



# SMOOTHFLOW™ FCC ADDITIVE

## The solution for FCC fluidization and circulation problems

SMOOTHFLOW from Albemarle offers a solution to FCC unit fluidization and circulation problems. Fluidization problems sometimes begin suddenly, often as the result of an unexpected process upset causing significant catalyst losses and possible mechanical damage inside the unit. The finest catalyst particles in the circulating inventory are usually lost first, which results in a sharp increase in the equilibrium catalyst average particle size, Figure 1.

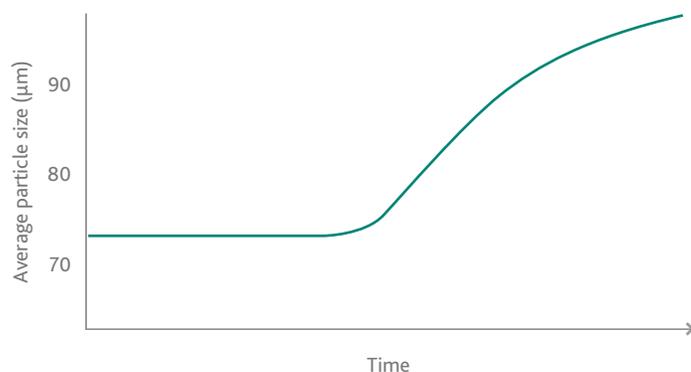


Figure 1: An increase in average particle size due to a process upset

In other cases, fluidization issues arise more slowly. They can occur when units push charge rate and maximize conversion. In other cases, preferential fines losses can occur through decreased cyclone efficiency as the cyclones erode or holes form in them.

A gradual loss in catalyst fines may go unnoticed until the critical level is reached. Exceeding the critical minimum of fines can lead to defluidization of the cyclone diplegs, which, in turn, leads to rapid catalyst loss. Loss of fines can also manifest as erratic slide valve delta pressures and loss of stability or even control of the unit.

### Ideal fluidization and retention properties

Achieving and maintaining proper aeration and fluidization can be challenging on units with unusual standpipe configurations, for example, sloped or with bends or dog legs, and where standpipes have long distances between aeration taps.

SMOOTHFLOW from Albemarle is a Geldart Group A powder having substantial fluidization properties because of its low mean particle size and lower particle density. It increases the differential between the minimum gas velocity required to fluidize the catalyst ( $U_{mf}$ ) and minimum velocity of bubble formation ( $U_{mb}$ ), which is commonly expressed as the ratio  $U_{mb}/U_{mf}$ , Figure 2.

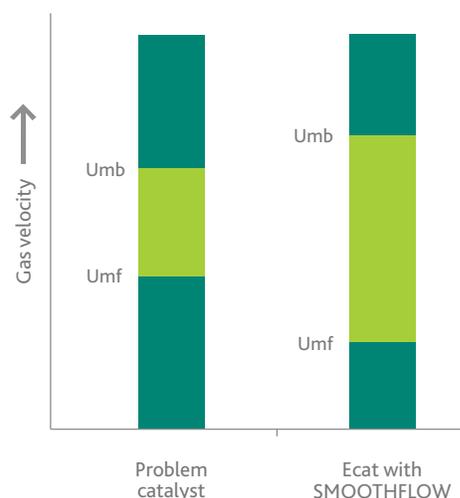


Figure 2: SMOOTHFLOW expands the region between  $U_{mb}$  and  $U_{mf}$ , which results in a larger, more-stable operating window

The use of SMOOTHFLOW is far more effective than recycling fines back to the FCC unit from the electrostatic precipitator or third-stage separator because it contains very little material smaller than  $20\ \mu\text{m}$ . Particles of this size are immediately lost from most FCC units, so, fines, being mostly smaller than  $20\ \mu\text{m}$ , do not stay in the FCC unit long enough to provide a benefit. SMOOTHFLOW has a significant quantity of  $30\text{--}80\text{-}\mu\text{m}$  range particles, which are easily retained in the unit and provide a superlative fluidization benefit.

## Activity and addition rates

SMOOTHFLOW™ FCC additive's formulation has active FCC catalyst components that contribute to the primary catalytic cracking, thereby avoiding possible loss of activity because of dilution effects.

SMOOTHFLOW can be added consistently to units with ongoing fluidization problems. It has also been added in large quantities (up to 20% of a unit's circulating inventory at one time) to immediately correct sudden process upsets.

## SMOOTHFLOW helps with difficult FCC unit startups

SMOOTHFLOW can play an important role during FCC unit startup. Occasionally during startup, a unit experiences problems such as plugged or obstructed cyclone diplegs, stuck flapper valves or clogged standpipe aeration taps. If one of the first two issues occurs, the finer fraction of the inventory can be lost very quickly from the unit, and, as a result, the unit may no longer circulate catalyst well. SMOOTHFLOW can be used to quickly restore the particle size distribution to the preupset conditions.

