The modern petroleum industry has to operate within tight restrictions on refinery effluent discharges. One source of effluent discharge is the flared 'off-gas' from the catalytic cracking of crude oil, which has traditionally contained appreciable levels of catalyst particles. To effectively reduce airborne catalyst emissions, Pall have installed blowback filter units which are capable of removing greater than 99.97% of entrained catalyst particles at 1 µm (by weight) from the 600°C 'off gas'.

A regulated blowback of the filter unit enables the porous sintered stainless steel media to be cleaned and regenerated whilst maintaining full forward flow.

In conjunction with existing stages of cyclone units, the Pall blowback filter offers an economic means of reducing the catalyst emission levels to within the present environmental discharge limits.

INTRODUCTION

With ever tightening restrictions on discharge emission levels all process industries are having to review their present operations and incorporate means of reducing to a minimum their effluent discharges (whether released into air, water or land).

This has been very actively pursued in the oil refining industry. In outline a refinery converts crude oil into hydrocarbon based products ranging from...
liquefied petroleum gases to petroleum coke, by means of physical, physicochemical and chemical processing methods.

Of particular interest is the fluid catalytic cracking (FCC) process, where long chain hydrocarbon oils are converted to gas, liquid petroleum gas (LPG) and blended components for gasoline, gas oil and fuel oil. The catalysts used in general are synthetic zeolites (crystalline alumina silicates), which are usually doped with rare earth and/or precious metal elements.

In the cracking reactor, heavy carbonaceous materials and coke deposit on the surface active catalyst reducing its efficiency. Continuous regeneration of the catalyst is achieved by combustion of the deposits in a fluidised bed regenerator.

During the recirculating cycle from the reactor to the regenerator catalyst fines are carried over in the high temperature flue gas stream (up to 740°C), which prior to passing through power/heat recovery units and eventual discharge to atmosphere (via a 'flare stack') must be stripped of the catalyst.

Most of the catalyst fines entrained in the regenerator flue gas are removed by a number of cyclone stages within the regenerator vessel and returned to the bed. A final stage fines removal unit (typically a third stage cyclone) further cleans the gas before it passes downstream to other equipment. Early experiments with energy recovery equipment in FCC flue gas streams demonstrated that the rotating equipment could not last more than a few hundred hours unless an efficient stage of separation was added to reduce carry over of catalyst fines.

Traditionally, electrostatic precipitators or scrubbers have been employed for final particulate removal prior to exhaust into the environment. However, these methods are limited by their maximum operating temperature and their performance is variable with fluctuating gas flows and catalyst loadings.

Pall have developed a fourth stage high temperature resistant sintered metal filter, which can overcome these operating and performance limitations. The selected grade of filter media is capable of removing the catalyst to an efficiency of greater than 99.97% at 1μm (by weight) and upon reaching pre-determined differential pressure or an elapsed time can regenerate the filter media using a blowback technique.