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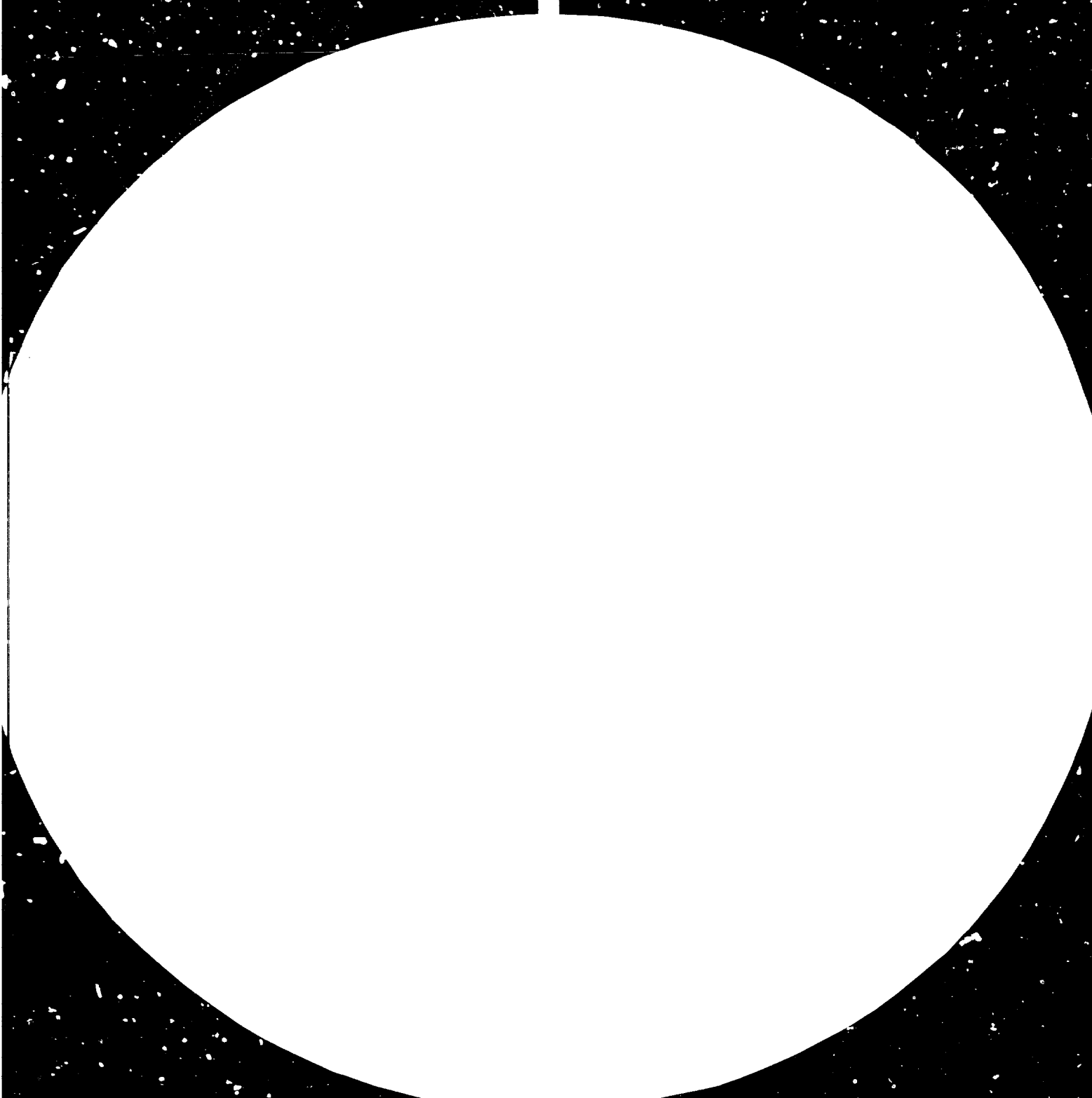
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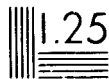
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CENTRAL METALLURGICAL RESEARCH AND DEVELOPMENT, EGYPT *

by

A.A. Abdul Azim **

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** Professor and Director, Central Metallurgical Research and Development Institute, Dokki, Cairo, Egypt

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ABSTRACT

The paper starts with a historical background featuring the birth and growth of CMRDI. The objectives of the institute are briefly outlined. It is shown that the set-up, the staffing and facilities have been made in the light of these objectives. The internal and external relations enable the institute to be oriented toward the needs of industry. The success of the institute to build an image reflects itself in the continuous increase in number and volume of sponsored research projects, training programmes and technical services. Brief accounts of the ongoing sponsored industrial projects are given.

HISTORICAL BACKGROUND

The National Research Centre, a multidisciplinary applied research institute, was inaugurated in 1956. The NRC consisted of a number of divisions, namely; Glass, Refractories, Pulp and Paper, Fats and Oil, Medicine, Engineering, Agriculture, Organic Chemistry, Inorganic Chemistry, Microbiology, Biochemistry and Metallurgy. Some divisions grew, separated and moved to new premises to cater for the needs of specific sectors, e.g., Egyptian Petroleum Research Institute (EPRI). The Central Metallurgical Research and Development Institute is another example.

