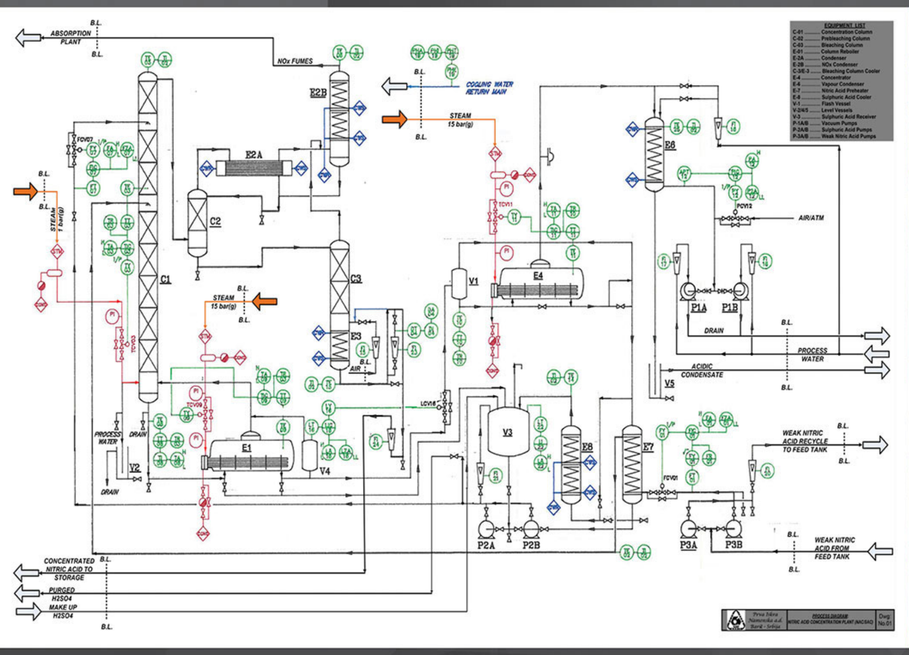
RECOVERY

Acids and Waste Gases Recovery Technologies



These technologies are used for processing and recovery of the waste acids and gases originating from the HMX, RDX, PETN and TNT manufacturing plants.

THE DISTILLATION AND RE-CONCERTATION WASTE ACETIC ACID

In the course of HMX manufacture as by-product is obtained weak acetic acid, containing traces of nitric acid and explosive precipitate. The recovery of weak acetic acid is performed by distillation and concentration.

Within the plant for HMX manufacture we also supply supporting plants for acetic acid recovery and acetone recovery. Carried out after distillation of the waste acid from the manufacture of HMX/RDX. The process is based on azeotropic rectification with organic acetate as dehydrating agent. The obtained glacial acetic acid partly returns to the octogen production process and is partly used for other purposes.

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THE ABSORPTION OF NITROUS GASES

The absorption of nitrous gases with the formation of nitric acid can be applied to all processes where are waste gases of relatively high nitrous content. Simultaneous gas and fluid reactions occur in the absorption columns in accordance with the gas phase and fluid phase reactions. Heat removal in the columns is a significant issue due to the exothermal reaction. The result is that at normal pressure and with the use of cooling water it is possible to produce nitric acid at a concentration of approximately 50 %, and the exhaust gas leaves the column with NOx content less than 150 ppm. Nitrous gases under slight pressure will be led to the first absorption column. Absorption of NOx gases is carried out in countercurrent flow with demi water/waste acid via multistage recirculation of nitric acid by means of pumps. Recirculation enables the intensive contact of NOx gases with water/weak acid in the towers in order to realize entire absorption of NOx gases. Tail gases leaving the top of the last column to atmosphere and contain the NOx gases less than 150 ppm. 50 % HNO3 as product is transported from the first column by pump to the storage tank.

THE DENITRATION OF SPENT SULPHURIC ACID

Spent sulphuric acid from TNT production plant feeds the denitration unit over the overflow vessel. Excess of spent acid recycles back to the storage tank. Feeding spent sulphuric acid is preheated in the heat exchangers by means of hot denitrated sulphuric acid leaving the bottom of the stripping column. Preheated spent sulphuric acid is finally heated in tantalum heater by means of high pressure steam and feed to the stripping column. Here are the organics, nitric acid and nitrous stripped of by live low pressure steam. In the condenser, nitric acid is condensed at a proper temperature to avoid crystallization of the MNT/DNT. Separation of weak nitric acid and NOx gasses is carried out in separator. NOx gasses are driven in to absorption unit while weak nitric acid overflows to the storage tank. Cooled denitrated sulphuric acid is finally cooled in cooler by means of cooling water and feed to the storage tank.

NAC/SAC Plant

Technology for nitric acid concentration

Due to the existence of an azeotrope between nitric acid and water, when the feed concentration is less than 68% HNO3, it is necessary to use an extractive distillation process. By adding sulphuric acid to the nitric acid/water mixture, the equilibrium curve is displaced to the point of eliminating the azeotrope. Weak nitric acid is taken from storage and delivered by pump. The acid is preheated by heat exchanger with hot sulphuric acid discharged from the reconcentration section in exchanger. Weak nitric acid (40% to 70%) and concentrated sulphuric acid (88%) are fed to the top of a packed tower. Steam is injected into the bottom of the column. The nitric acid is stripped out and delivered as overhead product at a concentration of 98.5% to 99.2%, while weak sulphuric acid is discharged from the base of the column at 65% to 72%. The nitric acid vapor is condensed and bleached free of NOx, by air in a short bleaching column. The NOx passes through a guard condenser to an absorption system. The stripping steam can be generated from a reboiler at the base of the column. This will give energy savings where the weak sulphuric acid is recycled through a sulphuric acid concentration plant – SAC (as associated process). Diluted sulphuric acid from the column reboiler is fed to the vacuum concentration unit (SAC) and initially enters flash vessel where it partially concentrates by flash evaporation. The sulphuric acid is concentrated by evaporation under vacuum, using steam (typically at 13-17 bar) with tantalum tubed heat exchangers. All equipment in contact with the acid is manufactured from borosilicate glass, glass-lined steel, PTFE or tantalum for long life. Water vapor evaporated is condensed in exchanger. The condensate is discharged and vacuum is produced by liquid vacuum pump.

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