

## Spent Acid from Nitration of Toluene

The nitration of toluene to form MNT, DNT and/or TNT results in the production of a large stream of contaminated spent sulphuric acid. Chemetics® offers a proven process for the Purification and Concentration of this spent acid that operates fully integrated with the nitration plant.

The success of the recycling of this sulphuric acid stream depends on the effective removal of the contaminants (mainly MNT, DNT,  $\text{HNO}_2$  and  $\text{HNO}_3$ ) in the Denitration unit. Chemetics' Denitration process is designed for the complete removal of contaminants. This eliminates problems in the downstream concentration unit and allows unlimited recycle to the nitration plant.

The steam heated acid concentration unit is operated under vacuum to increase the concentration of the sulphuric acid, allowing the acid to be recycled to the nitration plant. Common product acid concentration is 89–93 wt%, but concentrations up to 96wt% are offered.

The contaminants removed in the Denitration unit are further separated in the Overheads Separation unit. The organic components (MNT/DNT) are removed in a gravity settler and recycled to the nitration plant. This improves the total yield of the nitration. The  $\text{HNO}_2$  and any  $\text{NO}_x$  produced in the nitration or acid recovery units are converted into Nitric Acid and recycled to the mono-nitration reactors in the nitration plant.

Vapours from the Acid Recovery Plant and the Nitration Plant are treated to remove CO,  $\text{NO}_x$  and MNT/DNT vapours. Depending on the location and allowable emission limits, a  $\text{NO}_x$  absorption system (producing additional nitric acid) or a combination of  $\text{NO}_x$  Absorption system and a VOC/SCR unit (for removal of CO and residual  $\text{NO}_x$ ) is utilized.

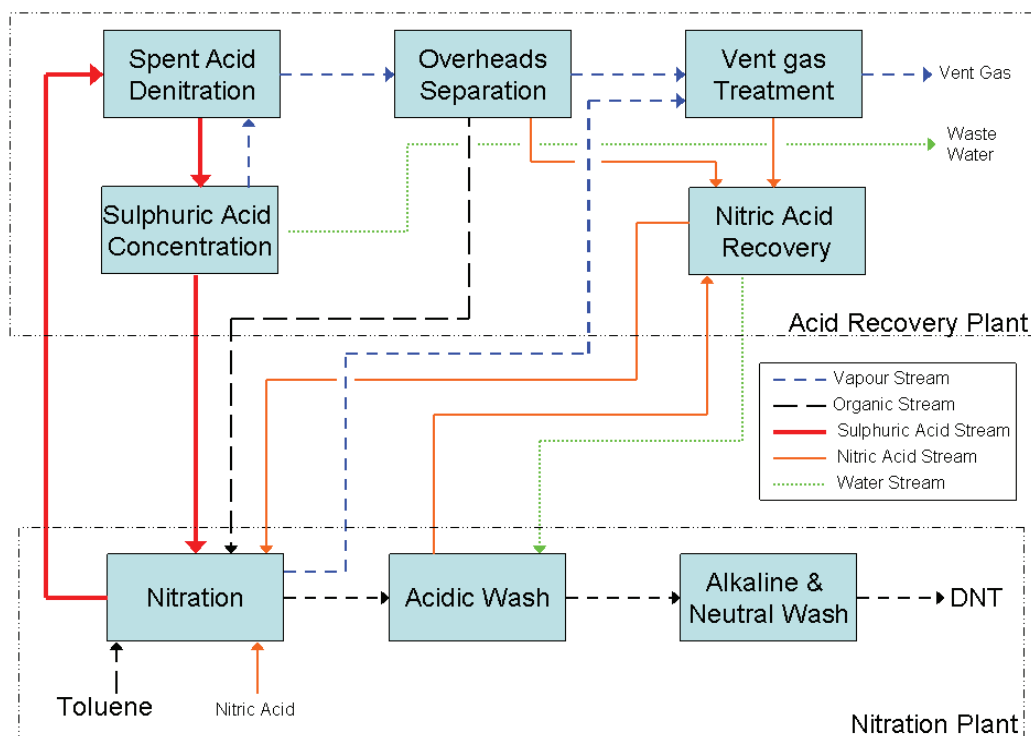
As an important option, Chemetics can incorporate the recovery of Yellow Water (Effluent from the acidic wash step) from the nitration plant. This stream contains valuable sulphuric and nitric acid as well as organics which can be recovered and returned to the nitration plant. The water removed in this Nitric Acid Recovery Unit can be recycled to the wash section of the nitration plant.

The Chemetics process is adaptable to the requirements of every nitration technology supplier (e.g. Air Products, Biazzi, Meissner) as well as to the unique situation at each site. Heat integration within the acid recovery unit and/or the utilization of low cost heat sources (e.g. the use of LP steam for yellow water treatment) is routinely incorporated into the design to minimize operating costs.

The block diagram on the next page provides an overview of the required integration between the two plants. Communication with both the end-user and the nitration supplier is key for a successful project. Chemetics has a proven track record of providing spent acid concentration plants that are tailored to the client requirements and work seamlessly and fully integrated with the nitration plant.

### Chemetics Spent Acid Recovery Plant Features

- Virtually complete removal of contaminants from the spent acid in the de-nitration for reliable and trouble free operation of the Acid Concentration unit and the nitration plant;
- >99% recovery and recycle of nitro-aromatics (DNT/MNT) for recycle to the nitration plant;
- >98% recovery of  $\text{HNO}_3$ ,  $\text{HNO}_2$ , and  $\text{NO}_x$  fumes in the form of valuable Nitric Acid that is recycled to the nitration plant;
- Liquid effluent is minimized. Only a portion of the water removed from the Spent Acid has to be exported as effluent. All other water streams are suitable for recycle to the nitration plant;
- No pumps in hot acid service for improved reliability and safety.



Client/Location	Plant Type	Capacity (as 100% acid) tons/day	Start-Up
<b>Confidential</b> Texas, USA	SAC	>1000	2009
<b>NanYa Plastics</b> Mailiao, Taiwan	SAC	>600	2000
<b>BASF</b> Geismar, Louisiana, USA	SAC	>1,500	1998
<b>Enichem (now Dow Chemical)</b> Venice, Italy	SAC	>400	1997
<b>American Cyanamid</b> Bound Brook, New Jersey, USA	SAC	>400	1979
<b>Korean Explosives</b> Yosu, South Korea	SAC	85	1977
<b>Air Products</b> Pasadena, Texas, USA	SAC	>500	1975