



Various types of steel plates are used in the energy plant field, which includes oil refineries and other chemical plants, as well as power generating equipment and the like. In recent years, there has been an orientation toward heavier weight in the steel products used in these plants due to the adoption of heavy gauge, wide, and long products in response to plant upscaling, more severe operating conditions and service environments, and the need for higher efficiency in welding with the aim of reducing construction costs. Together with these trends, thickness reduction by high strength, improved toughness and weldability, and other features are required. Moreover, increased global energy demand has resulted in a higher level of activity in energy plant construction, and this has heightened the need for high performance steels.

JFE Steel is developing heavy section Cr-Mo steel plates to meet these needs¹⁻⁴⁾. This report introduces various types of heavy section Cr-Mo steel plates developed for energy plants.

Among the production processes for large weight, heavy section steel plates, in addition to the continuous casting process, JFE Steel has an ingot casting process which makes it possible to produce large-scale steel ingots up to 120 tons in weight by melting high purity steel in an LD converter-RH vacuum degassing process. In addition to slabbing mills and plate rolling mills, JFE Steel also employs a 6 000 tons free forging process () which makes it possible to produce high quality, heavy section, large weight steels^{1, 2)}.

	Capacity: 150 t Max. temperature: 1 050°C Effective height: 400 mm
Quenching pit	Dipping type
Surface grinder	Max. thickness: 450 mm Rough and fine whetstone
Flame cutter	Max. thickness: 400 mm

A new heat treatment plant (new special plate equipment,) for production of heavy thickness, wide, and long heat-treated plates with large weight was

400 mm in thickness by a batch type heat treating furnace and quenching by a dip-type water quenching pit²⁾.

By using the heavy section steel production process described in Chapter 2, JFE Steel can produce not only plate product standards, but also high quality heavy section heat-treated steels for forged product standards.

† Originally published in Batch type heat treating furnace

shows examples of ASME and JIS for the main Cr-Mo steel plates and forgings for energy plant pressure vessels. JFE Steel has developed heavy section high performance Cr-Mo steels for these plate and forging standards, and already has an extensive production record. Examples of the features of these products are presented in the following. (ASME: The American Society of Mechanical Engineers, JIS: Japanese Industrial Standards)

1.25Cr-0.5Mo steel is used in a wide range of applications in the energy field. With heavy section materials, there is a tendency to apply high-temperature/long-time post weld heat treatment (PWHT) conditions and strict toughness conditions, including the plate center (1/2) position. JFE Steel has developed various types of heavy section 1.25Cr-0.5Mo steel in response to these needs. Examples of their chemical composition are shown in . In addition to limiting impurity elements to low levels, microalloying elements are actively used for microstructural control.

shows the mechanical properties of the base material of 1.25Cr-0.5Mo steel plate (ASME SA-387 Gr. 11 Cl2) with a thickness of 130 mm, which is produced by the ingot casting-slabbing-plate rolling-heat treatment (Q-T) process. This steel amply satisfies the ASME standard and has high Charpy absorbed energy at -20°C , including the 1/2 position.

shows the mechanical properties of the base material of a 1.25Cr-0.5Mo forged steel product (SA-336 Gr.11 Cl.3) with a plate thickness of 279 mm, which is produced by the ingot casting-forging-plate rolling-heat treatment (Q-T) process. This steel amply satisfies the ASME stan chathe ba /

