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Control your FCC SOx emissions

by employing novel SOx reduction additive technology

Johnson Matthey
Inspiring science, enhancing life

SUPER SOXGETTER X2 performance

Background

Government agencies continue to introduce stricter legislation to reduce the amount of sulphur oxide emissions. Sulphur oxides (SOx) are pollutants that contribute to the formation of acid rain, as well as particulate pollution.

Process technologies and high-performance catalysts have been developed to reduce SOx emissions in the Fluid Catalytic Cracker (FCC) flue gas stream. SOx reduction additives or hybrid solutions combining SOx reduction additives and hardware are often found to be the most cost effective and flexible options by operators to meet their SOx emissions limits. SOx reduction additives provide the flexibility to meet environmental SOx limits without capital investment and with minimal operating expenses by only using the amount required. SOx reduction additive usage rates can be adjusted flexibly to stay within consent decrees when processing a variety of feeds.

SOx reduction additives are injected into the FCC regenerator, where they mix with the circulating catalyst. SOx is captured in the regenerator and the circulating catalyst transfers the captured SOx to the reactor. This captured SOx is converted to hydrogen sulfide (H_2S) in the reactor. H_2S is removed from the FCC fuel gas and LPG product in the unsaturated gas plant. H_2S is eventually converted to elemental sulphur.

Cost-effectively managing SOx emissions is a challenge for many FCC units.

Johnson Matthey's solution

Johnson Matthey has developed and successfully commercialized a novel SOx reduction additive, **SUPER SOXGETTER™ X2**. This new additive incorporates an innovative metal dispersion technology. Higher SOx capture with this novel additive allows FCC unit operators across the globe to:

1. Achieve the same SOx reduction using less additive i.e., reduce their daily operating cost, and/or
2. Expand their FCC unit operating window i.e., improve their FCC unit margin.

SUPER SOXGETTER X2 is a full burn SOx reduction additive that has shown a notable improvement in performance over the current benchmark additive **SUPER SOXGETTER II** at commercial scale.

Refinery case study

In this case study, an FCC unit on the U.S. Gulf Coast (USGC) generated significant OPEX savings by replacing **SUPER SOXGETTER II** with **SUPER SOXGETTER X2**.

This refinery has been using Johnson Matthey's **SUPER SOXGETTER II** to control flue gas SOx. The unit processes hydrotreated feed with typical feed sulphur at 0.26 wt%.

In this unit, **SUPER SOXGETTER X2** achieves similar SOx reduction using up to 25% less additive, for a wide range of typical operating conditions as illustrated in Figure 1.

SOx pick-up factor (PUF) quantifies the efficiency of SOx removal. It is defined as the amount of SOx removed per pound of SOx reduction additive added in the same time period. SOx pick-up factor (PUF) is unique for each FCC unit and depends on several variables. At this USGC refinery, the typical PUF was 18 using **SUPER SOXGETTER II**. For a wide range of operating conditions, the PUF for **SUPER SOXGETTER X2** was greater, reflecting its higher activity (Figure 2).

SUPER SOXGETTER X2 was injected in the unit using an **INTERCAT™** addition system which allowed precise additions to remain compliant at minimum OPEX. Separate additions through the loader also allow the operator to quickly respond to changing market conditions through flexibly increasing or decreasing additions based on feed sulfur.

The trial was a success and this refinery proved **SUPER SOXGETTER X2** can be used to achieve the same SOx reduction using up to 25% less additive, for a wide range of typical operating conditions. An additional benefit was less additive handling, saving operators' time. There was a small reduction in catalyst disposal as well.

Please contact Johnson Matthey for more information.

