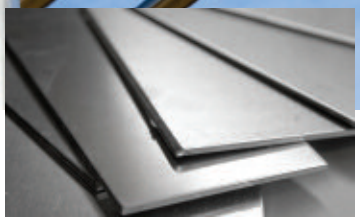
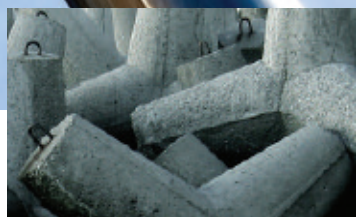
Clyde Materials Handling

TRANSFORMING PROCESSES ► NO LIMITS ► INFINITE POSSIBILITIES

Transforming Processes
No Limits
Infinite Possibilities



Clyde Materials Handling is an established, global, customer-driven solutions provider, which utilises its knowledge, expertise and technologies to transform the production processes of its customers, who operate predominately in the metals and minerals markets.

With over 30 years experience in the process improvement industry, Clyde Materials Handling has helped their global and diverse customer base transform the way in which they operate their processes, which has enabled them to generate sustainable economic benefit and maintain their positions as leaders in their respective markets.

Clyde works closely with its customers to understand their exact requirements and then utilises its innovative pneumatic conveying, pneumatic injection and dome valve technologies, together with their extensive knowledge of industrial processes, to create pioneering solutions, which solve problems and generate value.

Clyde has developed an array of solutions that have the capability to pneumatically convey or inject materials used within modern production processes for the iron and steel, non-ferrous metals, gypsum and cement markets. Clyde solutions have been created to:

- Convey and inject copper concentrate into bath smelting and other pyrometallurgical processes such as a Codelco CT Converter, Noranda Converter, Pierce Smith Converter, Mitsubishi Process, TSL Smelter and Flash Furnace
- Inject granular or pulverised coal directly into a blast furnace
- Transport synthetic gypsum (DSG), scrap and mineral used in the production of wallboard
- Manage the movement of traditional and alternative raw materials, which are required in the cement production process

Clyde's purpose is to continually invent solutions that solve the evolving needs of their customers, delighting them in the service they provide, and the value they create.

Clyde Materials Handling is proud of 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

With offices based in the UK, USA, Brazil and China and joint ventures operating from South Africa, India and Singapore, Clyde Materials Handling has a global infrastructure capable of delivering solutions on a supply only or turnkey basis, utilising local supply chains and ensuring that Clyde remains competitive and easily accessible to customers irrespective of their location in the world.

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

Market-Driven >
Analysis. Innovation. Results.

Clyde Materials Handling continually analyses its key markets so that it is constantly made aware of the dynamics and drivers that may impact on the way in which its customers operate their production processes.

During its lifetime, Clyde Materials Handling has generated a vast repository of knowledge across the metals and minerals markets. Industry specialists from the iron and steel, non-ferrous metals, gypsum and cement markets have added to Clyde's pool of process expertise and are ideally positioned to support their customers in these industries.

Clyde Materials Handling recognises that the markets in which they operate, and the customers they serve, are the fuel to their Research and Development programmes. It is by adopting this approach – listening to customers and the way in which their markets are transforming – that Clyde can create new, innovative and exciting solutions.

The hub of invention at Clyde is located within its Research, Development and Testing facility, located in the UK. It is within this facility that many of Clyde's market-driven solutions have been created.

