Method and Apparatus of Auxiliary Fuel Injection in a Blast Furnace to Reduce Specific Rate

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INSTITUTE OF INTELLECTUAL PROPERTY RESEARCH & DEVELOPMENT
INTRODUCTION:

- Method and apparatus for reformed coal injection in a blast furnace
- Method uses clean producer gas as gaseous reductant
- Method and apparatus uses non-coking coal, which is abundantly available in India for gasification (having high Ash content)
- Method produces direct reduced iron without using carrier gas
- The method is simple, economical, environment friendly and efficient
- Method and apparatus is suitable for small scale and medium scale production with less budget
Technology is backed by 3 Indian patent applications:

EXISTING METHODS:

- Existing method uses coke and powdered coking coal along with natural carrier gas as reductant, which when heated in a blast furnace along iron ore produces reduced iron.

- Existing method needs coking coal, which is to be imported, as coking coal of good quality is not available in India.

- Existing method also needs importing of natural carrier gas, which is not widely available in India.

- The method is costly, causes pollution and needs huge investment.

- Very difficult to adopt for the small scale manufacturers.
The proposed technology allows the manufacturer to produce direct reduced iron by injection of heated producer gas from coal gasification plant.

The present process uses coal gasification process to convert solid non-coking coal to produce producer gas in gas producer battery.

No requirement of carrier gases like Nitrogen.

Use of relatively high temperature as compared to conventional process.

Recycled CO is used to heat the producer gas before blasting into the blast furnace.

Low consumption of coke and increased furnace productivity.

Use of high ash content non-coking coal which found abundantly in India.

Suitable for small scale blast furnace.
How It Works:

• Solid non coking coal with 40% - 45% (Ash + Moisture) is burnt in fixed gasifier battery to produce raw producer gas

• Tar content is removed from the raw producer gas in electrical tar precipitator

• Sulphur and carbon dioxide content is removed from the raw producer gas in sulphur and carbon dioxide removal station

• Moisture is removed from the raw producer gas to produce clear producer gas in moisture removal station

• Freshly produced clear producer gas is boosted to attain high temperature and high pressure using pre booster boosting station
• Mixture of Iron ore and coke is introduced into the furnace.

• Hot produced gas then injected through tuyeres into the iso-thermal zone at lower shaft region of furnace.

• After certain time interval, direct reduced iron is removed from the bottom of the furnace and cooled.

• Residual gases generated during chemical reaction in the furnace are removed and filtered to minimize pollution.

• CO obtained in the chemical reaction is recycled to pre boost clear producer gas before blasting in the furnace.
Flow Diagram of Auxiliary fuel Injection
The process is used to produce direct reduced iron by coal gasification method using solid non coking coal and gaseous reductant.

The process is simple, efficient, environment friendly and cost effective.

The process uses non coking coal, which is low grade, cheap and abundantly available in India.

The process avoids use of natural carrier gas and thereby reduces manufacturing cost.

The process allows small scale and medium scale investors to manufacture iron with good quality and less impurities.
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