLBORO KS
DS SCAN DATA FOR AMMONIA/CASING MARKERS (AREA COUNTS)

COUNTRY	MANUFACTURE LOCATION		DATE	NICOTINE (12)	DS (1)	UREA (2)	PHOSPHATE (3)	2,5+2,6 DF (40+41)	2,5+2,6 F (44+45)	FRUCTOSE (21+22+23)	GLUCOSE (24+26+30)	MALTOSE (42+43)	SUCROSE (39)
GUATAMALA	GUATAMALA	SSG	1991	1.19	1.90	0.00	0.40	0.18	0.05	6.57	5.63	0.02	4.66
ARGENTINA	ARGENTINA	SA	1992	1.42	5.78	0.00	0.35	0.04	0.07	8.04	8.67	0.06	5.32
MALAYSIA	MALAYSIA	FEM	1991	1.63	1.62	0.00	0.63	0.51	0.07	5.71	4.45	0.10	4.85
MALAYSIA	MALAYSIA(RJR)	FEM	1992	1.38	1.40	0.03	0.38	0.25	0.05	5.15	4.28	0.04	0.34
JAPAN	JAPAN	FEJ	1992	1.63	2.77	0.00	0.38	0.05	0.06	6.43	7.47	0.02	4.80
INDONESIA	INDONESIA/USA	FEI	1992	1.60	3.49	0.02	0.59	0.52	0.08	6.50	5.82	0.13	2.87
SWITZERLAND	SWITZERLAND	E	1991	1.50	2.10	0.00	0.60	0.43	0.06	5.96	5.00	0.10	4.71
SPAIN	SPAIN	E	1990	1.52	1.64	0.00	0.58	0.51	0.06	6.47	5.52	0.10	2.89
SPAIN	SPAIN	E	1991	1.52	2.60	0.00	0.62	0.26	0.07	7.64	9.06	0.11	3.72
HOLLAND	"C"	E	1991	1.30	1.92	0.04	0.46	0.35	0.06	6.06	5.62	0.09	4.73
GREECE	"C"	E	1990	1.66	2.79	0.06	0.56	0.42	0.07	6.05	5.42	0.13	4.85
GREECE	"C"	E	1991	1.74	3.82	0.13	0.51	0.32	0.07	7.83	8.62	0.13	3.48
CANARY IS	CANARY IS	E	1991	1.57	2.60	0.06	0.52	0.35	0.07	6.46	7.01	0.16	2.76
	AVERAGE			1.54	2.50	0.04	0.55	0.38	0.07	6.64	6.61	0.12	3.88
GERMANY	GERMANY	G	1991	1.58	3.64	0.18	0.38	0.15	0.06	7.14	8.74	0.04	4.89

TABLE C-2
MARLBORO KS
DS SCAN DATA FOR BLEND MARKERS (AREA COUNTS)

COUNTRY	MANUFACTURE LOCATION		DATE	MALIC ACID (15)	PYROGLUTAMIC ACID (16)	TRIHYDROXY BUTANOIC ACIDS (17+18)	INOSITOLS (27+33)	CHLOROGENIC ACIDS (46+47)
THAILAND	USA	UE	1992	2.36	0.25	0.79	2.26	0.91
THAILAND	USA	UE	1991	1.98	0.25	0.67	1.82	0.94
TAIWAN	USA	UE	1991	2.23	0.19	0.82	2.00	0.92
SAUDI	USA	UE	1990	2.19	0.28	0.78	1.95	0.91
RUSSIA	USA	UE	1992	2.14	0.19	0.75	2.30	0.91
PARAGUAY	USA	UE	1990	2.09	0.23	0.75	1.84	0.90
PARAGUAY	USA	UE	1991	2.13	0.25	0.76	1.85	1.02
KOREA	USA	UE	1991	2.00	0.26	0.73	1.81	0.97
ISRAEL	USA	UE	1990	2.11	0.32	0.75	1.74	0.96
IRAN	USA	UE	1992	1.95	0.40	0.65	1.72	0.84
HONG KONG	USA	UE	1992	2.31	0.39	0.74	2.10	1.05
CHINA	USA	UE	1991	2.13	0.28	0.80	2.07	0.98
CHINA	USA	UE	1991	1.93	0.16	0.70	1.76	0.95
CHINA	USA	UE	1991	2.20	0.23	0.80	2.68	1.02
	AVERAGE			2.13	0.26	0.75	1.99	0.95
USA	USA	U	1992	2.00	0.15	0.60	1.84	1.00
USA	USA	U	1992	2.19	0.28	0.77	2.33	0.95
	AVERAGE			2.10	0.22	0.69	2.09	0.98
VENEZUALA	VENEZUALA	SV	1991	1.88	0.27	0.54	1.60	0.73
PANAMA	PANAMA	SSP	1991	2.80	0.27	0.93	1.53	0.73
PANAMA	PANAMA	SSP	1992	2.84	0.29	1.00	1.78	0.90
	AVERAGE			2.82	0.28	0.97	1.66	0.82
GUATAMALA	GUATAMALA	SSG	1991	2.08	0.21	0.66	1.56	1.25
ARGENTINA	ARGENTINA	SA	1992	1.73	0.22	0.79	2.25	1.10

