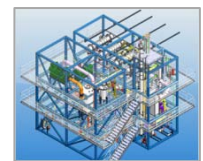
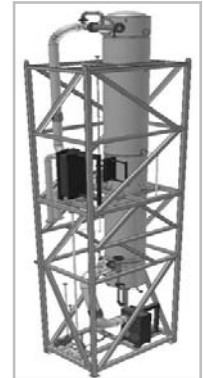


# SOLVENT RECOVERY

## APPLICATION BROCHURE



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EPCON EVAPORATION TECHNOLOGY AS

EVAPORATORS – DRYERS – DISTILLATION & DEHYDRATION – HEAT RECOVERY SYSTEMS  
ENGINEERING AND AFTERSALES SERVICES

### EPCON products

EPCON supplies process plants for separating different types of fluids or fluids from solid material, based on the principles of evaporation, distillation and drying. EPCON has developed unique energy efficient technical solutions for a number of separation and purification processes.

### Energy saving

EPCONs core competence is energy utilization in evaporation, distillation and drying processes for a number of applications and industries. Energy savings of 80-98% are normally achieved, within a very favorable investment pay-back time.

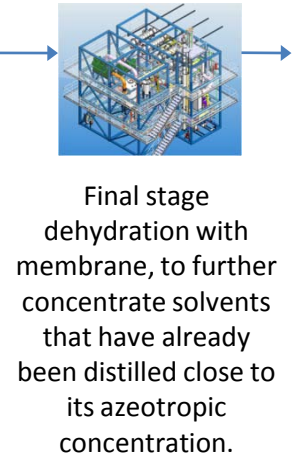
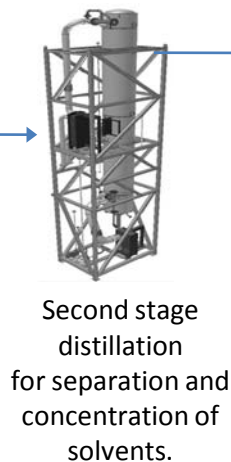
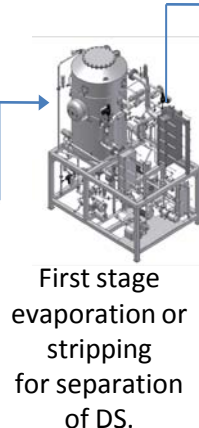
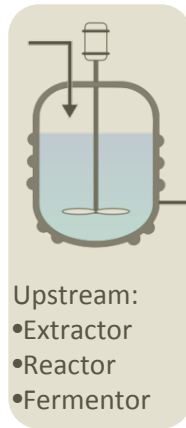
### Solvent recovery

EPCONs technology for recovery and purification of solvents are based on the principles of either one- or several stage distillation or membrane dehydration. The process could either be batch wise or continuous operation.

This type of plants are very liquid- and separation task dependant, and hence customised process solution are often required. The process design is based on our range of products and process plants.

Also the energy system is dependant of the actual case, and the full range from direct steam, cascade, MVR and indirect heat pump is available.

### Example (\*) of process route for alcohol solvent recovery.



**(\*): process route and number of stages depends upon feed- and product specification.**

### EPCON products and processes for solvent recovery applications:

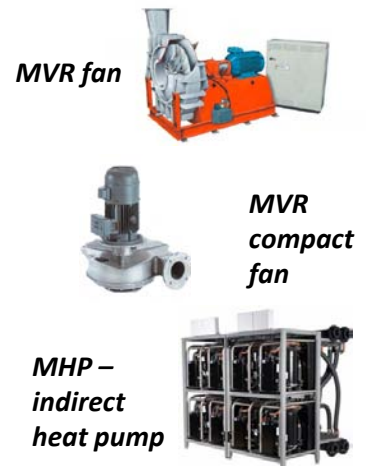
- Falling film-, climbing film-, flash-, compact EPCOVAP-MVR and EPCOVAP-MHP evaporator, both as standalone evaporator and as re-boiler for stripper- or distillation column.
- The EPCOVAP-MHP evaporators are a series of standardized low temperature (35-40°C) compact evaporators with energy recovery. These are for lower capacity evaporation, in the range of 50 to 250 kW.
- Distillation plants, with the one of the above listed evaporators as re-boiler. The EPCON distillation systems are characterized by an throughout energy optimized design.
- Type of evaporator used depends upon plant capacity, ATEX requirement and liquid-/DS characteristics, the latter give basis for design operating conditions.
- Dehydration plant based on MVR vapor permeation. EPCON has developed a new patented ethanol and iso propanol dehydration system.



**Refer the EPCON separate datasheets for further information of the listed process plants.**

### EPCON energy systems for solvent recovery applications:

- EPCON has experience with direct steam, cascade and MVR in solvent recovery plants.
- MVR is a technology where the vapor is compressed in a compressor or fan and then used as energy source.
- MHP, compact indirect heat pump technology, is the energy system utilized in the novel EPCOVAP-MHP system.
- MVR could be utilized either in direct process vapor or indirectly with water vapor.
- EPCON has experience with ATEX MVR fans. Indirect MVR or MHP give rise for non-ATEX energy system in ATEX application.



