

RESEARCH AND DEVELOPMENT

IN THE

PAINT INDUSTRY IN CANADA

R & D IN THE PAINT INDUSTRY IN CANADA

INTRODUCTION

Achievements through R & D in the Paint Industry have not set Canada apart from the United States or the United Kingdom. In fact, most R & D in Canada derives mainly from the application to the Canadian market requirements of American R & D results.

The coatings industry has a long history in Canada, starting with the Indians followed by "Habitant" home-made paints. The first commercial paint manufacturing, however, in Canada was established in 1870 by Henderson & Potts in Nova Scotia. The earliest pigments manufacture dates back to 1887. These were not new processes based on research and development, rather, they were the application of the known technology. Paints and varnishes were formulated as an art. The varnish maker was akin to an alchemist who would not disclose his secret formulae. The artisans of varnish making were generally replaced by chemists and chemical engineers about the end of the first quarter of this century. The introduction of nitrocellulose finishes based on R & D in the United States, along with the discovery of synthetic film formers like "alkyds" marked the beginning of R & D in the paint industry in Canada. Chemists and chemical engineers were now required to evaluate new materials that were coming abundantly from the raw materials suppliers to the paint industry. The shortage of tung oil and European pigments cut off by the second world war spurred R & D in the United States and Canada. After the war, the chemists and chemical engineers as relatively newcomers to the paint industry concentrated on the development of new products based on the newly found ingredients for making more durable, faster curing and generally more desirable finishes for both the retail trade and production line needs. It was

also about this time that the demand for protective coatings exceeded manufacturing capacity and consequently a great deal of R & D work was directed towards increasing production rates of the plants and equipment. While much of this work was emperical, nevertheless grinding cycles were shortened and yields from existing equipment were increased several fold.

It is obvious that paint has an important place in the economy of any country. It has been used from ancient times for decorative and protective purposes. While the products of the paint industry have an important decorative function, they have an even more important function as protective materials. Without paint, wood would deteriorate and metal products (such as cars), would rust on exposure to the weather.

Virtually every manufactured item in Canada is decorated and protected with organic coatings - from a locomotive to a refrigerator to a hair pin. Canada's secondary industry could not survive nor compete without an alert, vibrant protective coatings industry. As large consumers of Canada's raw materials from oil wells, mines, farms and forests and as a leading employer of scientists and technicians, the protective coatings industry is an indispensable asset to the Canadian economy.

EXPENDITURES ON R & D IN CANADA

Through the Canadian Paint Manufacturers Association, paint companies have carried out a detailed annual Survey of Financial Data for some years now. Figures are available beginning with 1953 through 1967. In this latter year, participating companies had total sales of \$195 million. This compared with total industry sales of \$210 million as reported by DBS preliminary annual figures.

Over the period 1963-67, the total sales income of companies in the Survey increased by 30%. In the same five year period, the total amount spent on Research & Development increased by 65%.

For the purpose of the CPMA Survey, "research" is defined as "Total expenses involved in basic and applied research not including the cost of product control".

The following table shows "research" expenditures as defined above, expressed as a percentage of participants' sales:

1963	1.96%
1964	1.81%
1965	1.98%
1966	2.02%
1967	2.09%

In absolute terms, total "research" expenditures by Survey participants in 1967 were \$4.1 million.

It should be noted that the bulk of research is done by the larger companies in the industry. In 1967 only 11 companies reported individual sales in excess of \$5 million. These companies spent 2.29% of sales on "research".

Provincial and Federal government agencies, some of which were not covered in the CIC Survey data, spent \$225,800 on R & D Work, of which \$219,500 was performed in Federal government laboratories.

It is useful to compare the research effort of the Canadian paint industry with the research efforts of the industry in the United States and the United Kingdom.

The latest figures available for publication are for 1964. In that year, the U.S. and U.K. figures lumped "research" and "product control". The following table compares combined expenses for these two items expressed as a percentage of sales:

	<u>1964 research and product control expenses as a % of sales</u>
United States	2.3%
United Kingdom	2.7%
Canada	2.7%

More recent figures are not available for publication but continue to show that the magnitude of the Canadian effort compares favourably with both the United States and the United Kingdom.

It is estimated that in 1966 there were 140 university graduates and 200 technicians involved in R & D.

OWNERSHIP AND ITS EFFECT ON R & D IN CANADA

The eleven major paint companies in Canada are all subsidiaries of U.S. or U.K. companies. Some of the smaller companies are also subsidiaries of U.S. or U.K. companies.