TABLE C-2
MARLBORO KS
DS SCAN DATA FOR BLEND MARKERS (AREA COUNTS)

COUNTRY	MANUFACTURE LOCATION		DATE	MALIC ACID (15)	PYROGLUTAMIC ACID (16)	TRIHYDROXY BUTANOIC ACIDS (17+18)	INOSITOLS (27+33)	CHLOROGENIC ACIDS (46+47)
MALAYSIA	MALAYSIA	FEM	1991	1.96	0.23	0.70	1.76	1.04
MALAYSIA	MALAYSIA(RJR)	FEM	1992	1.47	0.19	0.56	1.76	1.02
JAPAN	JAPAN	FEJ	1992	2.10	0.24	0.62	2.06	1.23
INDONESIA	INDONESIA/USA	FEI	1992	2.28	0.39	0.84	2.21	0.92
SWITZERLAND	SWITZERLAND	E	1991	2.21	0.23	0.86	2.09	1.13
SPAIN	SPAIN	E	1990	2.10	0.23	0.77	2.21	1.09
SPAIN	SPAIN	E	1991	2.22	0.26	0.80	2.63	1.00
HOLLAND	"C"	E	1991	1.80	0.22	0.83	1.74	1.18
GREECE	"C"	E	1990	2.17	0.27	0.78	1.70	1.22
GREECE	"C"	E	1991	2.37	0.30	0.88	1.97	1.15
CANARY IS	CANARY IS	E	1991	2.15	0.19	0.68	2.12	1.03
	AVERAGE			2.15	0.24	0.80	2.07	1.11
GERMANY	GERMANY	G	1991	2.08	0.26	0.79	2.29	1.22

TABLE D-1
US MARLBORO STYLES
BLEND COMPOSITION

	TAR	STYLE	DATE	% ET	% STEM	% TOTAL LIGHT RECON	% BANDCAST RECON	% TOTAL RECON	% TOTAL BY-PRODUCTS
MARLBORO	FF	KS	1988	10.2	2.4	16.7	6.8	23.5	25.9
MARLBORO	FF	KS	1989	9.0					
MARLBORO	FF	KS	1990	8.4	2.6	18.5	6.2	24.7	27.3
MARLBORO	FF	KS	1990	7.3	2.6	18.5	6.2	24.7	27.3
MARLBORO	FF	KS	1991	7.6	2.9	17.4	5.4	22.8	25.7
MARLBORO	FF	KS	1992	7.6	2.4	18.6	5.6	24.2	26.6
MARLBORO	FF	KS	1992	6.8	1.9	18.2	5.4	23.6	25.5
MARLBORO	FF	KS	1992	9.0	8.0	18.0	6.0	24.0	32.0
		-	AVERAGE	8.2	3.3	18.0	5.9	23.9	27.2
MARLBORO	FF	100	1988	8.8					
MARLBORO	FF	100	1989	9.1					
MARLBORO	FF	100	1990	7.6					
MARLBORO	FF	100	1992	7	3	17	6	23.0	26.0
MARLBORO	FF	100	1992	9.0	7.0	15.0	7.0	22.0	29.0
			AVERAGE	8.3	5.0	16.0	6.5	22.5	27.5
MARLBORO	MD	KS	1991	9.2	1.5	17.6	4.5	22.1	23.6
MARLBORO	MD	KS	1992	6.0	2.0	18.0	8.0	26.0	28.0
MARLBORO	MD	KS	1992	8.0	9.0	15.0	5.0	20.0	29.0
MARLBORO	MD	KSB	1991	9.7	1.6	16.7	5.6	22.3	23.9
			AVERAGE	8.2	3.5	16.8	5.8	22.6	26.1
MARLBORO	MD	100	1992	7.0	2.0	18.0	8.0	26.0	28.0
MARLBORO	LT	KS	1988	7.7					
MARLBORO	LT	KS	1989	8.3					
MARLBORO	LT	KS	1990	7.4					
MARLBORO	LT	KS	1991	9.7	2.0	14.0	6.2	20.2	22.2
MARLBORO	LT	KSB	1992	7.0	2.0	17.0	6.0	23.0	25.0
MARLBORO	LT	KS	1992	7.9	3.0	19.3	5.9	25.2	28.2

