TORBED* Process Reactor Technology
Application Description

Industrial and Commercial Mineral & Chemical Processing

The ability of the TORBED reactors to carry out precise calcination and heat/mass transfer processes has allowed the development of unique process plants. The first mineral processing application was the **exfoliation of vermiculite.**

Vermiculite is a naturally occurring mineral. When crushed, graded and fed into a hot furnace (1,200ºC or 2,200°F), the vermiculite expands or exfoliates to produce a lightweight particle that is then used as an insulating and fire retardant fill. The process requires a very rapid heat transfer to the particles to promote as large an increase in particle size as possible to give low densities. Historically, vertical shaft and rotary kilns have been used to exfoliate vermiculite.

The TORBED reactor has shown itself to have unique capabilities in this application in producing higher quality, lighter and more consistent product with lower energy consumption. High heat and mass transfer and precision of control with the TORBED reactors have provided these advantages. Most important, the TORBED process provides more saleable product per unit of raw material fed i.e., a higher yield.

The TORBED process is in successful operation in 11 major production plants in Europe and Japan. Throughputs vary according to raw material grading but typically range from 1-5 tonnes per hour. The UK Department of the Environment Energy Efficiency Office, Best Practice Programme, published their Case Study 216 describing the use of the TORBED Reactor for this application with several significant benefits identified.

A 1m diameter high temperature “fuel injected” TORBED reactor was commissioned in 1998 to **calcine industrial minerals at temperatures up to 1,600°C**. The use of direct injection techniques whereby natural gas is mixed and combusted directly in the process chamber base allows intense high temperature calcination reactions to be undertaken.

High Temperature Mineral Calciner

The ability of TORBED reactors to carry out flash processing of fine powders with particle retention times of often less than 50 milliseconds has led to the development of novel products and processes. This ability was developed at pilot scale (up to 300 kg/h) and a 1.5m diameter TORBED Reactor was successfully commissioned in 1999 for the flash processing of sub 5 micron ore. This reactor uses the same direct gas injection technique described above.

Flash Processor for Fine Ore

Multiple dense phase conveying injectors are used to distribute the raw material feed around and into the TORBED Reactor process chamber. The finished product is carried out of the TORBED Reactor in the exhaust gas stream and collected in a bag house after gas and solid cooling.

The ability to heat the fine particulate feed from ambient to more than 1,000ºC in milliseconds provides a process environment where high surface area products are routinely produced. It is not uncommon for a tenfold increase in particle surface area to be achieved.

The roasting of sulphide ores with the TORBED Reactor has also produced high surface area, more leachable materials.

Catalysts and Zeolites are commercially processed in TORBED Reactors to remove carbon and volatiles prior to metals recovery or impregnate/form the substrates required. The precision of the process environment usually creates unique, higher surface area materials that can revolutionize total processes.

The removal of VOCs from mineral matter, particularly where there is a large exotherm potential, is well controlled and precise utilizing a TORBED Reactor. This precision enables faster and less energy intensive commercial operation to be achieved.

TORBED Reactors are co-current heat transfer devices that have similar characteristics to fluidised beds. However, their very low pressure drop compared with fluidised beds allows multistage operation creating near plug flow processes. TORBED Reactors are smaller, cheaper and are usually factory assembled and tested.

A Catalyst Processor is hoisted into position

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