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Industrial Research and Development News

VOL. V NO.2

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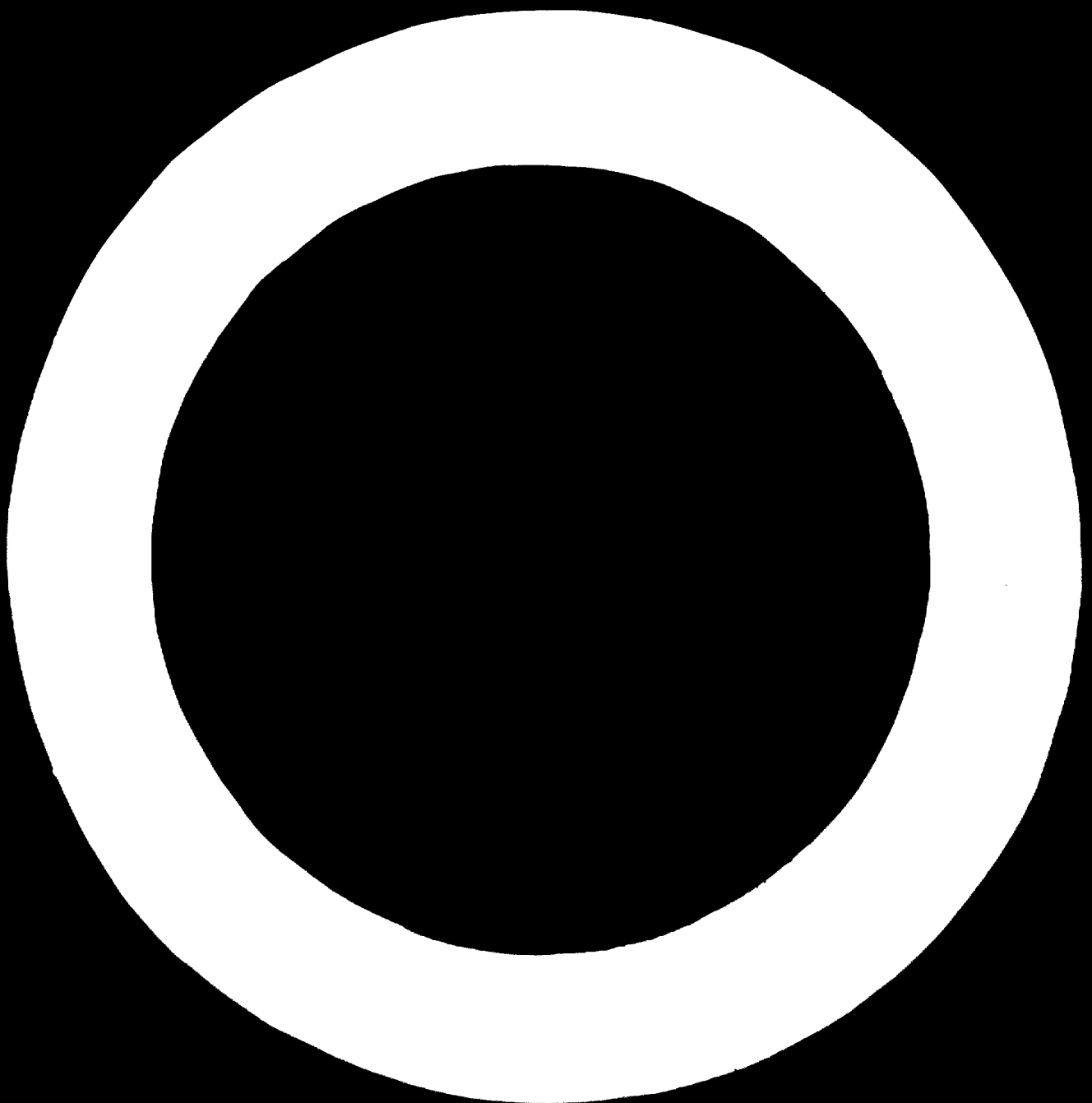

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Summer 1970

Industrial Development Board Ends Fourth Session by Approving Four Resolutions

THE INDUSTRIAL DEVELOPMENT BOARD, the principal policy-making organ of UNIDO, concluded its fourth session in Vienna on 1 May 1970.