The CMRDI was established to meet the research and development demands of the metal producing and consuming industries. The Academy of Scientific Research and Technology, ASRT, and General Organization for Industrialization, GOFI shared the building costs. Iron and Steel Co. offered the land and supervised the building activities.

To foster relationship between the industry and research and the formation of a nucleus of CMRDI, UNDP approved a preparatory assistance for US \$1,000,000 and this was followed by the 1st phase in 1972-1974, with UNIDO as the Executing Agency. The first phase with UN inputs of US \$463,700 provided for supply of some equipment for research in industrial and extractive metallurgy to the value of US \$100,000, together with 108 man months for UN experts and training fellowships at an estimated cost of US \$74,600 in various metallurgical fields. The Government inputs were LE 1,465,276.

The original UNDP inputs of 1.86 million US \$ during the 2nd phase had to be revised to meet the increasing costs of experts and US \$345,000 were allocated to 1979, extending the tenure of project and supply of additional equipment. The latest UNDP inputs of US \$2.523 million include supply of equipment to the value of 1.335 million US \$, 192 m/ms services of experts and training fellowships for 108-man months.

The Government inputs during the 2nd phase are about 3.0 million LE towards the cost of the establishment of new facilities at its new premises at El Tebbin excluding the cost of the existing equipment as well as the services of 100 scientists and other supporting staff.

OBJECTIVES

The Government of the Arab Republic of Egypt has been engaged in the development of the metallurgical industry in Egypt. During the last decade, the steel production has been expanded from 250,000 to 1,500,000 tonnes/annum and there are plans to develop the iron and steel industry to produce 10 million tonnes/annum of finished steel by the end of the century. The expansion would be based on the latest technological developments as suitable to Egypt. The alumina smelter with a capacity of 100,000 tonnes/annum of aluminium, based on imported alumina, is to be expanded to 166,000 tonnes/annum. The ferro-silicon production is being stepped up and there are plans to produce ferro-manganese and titania rich slag from ilmenite. With the extensive resources of natural gas, a sponge iron plant is being planned and tests conducted. Huge deposits of phosphates have been discovered and there are plans for their exploitation.

Extensive aerial survey for mineral deposits is being undertaken and there are reports of the occurrences of strategic minerals such as molybdenum, tin, copper, lead and zinc. It is hoped that the end of the century will see the increased exploitation of national mineral deposits.

The development of basic metal producing industry in the country is expected to show a big growth of metal fabricating and processing industry. This would result in the establishment of quality steel production as well as machine building industry.

The objectives of CMRDI tie in with the needs of metallurgical and engineering industries. These include:

- Testing, analysing and evaluating raw materials and their treatment for recovery of metallic values.
- Testing, and analysing intermediate and end products for quality control.
- Improvement of product and process of production.
- Development of substitute materials from the indigenously available materials.
- Trouble shooting.
- Technical services.
- Providing specific informations on the current state of world knowledge.
- Training.

ORGANIZATION AND CAPABILITIES

The organization set-up of the institute was made in the light of scope of work. The structure covers the specializations displayed in Fig. 1. The staff members (see Table 1) had their training in U.S.A., U.K., Europe, Japan and India. On-the-job training (some times by a foreign expert) within sponsored or in-house projects presents an excellent opportunity for young engineers, chemists and technicians to acquire skills and gain experience specially in pilot plant and industrial operations.

FACILITIES

The buildings spread over 7000 square meters of surface occupied by research laboratories, pilot plants, documentation centre, workshop, instrumental analysis and administrations. The new premises are located in the vicinity of the heavy metallurgical industry at El-Tibbin (Helwan).

Pilot plant facilities are established for mineral beneficiation and agglomeration, extractive metallurgy, foundry and metal working. The University of Berlin supplied the institute with a 300,000 dollars hydro- and pyrometallurgical pilot plant composed of a roasting, leaching and precipitation unit. A list of the most important equipments is shown in the Appendix.

EXTERNAL RELATIONS

The success of an industrial research institute to meet its objectives efficiently depends in the first place on the strength of its links with industry. Such links have been established in many ways. Thus, the chairmen of the big metallurgical companies are represented in the High Executive and Technical Committees of the institute. Figure 2 shows that the director of the institute is a member of the High Sectorial Council of Metallurgical and Engineering Industries which includes chairmen of thirty four companies and is presided over by the Minister of Industry. The council meets every three months to discuss the objectives, difficulties and achievements of each company.

The director of the institute is also a member of the specialized scientific councils of the academy. These councils include competent persons from the relevant government departments, big industries, army and R & D organizations. The institute is represented in the Councils of Mineral Resources and Industry.

