

Energy Efficient Injection Technologies for **Coal to Liquid** Production Processes



In today's economic and environmental climate, the need to source alternative methods of creating fuels has never been sharper. Oil remains one of the most sought-after commodities on the planet, which is used to power the various means of transportation that we take for granted.

However, the price of oil, which recently exceeded US\$100 a barrel, together with increasing demand and political uncertainty in the most oil-rich economies has culminated in producers seeking alternative methods of producing fuels.

One such method which has gathered momentum is the coal to liquids process, which effectively treats coal using various chemical processes and converts it into a liquid. This method of creating oil from coal was pioneered in the early part of the 20th century but as the factors highlighted above become more severe the need to tap into the world's coal reserves becomes apparent.

Conversion of coal to a liquid fuel is known as Liquefaction. Coal Liquefaction breaks the coal down into a solvent at an elevated temperature and pressure, followed by an interaction with hydrogen gas and a catalyst to produce liquid hydrocarbons. Most liquefaction processes require gasification of the coal to produce synthetic gas ("Syngas"), and then making synthetic fuels. This method produces environmentally compatible zero-sulphur liquid fuels that are inherently cleaner than traditional forms of production.

Clyde Materials Handling has, over the past three decades, developed a range of pneumatic conveying and pneumatic injection solutions that have been deployed in various process technologies. These pneumatic conveying and injection technologies have been utilized to help producers reliably, accurately and efficiently handle the raw materials required to produce commodities. For example, Clyde Materials Handling

has installed a range of coal injection systems that inject, at high velocity and at high accuracy, coal into the heart of a steel blast furnace. This technology has been further adapted to inject ore into non-ferrous metal production processes.

We, at Clyde Materials Handling, understand the importance of reducing energy per tonne of production, reducing carbon emissions, reducing non-renewable material consumption and re-using waste materials into process and are committed, as an organisation, to helping our customers in the process industry create solutions that tackle these objectives.

Transforming Processes

Clyde Materials Handling is an established customer-driven solutions provider, which utilizes its knowledge, expertise and technologies to transform the production processes of its customers who operate within the process industry.

Clyde Materials Handling has helped its global customer base transform the way in which they operate their processes, which has enabled them to generate sustainable economic benefits and maintain their positions as leaders in their market.

Clyde Materials Handling's pneumatic conveying solutions have been able to transport various materials in an unrestricted, controlled and continuous manner at low velocity, consuming low volumes of compressed air.

Clyde's pneumatic injection solutions have been used to inject an array of materials such as iron ore, granular coal, pulverized coal, carbon, dust, charcoal, lime, plastics and recycled scraps into a range of production processes. It is vitally important to the performance of a process that a consistent, stable and smooth feed of material is accomplished so that processes can be stabilized allowing superior levels of production returns to be attained.

Producers are striving to accomplish higher returns from incumbent equipment and to utilize the process to its highest



level of production. To do this, many have found that exemplary injection accuracy and a stable, pulseless feed allows much higher material injection rates. Clyde is unique in its ability to provide injection rates of over 150tph and an injection accuracy of $\pm 0.5\%$ on short time frames, which eliminate furnace surging and inefficiency.

All of Clyde Materials Handling's conveying and injection solutions are enhanced through the use of the Clyde Dome Valve, widely regarded as the best material handling valve in the world. The Clyde Dome Valve has the ability to cut through static or moving columns of material through the use of its innovative inflatable seal mechanism, ensuring that a consistent pressure tight seal is created when the valve is in the closed position, but in the open position, it provides an unrestricted full bore opening for the best product flow possible.

Clyde has developed a range of coal injection and transport system and to date, in the iron & steel industry alone, has installed these solutions on 38 plants. These solutions have the ability to:

- Inject a coal/sorbent mix into a Pressurized Fluid Bed Combustor (PFBC), operating at 11.5 barg
- Inject granular coal into a blast furnace- this injection solution was pioneered by Clyde with Corus over two decades ago
- Inject pulverized coal into a blast furnace
- Inject carbon and lime into Electric Arc Furnaces (EAF)
- Convey and inject metallurgical dusts into process
- Convey lime over long distances – we have conveyed this material over 1000 metres
- Convey and inject carbon used within mini blast furnaces, which produce pig iron
- Inject plastics and scrap materials used as alternative 'fuels' in the production of steel

Clyde Materials Handling Solutions are designed to use minimal energy, have low wear on system components and pipelines. Clyde's solutions offer reduced maintenance costs and high system availability, reliability and production stability compared to current processes used in the industry.

No Limits. Infinite Possibilities

By placing the customer at the heart of their business, Clyde Materials Handling has developed a global, extensive and diverse set of references, who have become lifetime customers. They continually seek Clyde's guidance in areas of process improvement and material handling.

Clyde Materials Handling takes pride in the return on investment it has generated for its customers, which include:

- Significant increases in productivity
- Environmental sustainability
- High system availability, reliability and performance
- Low operating costs and maintenance
- Greater process control

- Cost savings through process efficiencies
- Flexibility to integrate with existing and emerging technologies

More specifically, Clyde Materials Handling has generated the following, typical returns for organisations who operate in the process industry:

- 99% system availability levels achieved
- High total injection accuracy – better than 1%, which has resulted in hundreds of tonnes of raw material saved in the production process
- High accuracy across injection points – better than $\pm 0.5\%$
- Superior flow control and measurement
- Reductions in power consumption, leading to subsequent savings in energy costs
- Significantly increased production rates
- Capability to handle a wide range of materials, without blocking the conveying line

Clyde Materials Handling is driven by an energy and passion which enables them to make the impossible happen – there are no limits to their capabilities. Together, with their customers, the possibilities are infinite.



Clyde Materials Handling Limited
Carolina Court, Lakeside
Doncaster DN4 5RA

Tel: +44 (0) 1302 321 313
Fax: +44 (0) 1302 554 400

solutions@clydematerials.co.uk



► www.clydematerials.com