

# Badger/Niro Meta-Xylene

## APPLICATION

The Badger/Niro Meta-Xylene Crystallization Process recovers high-purity meta-xylene product from aromatics streams. This Badger/Niro Technology employs the same unit operations used for the commercialized Badger/Niro Para-Xylene Crystallization Technology.

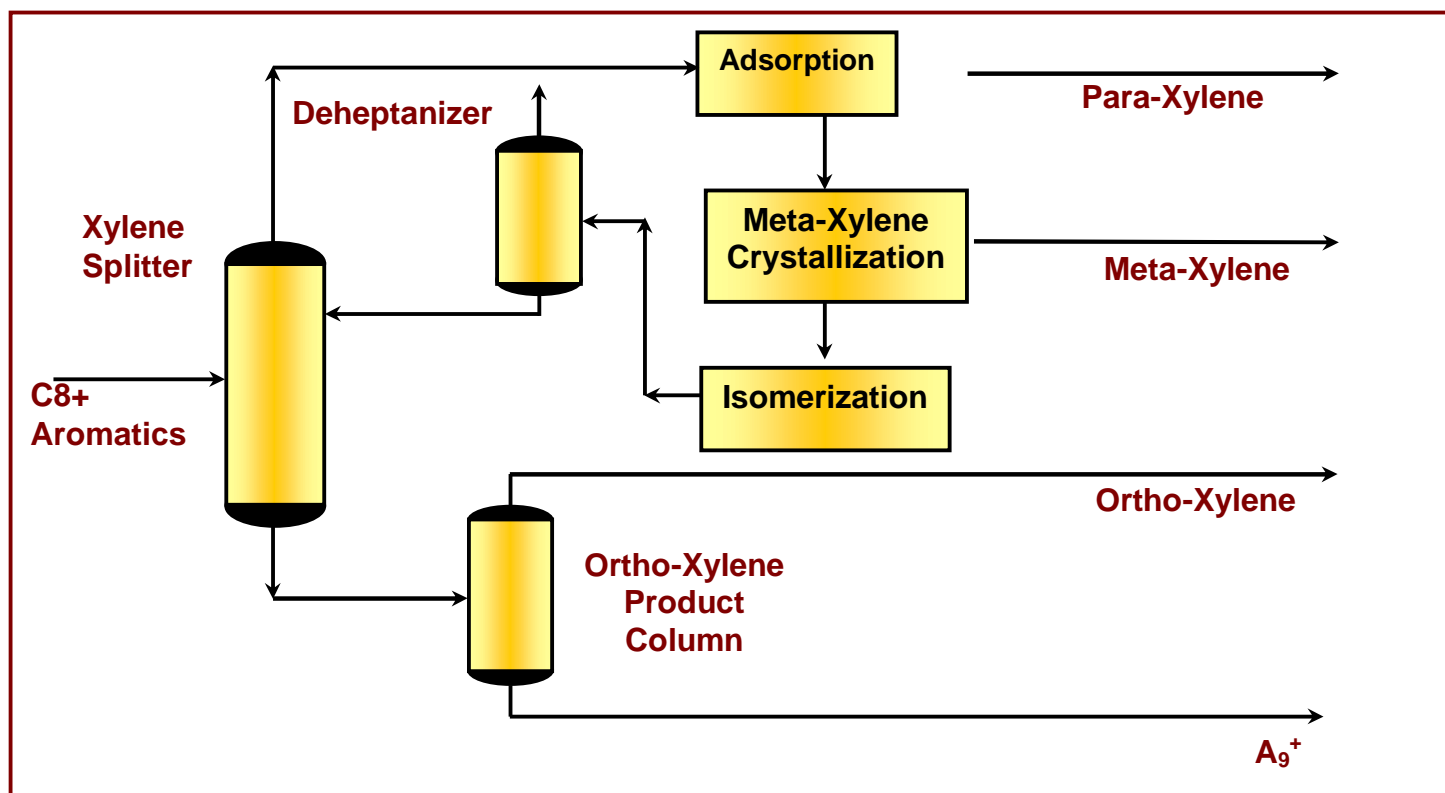
This Meta-Xylene Technology is particularly attractive for integration into existing Aromatics Plants which include Para-Xylene Adsorption Units. The near complete recovery of para-xylene in the Adsorption Unit essentially eliminates limitations associated with the para-xylene/meta-xylene eutectic.