TABLE D–1
US MARLBORO STYLES
BLEND COMPOSITION

	TAR	STYLE	DATE	% ET	% STEM	% TOTAL LIGHT RECON	% BANDCAST RECON	% TOTAL RECON	% TOTAL BY-PRODUCTS
MARLBORO	LT	KS	1992	9.0	8.0	13.0	7.0	20.0	28.0
			AVERAGE	8.1	3.8	15.8	6.3	22.1	25.9
MARLBORO	LT	100	1988	8.5					
MARLBORO	LT	100	1989	7.5					
MARLBORO	LT	100	1990	8.0					
MARLBORO	LT	100	1991	7.0	3.3	17.0	5.4	22.4	25.7
MARLBORO	LT	100	1992	6.0	2.0	17.0	7.0	24.0	26.0
MARLBORO	LT	100	1992	9.4	2.4	16.9	6.5	23.4	25.8
MARLBORO	LT	100	1992	9.0	6.0	13.0	7.0	20.0	26.0
			AVERAGE	7.9	3.4	16.0	6.5	22.5	25.9
MARLBORO	UL	KSB	1989	14.6	2.2	13.4	5.3	18.7	20.9
MARLBORO	UL	KSB	1992	14.0	8.0	16.0	5.0	21.0	29.0
			AVERAGE	14.3	5.1	14.7	5.2	19.9	25.0
MARLBORO	UL	100B	1989	15.8	2.8	16.2	5.4	21.6	24.4
MARLBORO	UL	100B	1992	10.0	3.0	16.0	5.0	21.0	24.0
MARLBORO	UL	100B	1992	6.0	8.0	13.0	7.0	20.0	28.0
			AVERAGE	10.6	4.6	15.1	5.8	20.9	25.5

TABLE D–2
US MARLBORO STYLES
AMMONIA CHEMISTRY

	TAR	STYLE	DATE	% ALKALOIDS	% AMMONIA	% PHOSPHATES	% UREA
MARLBORO	FF	KS	1988	2.06			
MARLBORO	FF	KS	1989	2.16	0.25		
MARLBORO	FF	KS	1990	2.01	0.26	0.68	
MARLBORO	FF	KS	1990	1.94		0.86	
MARLBORO	FF	KS	1991	2.00		0.80	
MARLBORO	FF	KS	1992	1.70	0.41	0.86	
MARLBORO	FF	KS	1992	1.81	0.35	0.81	0.19
MARLBORO	FF	KS	1992	1.78	0.29	0.89	
			AVERAGE	1.93	0.31	0.82	0.19
MARLBORO	FF	100	1988	2.03			
MARLBORO	FF	100	1989	2.19			
MARLBORO	FF	100	1990	1.97	0.24	0.86	
MARLBORO	FF	100	1992	1.70	0.44	0.80	
MARLBORO	FF	100	1992	1.69	0.27	0.87	
			AVERAGE	1.92	0.32	0.84	
MARLBORO	MD	KS	1991	1.82	0.30	1.56	
MARLBORO	MD	KS	1991	1.86	0.45	0.73	
MARLBORO	MD	KS	1992	1.83	0.28	0.85	
MARLBORO	MD	KSB	1991	1.91	0.29	0.88	
			AVERAGE	1.86	0.33	1.00	
MARLBORO	MD	100	1992	1.73	0.35	0.82	
MARLBORO	LT	KS	1988	2.06			
MARLBORO	LT	KS	1989	2.15	0.21		
MARLBORO	LT	KS	1990	1.97	0.16	0.85	
MARLBORO	LT	KS	1991	1.95	0.34	0.86	0.19
MARLBORO	LT	KSB	1992	1.72	0.40	0.61	
MARLBORO	LT	KS	1992	2.01	0.33	0.83	0.14
MARLBORO	LT	KS	1992	1.77	0.27	0.92	
			AVERAGE	1.95	0.28	0.81	0.17

