

# Nitric Acid

PLINKE's Nitric Acid technologies can be used for concentration, purification and recovery of Nitric Acid. PLINKE technologies can be used in different applications:

- Concentration of diluted acid streams for processes, where high concentration Nitric Acid is required
- Recovery of spent Nitric Acid for re-use in the process or for resale
- Removal of Nitric Acid from waste water for yield and/or environmental reasons

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PLINKE also offers NO<sub>x</sub> Absorption technology for maximum yields and lowest environmental emissions, as well as acid treatment and stabilization options to ensure the desired Nitric Acid quality is achieved.



**Pre-Concentration NAPC®** Weak Nitric Acid Pre-Concentration NAPC® is used to concentrate acid up to about 68 wt% HNO<sub>3</sub>. This NAPC® Process removes water from diluted Nitric Acid by rectification without the use of extractive agents. The maximum concentration by rectification is about 68 wt% Nitric Acid because the two components mixture of Nitric Acid and water forms an azeotropic mixture at that concentration level.

**High Concentration with Sulfuric Acid NACSAC®** NACSAC® is used to produce high concentration Nitric Acid (up to 99 wt%) either from spent or fresh Nitric Acid. In this process, Sulfuric Acid serves as the extractive agent which gets diluted in the NAC® and is re-concentrated in the attached SAC® to make a closed loop. The operating pressure of the NAC® column is atmospheric and the respective SAC® unit is operated under vacuum. The energy requirements are usually exclusively covered by indirect heat transfer. Additional heat is recovered where possible. The SAC® unit is designed to evaporate water and to minimize losses of Sulfuric Acid. Condensate from SAC® is distilled water which contains small amounts of Sulfuric Acid. This water may be used in the associated NO<sub>x</sub> Absorption or in other processes accordingly. Recovered acid at about 85 wt% concentration is optimal for use an extractive agent but other concentrations can be used if desired. Instead of a closed loop with NACSAC® NAC® can operated stand-alone using fresh feed of Sulfuric Acid which will be disposed or used in other applications.

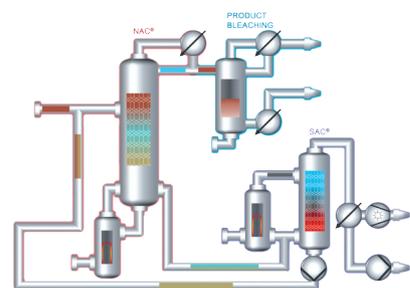
**High Concentration with Magnesium Nitrate Solution MAGNAC®** MAGNAC® is used to produce high concentration Nitric Acid (up to 99 wt%) from fresh weak Nitric Acid. Magnesium Nitrate solution is used as the extractive agent. The NAC® column is operated at atmospheric pressure and the respective unit for Magnesium Nitrate re-concentration is operated under vacuum condition. Condensate from the Magnesium Nitrate brine concentrator is distilled water, which contains only traces of Nitric Acid. This water is often used as feed water for the production of weak Nitric Acid from ammonia.

**Treatment of Spent Acids in Stabilization Unit/ Decomposer STAB®** Spent acids resulting from nitration processes such as Nitrocellulose (NC), Nitroglycerine (NG), Penta (PETN), Hexogene (RDX), Octogene (HMX), Dinitroanisole, and Nitroguanidine (NiGu) contain high levels of organics that can cause process safety and operational issues. PLINKE offers treatment solutions to remove or reduce concentration of these contaminants to an acceptable level. All acid types are treated similarly for stabilization in a combined thermo-chemical process step where the organic compounds are destroyed in a controlled and safe way. The treatment conditions are tailor-made for the contaminants to avoid foaming and spontaneous development of gas. The resulting acid can be stored for later disposal or can be sent for re-concentration as described above.

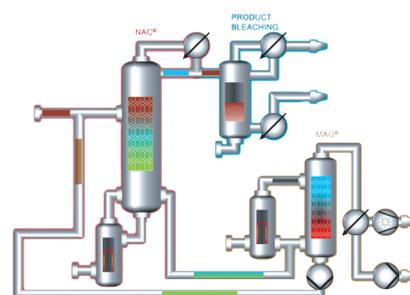
**Bleaching of Final Product**  
A bleaching unit may be applied to produce colorless, NO<sub>x</sub>-Reduced concentrated Nitric Acid (up to 99% HNO<sub>3</sub>).

**NO<sub>x</sub> Absorption** All nitrous gases produced during treatment and/or from other processes can be recovered as Nitric Acid, using PLINKE's NO<sub>x</sub> Absorption technology. NO<sub>x</sub> is recovered as HNO<sub>3</sub>, resulting in total HNO<sub>3</sub> yields beyond 99.9 wt%.

### Process schemes



NACSAC: High Concentration of weak Nitric Acid up to >99% HNO<sub>3</sub> by extractive rectification with Sulfuric Acid (NACSAC®). NACSAC® can be used for both spent and fresh Nitric Acid.



MAGNAC: High Concentration of weak Nitric Acid up to >99% HNO<sub>3</sub> by extractive rectification with Magnesium Nitrate Solution (MAGNAC®). MAGNAC® is restricted to fresh Nitric Acid only.