Despite this, the industry's R & D expenditures compare favourably with those made in the U.S. and U.K.

One factor which contributes to this is the necessity of adapting products to Canadian conditions.

Another factor is the increasing tendency for parent companies to establish research activities in Canada which fit into the overall research program of the company. It seems reasonable to conclude that the dramatic increase in paint research expenditures in Canada over the last five years is at least partially a result of this.

The Canadian Government's research incentive programs have undoubtedly contributed to this to some degree. Also, some of the Canadian paint companies with the principal ownership outside Canada have been assigned by their parent companies specific fields of research which work is being done in Canada as an integral part of the United States or United Kingdom owned company R & D.

In addition to the efforts being made in Canada, subsidiaries have access to the research work being done by their parent companies which means that the industry can offer the Canadian consumer products as technically advanced as can be found anywhere in the world.

THE NEED FOR PAINT R & D

The paint industry does not earn high profits although its profit performance in recent years has been better than the average for Canadian manufacturing.

In the more sophisticated marketing areas such as automotive and product finishes, the high degree of seller concentration is largely offset by a very high degree of buyer concentration. For example, about six paint companies sell automotive finishes to three automobile companies.

There is extreme price competition in most markets.

It is particularly acute in the painter-maintenance market where barriers to entry are low. It is relatively easy to make paint for this market. The basic know-how can be gained freely and is fully provided at no charge by raw materials suppliers who wish to sell their products to the new prospective customer.

To gain entry to the retail paint market is also relatively easy although entering the market on a large scale is more difficult and very expensive.

More technology is required here although again much of this can be readily obtained from raw materials suppliers.

It is probably fair to say that the main thrust of the industry R & D effort is directed towards the two automotive markets and the product finishes market. The formulation and manufacture of modern industrial coatings requires a high level of technical and scientific capability. For the paint industry to be competitive with other industries striving to replace paint materials or to gain new markets, intensive R & D is needed at the concept level.

Some ten years ago this was recognized by the Federation of Societies for Paint Technology (the technical organization of the paint industry in the U.S., U.K. and Canada), and the Paint Research Institute was established to sponsor fundamental research at universities in order to develop new knowledge that can be applied to the paint industry. In this period, over one million dollars have gone to support projects at United States, United Kingdom and Canadian universities. Some of this research has been done at McGill, Toronto, Western Ontario and Montreal universities. This type of research is proving effective in providing new approaches to the understanding of film formers chemistry and paint making in general.

The Associate Committee on Paint Research of the National Research Council is most anxious to have basic research done at universities on coatings with projects selected by this or any other appropriate committee as a part of the NRC support of university research.

At present most of the R & D effort is in developmental work and a need exists for fundamental research to supplement the research carried out by paint companies in the United States and the United Kingdom as well as that supported by the Paint Research Institute.

INDUSTRY STRUCTURE AND ITS EFFECT ON R & D

An understanding of any aspect of the paint industry requires an understanding of its structure. By structure, is meant the organization of sellers and buyers in a market. Characteristics of structure are the degree of seller concentration; the degree of buyer concentration; the degree of product differentiation; and the ease of entry.

By the degree of seller concentration is meant the share of the market held by various sellers.

According to DBS figures, there were 150 paint manufacturing plants in Canada in 1965. Some of these were owned by the same company, so that there were 134 paint companies operating that year.

The four largest paint companies had combined sales that year accounting for about 53% of the industry total. The eight largest companies accounted for about 71% of total industry sales. The twenty largest accounted for close to 90%. This leaves 114 companies splitting about 10% of the market between them.

There are five main paint markets. These are the automotive original finish market; the automotive refinish market; the product finish market; the retail paint market; and the painter-maintenance market.

Only about half-a-dozen paint companies operate in the two automotive markets. Only about thirty paint companies have any position in the product finish market.

The reason for this is that a high degree of technological know-how is required to provide the sophisticated chemical coatings sold in these three markets and to provide the high quality of technical service which customers demand.

Many more companies operate in the retail paint market, possibly as many as one hundred. However, only twelve operate nationally, selling their products in most parts of Canada. A few more operate over several provinces but the majority operate within a province or within a metropolitan area.

Almost all paint companies sell products to the painter-maintenance market.