TABLE D-2
US MARLBORO STYLES
AMMONIA CHEMISTRY

	TAR	STYLE	DATE	% ALKALOIDS	% AMMONIA	% PHOSPHATES	% UREA
MARLBORO	LT	100	1988	2.08			
MARLBORO	LT	100	1989	2.14	0.28		
MARLBORO	LT	100	1990	1.87	0.28	0.75	
MARLBORO	LT	100	1991	1.97	0.32	0.91	0.16
MARLBORO	LT	100	1992	1.98	0.32	0.72	0.19
MARLBORO	LT	100	1992	1.74	0.41	0.76	
MARLBORO	LT	100	1992	1.85	0.30	0.87	
			AVERAGE	1.95	0.32	0.80	0.18
MARLBORO	UL	KSB	1989	2.26	0.29		
MARLBORO	UL	KSB	1992	1.82	0.27	0.85	
			AVERAGE	2.04	0.28	0.85	
MARLBORO	UL	100B	1989	2.28	0.28		
MARLBORO	UL	100B	1992	1.87	0.28	0.87	
MARLBORO	UL	100B	1992	1.77	0.27	0.86	
			AVERAGE	1.97	0.28	0.87	

TABLE D-3
US MARLBORO STYLES
CASING CHEMISTRY

	TAR	STYLE	DATE	% PG	% GLYCERINE	% TOTAL SUGARS	% REDUCING SUGARS	% GLUCOSE	% FRUCTOSE	% SUCROSE	% COCOA	% LICORICE
MARLBORO	FF	KS	1988	1.9	2.3	12.1	8.8					
MARLBORO	FF	KS	1989	1.9	2.3	12.4	8.6					
MARLBORO	FF	KS	1990	2.0	2.2	12.5	8.1					
MARLBORO	FF	KS	1990	2.0	2.3	12.7	8.6					
MARLBORO	FF	KS	1991	1.9	2.3	12.8	8.6	1.7	2.7	2.7	0.5	0.9
MARLBORO	FF	KS	1992	2.0	2.4	12.3	8.7				0.4	0.8
MARLBORO	FF	KS	1992	2.0	2.5	12.0	8.0	2.4	3.0	3.2	0.4	0.6
MARLBORO	FF	KS	1992			11.4	9.1					
			AVERAGE	2.0	2.3	12.3	8.6	2.1	2.9	3.0	0.4	0.8
MARLBORO	FF	100	1988	1.8	2.3	12.3	8.8					
MARLBORO	FF	100	1989	1.9	2.3	12.3	8.9					
MARLBORO	FF	100	1990	1.9	2.3	12.7	9.0					
MARLBORO	FF	100	1992	1.9	2.3	12.3	8.8	2.1	2.4	3.3	0.5	0.6
MARLBORO	FF	100	1992			12.3	9.5					
			AVERAGE	1.9	2.3	12.4	9.0	2.1	2.4	3.3	0.5	0.6
MARLBORO	MD	KS	1991	1.9	2.3	11.7	8.9	2.3	3.0	1.2	0.4	0.8
MARLBORO	MD	KS	1991	1.9	2.3	12.6	8.3	2.5	3.2	2.0	0.4	0.6
MARLBORO	MD	KS	1992			11.5	7.7					
MARLBORO	MD	KSB	1991	1.9	2.3	12.6	8.6	1.8	2.4	2.3	0.4	0.7
			AVERAGE	1.9	2.3	12.1	8.4	2.2	2.9	1.8	0.4	0.7
MARLBORO	MD	100	1992	2.0	2.3	12.6	8.2	2.0	2.6	2.7	0.5	0.6
MARLBORO	LT	KS	1988	1.9	2.4	11.7	7.9					
MARLBORO	LT	KS	1989	1.9	2.3	12.7	8.8					
MARLBORO	LT	KS	1990	1.9	2.2	12.4	8.0					
MARLBORO	LT	KS	1991	1.9	2.2	12.8	9.3				0.5	0.7
MARLBORO	LT	KSB	1992	1.9	2.3	12.4	9.4	2.8	3.4	2.4	0.5	0.8
MARLBORO	LT	KS	1992	1.9	2.2	12.3	8.8				0.5	0.9
MARLBORO	LT	KS	1992			11.2	8.2					
			AVERAGE	1.9	2.3	12.2	8.6	2.8	3.4	2.4	0.5	0.8