The session was preceded by a two-week meeting of the Working Group on Programme and Co-ordination, a subsidiary body of the Board, which examined the past, current and proposed work programmes of UNIDO, including co-ordination questions pertaining to projects.

In the course of the session, the Secretary-General of the United Nations addressed the Board. He drew attention to the importance of industrial development as an instrument of change in society and noted that the industrialized nations were now supporting the expansion of industry in the developing countries. In this connexion, the Secretary-General mentioned the role and potentiality of UNIDO. He stated that the activities of UNIDO were developing "most satisfactorily" and that, through the voluntary contributions, the volume, scope and flexibility of the Organization's operations had increased.

In the General Debate the Board noted with approval the growing emphasis on operational activities as compared with supporting programmes of studies and research; the gradual shift to long-range country programming of technical assistance; the planned increase in the number of industrial field advisers; the arrangements concluded with the United Nations Development Programme (UNDP) to finance the Special Industrial Services (SIS) programme from the UNDP Revolving Fund; and the increase in the number of UNIDO projects financed by the UNDP.

Some speakers, however, felt that the share of industry in the total flow of UNDP assistance was still inadequate. Concern was also expressed that the SIS programme receive an adequate proportion of the UNDP Revolving Fund.

In view of the increasing number of requests for assistance and the limited resources available, it was considered that greater attention should be given to the formulation of priorities in the work programme of UNIDO, always recognizing the sovereign right of the developing countries to set their own priorities in making requests.

The proposed expansion of UNIDO's in-plant training programmes for middle and high-level engineers was especially welcomed. Concern was expressed at the delay in nominating candidates for fellowships as the fellowships played a significant role in the development programme.

It was felt that the effectiveness of field projects could be increased if procedures for recruiting experts could be streamlined and speeded up. The need to evaluate field projects in order to assess their effectiveness and impact on the recipient countries was also underlined. This, it was pointed out, required the full co-operation of the developing countries themselves.

There was a divergence of views on the subject of UNIDO's promotion services. Some delegations stressed the value of establishing contacts between representatives of developing countries and potential associates from the industrialized countries at trade fairs and drew attention to the role that private investment could play in supplementing public aid and in promoting the flow of capital and know-how to the developing countries. Others were of the view that foreign investment only increased the burden of debt of the developing countries. UNIDO, they maintained, should concentrate on assisting these countries to mobilize their internal financial resources, while at the same time helping them to obtain external aid on the most acceptable terms and under conditions over which they had full control. It was also felt that the collection, collation and dissemination of industrial information should be one of the priority areas in UNIDO's work. This should be done in close co-operation with other members of the United Nations system, such as UNESCO, and with the judicious use of voluntary contributions from Member States.

There was a wide measure of agreement of the secretariat's proposal for a long-range programme of industrial development. Several speakers stressed the important role UNIDO could play in country programming by harmonizing its own activities with those of bilateral aid programmes. Close working relationships with sources of industrial financing, both internal and external, particularly international finance institutions and national and regional organizations, were advocated. UNIDO's initiative in encouraging regional and sub-regional co-operation was welcomed.

The potential contribution of UNIDO to the Second Development Decade was recognized as one of the most

important elements of the Organization's activities. Many delegations voiced support for the Executive Director's "pragmatic approach" in outlining proposals for action. Co-operation with other United Nations bodies was considered essential in many of these areas.

The central role of UNIDO in co-ordinating the activities of the United Nations system in the field of industrial development was reviewed. The Board noted with appreciation the measure of agreement reached by UNIDO with other United Nations organizations concerned in co-ordinating the activities connected with industrial development. At the same time, the need was underlined to further strengthen and expand such co-operation with organizations both within and outside the United Nations family. Some delegations, however, expressed reservations concerning the co-operation of UNIDO with the World Bank. The planned increase in the number of industrial field advisers was cited with satisfaction as a means of strengthening the links of UNIDO with the field. Their co-operation with National Committees for UNIDO, it was suggested, could contribute to the effectiveness of the Organization's work.