The bulk of research is carried out by the few companies that sell in the two automotive markets, in the product finish markets and which operate nationally or throughout a large region in the retail paint market.

In 1967, only eleven companies accounted for 90% of the total research expenditures by the paint industry.

PROSPECTS FOR R & D IN THE PAINT INDUSTRY

The percentage of the sales dollar devoted to R & D has increased steadily over the last five years and compares favourably with the percentage spent by the industry in the U.S. and the U.K. While the absolute amount spent will continue to grow with the growth of the industry, it is unlikely that it will ever significantly exceed the percentage of sales expended in other leading industrialized nations.

The need to adapt products to Canadian conditions, the desire of parents to have their subsidiaries operate as good corporate citizens in Canada and the Canadian government's research incentive programs are all factors which will contribute towards the maintenance of the present relative level of R & D expenditure.

It is unlikely that the impending action by the Canadian government to cut paint tariffs by one-quarter, i.e., from a present level of approximately 20% MFN to 15% MFN, will have any serious effect on paint industry R & D expenditures in Canada in the short term.

Competitive paint imports now total approximately \$10 million, most of which comes from the United States. This is about 5% of the domestic market. Most imports enter not because they are cheaper or technically superior but because of customer preference resulting to some degree from over-flow advertising and to some degree from engineering or architectural specifications calling for a specific U.S. product by brand name or company designation.

However, there are some clouds on the horizon. The rate of growth of the Canadian paint industry over the last five years has averaged 5.3% annually in current dollars. The increase in imports over the same period has averaged 10.5% annually. The lower tariff will likely accelerate this to some degree. How much is still a matter for speculation. Export prospects for Canadian paint manufacturers are, for all practical purposes, non-existent.

Therefore, a growth in R & D will have to be financed by a growth in the domestic market and could be inhibited by imports to the extent that domestic growth is inhibited by imports.

Apart from this possibility, the Canadian industry should maintain a level of R & D expenditure comparable to its counterparts elsewhere. The long term outlook is likely to favour R & D that aims at a specialized area, or technology that can be exploited in markets larger than those of Canada. Further research in Canada by foreign-owned companies may arise when there is special expertise available and when

the economics of R & D in Canada are favourable. To improve this, artificial stimulants, such as increased government incentives, will probably be necessary.

RECOMMENDATIONS

While the percentage of sales dollars of R & D seem to be comparable to U. S. and U. K., there is in fact little basic research being done by the paint industry in Canada.

It is recommended that governmental money be made available to conduct concept research for the paint industry at Canadian universities. There are at present some university professors conducting such work. More work of a pertinent nature would be done if special grants were provided, or if priority were given to regular grants for research, leaving technological potential to the protective coatings industry. This type of work would complement and extend the work now being done by the industry and the Paint Research Institute. The Associate Committee on Paint Research of the National Research Council and the Paint Research Institute have the mechanism to seek out and oversee such work but would require the funds to support the actual work.

Dyestuffs

For the purpose of this report, dyestuffs will be defined as the tinctorial substances that are employed in the colouring of textiles, paper, plastics, foods and other materials. Auxiliary chemicals that are used as dispersing, levelling or wetting agents or other assistants that may be used in dyeing and finishing will not be included.

The retail sales value of dyestuffs consumed in Canada during the year 1967 was of the order of \$16,000,000 to \$18,000,000. In the main these dyes were supplied by approximately 30 outlets, about 17 of which are branch companies or offices of bona fide manufacturers of dyestuffs, and the remainder are sales agents.

Practically all of the dyestuff companies that operate laboratories in Canada are foreign owned and all basic research on dyestuffs is carried out by the parent companies. The Canadian dyestuff industry is, however, engaged in a certain amount of applied research and development which is concerned chiefly with shade matching and providing technical service to customers. The current intra-mural expenditures for the year 1966 are shown in Table I.

Table I

Current Intra-Mural R. and D. Expenditures by the Dyestuff Industry in Canada - 1966

<u>Basic Research</u>	<u>Applied Research</u>	<u>Development</u>	<u>Total</u>
0	\$45,300	\$218,900	\$264,200

Source of Data: Company Questionnaires, C.I.C. Survey, Table 26, Section 18.

It will be noted that according to the above figures, the total amount spent by the dyestuff industry on research and development in Canada in 1966 was slightly more than 1 $\frac{1}{2}$ % of dyestuff sales.

No expenditures in this R. and D. area (053) were reported by government or the universities (Institutes).