TABLE D–3
US MARLBORO STYLES
CASING CHEMISTRY

	TAR	STYLE	DATE	% PG	% GLYCERINE	% TOTAL SUGARS	% REDUCING SUGARS	% GLUCOSE	% FRUCTOSE	% SUCROSE	% COCOA	% LICORICE
MARLBORO	LT	100	1988	1.9	2.5	11.6	7.8					
MARLBORO	LT	100	1989	2.0	2.3	12.4	8.4					
MARLBORO	LT	100	1990	1.9	2.2	12.0	7.6					
MARLBORO	LT	100	1991	1.9	2.2	13.0	9.1				0.5	0.6
MARLBORO	LT	100	1992	2.0	2.2	11.7	8.2				0.5	0.8
MARLBORO	LT	100	1992	1.9	2.3	12.2	8.9	2.1	2.4	2.6	0.5	0.7
MARLBORO	LT	100	1992			11.7	8.9					
			AVERAGE	1.9	2.3	12.1	8.4	2.1	2.4	2.6	0.5	0.7
MARLBORO	UL	KSB	1989	2.2	2.2	11.7	8.4	2.0	2.7	2.1		1.3
MARLBORO	UL	KSB	1992			10.9	7.2					
			AVERAGE	2.2	2.2	11.3	7.8	2.0	2.7	2.1		1.3
MARLBORO	UL	100B	1989	2.1	2.1	11.5	8.2	2.1	2.8	2.1		1.3
MARLBORO	UL	100B	1992			10.9	7.4					
MARLBORO	UL	100B	1992	2.1	2.1	10.9	7.1	1.7	2.3	2.8	0.6	1.1
			AVERAGE	2.1	2.1	11.1	7.6	1.9	2.6	2.5	0.6	1.2

TABLE D–4
US MARLBORO STYLES
BLEND CHEMISTRY

	TAR	STYLE	DATE	% CHLORO-GENIC ACID	% RUTIN	CA/RUTIN RATIO	% NITRATES
MARLBORO	FF	KS	1988				
MARLBORO	FF	KS	1989				
MARLBORO	FF	KS	1990				
MARLBORO	FF	KS	1990				
MARLBORO	FF	KS	1991	0.44	0.27	1.63	0.70
MARLBORO	FF	KS	1992				
MARLBORO	FF	KS	1992				
MARLBORO	FF	KS	1992	0.38	0.25	1.52	1.02
			AVERAGE	0.41	0.26	1.57	0.86
MARLBORO	FF	100	1988				
MARLBORO	FF	100	1989				
MARLBORO	FF	100	1990				
MARLBORO	FF	100	1992				
MARLBORO	FF	100	1992	0.40	0.26	1.54	1.06
			AVERAGE	0.40	0.26	1.54	1.06
MARLBORO	MD	KS	1991	0.44	0.27	1.63	1.10
MARLBORO	MD	KS	1991				
MARLBORO	MD	KS	1992	0.42	0.26	1.62	1.02
MARLBORO	MD	KSB	1991	0.45	0.29	1.55	1.00
			AVERAGE	0.44	0.27	1.60	1.04
MARLBORO	MD	100	1992				
MARLBORO	LT	KS	1988				
MARLBORO	LT	KS	1989				
MARLBORO	LT	KS	1990				
MARLBORO	LT	KS	1991				
MARLBORO	LT	KSB	1992				
MARLBORO	LT	KS	1992				

TABLE D–4
US MARLBORO STYLES
BLEND CHEMISTRY

	TAR	STYLE	DATE	% CHLORO-GENIC ACID	% RUTIN	CA/RUTIN RATIO	% NITRATES
MARLBORO	LT	KS	1992	0.39	0.26	1.50	1.02
			AVERAGE	0.39	0.26	1.50	1.02
MARLBORO	LT	100	1988				
MARLBORO	LT	100	1989				
MARLBORO	LT	100	1990				
MARLBORO	LT	100	1991				
MARLBORO	LT	100	1992				
MARLBORO	LT	100	1992				
MARLBORO	LT	100	1992	0.39	0.26	1.50	1.02
			AVERAGE	0.39	0.26	1.50	1.02
MARLBORO	UL	KSB	1989	0.38	0.26	1.46	1.00
MARLBORO	UL	KSB	1992	0.40	0.23	1.74	1.06
			AVERAGE	0.39	0.25	1.60	1.03
MARLBORO	UL	100B	1989	0.39	0.26	1.50	1.00
MARLBORO	UL	100B	1992	0.41	0.24	1.71	1.06
MARLBORO	UL	100B	1992				
			AVERAGE	0.40	0.25	1.60	1.03

