Modularized revolution for efficient solvent extraction

Outotec has been developing a wide range of solvent extraction technologies for decades and is now introducing the new Outotec VSF®X Plant. The standardized and modularized Outotec VSF®X Plant provides a novel way to design, manufacture, transport, install, operate and maintain a solvent extraction plant far better than in the past with highly sustainable and safe methods.

The Outotec VSF®X Plant is designed to handle flows from 100 m³/h up to 10 000 m³/h and metal content from 1g/l up to 50g/l. All metals for which an extraction reagent is available can be extracted using Outotec VSF®X solvent extraction technology.

BENEFITS

- 20% shorter lead time
- Decades of experience in solvent extraction
- Predefined concept and modular design
- Lower investment, installation and operation costs
- Increased availability
- Proven environmentally sound technology
- Enhanced safety
- Life cycle services available
Decades of experience in SX technology
In the solvent extraction phase of the process, a metal in the pregnant leach solution (PLS) is concentrated and purified into electrolyte. The pure electrolyte is then used in electrowinning to produce a chemically and physically high-quality product.

Outotec has been developing a wide range of solvent extraction technologies for decades. This long history of dedicated R&D began in response to increasing demands for lower operation and investment costs, together with more reliable and stable production where health and safety issues are given high priority in the plant design. In copper solvent extraction applications Outotec has been using settling rates up to 10 m³/h/m².

The results have been impressive, and today the plants that use the ground-breaking Outotec VSF® [Vertical Smooth Flow] mixer-settler technology are among the most profitable in the world. Since launching the VSF® technology for copper applications two decades ago, Outotec has gained a leading market share of new copper solvent extraction capacity.

Solvent extraction with the modularized Outotec VSF®X Plant provides customers a more reliable and cost-efficient total delivery package with superior results. Benefits include a 20% shorter lead time from contract to production, a predefined supply chain, transportation, site logistics, and minimized site work and pre-commissioning activities.
Decades of experience in SX technology
Outotec is the only technology provider that offers a highly predefined but still tailor-made total delivery package based on customers’ needs. Outotec’s renowned SX knowledge is automatically included in predesigned VSF®X Mixer-Settler modules. This innovative, modular product enables fast-track deliveries, predefined costs, state-of-the-art documentation and implementation, efficient logistics, and fast installation - all this in an environmentally friendly and sustainable way.

The modular system allows flexible capacity since more capacity can be built while the plant is running by increasing additional lines of sections. Soil contamination of each mixer-settler is totally avoided and possible leaks are easy to detect and repair. Furthermore, the settlers have extra residual value since they are easy to disassemble and transport to a new site.

All SX equipment (DOP®’s, SPIROK®’s, settlers, loaded organic tanks and after settlers) is covered making the SX process very stable against organic phase oxidation and enhancing work safety by minimizing organic evaporation. Fire safety is maximized due to the low oxygen presence and limited combustion space. There are no carbon steel parts inside of the equipment, which also reduces the fire risk during maintenance.

VSF®X DOP Unit
In Outotec’s VSF® (Vertical Smooth Flow) solvent extraction technology, pumping and mixing are separated. This ensures low entrainment losses even if flows have to be increased above the design values for operational reasons. The DOP unit consists of a suction tank with a conical overflow rim, a turbine, a flow stabilizer and a baffled cylindrical outer tank.

VSF®X Spirok® Mixer Unit
The SPIROK mixer is designed to ensure the gentle and uniform mixing needed for the proper dispersion mixing. The mixer maintains a vertical flow throughout the whole mixer with a low rotation speed. The SPIROK mixer covers the entire volume of the mixer tank, thus avoiding local high shear forces. This has a positive impact on the residual organic and aqueous entrainment levels.

VSF®X Settler
The settler design is very important for the solvent extraction plant operation. The VSF®X Settler has a deep, dense and packed dispersion layer at the feed side of the settler.

The incoming dispersion flow is distributed evenly with a feed launder. Dispersion is then kept in a compressed state by means of DDG® separation fences. The dense dispersion layer filters small droplets and enhances coalescence. More flexibility to handle higher feed flows is achieved when the dispersion and the separated organic phase are not allowed to spread over the whole settling length. The separated organic and aqueous phases are finally collected into separate launders. The aqueous inner circulation is taken from the settler bulk without disturbing the flows inside the settler.
**Sustainability**

Environmental awareness and protection are important features of all Outotec technologies. We promote the effective use of raw materials and aim to reduce water and energy consumption. Consequently, environmental protection is an integrated feature of our technologies.

Health and safety issues are essential elements of Outotec’s solvent extraction technologies. We ensure that our technologies are easy to control and have a low maintenance requirement. The operator’s safety is strictly observed from the design phase forward. Safety with respect to operation, equipment, the environment and personnel is enhanced in an easy and convenient manner with the help of advanced automation.

Health, safety and environmental (HSE) aspects are an inseparable part of the VSF®X Plant concept. They are considered thoroughly already during the product definition phase, providing a safe and sustainable plant that is easy to operate and maintain:

- Possibility to use sea water as process water
- Waterlocks in the inspection/maintenance hatches
- Minimized VOC emissions
- Minimized energy consumption due to VSF design
- Reduced plant area with reduced excavation costs
- Minimized environmental impact and carbon footprint
- Safest available technology for operators
- Mixer-settlers have a high residual value