PETROCHEMICALS

Arofining™

Aromatics Purification through Selective Hydrogenation Unit

Aromatics commercial specifications, as well as transformation and separation processes, require aromatic streams free of unsaturated compounds. Arofining™ is an aromatics purification technology aiming at hydrogenating in a selective manner olefins, diolefins and styrenics while preserving the highly valuable aromatics.

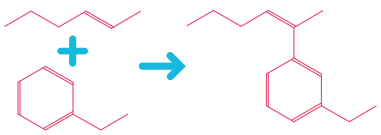
Olefins, Diolefins, Styrenics Sources and Effects

An important source of aromatics for petrochemical end-uses originates from high severity, continuous catalyst regeneration (CCR) reformers. The current trend towards high severity operation results in higher concentrations of undesired unsaturated hydrocarbons (diolefins, olefins, styrenes) in the reformate produced.

These components are detrimental to performances of aromatics separation and transformation process units (fouling, loss of activity and selectivity of downstream catalysts,...). Therefore they must be removed from unit feeds and final products (Benzene, Toluene, Xylenes,...).

Historical Treatment

Clay treatment was historically elected for elimination of undesired compounds resulting from aromatics alkylation reactions (figure 1). These reactions produce heavier aromatic components leading to an inevitable loss of yields in high chemical value sales and therefore to lower profitability.



↑ Figure 1: Clay treatment principles

Clay treatment solution suffers from poor cycle length leading to a logistic nightmare for operators and large solid waste to handle.

In some cases, it may be necessary to reduce CCR operating severity at the expense of Aromatics and Hydrogen production.

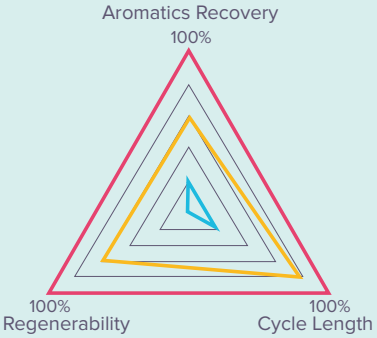
Arofining™ Solution

Axens Arofining™ innovative solution overcomes these difficulties by implementing selective hydrogenation on the full reformate or any individual aromatics fraction depending on specific needs.

It either eliminates the need for activated clay or allows a major increase in clay lifetime. In both cases, it enhances aromatics complex operation and improves end user revenue compared to the other non-selective solutions (figure 2).

BENEFITS

- Negligible aromatics losses to maximize the revenue
- Reliability of the overall olefins removal system to secure specific aromatics production
- High olefins removal system availability
- Low cost and seamless integration in aromatics complex



↑ Figure 2: Arofining™ main advantages

Axens SOLUTIONS

Arofining™ Benefits over Clay Treatment

› C_6 Cut: no Clay Treatment

In a benzene-rich C_6 cut destined for extractive distillation, Arofining™ reduces the diolefin content to less than 5 ppm wt (detection limit). The product meets specifications for acid wash color (less than one). Clay treatment is not required and and benzene losses are minimized (less than 100 ppm).

› Heavy Reformate: Large Improvement of Clay Cycle Length

For heavy reformate, clay treatment is necessary to reduce the bromine index to levels required by molecular sieve adsorbents use for paraxylene separation. However, clay consumption, bed change frequency and used clay disposal can be major problems. Thanks to Arofining™ unit, clay cycle length is drastically increased minimizing these issues.

Table 1 shows results obtained on a typical, high severity reformate from a CCR Reforming unit at stabilized temperature conditions.

CLAY LIFETIME	WITHOUT AROFINING™	WITH AROFINING™
C_6 CUT	BASE	*
HEAVY REFORMATE	BASE	BASE * 8

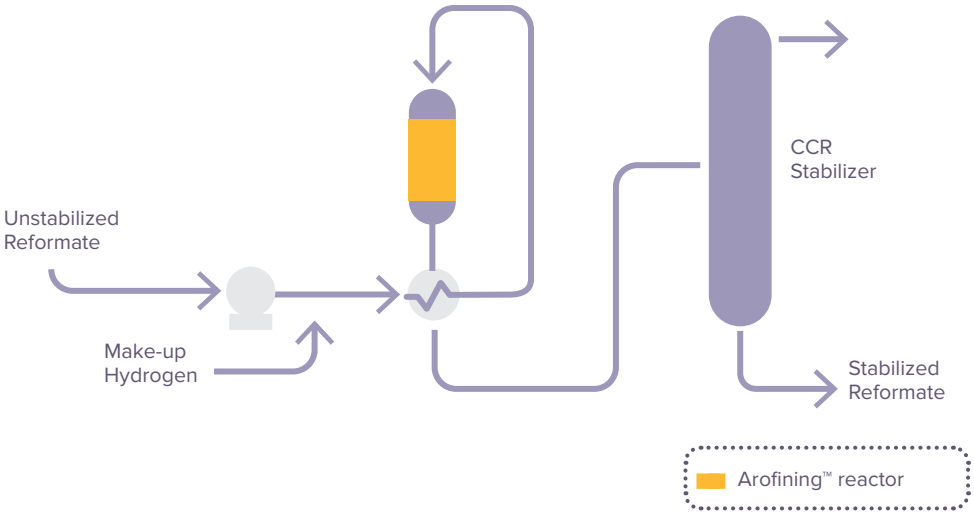
*Clay not required anymore.

↑ Table 1: Arofining™ benefits on clay treatment

Arofining™ Description

Aromatics and hydrogen are contacted with a highly active and selective catalyst, LD 267R (manufactured by Axens) under high LHSV conditions. The hydrogenation reaction is fast and complete with respect to diolefins and styrenes, exhibits a high conversion for linear olefins, and moderate conversion for branched olefins. The highly selective catalyst ensures negligible aromatic ring saturation.

Arofining™ integrates nicely into a new or existing reformer separation train. Although there are several options concerning the location of the reactor section, it is often advantageous in existing complexes to use the reformer effluent as the feed to the unit before stabilization.



↑ Figure 3: Arofining™ implementation in CCR unit

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