Following the General Debate, the Board unanimously adopted the Report of the Working Group on Programme and Co-ordination on the acitivites of UNIDO in 1969 and the programme of work for 1970 and 1971.

The Board then took note of UNIDO's budget estimates for 1971, totalling $11,898,000, which had already been approved by the United Nations Secretary-General, but may be revised before being submitted to the General Assembly, pending the outcome of a survey on manpower utilization throughout the United Nations Secretariat.

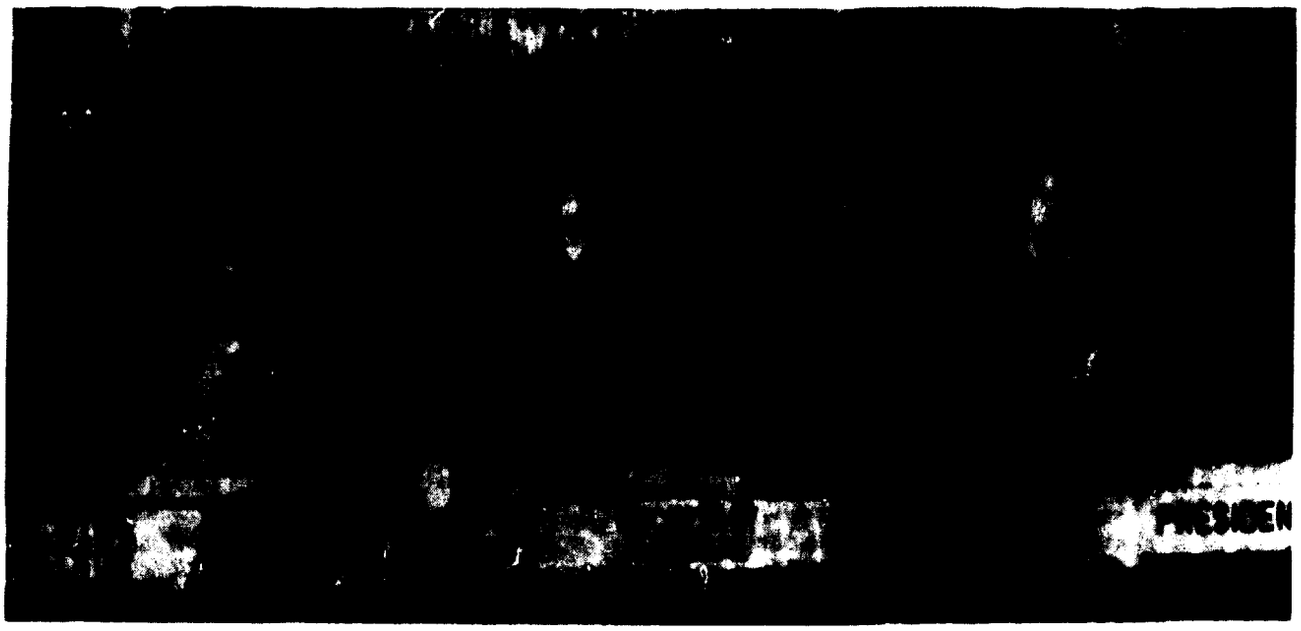
The Board supported the activities under the Special Industrial Services and called for additional allocations for financing of these activities. It also approved the regular programme of technical assistance for implementation in 1971 in accordance with the planning level for that year, of $1.5 million approved by the Board at its third session, and recommended the sum of $1.5 million as the planning level of the regular programme of technical assistance for industrial development in 1972.

The Board granted consultative status to two intergovernmental organizations the League of Arab States and the Organization of African Unity and six non-governmental organizations, the International Organization for Standardization, the International Association for the Exchange of Students for Technical Experience, the Union of International Engineering Organizations, the European Association of Management Training Centres, the International Institute for Industrial Planning, and the International Federation for Documentation.

