**Analytical Products and Solutions**

# Refining Industry Aromatics Fractionation Unit (BTX)

**Process Gas Chromatograph Application Note**

**usa.siemens.com/processanalytics**

The Aromatics Fractionation Unit is used by refineries to separate a mixture of aromatics into pure benzene, toluene, and mixed xylenes products. It is also commonly called a BTX (benzene-toluene-xylene) Unit. The product streams are then either processed by a chemical unit within the refinery or sold to a nearby chemical plant.

The feedstock to the BTX unit is typically the reformate from a catalytic reforming unit (reformer). This stream is rich in aromatics with light paraffin and light naphthene (P&N) impurities. Most P&N impurities are removed overhead in the dehexanizer, and the rest flow out in the bottom product stream to the benzene column.

In the benzene column, benzene and remaining P&N go overhead while toluene, mixed xylenes, ethyl benzene, and C9+ aromatics go out the bottom. The overhead enters an absorber and a stripper unit to purify the benzene. The remaining P&N enters a benzene recovery column where any remaining benzene is stripped out and recycled with the remaining impurities are sent on to further processing (typically to an Isomerization Unit).

The bottoms product of the benzene column enters a set of absorbing and stripping columns to remove any remaining P&N impurity in the aromatics. The P&N steam goes overhead to a toluene recovery column where any remaining toluene is stripped out and recycled before the impurities leave the unit. The purified aromatics stream then enters the toluene column to separate out the toluene and mixed xylenes. In some refineries, the mixed xylenes are further separated into pure paraxylene, metaxylene, orthoxylene, ethyl benzene and C9+ aromatic streams.

The absorber-stripper-recovery section can be a number of solvent extraction processes. The solvent extraction process varies from plant to plant so it will likely be different than shown on the drawing, but the purpose remains the same.

**Typical GC Measurements**

The process gas chromatographs used in this unit fall into two categories: 1) insuring product purity, and 2) minimizing loss of product. Due to the large savings from computer control, the large number of analyzers needed is usually easy to justify. However, special attention should be paid to the design of the analytical sections of the analyzers. Many of the compounds are difficult to properly separate and analyze which can lead to long cycle for the analyzers. It is often desired to use high efficiency separation columns for the gas chromatographs coupled with high temperature ovens for reduced cycle times.

1. **Dehexanizer Bottoms** – monitors the bottoms stream for MCP and benzene to minimize the non-aromatic impurities entering the benzene column.
2. **Dehexanizer Overhead** – monitors for benzene exiting the overhead in order to reduce benzene loss
3. **Benzene Column Bottoms** – the components measured by this analyzer are benzene and toluene. It minimizes losses of benzene in the toluene stream, and minimizes impurities in the toluene product stream.
4. **Benzene Column Overhead** – the components measured by this analyzer are MCH, benzene, and toluene. It minimizes losses of toluene in the benzene stream, and minimizes impurities in the benzene product stream.
5. **Benzene Product** – determines MCP, MCH, and toluene content to reduce impurities in the benzene product.
6. **Benzene Recovery Overhead** – monitors benzene to limit its loss.
7. **Non-Aromatics Stream** – monitors toluene to limit its loss.
8. **Mixed Xylenes Stream** – monitors toluene to limit its loss.

# Aromatics Fractionation Unit



| Analyzer No. | Stream | Components Measured | Measurement Objective |
|---|---|---|---|
| 1 | Dehexanizer Bottoms | MCP, Benzene | Minimize non-aromatic impurities before they enter the product streams |
| 2 | Dehexanizer Overhead | Benzene | Reduce losses of Benzene |
| 3 | Benzene Column Bottoms | Benzene, Toluene | 1) Minimize Benzene losses in the Toluene stream<br>1) Minimize impurities before they enter the Toluene product stream |
| 4 | Benzene Column Overhead | MCH, Benzene, Toluene | 2) Minimize Toluene losses in the Benzene stream<br>2) Minimize impurities before they enter the Benzene product stream |
| 5 | Benzene Product | MCP, MCH, Toluene | Reduce impurities in the Benzene Product |
| 6 | Benzene Recovery Overhead | Benzene | Minimize losses of Benzene |
| 7 | Non-Aromatics Stream | Toluene | Reduce losses of Toluene |
| 8 | Mixed Xylenes Stream | Toluene | Reduce losses of Toluene |

## For more information please contact:

5980 West Sam Houston Parkway North
Suite 500
Houston, TX 77041
713-939-7400
ProcessAnalyticsSales.industry@siemens.com