Visit to a few French and West German Battery Research Laboratories

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MOST of the Industrial Research Laboratories are engaged in work on certain developmental projects. These laboratories form independent units. In most cases they are not concerned with daily production. The factories have their own control unit and a laboratory to attend to production problems which a rise from time to time.

Director of Research who is the head of such organizations, formulates the broad programme of research. These laboratories are further divided into different sections manned by qualified and experienced scientific personnel, who are helped by a number of assistants. The co-ordination between the sections is effected by the section heads themselves. Often the professors of the universities are associated with these industrial research laboratories as consultants, advisors, and sometimes as Research Directors.

The problems are approached systematically and from a fundamental point of view keeping in view always the long term objective of the investigation. Quite a good deal of research is undertaken on such fundamental and theoretical problems, results of which are likely to be useful in the long run.

The results of the investigations are usually kept secret and are the property of the concern. Patents are often taken to safeguard the interest of the inventions. The results which are thought to be of general and fundamental nature are published in scientific journals.

The Industrial Research Laboratories are provided with lastest equipments and facilities to carry out the work efficiently and speedily. Most of the equipments used are made in their own country. They use foreign make instruments only when they are known for their standard design and efficient operation. The specialized equipments for specific purposes are usually fabricated in the laboratories. Each research laboratory has its own technical department for fabricating special type instruments for their purpose.

The work of a few industrial research laboratories in France and West Germany which the writer had the privilege to vist are described here. Since the industrial research laboratories may not like to give publicity to many of them. the problems are discussed in a general way leaving the details.

The following are the Battery Research Laboratories which were visited due to the kind cooperation from the individual organizations :

1. Pils Wonder, Paris :	Manufacturers of Primary batteries, Leclanche type dry cells, Flash lights etc.
2. Société des Accumulateurs Fixés et de Traction, Paris (Saft)	Manufacturers of Primary batteries, Leclanche type; Secondary batteries, lead-acid Sintered type nickel-cadmium etc.
3. Accumulatoren — Fabrik — Aktiengesellschaft (AFA) and Pertrix-Union. G.m.b.H. Frankfurt a Main	Manufacturers of Primary batteries and Secondary batteries — Lead-acid Nickel-Cadmium all types etc.
4. Robert Bosch G.m.b.H. Stuttgart :	Manufacturers of Secondary Lead-acid batteries.

These are some of the leading battery manufacturing concerns. The names of the above manufacturers are not only renowned in the field of battery manufacture in Europe, but also are known throughout the world. It may not be of any interest to narrate the production figures or the capital outlay of these concerns which are sometimes difficult to procure, but the research activity, laboratory set-up, and their organization will be definitely of interest to all.

1. *Pils Wonder:* This organization has been in existence even before the First World War. This is managed and owned by Brouillet family of France. This factory was destroyed by the First and Second World Wars, and subsequently rebuilt. The research laboratory and a small production unit are now situated in Paris. Both the research and control laboratory are housed in the same building. Major production units, manufacturing different types of primary cells, flash light torches, activated manganese dioxide etc., are situated outside Paris.

Investigations on manganese dioxide depolarizer, activated carbon, corrosion of zinc, constitute a few of the research problems. The physical section of the laboratory is equipped with three X-ray diffraction units, BET-surface area measuring apparatus. and other equipments to study the thermal and crystallographic changes of MnO_2. The chemical laboratory is engaged in the analysis and preparation of different activated samples of manganese dioxide and carbon used in the experimental cell fabrication. Electrochemical section of the laboratory is equipped with galvanostats, potentiostats, recording pH meter, vacuum tube voltmeters employed in the study of passivation and corrosion of different metals. The testing laboratory is elaborate. Cells manufactured by the different manufacturers are tested to compare and to improve the quality of their own products.

This laboratory has contributed many papers of fundamental importance to various scientfic, journals, and international scientific bodies like CITCE. They often publish their results of fundamental interest and take part in scientfic meetings.