CMRDI MEETS ITS OBJECTIVES

1. CMRDI is evaluating, beneficiating and activating local ores such as iron ores, phosphate ores, clays, nepheline syenites, bentonites, alums, .. etc. The pilot plants for ore beneficiation and extraction are contracted for a series of projects.
2. CMRDI is transferring the technology for production of special steels using the UNIDO pilot plant facilities for melting and casting and metal working.
3. CMRDI is examining technologies and making recommendations for quality improvement and reducing rejects, e.g , quality of castings, galvanised steel and spring steel.
4. CMRDI conducts technical services and trouble shooting and is analysing failures for public and private sectors. Requests for technical services are continuously increasing.
5. CMRDI is successfully conducting training courses in corrosion, surface protection, heat treatment, foundry, .. etc. Courses are conducted in the companies as well. More than 300 engineers have been trained during the last two years.

A QUICK OVERVIEW OF THE ON-GOING SPONSORED PROJECTS

1. Egyptian phosphates for phosphoric acid and phosphatic fertilizer production (Phase II). Nile valley (Sabia East Ore): Contract value, L.E. 50,000. A joint project from the Egyptian Academy of Scientific Research and Technology and the U.S. Aid Programme. This involves substantial pilot plant work; the work programme involves: preparation of ore samples, screening and washing tests, calcining and water quenching tests, production of wet process P.A., production of compound fertilizers.

2. Large scale washing and sintering tests of Baharia Iron Ore: A project with the Egyptian Iron and Steel Co. contract value, L.E. 18,000. This involves very substantial pilot plant tests. The work programme includes preparation of large ore samples. Major modifications to pilot plant layout and flow sheet, screening and washing tests, ore drying tests, sintering to compare raw and washed ores.
3. Optimization of the industrial concentration operations of the Hamrawein phosphate at the Red Sea plant of Misr Phosphate Co.: A project with Misr Phosphate Co. contract value, L.E. 10,000. The work includes: observation of industrial operation taking special samples during operations, analysing samples in laboratory, laboratory optimization of washing, calcining and quenching process using Red Sea water, taking special measurements during operation, making recommendations for changes in industrial procedure at plant to minimize MgO and Cl contents in product.
4. Pilot plant evaluation of laboratory technique developed by MRDI for the attrition scrubbing of samples representing the Abu Shegela and Abu Tendeb phosphate mines of the Red Sea Phosphate Co. (Phase II): A project with the Red Sea Phosphate Co. contract value, L.E. 7000. The work programme includes: crushing, grinding, attrition scrubbing tests, classification of washed product and slime removal, Recommendations for economic utilization of these are deposits.
5. Comparative washing tests of some Egyptian white sands for the glass industry. A joint project with the Sini Mining Co. contract value, L.E. 5000. Pilot plant work; the programme includes: washing classification flotation and/or HMS tests. Recommendation of process flow sheet.
6. Evaluation of Egyptian bentonite for industrial use in foundries, oil drilling and agriculture: A joint project with ASRT and U.S. Aid contract value, L.E. 100,000. The work programme includes pilot acid and alkali activation of bentonite and testing of activated products.
7. Investigation of possibilities of alumina production from Egyptian nepheline syenite and clay: A joint project with the GOFI, value L.E. 5000. Appraisal of literature, economic feasibility.
3. Preliminary studies of the factors affecting aluminium production in Egypt. A project with aluminium Co. This work

programme includes: studies on the influence of imported fluorides on: a) physico-chemical properties of the melt; b) the electrolysis process.

9. Improving production of three types of steel in Egypt: Free cutting steel, spring steel, carbon steel for nuts and bolts. A project with Delta St. Co., value 20,000. The work programme of each steel includes: development of melting technique, metal forming mechanical and metallurgical testing of products. In the second phase, application in industry will be undertaken.
10. Evaluation of heat treatment process for spring steel manufacture: A project with Spring Steel Co. Value 3000. Investigation of optimum heat treatment cycles on metal quality.
11. Improving production techniques and product quality of hot dipped galvanised sheets: A project with Egyptian Iron and Steel Co., value L.E. 6000. This involves operational studies at the galvanizing plant. The work programme includes: improvement of industrial operational control leading to better grades of product, lowered production losses and savings in zinc.
12. Introduction of oxygen lancing in electric ore steelmaking: A project with Egyptian Iron and Steel Co. contract value, L.E. 15,000. This involves pilot plant tests and field studies at works. The work programme includes testing of oxygen lancing in electric furnaces and analysis of the effect of this technique on metal quality and economic performance of the steelworks furnaces.
13. Investigation of industrial failure: A project with Canal Tex Co., value L.E. 2000.

Investigation of industrial failure of machine parts: A project with Cairo Contracting Co., value L.E. 700.

Investigation of failure of underground pipe: A project with Gipro Oil Co., value L.E. 700.
14. Estimation of the national costs of corrosion: Contract with the ASRT. Contract value L.E. 130,000. The project aims at finding the losses due to corrosion in all sectors, government and private. Selection of one or two sectors will be done in Phase II to demonstrate how such losses can be cut down by proper use of available information.

CONCLUSIONS

1. The success of CMRDI to build an image may be illustrated by the increase in contract values with one company. The contract value started a few years ago with L.E. 500 and increased to L.E. 70,000. With another company, the start was L.E. 55,000.
2. The Central Metallurgical Research and Development Institute is ready to share its experience with other institutes in the developing world in the areas of ore evaluation, ore dressing, ore agglomeration, steelmaking, hydrometallurgy, alloy steel and foundry.



