Clyde Process Provide Solution for Copper Smelter Upgrade

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Clyde Process has been commissioned to upgrade the feed and transport systems of the Codelco Chuquicamata Smelter in Chile. Codelco are the world’s largest copper company, owning and running integrated mines, smelters and refineries in Chile.

Clyde Process has been delivering market leading pneumatic conveying and injection technology based systems to Codelco since 2002. The first system to be installed was for metallurgical dust disposal with a pneumatic conveyor system taking 10 tph of dust over 650m to a storage location for disposal. The system impressed Codelco with its efficiency and performance that they implemented Clyde Process conveying solutions across their sites at Chuquicamata and El Teniente in Chile.

For example together with Codelco, Clyde Process and HRI SA has developed new methods to deliver copper concentrate into molten metal baths below the metal line and this has resulted in a 100% increase of the production rate in the Teniente Converter.

Over the last few years Codelco has been faced with opening of new copper mines that has ore heavily tainted with arsenic. Codelco has carried out extensive development work resulting in a series of new processes which allow them to exploit this material freeing up clean material for direct export to toll smelters. One of the processes removes arsenic and some sulphur reducing the fuel value. The low fuel value material now has to be mixed with standard copper concentrate and fluxes before delivering to the smelting furnaces to ensure the correct temperatures are achieved. The material that has a density of over 2000 kg/m³ and has a Granulometry 100% < 80 microns and is very abrasive and difficult to convey.

To handle this material Clyde Process are providing a new transport system to convey calcine from the Roster to dispatch storage silos, a new transport system to convey calcine from Storage silos to CT and Flash Furnace day bins, a Blending system for the Flash Furnace Feed Mix and an injection system to blend in calcine with copper concentrate into the CT.

For the transport system Clyde Process has created a system of pumps and valves to be able to pneumatically handle the calcined material from the reactor vessel and convey it to the dispatch storage silos ready for road transport to the smelter. Transport from the delivery point at the Smelter to the day bins ready for injection.

The dispatch system is designed to handle 100 tph of material over a distance of 185m including a 45m vertical lift to the six dispatch silos. This is achieved with three Clyde Process PD pumps.

The reception conveying system to the two Day Bins utilises four Clyde PD Pumps delivering over 500m to the Codelco Teniente Reactor and 600m to the Outotec Flash Furnace. These systems both have a 50m vertical lift.

Aerial View of Pneumatic Conveying System
The Blending system to the Flash Furnace day bin uses a pair of tandem RotoFeed Units (2 working/2 standby) for feeding the concentrates, three Rotofeed Units (2 working/1 standby) for feeding the calcine and two continuous RotoScrew Units (1 working/1 standby) for feeding the silica. The concentrate and silica are mixed in line at ground level and the calcine is added into the lines part way up the building to the day bin. The resulting material will be delivered to the main Flash Furnace feed hopper a blend with an accuracy and a homogeneity of ±1%.

Below the new calcine silos for the CT, three Rotofeed Units (2 working/1 standby) will be provided for feeding the calcine into the existing concentrate line to the CT. The system capacity is 180tph of standard concentrate, up to 100tph of calcined concentrate and upto 10tph of the flux which is Silica, over 110m distance including a 39m vertical lift.

This project demonstrates the confidence that the client has with Clyde Process systems and the close working relationship that has developed between them over a long period of time.

The partners have worked together to bring a state of the art solution to the problem of handling a new and potentially difficult material and has provided an innovative system with low implementation and running costs.