TABLE D–5
US MARLBORO STYLES
CIGARETTE CONSTRUCTION

	TAR	STYLE	DATE	% MOIST	TOBACCO WEIGHT	TOBACCO WEIGHT @ 13.5%	NON TOBACCO WEIGHT	CIRCUM	CIGARETTE LENGTH	FILTER LENGTH	DRY DENSITY	PAPER POROSITY	PAPER ADDITIVE
MARLBORO	FF	KS	1988	14.5	768	759	217	24.90	84	21	211	30	0.47
MARLBORO	FF	KS	1989	15.2	774	759	215	24.83	84	21	212	32	0.51
MARLBORO	FF	KS	1990	14.1	765	760	218	24.87	84	21	212	30	0.43
MARLBORO	FF	KS	1990	14.9	768	756	217	24.86	84	21	211	34	0.45
MARLBORO	FF	KS	1991	14.1	757	752	216	24.82	84	21	210	36	0.45
MARLBORO	FF	KS	1992	13.6	755	754	216	24.85	84	21	211	39	0.54
MARLBORO	FF	KS	1992					24.65	84	21		43	0.57
			AVERAGE	14.4	765	757	217	24.83	84	21	211	35	0.49
MARLBORO	FF	100	1988	14.3	876	868	267	24.84	99	27	212	40	0.42
MARLBORO	FF	100	1989	14.8	887	874	267	24.86	99	27	213	32	0.48
MARLBORO	FF	100	1990	14.3	876	868	262	24.88	99	27	212	30	0.47
MARLBORO	FF	100	1992					24.85	99	27		45	0.57
			AVERAGE	14.5	880	870	265	24.86	99	27	212	37	0.49
MARLBORO	MD	KS	1991	15.0	697	685	253	24.84	84	27	212	37	0.53
MARLBORO	MD	KS	1992					24.86	84	27		27	0.60
MARLBORO	MD	KSB	1991	15.4	684	669	250	24.80	82	27	215	29	0.42
			AVERAGE	15.2	691	677	252	24.83	83	27	213	31	0.52
MARLBORO	LT	KS	1988	14.9	699	688	265	24.82	84	27	213	34	0.44
MARLBORO	LT	KS	1989	15.3	699	684	263	24.80	84	27	212	30	0.40
MARLBORO	LT	KS	1990	14.0	691	687	263	24.81	84	27	213	46	0.41
MARLBORO	LT	KS	1991	13.6	689	688	260	24.87	84	27	212	31	0.46
MARLBORO	LT	KS	1992	13.8	694	692	263	24.82	84	27	214	44	0.49
MARLBORO	LT	KS	1992					24.94	84	27		46	0.62
			AVERAGE	14.3	694	688	263	24.84	84	27	213	39	0.47
MARLBORO	LT	100	1988	15.0	835	821	306	24.87	99	32	215	36	0.44
MARLBORO	LT	100	1989	14.9	833	820	304	24.83	99	32	216	39	0.43
MARLBORO	LT	100	1990	14.2	826	819	301	24.83	99	32	215	31	0.42

TABLE D–5
US MARLBORO STYLES
CIGARETTE CONSTRUCTION

	TAR	STYLE	DATE	% MOIST	TOBACCO WEIGHT	TOBACCO WEIGHT @ 13.5%	NON TOBACCO WEIGHT	CIRCUM	CIGARETTE LENGTH	FILTER LENGTH	DRY DENSITY	PAPER POROSITY	PAPER ADDITIVE
MARLBORO	LT	100	1991	13.9	830	826	302	24.89	99	31	213	29	0.42
MARLBORO	LT	100	1992	13.8	825	822	302	24.90	99	31	212	29	0.39
MARLBORO	LT	100	1992					24.88	99	31		27	0.57
			AVERAGE	14.4	830	822	303	24.87	99	32	214	32	0.45
MARLBORO	UL	KSB	1989	13.9	607	604	271	24.81	83	27	190	44	1.67
MARLBORO	UL	KSB	1992					24.80	83	27		43	0.53
			AVERAGE	13.9	607	604	271	24.81	83	27	190	44	1.10
MARLBORO	UL	100B	1989	14.0	714	710	309	24.80	98	31	187	45	2.49
MARLBORO	UL	100B	1992					24.74	98	31		47	3.20
			AVERAGE	14.0	714	710	309	24.77	98	31	187	46	2.85