In the course of the session, the Board adopted four resolutions: on the follow-up of the 1967 International Symposium on Industrial Development; on the Role of UNIDO in Co-ordination of Activities in Industrial Development; on the Operational Activities of UNIDO; and on a Special International Conference of the United Nations Industrial Development Organization. In the last resolution, the Board recommended that the General Assembly of the United Nations, at its twenty-fifth session, "convene a Special International Conference of UNIDO, open to all members of UNIDO, at the highest possible level of governmental representation, to be held in Vienna immediately after the fifth session of the Board, either in May/June 1971, or in November/December of the same year, for one week".

The report of the Board will be submitted to the 25th session of the United Nations General Assembly through the Economic and Social Council (ECOSOC).

Secretary-General U Thant addressed the Industrial Development Board on 21 April. On his right is Ibrahim H. Abdel-Rahman, Executive Director of UNIDO; on his left is Zdeněk Šedivý, President of the Fourth Session



DO 1619

By R. T. Thampy

Selection, Formulation and Execution of Projects at the Shri Ram Institute

INDUSTRIAL RESEARCH today plays a vital role in the industrial strategy of developed countries and has an even greater significance in the industrial growth of developing countries. It is a unique form of research that has acquired a value that was not apparent a few years ago. It is a business oriented activity and stresses factors that do not occur in other types of research. For instance, research sponsored by a university aims at the extension of scientific knowledge, whereas the results of industrial research find application in a country's industrial strategy.

Realizing the importance of industrial research, the Government of India established a chain of national laboratories in the main fields of technology. Unfortunately, the objectives for which the laboratories were founded have not fully materialized and it is in this context that the selection, formulation and execution of projects at Shri Ram Institute are reviewed.

The Shri Ram Institute for Industrial Research (SRI) is a non-profit organization that undertakes research and development for industry and for the Government on a contractual basis. It aims to assist those without adequate facilities by providing research skills and expertise beyond the competence of their organization.

Since it was established in 1950, the Institute has been responsible for developing a number of products, processes and instruments that are now commercially exploited by industry. The yearly turnover of products based on SRI work now exceeds US$5 million.

The success that has been achieved so far is a result of the care taken in the selection of projects and in their execution, a process described in this article.

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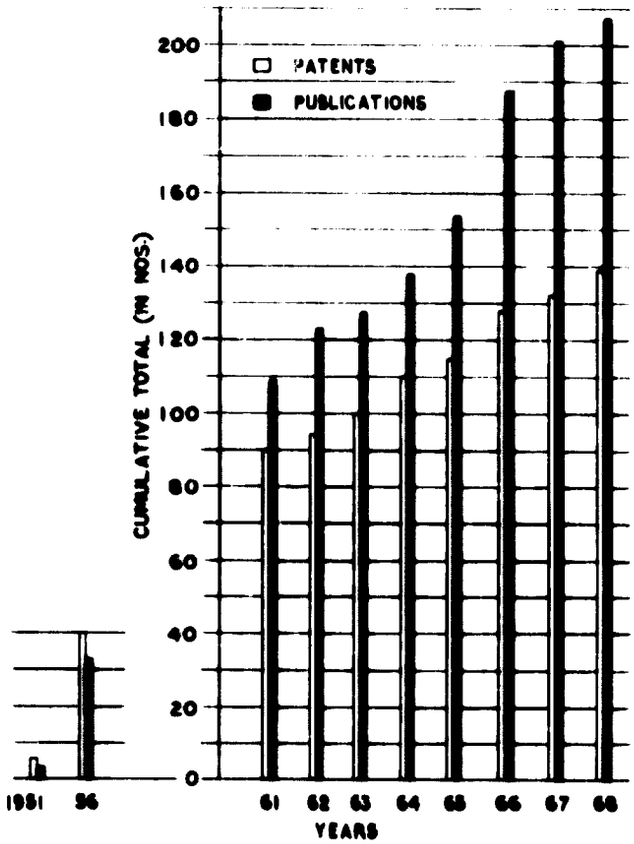
Project selection

The aim of the SRI is to orient research and development to the needs of industry, and in a developing country like India rapid industrialization is vital. This means that the know-how of essential processes has to be purchased from advanced countries, a policy carried out by Japan. It is important, however, that research and development be initiated simultaneously so that improvement of processes or products can be effected by domestic skills and resources. Where the demand for a product of strategic importance is too small to be economic and does not warrant foreign

collaboration, the development of the product may have to be undertaken anyhow in the interests of the country. The development of products that are not needed immediately but which will be required in quantity in about five or ten years, is kept in mind by the Institute when selecting projects.