Clyde Materials Handling has developed an array of solutions within the metals and minerals markets. Examples of some of the applications developed for these industries include:

Iron & Steel

- Pioneers of Granular Coal Injection with Corus over two decades ago
- Injection of carbon and lime into Electric Arc Furnaces (EAF)
- Long distance conveying of lime
- Carbon conveying and injection within mini blast furnaces, producing pig iron
- Injection of raw materials used in alternative iron making processes, such as HIsmelt®, COREX® and FINEX®

Non-Ferrous Metals

- Convey and inject metal concentrates, ores, mattes, white metal, silica, coal, dusts, reverts, other additives, alumina, fluorides, cryolite and recycled scraps including aluminium process arisings and electronic materials – the key materials used in the production of non-ferrous metals
- Provide solutions for copper, nickel, zinc, tin, lead, aluminium, and platinum producers
- Provide solutions, regardless of process employed, including Flash, TSL, Mitsubishi, Teniente or Noranda converters, Anode furnaces, aluminium pot lines, carbon houses
- Submerged stable pulseless lance injection for bath processes
- Stable and pulseless burner feed for flash type processes
- Stable and pulseless tuyere injection to fumers
- Stable and pulseless tuyere injection to Pierce Smith and Anode Furnaces
- Transport an array of aluminium refining materials

Gypsum

- Conveying of mined gypsum and stucco used in the production of wallboard and plaster
- Efficient conveying of scrap material, which is re-introduced to the wallboard manufacturing process
- Reliable and innovative conveying of synthetic gypsum (DSG) used in the production of wallboard and plaster

Cement

- Convey cement, limestone, pulverised fly ash and raw meal – materials used in cement manufacture over short, medium and long distances
- Replace screw pump systems with low energy pneumatic solutions
- Convey ESP, filter, clinker and kiln bypass dusts
- Implement ship loading, truck/train loading and unloading systems
- Inject pulverised fly ash into a cement kiln
- Inject sodium bicarbonate, developed to help remove chloride emissions
- Inject pulverised coal into a cement kiln

Clyde's solutions have been designed to help protect the environment in which their customers operate their production processes. By managing the movement of materials in an enclosed pipeline, the risk of material spillage and wastage is negated, as well as significantly reducing the possibility of emitting dusts from these systems.

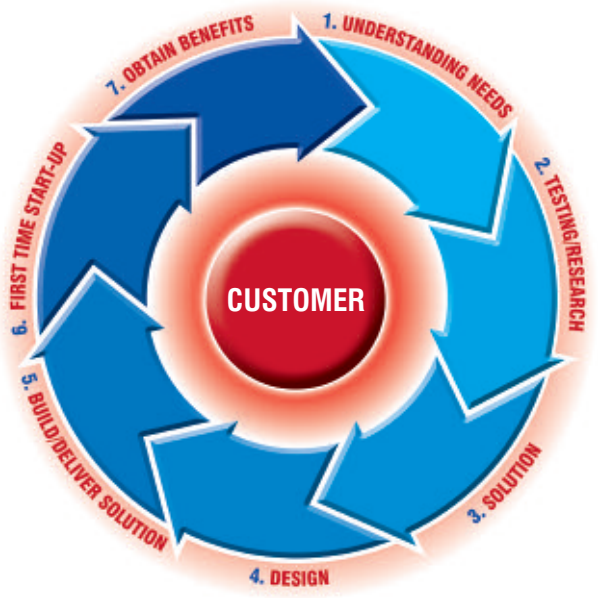
The materials that Clyde has injected into process have also been able to help reduce emission levels and have used, more efficiently, the raw materials required to manufacture products in the metals and minerals markets.

Clyde Materials Handling has clearly demonstrated over time, that through continual analysis and communication, innovative solutions to critical issues can be created to help their customers.




Customer-Focused > 7 Steps to Success

At Clyde Materials Handling, the customer is at heart of everything it seeks to achieve. Clyde strives to follow a customer-centric seven step process and believes that this rigorous approach enables them to develop low risk solutions, which generate rapid returns.



Understanding Needs

At this first point of contact, Clyde Materials Handling seeks to understand the issues and problems the customer is currently facing, how these issues are affecting the performance of their operations and, at the same time, trying to identify what the customer believes is required to alleviate these problems.

Testing / Research

The Clyde Research, Development and Testing facility plays an integral role in the formation of a solution. When Clyde ascertains what type of a material the customer requires to be handled, it can call upon a material characterisation database that contains thousands of records, so that the system can quickly cross-reference previously handled materials and instantaneously identify a pneumatic conveying or injection solution which has been used to handle material with the same characteristics.

