



Recovery of high-boiling solvents from wet spinning processes

by means of distillation

Recovery of high-boiling solvents from aqueous solutions

Distillation is the separation of the constituents of a liquid mixture by partial vaporization and subsequent condensation taking advantage of differences in volatility.

Where high mass transfer rates are required, distillation in general provides an economic and efficient method for the separation of liquid mixtures. It especially applies for applications where high purities shall be achieved or multi-component mixtures are to be separated.

Since more than 100 years GEA supplies various kinds of separation and distillation plants. Depending on different requirements like operating capacity, feed properties, utilities, GEA provides the complete range from small batch system, continuous operating columns up to energy coupled multi-effective distilleries. The recovery and purification of high boiling solvents and water from aqueous mixtures represent a particular challenge. In separate process steps the components are separated and purified in the order of their vapor pressures. The first step is to evaporate and to purify the water in distillation columns. And second, the solvent is evaporated from the remaining mixture and purified in a rectification column. Last the waste stream is further concentrated, to minimize the losses of solvent and to reduce the waste.

Recovery of Water

Every day, thousands of tons of aqueous mixtures containing solvents accrue in all parts of the world. Combined systems consisting of evaporator and distillation units are used to recover the water out of these waste water or process streams, to purify and to recycle it. This is of benefit to the environment and results in a reduction of waste disposal costs and saves energy, utilities and feedstock.

GEA provides distillation technology using most efficiently heating technologies with Mechanical Vapour Recompression (MVR) or multi-effect heat integrated systems.

Recovery of solvents

The usage of high-boiling solvents, for example DMAc (N,N-Dimethylacetamide) or NMP (N-Methyl-2-pyrrolidone), in wet spinning processes for the production of various synthetic fibers (acrylic fibers, rayon, aramid fibers, etc.) as well as capillary membranes is a wide spread technology. In this process, the polymer is dissolved in the solvent before the spinning. After spinning the solvent is extracted with water from the fibers and has to be recovered. For this application, where a high



Mass flow diagram of the different process streams in a solvent recovery plant for aqueous solutions



Distillation plant for the recovery of solvents from a wet spinning process in a chemical fiber production plant

purity of solvent is required, GEA provides different distillation solutions of proven, energy saving technologies.

GEA is a pioneer in the recovery of solvents used for the production of medical membranes, where a high purity of 99,99 % is required.

Concentration of waste

Minimization of waste by recycling the containing valuable products is lowering the costs for disposal and reducing the consumption of resources in a most sustainable way.

High viscous wastes are concentrated in special designed evaporators, while the valuable products are recovered in a rectification column. Depending on the amount and the physical properties of the waste stream GEA offers various concentration technologies.



Engineering Portfolio and Applications

Continuous advancement is key in engineering efficient concentration and distillation technologies, tailored to the product properties. Therefore our experienced engineering team is supported by our process technology- and R&D-center using most modern simulation tools and variable distillation test units.

Engineering portfolio for various distillation Jobs:

- Pre-Engineering / FEED (Front-End Engineering Design)
- Basic Engineering
- Detail Engineering
- Engineering for tailor made applications, studies, consultancy

Key equipment for distillation plants:

- Columns with various internals
- Heat exchangers like reboilers and condensers
- Pumps and other machines or special vessels
- Automation equipment like field instruments, cabinets or PLC

Package units and systems or complete process lines:

- Supplementing key equipment deliveries to package units and systems, complete process lines with piping, insulation, automation etc.
- Integration of other process units from GEA or sub-suppliers (evaporator, dryer, crystallizer, filtration unit, decanter...)
- Supervision of assembly and commissioning or execution under defined conditions.

Chemical applications

Specialty and fine chemicals and solvents:

- Alcohol/solvent-dehydration with molecular-sieve units, entrainer-distillation/alcohol-dehydration with cyclohexane, MEG
- Purification of NMP, DMAc, GBL from wet spinning processes from fiber and hollow fiber production
- Purification and recovery of typical alcohols: Methanol, ethanol, n/i-propanol, n/i-butanol, pentanols, 2-ethyl-hexanol, glycol, DEG,
- Purification/recovery of typical esters, ethers, ketones, alkanes/aliphatics, aromatics, chlorinated solvents, bio- and other solvents

White Biotech:

- Polyol-separation (PDO/BDO from fermentation broth), organic acid recycling in lignocellulose-hydrolysis

Green Biotech/Energies/Environment:

- Bioethanol as fuel additive/substitute for ETBE; mash preparation, hydrolysis & fermentation, distilleries, glycerol/methanol separation for biodiesel, ethanol from waste water in pulp&paper production, advanced biofuels, HTF-recovery (Dowtherm™) for solar power plants, BTEX-removal from waste water

GEA Service - for your continued success

Working with GEA Service means partnering with a dedicated team of service experts. Our focus is to build, maintain, and improve customer performance throughout the entire life cycle of the plant and its equipment.

- Beginning of Life Services - Getting you started with seamless support for instant productivity and performance

- Lifetime Services - Keeping it running with the cost-efficient way of ensuring safety and reliability
- Extended Life Services - Constantly improving by sharing our knowledge to safeguard your investment
- Consulting & Enhanced Operations - Together with you by enduring commitment to you and your business

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