Another important factor that determines the selection of projects is the availability of expertise. Before any project reaches the commercialization stage, it has to go through various stages of development from laboratory, research and pilot plant investigation to large-scale operation. Market acceptability trials are also essential. Research organizations usually have the expertise needed for the first stage and to some extent for the second. The process of pilot plant development and commercialization involving engineering skills, however, are available only from industries or engineering concerns. In developing countries there is a paucity of engineering consultancy firms with the facilities necessary to scale-up the process. Collaboration with an industry that has engineering expertise in allied fields is required therefore. When the development of a process from the pilot plant scale upward is needed, only projects that could be associated with an industry are undertaken.

PATENTS & PUBLICATIONS FROM 1951 TO 1968



Project initiation

There are various ways in which projects are initiated by the Institute. In some instances an industry refers a problem to SRI, while in others the Institute suggests to the relevant government department the need for developing certain products or processes in national interests. In the first instance, it is important that the sponsor has the financial and technical wherewithal to absorb the know-how from the laboratory stage to scaling-up. In the second instance, the scientists of the Institute having researched the expertise take the initiative. The amount of demand for the product and the time required for completing the job are important factors in deciding the selection of projects.

Screening of projects

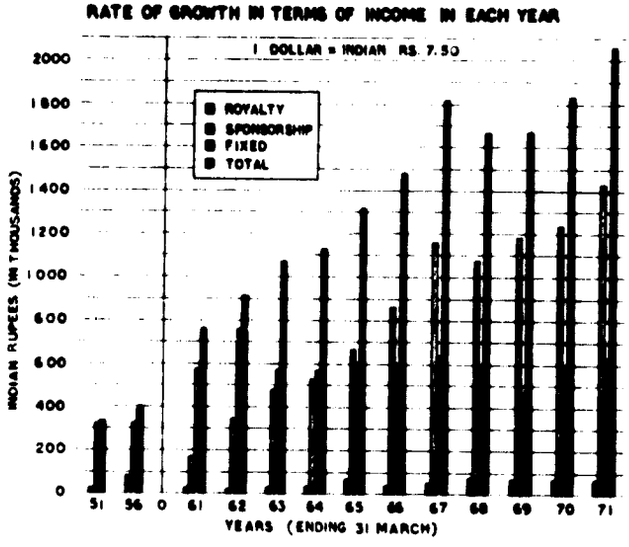
In all instances mentioned above, projects are referred to the screening committee composed of experts from: industry; the Technical Directorate of the Ministry of Industry, Government of India; and senior staff of the SRI. The screening committee scrutinizes the project with respect to technical and economic feasibility. Each project is submitted in the form of a proposal. The proposal indicates the objectives and scope of the project with the financial, staff and equipment requirements, and presents a detailed plan of the work involved. If these details are not clearly defined, there may be delay or even failures in achieving the objectives. Cost estimates are made for the following:

- Staff: two to three scientists and two assistants are generally needed for laboratory investigations;
- Contingencies: 80–100 per cent of staff cost;
- Overheads/Indirect cost: 160 per cent of staff salaries to offset utility, depreciation, administrative and research overheads;
- Raw materials etc.: (Required only at a later stage);
- Equipment: (Special equipment needed specifically for the project).

The expenditure per project for the first three items averages between US$20,000 and $25,000 per year.

When the project proposal has been approved by the screening committee it is drawn up and submitted to the sponsor in duplicate. The sponsor has final sanction of the programme as recommended, signs one copy of the proposal and returns it. This copy becomes known as "The Document".

Before actual work can begin, the necessary chemicals or apparatus are procured. A check chart assigning the duties of the scientists engaged on the project and indicating the time required and the nature of the work is drawn up. This



clarifies the type of programme to be executed and controls the function of the executives. After the preliminary experiments when it becomes necessary to optimize conditions, a statistician is brought in to plan the programme of work. This minimizes the number of experiments to be carried out by avoiding unnecessary ones. At each stage of the project, discussions are held with the technical staff of the sponsor. In general, monthly progress reports are submitted to the sponsor which form the basis of the discussions. In this way the scientists keep closely to the objectives and in some cases help to amend the programme. Projects that prove to have unworthy objectives may be dropped. Failures can be detected at an early stage through the progress report thus avoiding wasteful expenditure.

