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SMOKING PRODUCTS RESEARCH

PROGRESS REPORT : SEPTEMBER - DECEMBER, 1976

RESTRICTED

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PRODUCT RESEARCH

(1) Sensory & Preference Research

Examination of the vapour phase of the smoke from 57 Dutch cigarette brands (9) has led to conclusions which generally parallel and confirm those resulting from a previous O/WP examination, although the smoke components covered by the two techniques are of course different. Distinction between blend types and also between manufacturers has again been possible, and this reinforces the likelihood that tobacco usage differs significantly between manufacturers. Higher concentrations of methyl chloride have been found in the smoke from B.A.T brands than from competitors' brands. Certain vapour phase components appear to relate to the image consumers have of their own brand, but no relationship has been found with sales performance.

(2) Cigarette Design Studies

As a result of a recommendation made by the Hunter Committee, the smoke from cigarettes containing various combinations of BATFLAKE and tobacco has been analysed to determine the deliveries of alkyl nitrosamines (7). Extrapolation from two series of

experiments in which BATFLAKE MK.II was added in varying proportions to (a) a U.S.-type tobacco blend, (b) a flue-cured tobacco blend, suggested that BATFLAKE itself at a notional 100% level was delivering around 7ng per cigarette of dimethylnitrosamine, this being the most abundant of the 4 nitrosamines detected. The other 3 nitrosamines were present in amounts too small for consistent trends to be observed. The figure of 7ng is intermediate between the delivery of the two tobacco blends which were used in this exercise. It was found that the nitrosamine delivery could be substantially reduced by changing to BATFLAKE MK.III treated with a modified type of caramel.

Over a period of several years the transfer to smoke of small particles arising from certain types of filter has been monitored. The results achieved to date have now been drawn together in a single report (11). The technique, which involves use of the scanning electron microscope, enables separation of transferred particles into four size ranges, and it is particles of the smallest size (<5 microns diameter) which cause most concern because, if inhaled, they can deposit in the further airways of the lung. The greatest particle transfer, not surprisingly, occurs from filters which contain a quantity of fine material, such as the Sel-X4 filter, particularly when gaps are present between plug and filter wrapper due to inadequate sealing. A big improvement in the transfer from Sel-X4 filters has been recorded since monitoring began, and it is intended to continue the service.

Previous work has shown that when mainstream smoke immediately after issuing from a cigarette is moistened, in conditions intended to simulate those in a smoker's mouth and lungs, the mean size of the smoke particles increases rapidly due to absorption of moisture. In contrast, it has now been found (5) that exhaled smoke particles, as well as being only slightly larger than the mean size of smoke particles before inhalation, do not grow in size when moistened, and that mainstream smoke particles diluted a million-fold or more do not grow either. This has led to the hypotheses that water growth of smoke particles is determined by volatile water-soluble compounds, and that these compounds may be removed by vapour transmission in the lung (or alternatively by extreme dilution of smoke). If future work confirms these hypotheses, there is a good chance of designing a smoke aerosol

that will carry nicotine and flavour in the required amounts to a smoker and will deposit less of its particulate matter in the lung.

Variable diffusivity cigarette papers have been produced by Wiggins Teape by gravure printing narrow bands of gelatine onto medium porosity paper (10). Cigarettes wrapped in these papers give more puffs and less sidestream smoke than cigarettes wrapped in conventional papers. TPM and nicotine deliveries are little affected, but the deliveries of some gas phase constituents, including carbon monoxide, nitric oxide and hydrogen cyanide, are increased.

(3) Filters

Continuing the attempts to minimise the "off-flavour" normally associated with carbon filters, Smith & Nephew have been persuaded to scale up the process whereby they coat carbon with polyHEMA. They have supplied a number of one kilogramme samples of coated carbon which, on examination, have shown satisfactory performance (6). The samples have been made available to a number of B.A.T Associates who have been asked to carry out their own assessments. Attempts to develop the polyHEMA coating process at G.R. & D.C. have proved unsuccessful; however, initial experiments using poly(vinyl alcohol) look distinctly promising, and this approach is being actively pursued.

The filtration of N'-nitrosonornicotine (NNN) from smoke has been studied (13). Paper, cellulose acetate, polypropylene and carbon/cellulose acetate filters remove NNN with the same efficiency as they remove TPM, none of them showing any selectivity for NNN. The polypropylene filter used in this examination has been observed to be more efficient at removing TPM and NNN than a comparable cellulose acetate filter of about the same weight and pressure drop.

(4) Development of Techniques

Experimental and data analysis systems have been developed

(12) for measuring the changing contours of the concentration of carbon monoxide and other gases in the cigarette coal during a puff and during the smoulder period. The intention is to use the technique in studies aimed at reducing carbon monoxide formation in cigarettes.

(5) Microbiology

In view of the fact that the bacterium Listeria monocytogenes can develop in certain conditions on fermenting vegetable matter, and can cause disease (Listeriosis) in domestic animals and men, it was thought advisable to examine samples of fermented tobacco for the possible presence of this organism. This involved the development of a special technique for detecting a specific micro-organism in a large mixed population (4). Applying the procedure to cigar tobacco from a number of countries has yielded negative results, and no further work is considered necessary in this area.

(6) Tobacco Growing

Further investigations have been carried out (1) into the production of nicotine by means of isolated root culture, in order to obtain information on which the raw material costs of the process could be based. From the laboratory results achieved to date the cost of producing nicotine by root culture is many times that of producing it by growing a crop of tobacco in the normal way. However, if the improvements in efficiency which are theoretically possible could be achieved in practice the process would be economically attractive.

(7) Contracts

The current experimental programme on sidestream smoke concentrates deliberately on its irritant properties and on the means for reducing this irritation. Following discussions with Marketing Research Dept., Millbank, a London agency was commissioned to carry out, on a small scale, group discussions

among smokers and non-smokers to explore their attitudes towards sidestream smoke, including the concept of a cigarette that produces substantially less sidestream smoke than usual. Their report (3) suggests that, among those who object to being involuntarily exposed to cigarette smoke, the main source of annoyance is its aroma rather than its irritant nature. Attempts will now be made to develop the necessary techniques for control of sidestream smoke aroma.

SMOKER RESEARCH

Benefits of Smoking

Based partly on the published literature, partly on observations made in G.R. & D.C., it has been concluded (2) that, in certain important respects, the smoking behaviour of women differs from that of men. Several reports agree that women find it harder to give up smoking than do men, and it may be that women, on average, are more highly motivated to smoke than are men. Most brands of cigarette designed specifically for women are of the low delivery, bland type, and it is suggested that these are not in fact particularly well suited to the needs of most women smokers.

PRODUCT SERVICES

North America

In order to obtain information comparable with that already available concerning Philip Morris products, several versions of the two R.J. Reynolds brands, "Winston" and "Camel Filter", have been examined (8). The separate versions of each brand were obtained from different countries. Reynolds appear to pay less

attention to uniformity in nicotine delivery than do Philip Morris, but more attention to uniformity in filter triacetin content and the deliveries of carbon monoxide and nitric oxide. Both companies evidently exercise strict control over total cigarette pressure drop despite wide variations in other physical parameters. Most versions of both the Reynolds brands are characterised by comparatively high levels of cocoa and liquorice. Nearly all the Reynolds blends contain both puffed tobacco and PRT-type material; in fact in 4 out of the 5 versions of "Camel" it is possible to distinguish two different types of PRT differing in colour. The total amount of puffed plus reconstituted tobacco exceeds 30% in some brands.

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