If the material has never been tested before, Clyde conducts a series of simple tests to measure the bulk density, particle size, particle shape and fluidity of the material. The Clyde Research, Development and Testing Facility is equipped with an infrastructure to replicate exact conveying on-site environments. This process concludes with Clyde Materials Handling recommending a tested, proven solution which can handle the customers' material.

Solution

During this stage, Clyde Materials Handling discusses the testing and research analysis and outcomes with the customer, where requirements are explored in greater detail. From this, Clyde submits a formal proposal to the customers' exact needs.

Design

Clyde discusses the proposal in greater detail with the customer, in terms of investment figures, delivery date, project timescales and deadlines before agreeing and proceeding with the order for a Clyde solution.

Build / Deliver Solution

No matter where an organisation is located in the world, Clyde Materials Handling has a global network in place to engineer, project manage and deliver a solution. Where preferred by a customer, Clyde can undertake the management of complete solutions with principal contractor responsibility, from concept to completion and with control disciplines built in at all key stages.

First Time Start-Up

Clyde Materials Handling has a team of commissioning engineers who work with project teams on-site to install systems. Through the implementation of the customer-focused approach, Clyde guarantees rapid start-up, which enables the customer to realise maximum productivity, with minimal disruption.

Obtain Benefits

Clyde Materials Handling endeavours to develop solutions that work at the first time of asking. Clyde's customer-focused approach ensures that customer requirements are understood and explored in great depth. Materials and proposed solutions are tested extensively, so that Clyde can assure the first time, successful and value added implementation and start-up of a conveying or injection system.

Clyde Technologies > Innovation Delivered

Clyde Materials Handling is a leading provider of pneumatic conveying, pneumatic injection and dome valve technologies.

Pneumatic Conveying

Pneumatic conveying is, generally, the most efficient and effective method of transporting granular and bulk solid materials to storage, or to process within a production environment. There are three forms of pneumatic conveying that Clyde has expertise within, namely, Dense Phase, Medium Phase and Lean Phase.

Dense Phase Pneumatic Conveying

Dense Phase solutions are suitable for transporting difficult, abrasive or friable materials. This method of conveying pushes material along a pipeline in a plug flow at relatively low velocity (2-8 metres per second). This mode of conveying results in minimal wear on pipelines and bends, promoting minimum maintenance and long life on system components. Efficient use of compressed air also generates low power consumption and reduced operating costs.

Medium Phase Pneumatic Conveying

Medium Phase solutions have the capability to convey a wider range of materials with variable particle sizes using lower positive air pressures. This form of conveying is ideal for continuous, accurate conveying or for injecting controlled amounts of material directly into a process.

Lean Phase Pneumatic Conveying

Lean Phase solutions use either vacuum or positive air pressure and are low cost, quick and simple to install and dismantle. This form of conveying has the capacity to move materials at high velocities (15-30 metres per second) and is used predominately within the food and pharmaceutical sectors.

Vacuum Solutions

Vacuum Conveying solutions are used in a multitude of industries and applications. Forming vital links across total manufacturing processes, efficiency of operation and quality of design are of vital importance. Clyde Materials Handling provides modular Vacuum Conveying system with a wide range of optional components.

Clyde Materials Handling also offers a range of mobile and centralised vacuum cleaning systems, which operate in a similar means to pneumatic conveying. These systems allow operators to draw in spillages or waste at various locations, and convey the material, via pipelines, to a central location for recycling or disposal.