After the laboratory work has been completed, a consolidated report is made. Before embarking on the development programme, a detailed reappraisal is carried out on:

- The economic validity of the project;
- The engineering feasibility, particularly the potential for manufacturing and operation;
- Financial requirements for development work.

It is understood that for every dollar spent on research, $100 is required for commercializing the process, including the market acceptability studies.

In every phase of research and development for each project it is highly desirable that a multidisciplined team be employed. In the laboratory stage, the project requires an organic chemist, a physical chemist and a statistician. In the development stage, the team is headed by a chemical engineer assisted by the chemists who have worked on the project. Group discussions are held periodically, usually once a week. The team reviews the work accomplished with the help of the scientific staff of the Institute and invites comments and suggestions; discussions have proved generally helpful. When an evaluation of the work is made particular emphasis is given to:

- The existence of a sizable market, keeping in view the cost of material;
- The suitability and availability of raw materials;
- Avoidance of infringement of existing patents;
- Ease of reproduction of the process.

Since there are two types of sponsorship, the development programme falls into two categories, those projects sponsored by industry and those sponsored by government agencies. In the first category, the particular industry having spent considerable sums on research is anxious to scale-up to obtain returns as soon as possible. In the second category, the project is referred to the National Research Development Corporation of India (NRDC). This body assists the Institute in finding a suitable sponsor for the development work. A sponsor frequently becomes interested in a project as a result of personal contact with the scientist in charge.

For work sponsored under government auspices, development expenditure is wholly or partly borne by the sponsor, sometimes the National Research Development Corporation (NRDC) provides financial assistance. Such projects are licensed for commercial exploitation through NRDC. It is now customary for non-exclusive licences to be issued, although in the past the issuance of exclusive licences was the rule. When the sponsoring industry is meeting the total cost of the development expenditure exclusive licences for a period ranging from two to five years are awarded, thereafter the licences become non-exclusive. In such instances the first licensee receives a share of the royalty from the second licensee.

The following two case histories illustrate the points that have been made.

Catalyst for vinyl chloride polymerization

One of the industries manufacturing polyvinyl chloride (PVC) with foreign collaboration, suggested to the Institute that there was a possibility of developing a catalyst that could reduce the time of polymerization of vinyl chloride. The SRI undertook the development of the new catalyst based on the data furnished by the industry.

The programme was designed so that laboratory investigations were carried out at SRI and development work taken up by the industry. The staff of the Institute was allowed to study the working of the process at the factory. The discussions between the research team and the production team led to a proper direction of the work. Monthly meetings were held. The laboratory work was completed in six months and the first trial took place in January 1966. Additional development lasting a year was carried out by the industry. Over four thousand tons of PVC were marketed in India and abroad to discover the consumer acceptability before a decision was taken to use the process commercially.

By using this new catalyst, productivity was increased by 20 per cent and the quality of the product was considerably enhanced. This is an example of the purchase of foreign expertise. When research and development were undertaken by the firm, in order to improve the process, the product then paid rich dividends.

