An integrated approach to the optimum utilization of national tungsten resources: Technology gaps

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Abstract. A critical review of the current status of tungsten resources, of state-of-the-art processing technology and of product development in India vis-a-vis the world scenario is presented. An attempt has been made to identify technology gap areas requiring attention.

Keywords. Tungsten; scrap recycling; tungsten powder; solvent extraction; APT production; carbide scrap.

1. Introduction

Tungsten is one of the important metals for the modern industry due to its high density and high temperature properties, particularly hardness in the form of tungsten carbide. Tungsten found wide usage as a cutting tool (tungsten carbide) and as alloying element in steel during the rapid industrialization phase between the two world wars. Hard core tungsten penetrators using tungsten carbide for defeating frontal armour were developed during 1940's. The war efforts also led to a boost in tungsten consumption as a cutting tool for the manufacturing industry. As illustrated in figure 1 the demand for tungsten has been steadily growing. A sharp decline in tungsten prices is noted since the beginning of the eighties (Lenton 1987), as shown in figure 2. Considering the strategic importance of tungsten, particularly for a country like India deficient in tungsten resources, there is a need to work out a national policy towards the optimum utilization of tungsten resources available in the country. Some of the issues facing the national tungsten industry are discussed in this paper.

2. Indian scenario

With globalization of the world market, a new scenario is emerging with a dominant role being played by China in deciding the price and supply pattern of tungsten powder. This situation has compelled most of the tungsten-consuming countries to devise new strategies in order to assure supplies to meet domestic requirements. India needs to formulate a strategy to contend with the emerging scenario through an integrated approach to tungsten exploration, mining, beneficiation, processing, product development and application including recycling of scrap.

The present requirement of tungsten in India is met largely through imports of powder and ore concentrates. Domestic production of powder is about half of its total requirement. The production of ore concentrate is insignificant. The only source of tungsten, presently available in the country, is the Degana mine in Rajasthan owned by Hindustan Zinc Ltd., producing around 10 tons of concentrates. The indigenous ore concentrate has always been in short supply compared to what is required. Even so, the
concentrates produced in India are not much in demand due to the high cost attributable to rather primitive methods of concentration, inconsistent supplies and inability to meet the stringent specifications comparable to imported concentrates. The low tenor of Degana ore deposit is the root cause of indifferent progress in the downstream processing of the ore.

The demand and production of tungsten ore concentrates are indicated in tables 1 and 2 respectively. India has proven reserves of 35,000 tonnes of tungsten concentrate in Rajasthan, Maharashtra, Bengal, Andhra Pradesh, Uttar Pradesh and Karnataka (Dhruva Rao 1987) (figure 3). Inspite of the vast potential reserves of tungsten in the country, economic recovery of the metal value poses problems. Recovery is complex due to the manner of its dissemination, low tenor of occurrence and its association with