

**July 5, 2011**  
**Nippon Steel Corporation**  
**Toho Titanium Co., Ltd.**

## **Successful Development of the World's First Direct-cast Titanium Slab Mass-production Technology**

**Nippon Steel Corporation (head office: Chiyoda-ku, Tokyo; representative director & president: Shoji Muneoka; hereinafter referred to as "NIPPON") and Toho Titanium Co., Ltd. (head office: Chigasaki City, Kanagawa Prefecture; representative director & president: Takashi Kurushima; hereinafter referred to as "TOHO") have succeeded, as a world first, in the joint development of technology for the industrial mass production of direct-cast titanium slabs (known as "DC Slab™") for titanium sheets. TOHO has now begun mass production. This DC Slab™, directly manufactured through the use of an electron beam melting process (hereinafter referred to as "EB melting process"), makes it possible to eliminate the ingot breakdown process (i.e., slabbing or forging). Thus, it permits a faster delivery term and allows for the conservation of resources and energy, and it is expected to greatly help expand the titanium market.**

**Titanium sheets, now a major product for industrial use, are usually made by first reducing, in the breakdown process, the thickness of an ingot having a large sectional area and then by rolling it on a large-size continuous hot-rolling line. The mass-produced DC Slab™, now successfully made available to the market, is directly cast, utilizing, for high-quality titanium sheet manufacture, the EB melting process's advantage of greater freedom in designing optimum shapes for casting molds.**

**The novelty of DC Slab™ lies in the fact that, while the breakdown process is eliminated, optimum casting conditions and other parameters necessary for the advanced control of the surface properties and internal structure of the slab have been established so that sheet products having quality equal to that of conventional products can be produced. In this development, the advanced technologies and know-how of both companies, namely, TOHO's manufacturing technology supported by its EB melting experience and NIPPON's large-size hot-rolled coil manufacturing technology, plus R&D capabilities, have been combined together into a successful mass-production capability.**

**Through the development of DC Slab™ and the elimination of the breakdown process, etc., it has become possible to shorten the term of titanium sheet manufacture by about 20%, as well as to compress intermediate inventories and avoid yield loss from scrap loss. Moreover, because DC Slab™ is based on the EB melting process, which permits the recycle-melting of large quantities of scrap, its use will serve to hold down the consumption of sponge titanium**

**made from titanium ore. Its use will also lead to a reduction in power consumption during the smelting of metallic titanium. In conjunction with the benefits of conservation and energy savings, DC Slab™ will make a meaningful contribution to the structure of a resource-efficient recycling society.**

## **Terms**

### **Electron beam melting process:**

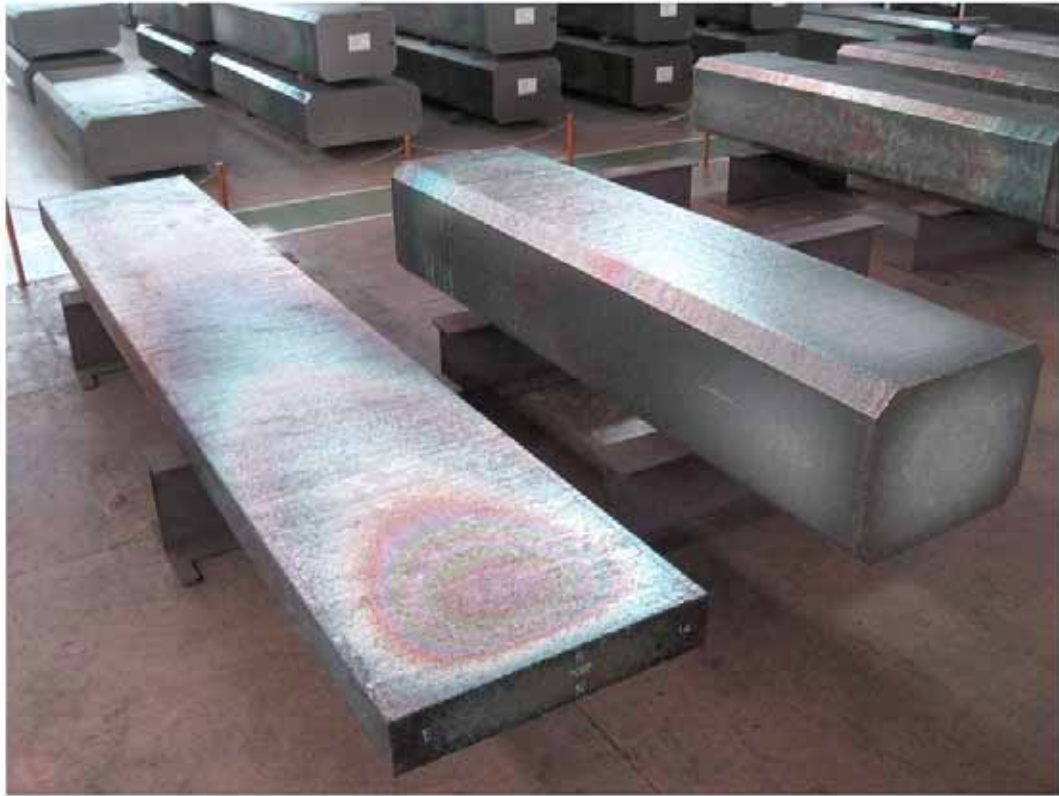
**The process of melting metallic titanium in a vacuum, using a large-input electron beam gun (EB gun) as a heat source; as a raw material, either titanium scrap or sponge titanium can be used. By changing casting molds, ingots of various shapes can be manufactured.**

### **Breakdown process:**

**Titanium ingots having a large sectional area are either rolled on a large-size hot-rolling mill or hot-forged on a press into a flat titanium slab having a rectangular cross-section that can be hot-worked on a large rolling mill for steel.**

### **Recycle-melting:**

**Re-melting of titanium scrap generated during the pure titanium sheet manufacturing process to make ingots or DC Slab™; large-sized titanium scrap, which heretofore was difficult to melt and recycle, can now be easily recycled due to the introduction of TOHO's EB process.**



**For inquiries regarding this matter, please contact:**

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