DEPARTMENT OF ATOMIC ENERGY

Industrial activities outside the field of atomic energy and relevant to exports:

1. Zirconium Powder

Technology has been developed for the production of micron size zirconium powder. The material is used as a 'getter' in the electronics industry and as a 'trigger' in the manufacture of photo-flash bulbs. Zirconium powder also finds application in pyrophoric devices such as ammunition primers and smokeless powder.

On the basis of information collected from the Indian manufacturers, their current demand for zirconium powder is assessed at 75 Kg per year. There is also a requirement of another 30 kg. in ordnance factories. With the steady growth of the electric bulb industry, a corresponding increase in the requirement of zirconium powder can reasonably be expected. Another relevant factor is the export potential. A recent enquiry received from Yugoslavia places their requirement at 2 - 3 t per year.

For a plant to produce 2 t. of the powder per year, the capital investment is estimated at Rs.8.00 lakhs. The powder is a high-cost material and corresponding material of comparable purity and physical characteristics is selling abroad at Rs. 525/kg. The production costs in India on the scale of 2 t/year are estimated at Rs. 322/kg.

2. Production of Special Materials and Capacitor Grade Tantalum Slugs

A plant is under establishment at Hyderabad (at the site of the Nuclear Fuel Complex) for the preparation of selected high purity materials for the electronics industry. The project covers the preparation of high-purity materials like antimony, arsenic gallium, zinc, cadmium, silver, gold, lead, bismuth, tin, selenium, tellurium, indium, $POCl_3$ and $B Br_3$

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and the production of some 5 lakhs of capacitor grade tantalum slugs per year (about 1 ton of tantalum). The capital cost of the project has been estimated at Rs.40.33 lakhs, including a foreign-exchange component of Rs. 7 lakhs. The operating expenses are estimated at Rs.52.5 lakhs and the ex-works cost abroad of the materials programmed for production is roughly computed at Rs. 76 lakhs per year although the landed cost would be considerably higher. As the technology is further developed, it will be possible to take up production of other high-purity materials required for the electronics industry, such as aluminium, nickel, molybenum, tungsten and mercury. The production of special alloys such as Kovar and Invar is also programmed.

3. Production of titanium

The world demand for titanium and its alloys has been steadily growing in the last two decades. High strength to weight ratio, excellent high temperature strength and corrosion resistance have been the main contributing factors. The estimated distribution of titaniur-mill product consumption is as under:

	%
Missile space components	32
Military air frames	27
Jet engines	25
Civilian air planes	9
Chemical industry	4
Ordnance	2
Experimental	1

Althought the bulk of titaniur produced in the world as of today goes into the aeronatutical and space industries, there is a steadily increasing demand for the metal in the chemical process industries where good corrosion resistance is desired.

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At present, the demand for titanium-mill products in India is very small, and in the initial stages the setting up of a titanium production facility in the country would have to be essentially export-oriented. The ready availability of the metal, however, is expected to give a fillip to the more wide-spread consumption of titanium in India.

Two firms have recently requested for the grant of licences for the processing of ilmenite for the production of titania pigment and titanium sponge. They propose to smelt ilmenite for the production of high-titania slag containing over 90% TiO_2 with iron as a by-product. The slag would then be converted into titanium tetrachloride by chlorination. The tetrachloride so produced would then be used either for the production of titania pigment or for the production of the metal. Both the firms have proposed treating some 80,000 to 100,000 tonnes of ilmenite per year to produce some 25,000 tonnes of titania pigment and 3,000 tonnes of titanium sponge.

The technology for the production of titanium metal has been developed at BARC on a small-scale of up to 2 kg per batch. If indigenous know-how has to be made available for setting up a large-scale plant, it will be necessary to erect and operate a medium sized pilot plant before the know-how could be passed on to one or more of the firms. As the technology involved for zirconium and titanium are simlar, such a plant could well be co-ordinated with the Zirconium Sponge Plant which is under establishment at Hyderabad. It is estimated that a pilot plant to produce 15 tonnes of titanium sponge per year will cost about Rs.30 lakhs. As regards the fabrication of mill-products, this could be undertaken at the Zircaloy Fabrication Plant. Additional melting furnaces will, however, be required.

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4. Recovery of by-product nickel and molybdenum from the Jadugoda ore

Jadugoda uranium ore contains low values of copper, nickel and molybdenum as sulphides. The assay of various samples of the ore have been as under:

Cu	-	0.15	to 0.25	% by wt.
Ni	-	0.15	to 0.20	%
Mo	-	0.03		%.

As the ore has to be milled for the extraction of uranium values, the cost of mining and milling the ore is already covered. Development work by flotation methods is in process for the recovery of copper, nickel and molybdenum values present in the ore. It is proposed to recover these minerals in the form of concentrates prior to processing the ore for uranium recovery. Good grades and recoveries have been obtained for the nickel concentrates, copper concentrates and molybdenite. Nickel concentrates have been obtained at a grade of 4.32% nickel and 2.6% copper, and copper concentrates with a copper content of 27.5 percent. A pilot plant to prove the flow-sheet will shortly be set up at Jadugoda.

5. Seamless tubes in stainless steel

As mentioned in the note on the Nuclear Fuel Complex, the Zircaloy Fabrication Plant has spare capacity, specially in extrusion. In view of this, it is planned to use this facility for extrusion of special steels, generally as under:

(i)	Ball bearing tubes	10,000 tonnes
(ii)	Boiler, superheater, and other creep resistant tubing	10,000 "
(iii)	Stainless steel tubing for chemical industry, refineries and nuclear power stations	2,000 "

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Implementation of the project will fill an important gap in the national economy. For extra equipment and facilities that would be required for handling steels, M/s. M. N. Dastur & Co., Consultants for the Nuclear Fuel C-omplex, have estimated that their cost might run into some Rs.1.5 crores This figure however is very tentative as full details have to be worked out. In the meantime, the concurrence to this project has been requested from the Ministry of Industrial Development and Company Affairs (Department of Industrial Development) who are concerned with the subject.

6. Special Alloys

The Bhabha Atomic Research Centre have developed the technology of making some special alloys required for the electronics industry, such as Kovar and Invar and it is proposed to include their production in the special materials plant in due course.

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