



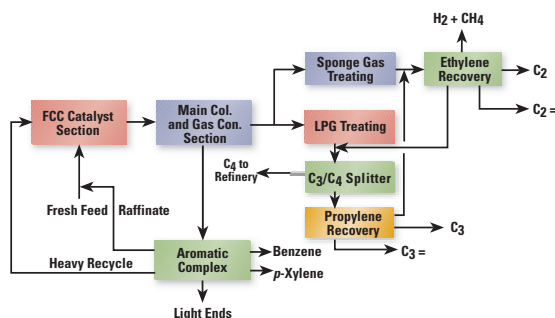
## PetroFCC<sup>SM</sup> Process for Petrochemical Feedstock Production

### Refining

#### Introduction

UOP has leveraged its FCC experience and know-how to develop and license a new type of cracking process. The PetroFCC process targets the production of petrochemical feedstocks rather than fuel products. The new process, which utilizes a uniquely designed FCC unit, can produce very high yields of light olefins and aromatics when coupled with an aromatics complex (shown in Figure 1).

Figure 1 ■ UOP PetroFCC Complex



Driven by an increased demand for polyethylene and poly-propylene, future demand is expected to increase for petrochemical feedstocks – particularly the light olefins, ethylene and propylene. Ethylene demand is projected to grow by a compound rate of about 5% per year for the foreseeable future, while growth in propylene demand is expected to be even greater. The additional propylene produced from the increase in steam cracker ethylene production is expected to be insufficient to meet the demand, and propylene from other sources will be required.

Because the FCC process has proven to be a very flexible process, it is in a unique position to fill this void in supplying the expected increase in propylene demand. Although its principal function has been to produce gasoline, the FCC unit is frequently operated to maximize other products, such as distillates or LPG. The LPG mode can be considered a step towards a petrochemical mode of operation since it provides enhanced yields of the petrochemical feedstocks. However, to be considered a major component in the petrochemical complex, an FCC style unit must produce substantially greater quantities of these light olefins, produce other petrochemical feedstocks of interest, and minimize or eliminate the yield of gasoline and heavier liquid fuels. This is the targeted area for the PetroFCC process.

#### Process description

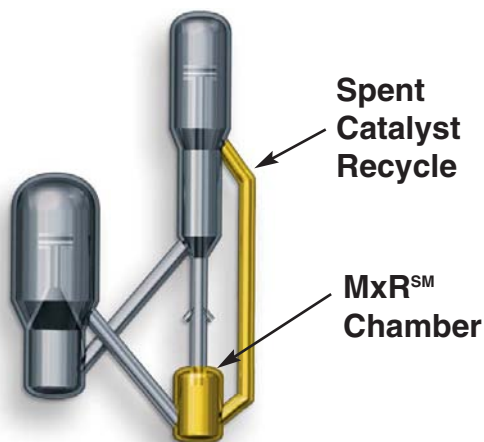
The PetroFCC process starts with a uniquely designed FCC unit and is capable of producing a product slate of 18 lv-% propylene, 7 lv-% ethylene, 10 lv-% butylenes, and 20 lv-% of benzene and paraxylene. This is a substantial increase in the yield of petrochemicals compared to a conventional FCC unit.

The catalyst section of the PetroFCC process uses a high-conversion, short-contact time reaction zone that operates at elevated reactor riser outlet temperatures and low partial pressures. It also incorporates a relatively high level of a shape selective zeolite catalyst additive with selected standard FCC catalyst as the balance. The PetroFCC process incorporates UOP's Optimix<sup>TM</sup> Feed Distribution system, VSS<sup>TM</sup> Vortex Separation<sup>TM</sup> technology, AF<sup>TM</sup> spent catalyst stripping technology and RxCat<sup>TM</sup> technology to enhance light olefin and/or aromatics production.

#### Advantages of RxCat Technology

Many of today's state-of-the-art FCC units utilize recent technologies such as elevated feed distributors, riser termination devices and improved spent catalyst stripping. These technologies along with catalyst formulation improvements have resulted in an operation of enhanced catalytic cracking and a reduced delta coke operation. RxCat technology was based on the observation that the reduced delta coke achieved in today's state-of-the-art catalytic crackers creates a "spent" catalyst leaving the riser, which still retains an inherently high level of activity. To utilize this activity, UOP developed the concept of recycling the spent catalyst to the base of the reactor riser.

The recycled "carbonized" catalyst is mixed with the regenerated catalyst in a mixing vessel (MxR<sup>TM</sup> Chamber) at the base of the riser. Since the recycle of this carbonized catalyst back to the riser is a heat balance neutral process, the catalyst circulation rate up the riser can be varied widely without increasing the coke yield. Essentially, RxCat technology breaks the link between catalyst circulation and coke yield. The result is a much higher catalyst/oil ratio than is possible via the normal heat balanced operation.



The use of RxCat technology provides significant advantages over alternate technologies:

- It allows much shorter contact times to be used, thereby reducing olefin oligimerization and hence reducing olefin loss.
- It allows the reactor riser to operate with relatively cool inlet catalyst temperatures, as the regenerated catalyst is mixed with the cooler carbonized catalyst, while maintaining an elevated riser outlet temperature.
- It provides more catalytic reaction sites in the reaction zone.

The benefits delivered from these advantages are significant. Operation with reduced temperature catalyst substantially increases olefin yield while minimizing dry gas make and allows for very high conversions due to the increased catalyst/oil ratios. These advantages result in a relative increase in propylene yield over that achieved by alternate technologies.

## FCC Revamp Applications

The components of PetroFCC technology can also be applied to existing FCC units that process more conventional VGO-based feedstocks and desire incremental propylene yield improvement. The extent of this light olefin yield improvement is usually dependent on the limitations in the existing light ends recovery section of the FCC.

## Commercial Application

UOP's first PetroFCC has been designed for 15 wt-% propylene and is due to be commissioned in January 2008. In addition, UOP has 9 units that incorporate RxCat technology in various stages of design and construction.

## For More Information

PetroFCC, RxCat and MxR technological services are available on request. For more information, contact your local UOP representative or our Des Plaines sales office:

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