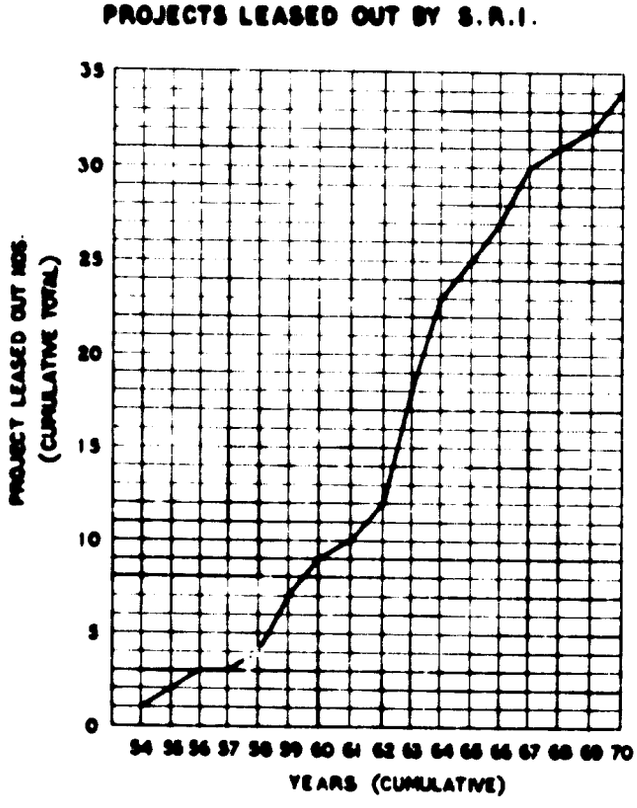
Based on the market evaluation and owing to the inherent advantages of the new catalyst, the industry has switched to the use of this catalyst for normal production.

Carboxy methyl cellulose

Carboxy-methyl cellulose (CMC) was originally a German invention used in various ways in the United States after the Second World War. At that time India was also importing small quantities of it. During the war the Central Cotton Committee and an Indian University had carried out some research, but without any tangible results. SRI scientists then submitted a scheme for the manufacture of CMC to the Council of the Scientific and Industrial Research, a government body, which readily accepted it. The scheme was dropped subsequently as it was thought that there might not be an appreciable market in India. However, the SRI scientists re-submitted the scheme four years later and successfully developed a process for the manufacture of CMC in 1957.

The scheme submitted to the CSIR was designed in three phases namely, *(a)* laboratory investigation for the standardization of the conditions of synthesis, *(b)* the scaling-up and design of the pilot plant and *(c)* consumer acceptability trials and market investigations, followed by the construction of a large-scale plant.

The cost of the scheme was $1,000 for the first year, $5,000 for the second and the grant for the third year to be based on actual cost.



The laboratory research lasted about six months. A survey of existing patents was made and the decision taken that elaborate work on the manufacture of cellulose pulp as raw material, or on the conventional process of alkali steep/shred/carboxmethylation for the synthesis of CMC, would not be practicable under Indian conditions. On the other hand, there were indications in published literature that the slurry process would be simpler and would not involve the difficulties of obtaining specialized equipment. Another incentive to research was that much of the literature published on the subject indicated the use of ethyl alcohol as slurry medium. In those days ethyl alcohol was regarded as surplus waste.

An Indian firm was contacted to discover whether the laboratory sample would arouse a favourable response. The firm co-operated in evaluating the process from the point of view of the user and asked a buyer of CMC for his advice.