TABLE D–6
US MARLBORO STYLES
FILTER AND PRESSURE DROP DATA

	TAR	STYLE	DATE	% VENT	% FILTER EFFICIENCY	% FILTER TRIACETIN	OPEN CIGARETTE PRESS DROP	SEALED CIGARETTE PRESS DROP	FILTER PRESS DROP	TOBACCO SECTION PRESS DROP
MARLBORO	FF	KS	1988	9.4	38.5	7.9	4.8	5.1	2.9	2.2
MARLBORO	FF	KS	1989	10.7	39.0	7.6	4.5	4.9	2.8	2.1
MARLBORO	FF	KS	1990	12.3	38.1	7.9	4.5	4.9	2.7	2.2
MARLBORO	FF	KS	1990	13.4	38.5		4.5	4.9	2.7	2.2
MARLBORO	FF	KS	1991	12.6	38.9		4.6	5.0	2.8	2.2
MARLBORO	FF	KS	1992	11.7	39.7	8.0	4.5	4.9	2.9	2.0
MARLBORO	FF	KS	1992	14.0			4.6	5.2	2.7	2.5
			AVERAGE	12.0	38.8	7.9	4.6	5.0	2.8	2.2
MARLBORO	FF	100	1988	13.8	40.4	8.0	4.8	5.4	3.0	2.5
MARLBORO	FF	100	1989	15.1	40.9	7.7	4.7	5.4	3.0	2.4
MARLBORO	FF	100	1990	15.5	39.6	7.6	4.8	5.6	3.2	2.4
MARLBORO	FF	100	1992	15.0			5.0	5.7	3.1	2.6
			AVERAGE	14.9	40.3	7.8	4.8	5.5	3.1	2.5
MARLBORO	MD	KS	1991	19.8	44.0	8.0	4.7	5.4	3.2	2.2
MARLBORO	MD	KS	1992	21.0			4.5	5.4	3.4	2.0
MARLBORO	MD	KSB	1991	15.3	41.5	7.8	4.6	5.2	3.1	2.1
			AVERAGE	18.7	42.8	7.9	4.6	5.3	3.2	2.1
MARLBORO	LT	KS	1988	22.3	48.5	7.4	4.9	5.9	3.9	2.0
MARLBORO	LT	KS	1989	23.1	47.7	8.1	4.9	5.8	3.7	2.1
MARLBORO	LT	KS	1990	23.7	47.5	7.3	4.8	5.9	3.9	2.0
MARLBORO	LT	KS	1991	23.6	45.9	7.2	4.9	5.9	3.8	2.1
MARLBORO	LT	KS	1992	24.4	47.1	7.3	5.0	6.0	4.1	1.9
MARLBORO	LT	KS	1992	18.0			5.1	5.7	3.7	2.0
			AVERAGE	22.5	47.3	7.5	4.9	5.9	3.9	2.0
MARLBORO	LT	100	1988	31.7	52.0	7.7	5.0	6.6	4.1	2.5
MARLBORO	LT	100	1989	32.0	51.9	7.9	4.9	6.5	4.2	2.3
MARLBORO	LT	100	1990	33.5	52.4	7.0	4.9	6.6	4.2	2.4

TABLE D-6
US MARLBORO STYLES
FILTER AND PRESSURE DROP DATA

	TAR	STYLE	DATE	% VENT	% FILTER EFFICIENCY	% FILTER TRIACETIN	OPEN CIGARETTE PRESS DROP	SEALED CIGARETTE PRESS DROP	FILTER PRESS DROP	TOBACCO SECTION PRESS DROP
MARLBORO	LT	100	1991	34.2	49.8	7.5	4.9	6.7	4.4	2.3
MARLBORO	LT	100	1992	35.7	51.5	6.8	4.9	6.9	4.3	2.5
MARLBORO	LT	100	1992	41.0			4.5	6.5	3.7	2.8
			AVERAGE	34.7	51.5	7.4	4.8	6.6	4.2	2.5
MARLBORO	UL	KSB	1989	42.8	57.7		4.4	6.3	4.8	1.5
MARLBORO	UL	KSB	1992	43.0			4.4	6.3	4.4	1.9
			AVERAGE	42.9	57.7		4.4	6.3	4.6	1.7
MARLBORO	UL	100B	1989	51.1	63.0		4.3	6.7	5.0	1.8
MARLBORO	UL	100B	1992	46.0			4.3	6.6	4.1	2.5
			AVERAGE	48.6	63.0		4.3	6.7	4.5	2.1