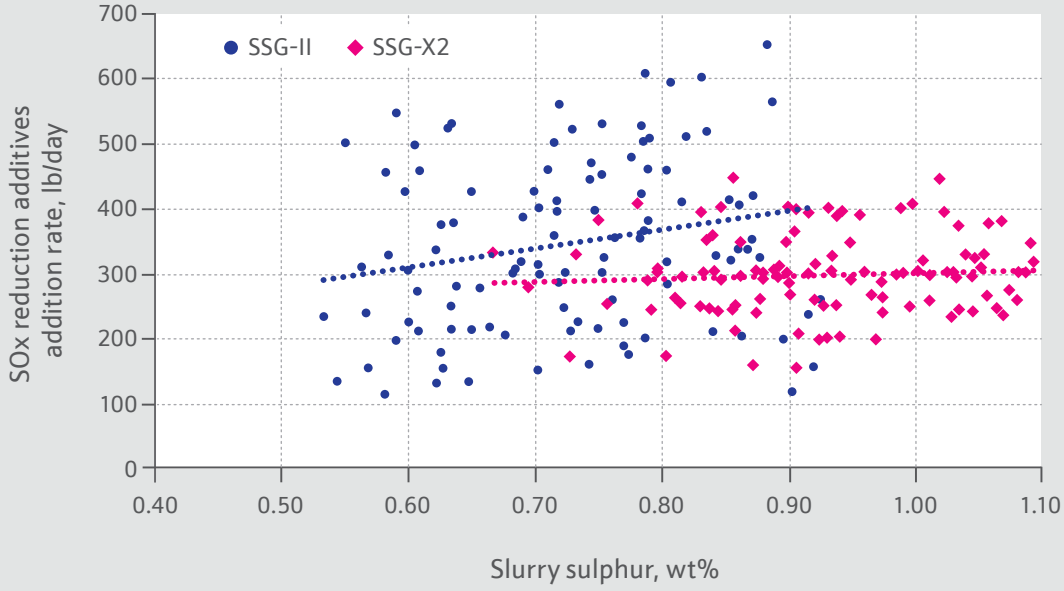

Figure 1: SOx reduction additives addition rate vs slurry sulfur

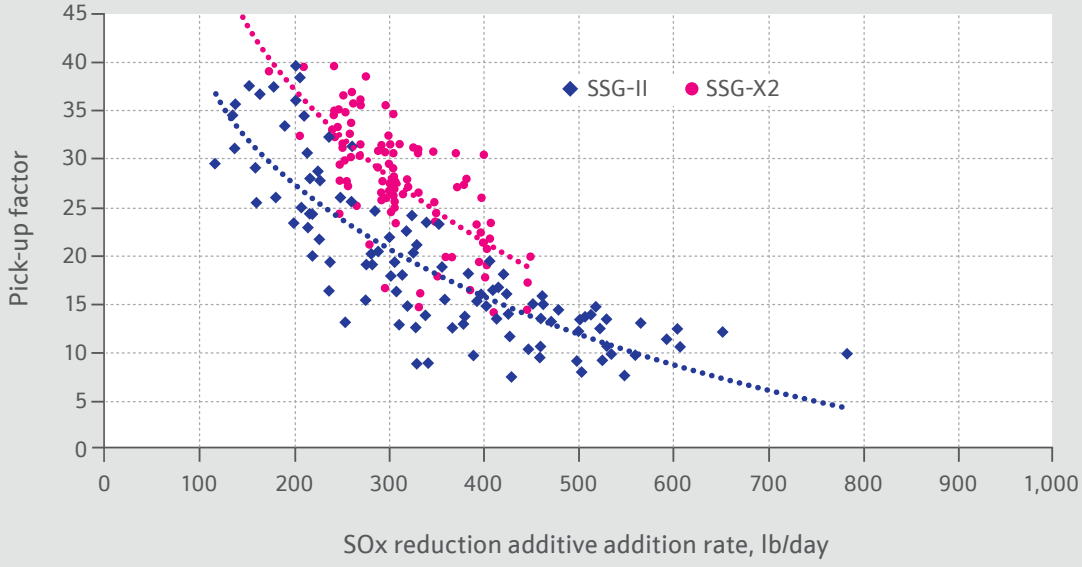

Figure 2: Pick-up factor vs SOx reduction additive addition rate

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