Top Combustion Hot Blast Stove

Features

A hot-blast stove is a facility to supply hot air to a blast furnace continuously. In the combustion (heat accumulation) phase, heat energy in hot exhaust gas from a burner is accumulated in checker bricks and, in the ventilation phase, a large quantity of air is blown through the checker bricks to raise the temperature of the air. The hot-blast stove of Nippon Steel & Sumikin Engineering (NSEC) has the following characteristics.

- Achievement of high efficiency combustion
  ⇒ Achievement of high efficiency combustion even in the operation only with blast furnace gas (BFG) (Mono-fuel BFG combustion)
- Achievement of ventilation of hot air
- Heat radiation from the stove body smaller than conventional stoves
  ⇒ It has a smaller radiation surface area than conventional ones because of its smaller size.
- Applicable to blast furnaces with volumes over 5,000 m³
  ⇒ NSEC’s design technology makes it possible to use the hot blast stove with large blast furnaces with volumes over 5,000 m³.
- Low construction costs
  ⇒ Because there are no complex burner bricks or partition walls and only a small volume of bricks, the hot blast stove is inexpensive.
- Short manufacturing cycle
  ⇒ The furnace manufacturing cycle is short since the lack of complex burner bricks means the furnace construction difficulty is low.
- Space saving
  ⇒ No need for a combustion chamber: The improved heat accumulation allows its installation in an area smaller than the area required for installation of the conventional hot-blast stoves.
- Stove service life of 40 years
  ⇒ The hot blast stove makes use of NSEC’s refractory technology with a track record of long service lives.
- Complete elimination of stress corrosion cracking
  ⇒ Stress corrosion cracking (SCC) is completely eliminated with Nippon Steel & Sumitomo Metal Corporation’s SCC-resistant steel and NSEC’s fabrication technology.

Basic Concept or Summary

Figure 1: NSEC furnace top combustion-type hot-blast stove

Figure 2: Concentration distribution of uncombusted CO in the stove

⇒ Reduction in uncombusted CO concentration in the stove with the use of a new burner
The concentration of uncombusted CO above the upper surface of checker bricks is reduced to 1/10 of the concentration in the conventional internal combustion stove during the mono-fuel BFG combustion.

**Effects or Remarks**

- **High combustion performance which reduces the concentration of uncombusted CO in the stove**
  ⇒ Potential for the reduction of energy consumption in a hot-blast stove for a 5,000 m³ blast furnace by 1 - 2 %
- **The concentration of uncombusted CO in the space above the checker bricks can be reduced to approx. 1/10 of the concentration in the conventional internal combustion hot-blast stoves.**
  ⇒ Consumption of energy required for the mono-fuel BFG combustion can be reduced by 2 - 3 %.
- **High heat-transfer efficiency**
  ⇒ The hot-blast stove provides high heat-transfer efficiency because cases flow at a constant velocity along the entire checker brick profile.
- **Reduction in the ratio of reducing materials in a blast furnace with hot air ventilation**
  ⇒ Reduction of 10 kg/ton-pig in the coke ratio by raising the ventilation air temperature in a 5,000 m³ blast furnace by 100 °C
- **The energy loss through heat radiation from the stove body has been reduced by approx. 30 % compared with the conventional hot-blast stoves.**

**Installation in Practice or Schedule**

**Domestic**
- Nippon Steel & Sumitomo Metal Corporation
- Yawata Works (under construction)

**Overseas**

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