For plugged or malfunctioning aeration taps, SMOOTHFLOW improves the fluidization properties of the entire catalyst inventory. This alleviates circulation limitations and can increase the slide valve differential pressures, thereby enabling the refiner to operate as normally as possible until the root cause of the problem is corrected.

## Typical properties of SMOOTHFLOW

Typical product analyses	
Additive name	SMOOTHFLOW
Application	Fluidization additive
Average particle size, $\mu\text{m}$	56
Particle size distribution (0–40), %	28
Particle size distribution (0–40), %	4
Attrition index, wt%	4.7
Average bulk density, g/ml	0.71

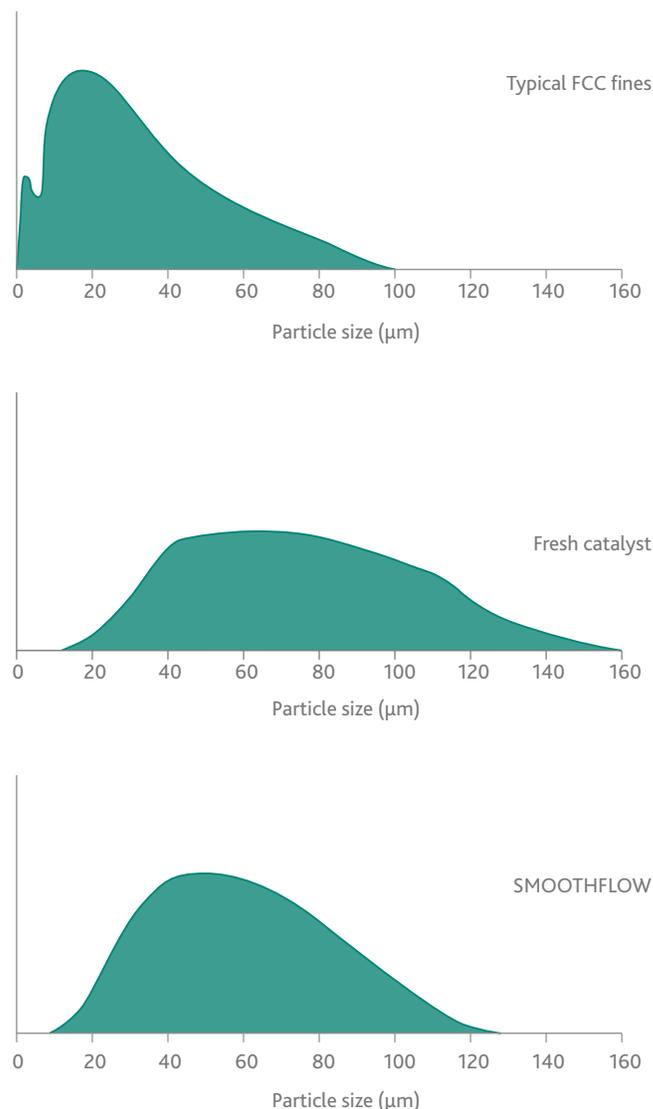


Figure 3: Unlike FCC fines or fresh catalyst, SMOOTHFLOW has a significant amount of 30–80- $\mu\text{m}$  particles, which is key to improving fluidization and circulation

### FOR MORE INFORMATION ON THIS OR OTHER ALBEMARLE PRODUCTS AND TECHNOLOGIES, PLEASE CONTACT YOUR ALBEMARLE REPRESENTATIVE.

**AMERICAS:** 13100 Space Center Blvd • Houston, TX 77059 • USA • Tel: +1 281 480 4747 • Email: [catmaster@albemarle.com](mailto:catmaster@albemarle.com)

**EUROPE AND AFRICA:** Nieuwendammerkade 1–3 • 1030 BE Amsterdam • The Netherlands • Tel: +31 20 634 7300 • Email: [catmaster@albemarle.com](mailto:catmaster@albemarle.com)

**MIDDLE EAST AND INDIA:** PO Box 293774 • 6W Block A, Office 201, 2nd Floor • Dubai Airport Free Zone • Dubai • Tel: +971 4 701 7770 • Email: [catmaster@albemarle.com](mailto:catmaster@albemarle.com)

**ASIA PACIFIC:** Room #3202, Gopher Center • No. 757 Mengzi Road • Huangpu, Shanghai 200023 • China • Tel: +86 21 6103 8666 • Email: [catmaster@albemarle.com](mailto:catmaster@albemarle.com)

[www.albemarle.com](http://www.albemarle.com)

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