Source:JASE-W Japanese Smart Energy Products & Technologies
https://www.jase-w.eccj.or.jp/technologies/index.html

						S4	FEMS
S-16	Keywords	Y3	equipment or facility	Z3	natural gas	D	Construction

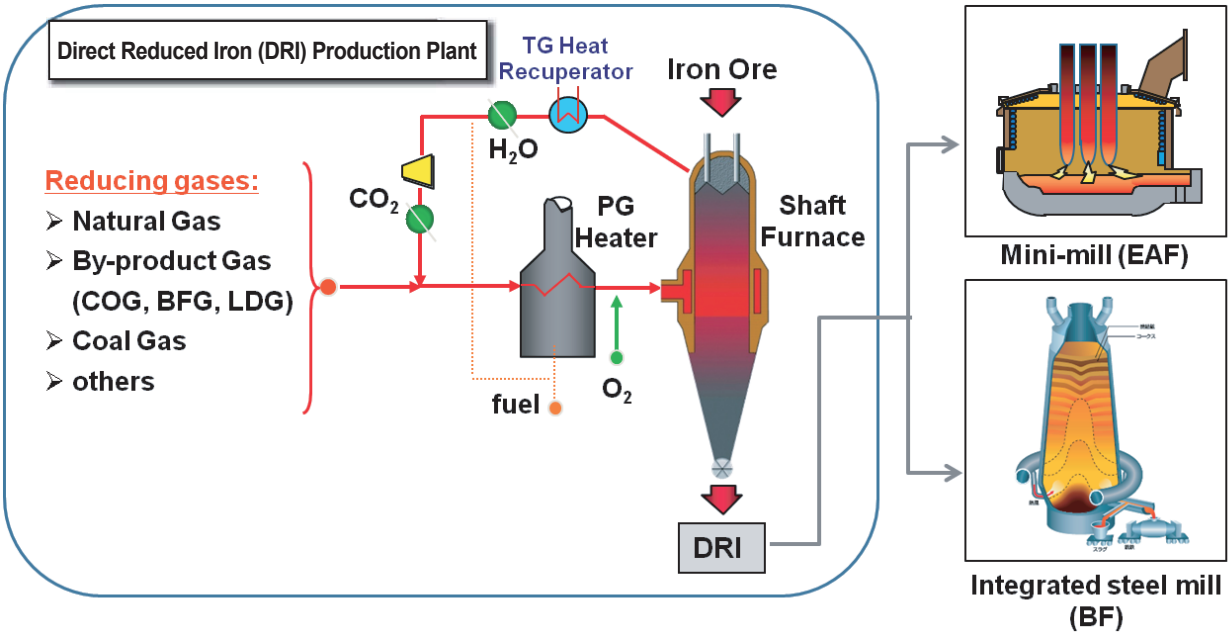
NIPPON STEEL ENGINEERING CO., LTD.

Direct Reduced Iron (DRI) Production Plant

Features

- A direct reduced iron (DRI) production plant is a shaft reduction furnace to produce DRI with large metal iron content by directly reducing iron ore (or iron ore pellets) with reducing gases.
- While the produced DRI is mainly used as the raw material of electric steelmaking, it is also used as blast furnace feed for energy saving (reduction in coke consumption) and increased production of molten iron at integrated blast furnace steelworks.
- A wide variety of gases including by-product gases generated in integrated blast furnace steelworks and coal gas refined in coal gasifiers, as well as widely-used natural gas, may be used as reducing gases.
- NSENGI, Tenova-HYL and Danieli concluded a strategic alliance agreement for the joint development of DRI steel production plant and expansion of the market of DRI in September 2013.

Basic Concept or Summary



Effects or Remarks

1. Energy saving (reduction in consumption of coal in blast furnaces)
   The use of DRI as blast furnace feed enables reduction in coal consumption in blast furnaces.
   (When 100 kg of DRI is used for the production of 1 ton of molten iron, the consumption of coal in blast furnaces will be reduced by 50 - 60 kg.)
2. Reduction in CO_2 emission
   The reduction in the consumption of coal by charging DRI to blast furnaces enables reduction in CO_2 emission from steelworks.
   (When 100 kg of DRI is used for the production of 1 ton of molten iron, CO_2 emission (including that from the DRI production plant) will be reduced by 50 - 100 kg.)
3. Increase in the productivity of blast furnaces
   The productivity of a blast furnace increased with charging DRI with large metallic iron content to it.
   (When 100 kg of DRI is used for the production of 1 ton of molten iron, the production of molten iron increases by 10 - 15 %.)
4. Reduction in the facility renovation cost
   The reduction in coal consumption in blast furnaces enables reduction in the repair cost of coke ovens.
   Reduction in the number and volume of blast furnaces with the increase in the productivity enables reduction in the repair cost of blast furnaces.
5. Improvement of ventilation in blast furnaces
   Charging of DRI to blast furnaces improves the ventilation in them and the improved ventilation leads to stable operation of blast furnaces.
6. Production of High-C DRI
   The use of *in-situ* reforming, or direct use of CH_4 in the reducing gas, enables production of DRI with high carbon content, High-C DRI. It is easy to handle High-C DRI because it is not easily re-oxidized. It also has the advantages mentioned below.
   - High-C DRI is highly reactive as blast furnace feed because the carbon in DRI facilitates reduction of residual FeO.
   - The use of High-C DRI in electric steelmaking reduces the electric power consumption rate as the carbon contained in DRI becomes an energy source.
7. No sulfur content restriction on raw materials and reducing gases
   The use of the in-situ reforming makes the sulfur content restriction irrelevant and makes it possible to use a wide variety of raw materials and reducing gases.

Installation in Practice or Schedule

Domestic

Overseas

<Plants for electric steelmaking (orders received in recent years)>
- Welspun Maxsteel (India)
- Emirate steel, Gulf sponge iron (UAE)
- Suez Steel (Egypt)
- Nucor (USA)
- JSPL (India), etc.

<Plants for blast furnace mills>
- A feasibility study in progress at a blast furnace mill overseas

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