TABLE D-7
US MARLBORO STYLES
DELIVERIES

	TAR	STYLE	DATE	TAR	NICOTINE	PUFFS	TAR/NIC	TAR/PUFF	NIC/PUFF
MARLBORO	FF	KS	1988	17.0	1.23	8.8	13.8	1.93	0.140
MARLBORO	FF	KS	1989	16.3	1.23	8.8	13.3	1.85	0.140
MARLBORO	FF	KS	1990	16.3	1.15	8.5	14.2	1.92	0.135
MARLBORO	FF	KS	1990	16.5	1.15	9.0	14.3	1.83	0.128
MARLBORO	FF	KS	1991	16.3	1.10	8.7	14.8	1.87	0.126
MARLBORO	FF	KS	1992	16.5	1.16	8.8	14.2	1.87	0.132
MARLBORO	FF	KS	1992	14.6	0.98	9.1	14.9	1.60	0.108
			AVERAGE	16.2	1.14	8.8	14.2	1.84	0.130
MARLBORO	FF	100	1988	16.4	1.24	9.9	13.2	1.66	0.125
MARLBORO	FF	100	1989	16.3	1.25	10.3	13.0	1.58	0.121
MARLBORO	FF	100	1990	15.6	1.17	9.8	13.3	1.59	0.119
MARLBORO	FF	100	1992	15.9	1.06	9.7	14.2	1.56	0.109
			AVERAGE	15.9	1.18	9.9	13.5	1.60	0.119
MARLBORO	MD	KS	1991	12.4	0.88	7.8	14.1	1.59	0.113
MARLBORO	MD	KS	1992	12.1	0.82	7.9	14.8	1.53	0.104
MARLBORO	MD	KSB	1991	13.3	0.94	7.8	14.1	1.71	0.121
			AVERAGE	12.6	0.88	7.8	14.3	1.61	0.112
MARLBORO	LT	KS	1988	10.7	0.86	8.3	12.4	1.29	0.104
MARLBORO	LT	KS	1989	10.3	0.84	8.1	12.3	1.27	0.104
MARLBORO	LT	KS	1990	10.6	0.85	7.8	12.5	1.36	0.109
MARLBORO	LT	KS	1991	11.2	0.78	8.0	14.4	1.40	0.098
MARLBORO	LT	KS	1992	10.7	0.82	8.0	13.0	1.34	0.103
MARLBORO	LT	KS	1992	10.0	0.75	7.7	13.3	1.30	0.097
			AVERAGE	10.6	0.82	8.0	13.0	1.33	0.102
MARLBORO	LT	100	1988	10.5	0.87	9.9	12.1	1.06	0.088
MARLBORO	LT	100	1989	10.3	0.84	9.8	12.3	1.05	0.086
MARLBORO	LT	100	1990	10.3	0.88	9.6	11.7	1.07	0.092

TABLE D–7
US MARLBORO STYLES
DELIVERIES

	TAR	STYLE	DATE	TAR	NICOTINE	PUFFS	TAR/NIC	TAR/PUFF	NIC/PUFF
MARLBORO	LT	100	1991	10.5	0.76	9.4	13.8	1.12	0.081
MARLBORO	LT	100	1992	10.3	0.82	9.7	12.6	1.06	0.085
MARLBORO	LT	100	1992	10.3	0.74	9.7	13.9	1.06	0.076
			AVERAGE	10.4	0.82	9.7	12.7	1.07	0.084
MARLBORO	UL	KSB	1989	5.8	0.52	6.8	11.2	0.85	0.076
MARLBORO	UL	KSB	1992	6.2	0.50	6.8	12.4	0.91	0.074
			AVERAGE	6.0	0.51	6.8	11.8	0.88	0.075
MARLBORO	UL	100B	1989	5.8	0.55	8.8	10.5	0.66	0.063
MARLBORO	UL	100B	1992	6.2	0.46	7.8	13.5	0.79	0.059
			AVERAGE	6.0	0.51	8.3	12.0	0.73	0.061