TORBED* Process Reactor Technology

Technology Description

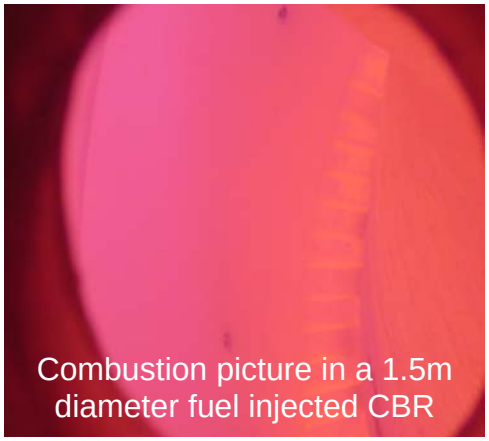
FUEL INJECTION

Background

In many gas-solid reaction systems, there are genuine benefits in being able to process at elevated temperatures. Unfortunately the optimum processing temperature often exceeds those permissible by the available materials of construction. The resulting compromise in processing conditions can lead to sub-optimal performance. A simple reactor system capable of overcoming materials based temperature limitations was therefore required.

The direct fuel injection process

Solids processed in the Torbed reactor form a compact bed just above the gas which is ideal for direct fuel injection. Using a proprietary technique, fuel is metered directly into the bed where it undergoes spontaneous combustion. The resulting flame envelopes the entire bed producing a high temperature, isothermal processing environment. Control is both straightforward and accurate. Localised temperatures approaching the actual flame temperature (>1,500°C/2,730°F) of the fuel being injected are possible. Because the elevated temperatures only exist within the compact bed zone suspended in the reactor chamber, the need for exotic construction materials is reduced.



Combustion picture in a 1.5m diameter fuel injected CBR

Major benefits

The primary advantage of this technique is that it enables solids to be processed at elevated temperatures on a commercial scale. Given this is now a viable processing option, a number of application dependant benefits previously unattainable become possible including:

- Higher single pass conversion
- Rapid heating
- Capability to create controlled oxygen processing environments
- Ability to create a reducing reaction environment
- Option to employ short time-high temperature (flash) processing strategies to increase throughput and/or enhance product quality
- Lower specific energy consumption

Because processing under such conditions has not been previously possible, the results can be unexpected and defy "conventional" wisdom. For example, the specific surface area of many solids increase dramatically upon processing. This is due to the formation of fissures, and the effect can lead to increased activity of the solid in downstream operations.

Application

Developed for a proprietary application, gas injection technology has since been successfully applied to a number of other duties including:

- limestone calcination
- reduction of metal ores
- high temperature mineral calcination
- flash processing of powders
- sintering of clay prills

A 1.5m diameter fuel injected powder processor

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