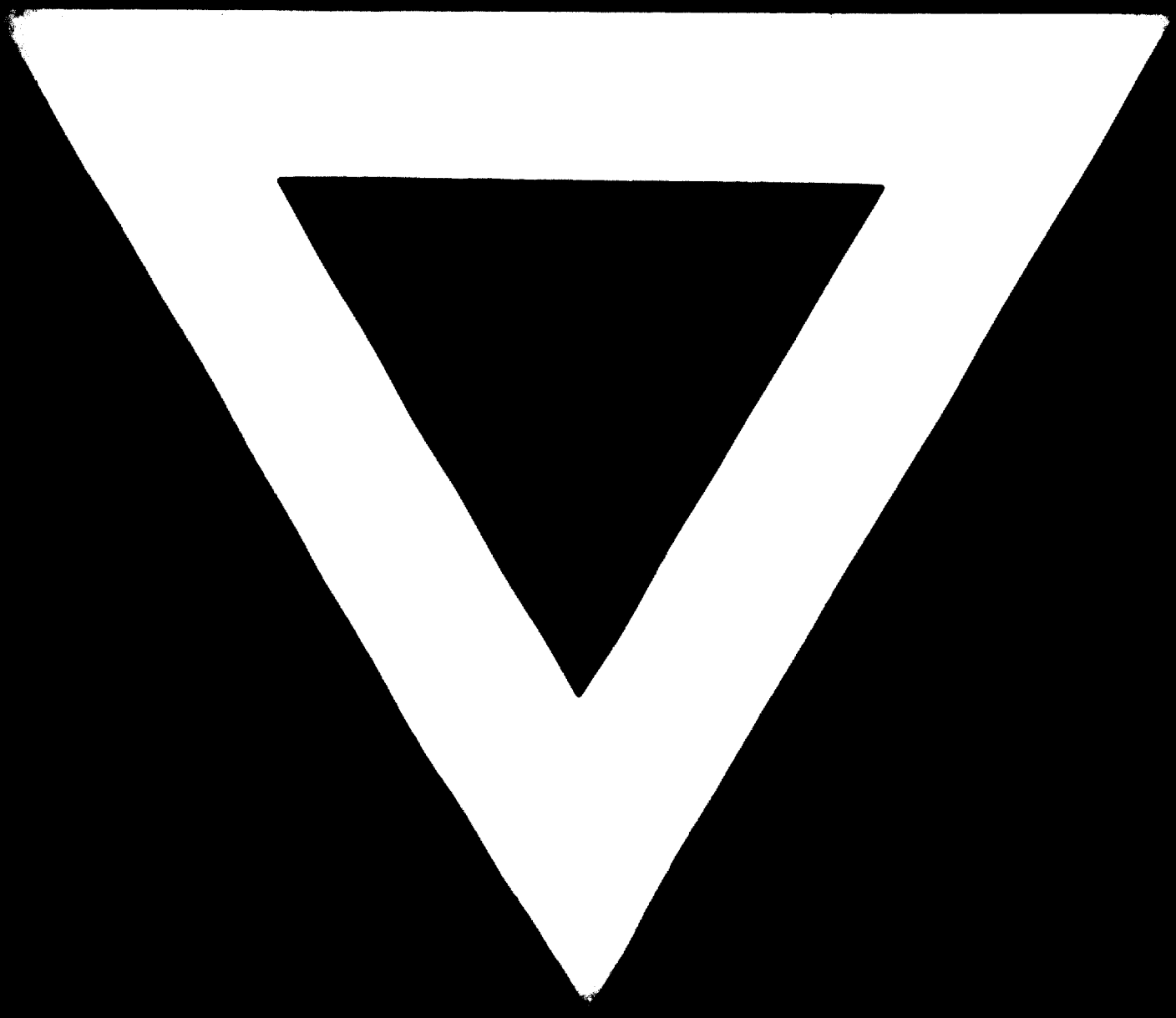
A bench-scale unit capable of producing three kilogrammes of CMC was constructed. Standardization of the processing was carried out and the unit was used for demonstration to SRI staff and potential users of the process. In addition, various raw materials were tested on the unit. This stage of the project took about twelve months.

The NRDC licensed the process to the firm concerned and production on batches of 50 kilogrammes was started fifteen months later. The 50 kilogramme plant was constructed under SRI supervision on the premises of the company. After six months of operation an adequate amount of data on design had been accumulated and confidence engendered the marketability of the product. At that moment the State Government banned the use of alcohol, the suspending medium in the process, so that kerosene had to be substituted. In spite of some complaints, this make-shift arrangement proved valuable and saved time.

While the 50 kilogramme batches were being worked, the SRI team was designing the commercial plant. The choice of manufacturers was difficult because of long delivery dates and refusals from big manufacturers who felt that the business was not sufficiently attractive. A medium-sized firm that was interested in acquiring experience in manufacturing was chosen. Established manufacturers and consultants were consulted to ensure that experienced advice was available. The third stage, commercial development, was the most difficult. However, with some modifications the commercial plan was inaugurated in January 1961, almost exactly three and a half years after the project was begun in the laboratory.

By the time the plant came on stream, $150,000 had been spent, of which $100,000 accounted for the cost of the full-scale plant, the remainder being spent on research and development, covering expenditure both at the SRI and at the works of the company.

In conclusion, it may be said that the success of Shri Ram Institute in implementing processes developed in their laboratories to the commercial stage, is mainly the result of a careful selection of projects, well planned execution and close co-ordination between industry and the Institute.



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