

# Process Notes



*Reactor LPG must be recovered*

## Be Smart about FCC Olefin Recovery

Whether the driver is propylene as a chemicals feedstock or propylene and butylene as alky feed, FCC units worldwide are being pushed to maximize olefin production. Increased hydrotreating to meet Tier 3 gasoline requirements is reducing gasoline pool octane at a time of high premium-to-regular gasoline price differentials. Maximizing FCC olefins to produce high octane alkylate barrels is attractive – if they can be recovered in the FCC gas plant LPG stream.

Higher reactor LPG yields increase wet gas compressor loading. So, in a unit that is already limited by wet gas compressor capacity, revamp modifications must be made to accommodate higher reactor LPG yields. Replacing the compressor entirely or installing a new parallel compressor are expensive options.

Instead, the keys to a practical offgas compressor revamp lie in the polytropic head equation (bottom right). Look to minimize main column inlet to wet gas compressor inlet pressure drop and overhead receiver temperature. Next, compressor speed and rotor modifications may afford additional capacity. On a mass basis, FCC wet gas rates have been increased by over 40% without installing a parallel compressor.

After compression to gas plant pressure of around 220 psig, the LPG must be condensed in the high pressure receiver or the absorber. Increasing reactor LPG yield stresses gas plant cooling systems and increases absorber and stripper column loads. Furthermore, high LPG yield often comes at the expense of naphtha yield, meaning that there is more vapor and less liquid in the absorber – this must be addressed to maintain high propylene recovery.

There is a strong incentive to maximize FCC olefin production with reactor temperature and catalyst formulation. Executing the correct revamp can economically address main column, wet gas compressor, and gas plant constraints so that theoretical reactor yields become actual barrels of valuable product.

### *Polytropic Head Equation*

$$H_p = \frac{1,545}{MW} Z_{AVG} T_1 \left( \frac{n}{n-1} \right) \left[ \left( \frac{P_2}{P_1} \right)^{\left( \frac{n-1}{n} \right)} - 1 \right]$$



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