2. SAFT: At the present time, this is one of the world's well-known producers of sintered type nickel-cadmium batteries, and sealed button cells. The research laboratory is in a newly built, air-conditioned building with the laboratory facilities. The laboratory is headed by a Director of Research who regulates the activities of the different sections engaged in the research on both primary and secondary batteries.

The section engaged in the study of surface area, and particle size distribution of lead oxides, manganese dioxide, nickel powder, etc., has a new and interesting automatic size separation equipment which also records the size distribution. The evaluation of the depolarizing characteristics of the different varieties of the natural and artificial manganese dioxide are the subject of study in the field of primary batteries. Research work on different problems of construction, fabrication on Leclanche type, lead-acid, nickel-cadmium, and silver oxide. zinc-cadmium batteries are pursued with definite objectives in view. Since the organization is engaged in the production for the defence purpose not only for the French Government but also to other countries of the World, the activities and the results of the research investigation of the laboratory are not published. Patents from this laboratory often appear on the inventions made.

3. *AFA & Partrix:* — This concern is one of the oldest organizations in the field of battery manufacture. It may be mentioned that for the first time the sintered plate nickel-cadmium batteries were developed by them during the last world war. This type of batteries are known for their high discharge characteristics similar to lead-acid batteries, with all the advantages of alkaline nickel-cadmium system. AFA and Partrix have a common management. AFA manufactures secondary batteries, Patrix manufactures primary batteries.

The Central laboratory in Frankfurt a Main functions jointly under the same head and management. In the central laboratory, problems of interest to AFA and Partrix are tackled. Now the laboratories are accommodated in an old building. The different sections of the laboratories are working in different floors of the same building. Primary battery section is engaged in the study of fundamental and applied problems concerning different varieties of manganese dioxide (natural, activated, and synthetic). Investigations on mechanism of the cell reaction of different types of cell systems, for example Leclanche type, lead-acid, nickel-cadmium, silver oxide-zinc/cadmium, are within the scope of investigation of the laboratory. By the identification of the orthorhombic and tetragonal lead dioxide alpha and beta PbO_2) reported independently, this laboratory has earned an appreciation throughout the world in the field of lead-acid, battery system. The problems of constant current and constant potential charging, gas evolution etc., on sealed type nickel-cadmium cells are subjects of the study, along with many other new fields of investigation.

An improved type potentiostat has been fabricated by the instrument section of this laboratory, suited for their own investigation in the laboratory. This section does the design and fabrication of most of the testing equipments and other special equipments for the laboratory.

Many papers from this laboratory of fundamental nature appear in different scientific journals. The laboratory takes part in symposia and scientific meetings, and publishes their results apart from taking patents on the inventions.

4. *Robert Bosch :* In West Germany this is one of the largest manufacturers of electrical accessories for the automobiles such as spark plug, dynamo, self-starter, current and voltage regulators (cut-out), and storage batteries. The activities of the Central laboratory in Stuttgart cover the research and development of all the products which they produce. Particularly the research on the lead-acid storage batteries is carried out in an extensive manner employing latest techniques like radio-tracer technique.

The novel method of determining the surface area of powders employing the gas chromotography, seems to be an improvement over the renowned B E.T. method. Sepectroscopic method is employed in estimation of trace impurities. The radio tracer laboratory is engaged in the study of antimony migration in battery plates and through the separators. Investigations to improve the self-discharge in lead-acid batteries using new technique is of interest.

The results of the investigations which are of general interest are published in scientific journals and patents are taken on different inventions.

In our country, the battery industry specially dry cells and the lead-acid batteries are well established ; yet the possibility of far reaching changes affecting the technology of the battery manufacture in all its aspects cannot be ruled out. In a country like ours which has recently entered the era of industrialization, there is the need for developmental research. Only by adequate planned research on developmental aspects it is possible to keep place with the improvements in the manufactring technique that are being effected in other countries. This aspect of industrial research forms the scope of industrial laboratories.

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