The attached Figure shows the integration of a Meta-Xylene Crystallization Unit into the xylene loop of an existing Aromatics Plant which consists of a xylene splitter, Adsorption Unit, Isomerization Unit with deheptanizer, and ortho-xylene product column. For an existing Aromatics Plant producing 300,000 MTA para-xylene and 75,000 MTA ortho-xylene, it is possible to efficiently produce over 100,000 MTA of high-purity meta-xylene, while maintaining the para-xylene and ortho-xylene productions, with the addition of a Badger/Niro Unit and minimal other changes and additions to the existing xylene loop.

## PROCESS DESCRIPTION

The process designs for Badger/Niro Crystallization Units are based on the use of vertical-vessel scraped-surface crystallizers and wash columns. In general, a system of crystallizers and other equipment creates a slurry of high-purity meta-xylene crystals in mother liquor. This slurry is fed to Niro wash columns where the crystals are separated from the mother liquor and the crystals are melted for the final product.

Inside the wash column, the crystals are mechanically pushed upward, and the mother liquor is counter-currently washed away from the crystals with product-purity liquid meta-xylene flowing downward. This wash meta-xylene is recovered because it freezes as it heats the crystals up to the melting point of pure meta-xylene. The crystals enter the top head and are fluidized by circulating product-purity meta-xylene liquid. The resulting slurry leaves the wash column and enters a heat exchanger where the crystals are melted. The net product meta-xylene is split off, and the rest of the melt is recirculated back to the top head of the wash column for the fluidization of more crystals. Because the crystal washing is countercurrent, the washing is very complete; and thus, the product purity is very high. With the wash recovered internally, there are no processing costs for wash recovery as is the case with either centrifuges or filters for this service.



In all forms of this Technology, the consumption of utilities is minimal because the meta-xylene is crystallized only once, there is effective heat integration, and crystal wash recovery is done without additional refrigeration or other utilities. For any specific application, the optimal process design using of this Technology depends on the feed purity, meta-xylene recovery, and the throughput. Consequently, each process design is optimized for the client's requirements.

## ECONOMICS

A summary of the investment cost and consumptions of utilities for a typical Badger/Niro Meta-Xylene Crystallization Unit is given below. The basis for this design is 100,000 MTA (12.5 MT/hr) of 99.7+ percent pure meta-xylene product from an Adsorption Unit raffinate stream containing 65.5 percent meta-xylene. The estimated inside battery limits erected cost for the Crystallization Unit assumes construction on a U.S. Gulf Coast site in 1999. The scope of the estimate includes engineering, procurement, and erection of equipment. The estimate excludes contingency, engineering fee, royalty, escalation, taxes, duties, spare parts, start-up, tie-ins, offsites, and site preparation.

Estimated ISB Cost, US MM\$      25.9

### Utility Consumption, per MT of Product

Electrical Power, kWh	213
Cooling Water, m <sup>3</sup>	37

## COMMERCIAL EXPERIENCE

Washington Petroleum & Chemicals, a division of Washington Group International, Inc., provides technology and engineering, procurement, and construction (EPC) services to the petroleum and chemicals industries worldwide. Washington has a global reputation for strong construction capabilities. Also, within the petroleum and chemicals market, Washington is renowned as a licensor - a technology provider. Specific petrochemicals where Washington

Group has built a strong technology reputation include ethyl-benzene, styrene, cumene, phosphoric acid, para-xylene, vinyl chloride, and gas to liquids.

Niro Process Technology B.V. is part of the German technology group GEA A.G. Niro Process Technology offers total engineering and services capability for the chemical industry, as well as for the liquid food processing industry and for pollution control/waste management. Niro has a worldwide network of sales and service offices to ensure quick and professional customer support.

Washington Group International and Niro Process Technology combined their Crystallization and Wash Column Technologies in 1993 with the formation of an exclusive alliance. Since then, this technology has been incorporated into six facilities for para-xylene purification by crystallization, and the first two of these commercial Units started up in 1999 and 2000 and met their performance requirements.

## CONTACT INFORMATION

### **Douglas S. Hubbell**

Washington Group International  
 One Broadway  
 Cambridge, MA 02142  
 Phone: (617) 494-7556  
 Fax: (617) 494-7009  
 Email: douglas.hubbell@wgint.com

