NIPPON STEEL CORPORATION

NS-Tundish Plasma Heater

Features

The NS Tundish Plasma Heater is a device used in continuous casting machines (equipment for cooling and solidifying molten steel) at steel plants. The device provides the function of generating a plasma arc between the plasma torch and the molten steel, to maintain a constant temperature of the molten steel in the continuous casting machine.

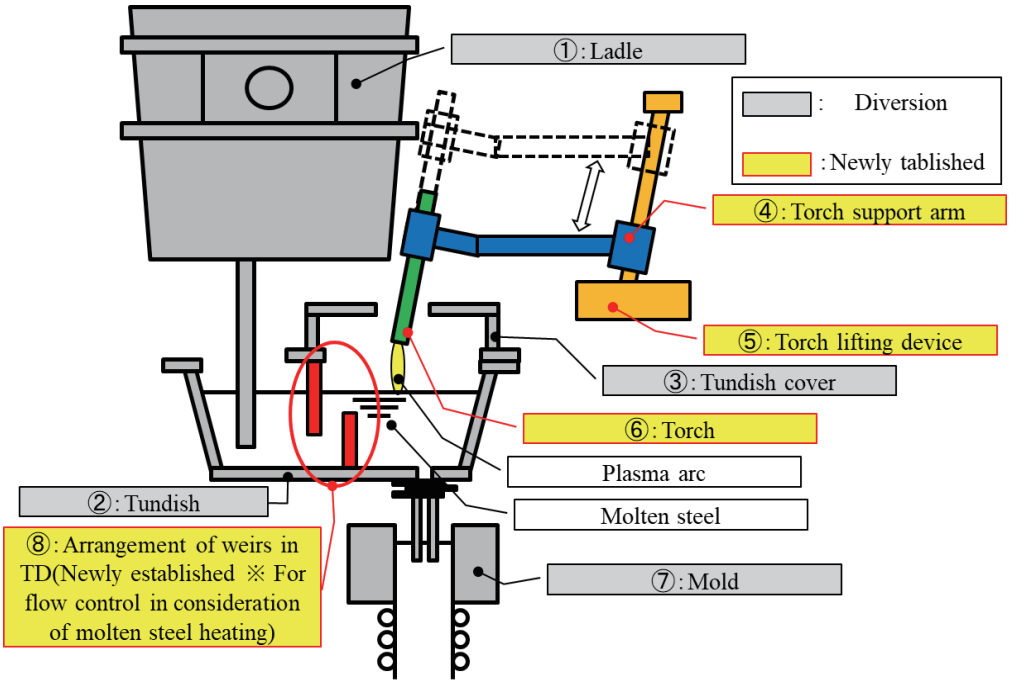
The device has the following features

(1) Lower energy consumption of steelmaking plant
⇒Reduce production cost and CO2 emission
(2) Stabilization of casting quality
(3) Higher productivity
(4) Less casting stop by nozzle clogging

Basic Concept or Summary

The NS Tundish Plasma Heater heats molten steel by generating a plasma arc between a plasma torch inserted from above the tundish and the molten steel inside the tundish.

Additionally, the NS Tundish Plasma Heater can be added to an existing continuous casting machine that is already in operation.



Effects or Remarks

◆ Energy saving effects

• Specific implementation effects are described below:

(1) CO2 emission reduction: 4,800 tons CO2/year at 500,000 tons steel/year
* 9.6 kg CO2/ton steel (at 0.434 tons CO2/MWh)

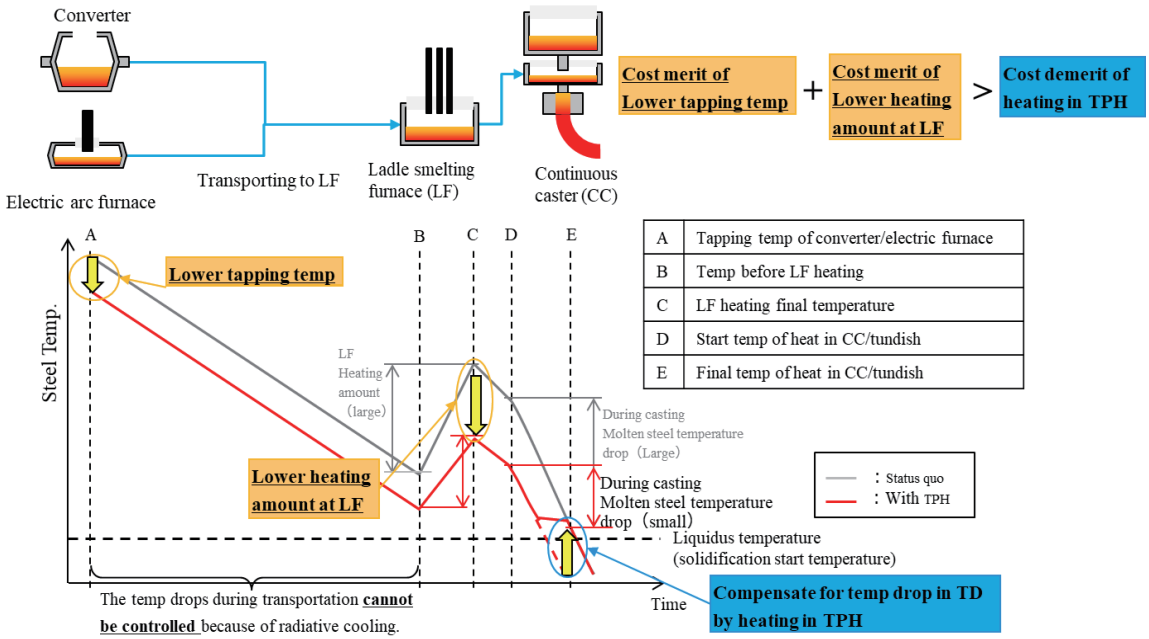
(2) Electric power consumption reduction: 11,000 MWh/year at 500,000 tons steel/year
** 22 kWh/tons steel

• Energy saving effects are described below:

The device provides the function of sustaining, at a constant temperature, the temperature of molten steel in the continuous casting machine, by generating a plasma arc between the plasma torch and the molten steel. This makes it possible to reduce the temperature drop in the continuous casting machine and reduce the tapping temperature from the converter furnace (converter), electric furnace (electric arc furnace) and secondary refining equipment (ladle smelting furnace), which is in the previous processes of the continuous casting machine. This reduces the power consumption of the EAF and LF and reduces CO2 emissions.

Simply lowering the tapping temperature in the previous process would ordinarily result in the temperature of the molten steel dropping below the liquidus temperature (solidification starting temperature) during the final stage of casting, in the continuous casting machine (location E in the graph), which renders production impossible. Production can continue even when the tapping temperature in the previous process is lowered, however, by compensating for the temperature drop in the continuous casting machine with the NS Tundish Plasma Heater.

Furthermore, the NS Tundish Plasma Heater heats about the last half of the molten steel in a production unit. This makes it possible to save energy compared to heating in a converter, electric furnace or LF, which requires heating all the molten steel in a production unit.



Installation in Practice or Schedule

Domestic Domestic: 19 units (as of March 2023)
Nippon Steel Corporation and others

Overseas Overseas: 3 units (as of March 2023)
People's Republic of China/Tianjin Rockcheck Union Steel Group Co., Ltd./No. 3CC
People's Republic of China/Tianjin Rockcheck Union Steel Group Co., Ltd./No. 5CC
People's Republic of China/Qingdao Special Iron and Steel Co., Ltd./No. 3CC

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