

APPLICATION REPORT



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Pneumatic Conveying system for Pulverised Coal Injection into Blast Furnaces

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Clyde Process, now part of the Schenck Process Group, has a long history of developing coal injection systems into blast furnace tuyeres having worked with British Steel (now TATA) since the early 1980's. Clyde Process was one of the originators of pneumatic conveying systems to use coal for injection that have now been employed worldwide from small mini blast furnaces through to the world's largest furnace at Shagang in China.

The PCI system is based on pulverised coal being fed to the individual tuyeres of the blast furnace in combination with the air blast for combustion in the furnace race way. **The advantages of this system are:**

- Reduces the coke burden required
- Reduces the total cost of production as coal is more economical
- More environmentally friendly to use than coke.

As a result pulverised coal injection (PSI) is now an industry norm.

Clyde Process has developed PCI systems that can perform to the following parameters:

- Feed from 150 to 360Kg of coal per Tonnes of Hot Metal depending on the process
- Result coal can be continuously dosed into the furnaces at smooth, pulseless and easily controlled rates of upto 80 tph
- Guaranteed weight accuracies of 1% from the set point with better accuracies being achieved on specific projects.

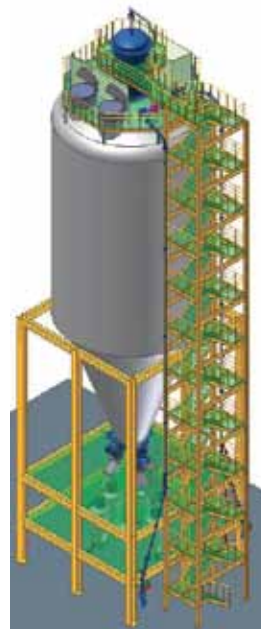
To achieve this high degree of accuracy Clyde Process has developed their RotoFeed system. The system delivers instantaneous real time accuracy measured per minute rather than per hour, as usually found in competitors solutions. This improved accuracy and constancy ensures that the Clyde Process solution is able to deliver exactly what the blast furnace process needs in order to give a higher rate of coke replacement than with comparable alternative systems. A high level of accuracy is very important in small furnaces where inaccuracy easily unbalances the furnace and in large furnaces where inaccuracy in the fuel feeding leads to wastage of material.

The Clyde Process PCI system has the advantages of:

- Being highly reliable and proven design with very low downtime

- Easily planned maintenance within the main furnace program
- Incorporates the Clyde Process Dome Valve® that is widely recognised as one of the most reliable valves in the world
- The flow of material to the blast furnace is delivered at low velocity which allows small pipework to be used so reducing the wear in the delivery pipework
- The Clyde Process system can be easily configured to convey with either nitrogen and/or air as required by the overall risk assessment of the production plant.

An example of a recent installations of the Clyde Process PCI system has included three mini blast furnaces at Pont a Mousson in France. Saint Gobain, the owners of Pont a Mousson, chose Clyde Process to provide their PCI solution for the production of ductile iron pipe using three small blast furnaces. Clyde Process supplied the complete turnkey for the system including the main pulverised coal 500 tonne capacity silo and three injection systems.



Diagrams of the Silo and Rotofeeders



Photo of the completed installation



Photo of the tandem Rotofeeder under the silo

Each blast furnace has a pair of dispensing vessels in a tandem configuration each fitted with Clyde Process RotoFeeder delivering up to 10tph of pulverised coal over a distance of 100 to 130m to Static Flow Splitters and then via local supply pipework over 25m to the 10 furnace tuyeres capable of achieving a rate of 150kg/THM. The system has been operational since late 2010 and the client is very pleased with the performance and efficiency of the system.

Pulverised coal is discharged from the dispensing vessel into the injection pipeline at a controlled rate via a vertical axis volumetric rotary feeder. The feeder speed, and hence coal injection rate, is regulated by a variable frequency drive deriving signals from the central logic control panel.

Load cells on the dispensing vessel provide an indication of contents weight and this is used on a loss-in-weight basis by the control system to enable an injection rate accuracy of up to $\pm 1\%$ of the operator set-point.

This project demonstrate that pulverised coal injection (PCI) is suitable for all sizes of blast furnace and that the Clyde Process solutions use market leading technologies that bring significant and long lasting advantages to the client. The projects also demonstrate a close working relationship that is formed between the client and Clyde Process' technical teams to achieve the client's goals and expectations.



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