Dome Valve

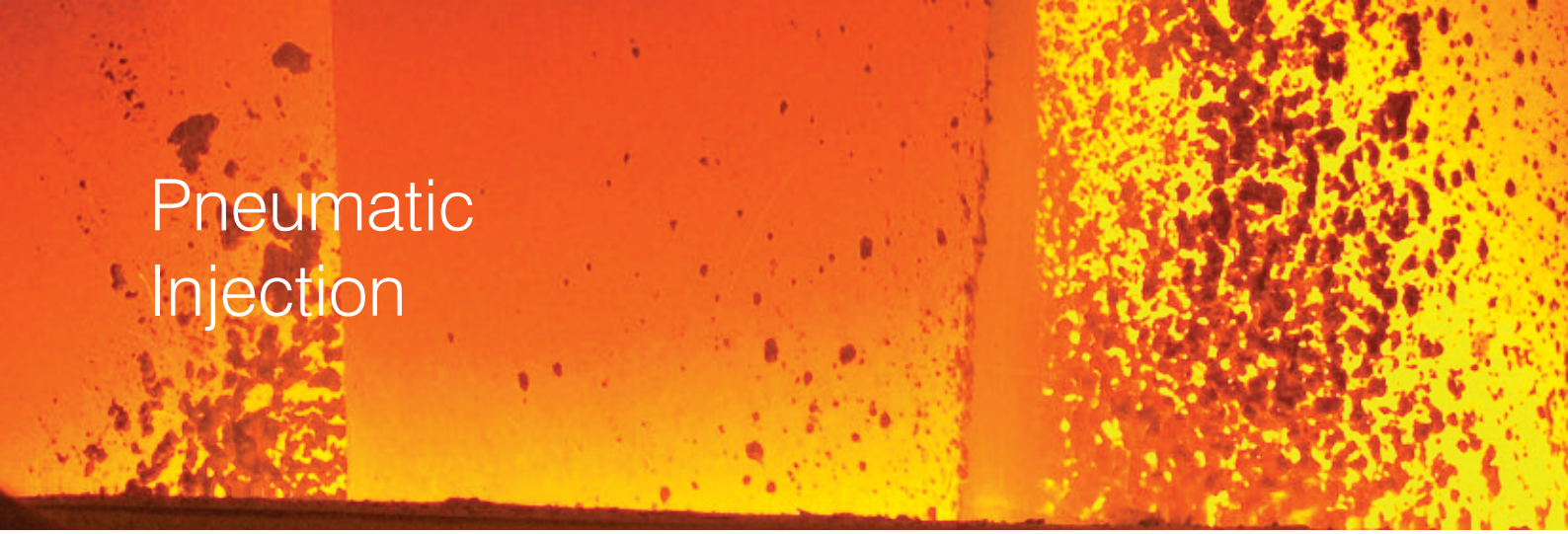
Clyde Materials Handling's solutions are supported and enhanced through the use of the Clyde Dome Valve, widely regarded as the best material handling valve in the world.

The Dome Valve was developed and built by Clyde over 30 years ago and continues to be an integral part of their pneumatic solutions. The 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 characteristics possible.

The Clyde Dome Valve is recognised as a low maintenance, long life solution that can last at least 1 million cycles between maintenance inspections. The Clyde Dome Valve is used to control material flow, airflow and vessel pressures in both conveying and injection solutions.

The Clyde Dome Valve's core features include:

- Full bore material flow
- Only a quarter turn from fully closed to fully open
- Can cut through a column of static material
- Handles with materials up to 480°C
- Sealing pressures up to 30 barg
- Handles abrasive products with ease
- No moving wear parts
- Long intervals between maintenance visits



Pneumatic Injection

Clyde Materials Handling's pneumatic injection solutions have been used to inject an array of materials such as coal, copper concentrate, lime and pulverised fly ash, into the heart of production processes. This has been accomplished through Clyde's innovative pneumatic injection technologies.

Producers across the metals and minerals markets are striving to accomplish high material injection rates and exemplary injection accuracy – Clyde is unique in its ability to provide injection rates of over 150tph and an injection accuracy of +-1%.

It is vitally important to the performance of a process that a consistent and smooth feed of material is accomplished so that superior levels of production can be attained.