## Applications and case studies

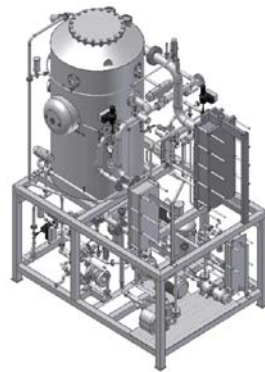
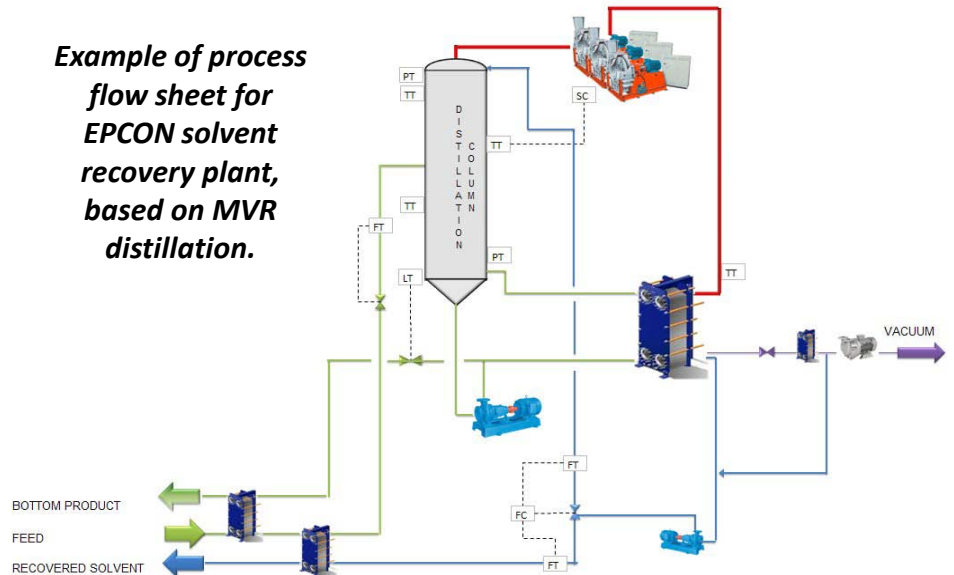
A solvent recovery system presents many advantages to any industry which uses liquid solvents in their operations. One advantage is the ability to purchase and store less amounts of solvents on-site. If also utilizing energy recovery, for instance MVR, in the processing, the energy cost is cut to a minimum.

A number of existing solvent recovery plants have potential for revamp with MVR energy system. Savings in the range of 80-90% could be achieved.

### Application examples:

- ❑ One- or several stage distillation of solvent used in upstream extraction processes, for instance in biomarine-, food- and pharmaceutical industry.
- ❑ One- or several stage distillation of solvents used in upstream chemical reaction processes.
- ❑ One stage distillation of ethanol from biomarine fat rich wastewater stream, for reuse of solvent and reducing deposit cost.
- ❑ Distillation of ethanol or methanol in streams from berry antioxidant extraction process.
- ❑ Stripping of methanol from intermediate streams in biodiesel processing, and a common distillation stage of the same methanol.
- ❑ Dehydration of ethanol or iso propanol in membrane based process with integrated recycling / distillation of solvent in permeate stream (EPCON patented process).
- ❑ Recycling of MEG and PEG, the latter for instance from sawing slurry for wafers.
- ❑ Revamp of existing solvent recovery plants for MVR operation, due to increased energy prices and more focus on environmental issues.

### Example of process flow sheet for EPCON solvent recovery plant, based on MVR distillation.



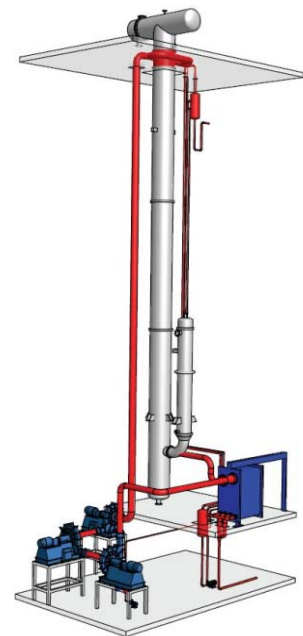
### CASE STUDY:

Recycling of ethanol from biomarine fat rich waste stream after extraction, including reduced deposit cost for dry matter:

- Solvent: Ethanol
- Conc. ethanol: > 90 %
- Capacity: 700 l/h
- Boiling temp.: 55 - 70 °C
- Dimensions: 2.5 x 1.8 x 3.5 m
- Steam cons.: 280 kg/h
- Op. pressure: 0.4 barA (vac.)

### ADVANTAGES

- Considerable cost savings by recycling used solvents
- Reduced deposit cost
- Flexible energy supply system, i.e. different heating agents possible
- High purity of distillate
- Efficient CIP
- Easy maintenance and repair
- Flexible in regard to liquid properties



### REVAMP CASE:

Revamp of existing solvent recovery distillation column for MVR operation, including new MVR type re-boiler:

- Solvent: Alcohols
- Capacity: 1500 kW
- MVR design: Direct
- Delta T MVR: ~20°C
- El. cons.: 180 kW
- Energy saving: 88%

### FURTHER ADVANTAGES

- 85-90% reduced cooling capacity
- Flexible integration, with possibility to also run without MVR
- Pay-back time of less than 3 years

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