10 kW Electron Beam Melter

Electron Beam
Thermal Applications

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Electron Beam (EB) Welding and Melting has become an indispensable tool for processing of nuclear and accelerator grade materials. Over the years, it has gained leverage in aerospace and automobile industries too. Processing of materials through EB route is usually done in high vacuum conditions, which makes it ideal for welding and melting of various refractory and reactive materials, including Tantalum, Tungsten, Molybdenum, Zirconium, Titanium, Niobium and Uranium.

In EB thermal processing, high intensity electron beams (beam power density in the range of 10^4-10^6 W/cm^2) are employed as heat source. BARC has been developing high power EB Welding and EB Melting Machines in-house for nuclear applications.

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Technology Innovations

EB Welding
EB Melting
Vacuum Melting and Refinement

Besides, the Indian industry is embracing this highly sophisticated and user-friendly technology in diversified areas.

EB Welding machines of power rating ranging 2 kW-12 kW are being developed in-house for deployment in various operations of BARC, Mumbai. A 12 kW EB Welding Machine has been installed at the Old Training School Building here for promoting the use of this technology within the constituent units of the Department of Atomic Energy (DAE). A 12 kW EB Welding machine had been installed at Steel Technology Centre, Department of Metallurgical and Materials Engineering, IIT Kharagpur, for EB Welding of materials. BARC is currently working on the development of a 20 kW EB Welding machine, which would cater to the potential needs of Indian industry.

EB Melting Machines of power rating ranging from 6 kW to 15 kW have also been developed in BARC for metallurgical studies on metals and alloys. A 10 kW, 15 kV EB Melting machine has been commissioned for preparation of new refractory alloys by Materials Science Division. Buttons (metal-based) of 25 mm diameter x 12 mm thickness and fingers of 40 mm x 25 mm x 12 mm dimensions can be easily prepared using this machine, which is equipped with a unique facility of online charge feeder system for vacuum drip melting and production of 40 mm diameter x 250 mm long ingots. A 40 kW, 25 kV EB Melting machine is also being developed for obtaining larger ingots (65 mm diameter x 500 mm long).

A 120 kW, 40 kV high power EB Melting gun column has been developed in BARC for Melting Furnace. Two electron guns were deployed in 300 kW EB Melting Furnace jointly with Nuclear Fuel Complex, which has deployed the system for development of new alloys and consolidation of metal scrap. Thus, the Beam Technology Development Group of BARC has acquired significant capabilities in this niche area .We welcome DAE fraternity to support and also embrace this high-end technology in their field of specialization.