Clyde's Rotofeed solution comprises of a dispensing vessel, volumetric feeder and valves to control the air supply, material flow and vessel pressures. A gearbox and an electric motor drives the volumetric feeder. Adjusting the speed of the motor can control the rate of material injected by the volumetric feeder, which is designed for high pressure to help manage abrasive materials.

The dispensing vessel is used to provide a constant supply of material to the volumetric feeder. A locking vessel is also used to periodically replenish the dispensing vessel with material, ensuring the injection of material into process is continuous and that the performance does not oscillate.

Clyde's Rotofeed has been used to:

- Inject copper concentrate into bath smelters / converters / furnaces
- Inject pulverised or granular coal into blast furnaces
- Inject carbon and lime into EAF's
- Inject pulverised fly ash into a cement kiln

As well as developing the Rotofeed solution, Clyde Materials Handling has also developed an injection solution which can be used to transport very abrasive, coarse granular and lump materials. This solution is called the Rotoscrew.

The Rotoscrew is based on the premise of the Rotofeed but it makes use of a feeder screw, which drives material through a pipeline and into process. The Rotoscrew has been used to inject materials such as granular limestone, iron ore, millscale, electronic scrap and singles coal. The benefits achieved from the Rotofeed can also be generated with the Rotoscrew for more abrasive materials.

Clyde Solutions > Generating Rapid Returns

Clyde Materials Handling has an exemplary record of working with the world's leading producers across the metals and minerals markets. These organisations have utilised Clyde's knowledge, expertise and pneumatic technologies to enhance and improve the way in which they operate their production processes.

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 has generated the following, typical returns across each of his key markets:

Iron & Steel

- 99% system availability levels achieved
- Superior flow control and measurement
- High injection accuracy rates accomplished – hundreds of tonnes of coal saved in the production process
- Reductions in power consumption, leading to subsequent savings in energy costs
- Significantly increased production rates

Non-Ferrous Metals

- 50% increase in bath smelter handling capacity per day by offering process stability
- Improved efficiency of smelting process – generating millions of dollars in additional revenue
- 3% increase in overall bath smelter system availability
- 6% increase in injection system availability on bath smelters
- Dramatic reduction in system downtime - 15 days of additional production generated

Gypsum

- 100% system availability levels attained
- 99.8% system reliability levels achieved
- Significant reductions in power consumption and air usage
- Reduced operating costs
- Reduced maintenance expenditure

Cement

- Reduction of power consumption by 1KW per tonne, per hour
- Significant reduction in maintenance costs
- 75% reduction on the total cost of ownership
- 200% improvement in system reliability
- Reduction in air usage

The solutions that Clyde Materials Handling develops and implements across the iron and steel, non-ferrous metals, gypsum and cement markets have been created to protect both internal and external plant environments. Clyde is resolute in their goal to continually design sustainable solutions for the environment.

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

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

E-mail: solutions@clydematerials.co.uk
Website: www.clydematerials.com

Clyde Materials Handling Inc
501 TechneCenter Dr.
Unit A, Milford
OH 45150
USA

Tel: +1 513 576 9200
Fax: +1 513 576 9300

E-mail: gcooper@clydematerials.com

Clyde Materials Handling Sistemas Do Brasil
Rua Akides Ricardini Neves
12 c.j. 410
Sao Paulo – SP
CEP 04575-050
Brasil

Tel: +55 11 5505 6244
Fax: +55 11 5505 8073

E-mail: danderson@clydematerials.com.br

Clyde Materials Handling Technology (Beijing)
Rm 909, Building 15, China Central Place
89 Jianguo Road, Chaoyang District
Beijing 100025
China

Tel: +86 10 5165 5971 10
Fax: +86 10 6530 5705

E-mail: barryc@clydematerials.com.cn

Clyde Materials Handling Africa
4 Industrial Road
Kyasands 2063
Gautang
PO BOX 1537
South Africa

Tel: +27 11 704 0580
Fax: +27 11 704 0597

E-mail: sales@cbz.co.za

www.**clydematerials**.com