MVR-HP

EPCON Evaporation Technology AS

Figure 1: EPCON standard MVR fan

Summary of technology
The Mechanical Vapor Recompression (MVR) system can have an open or a closed loop layout. It uses water as refrigerant, and features serial compression steps for flexible system design and optimized COP. It is well suitable in a cascade with bottom cycle HP. The driving energy is electricity.

Relevant applications include industries with existing- or new thermal separation processes as evaporation, distillation and drying, and/or plants with excess applicable thermal energy. MVR can boost temperature and/or generate water steam from district heating hot water loop, for industries using water steam in their processes.

The compression technology consists of high-pressure centrifugal fans or positive displacement blowers. The MVR-HP units are sold using well proven machinery. The fans have been used in MVR evaporators since mid-1980s. They allow for flexible design and operation, e.g. Fast start-up and shut down times. There is no lubrication. New developments include pilot-/demonstration plants together with SINTEF for verifying new type water vapor compressors for lower range capacity.

Suitable source media for MVR-HP is:
- Process vapors, e.g. water vapor, solvent vapor, etc.
- Hot water

Performance data for the MVR-HP system is given in Table 1.

The first row refers measured values from an installed system using a single stage MVR roots blower to supply water vapor to a reboiler in a distillation plant.

The second row refers to calculated values from a case study using multiple MVR fans in series in a closed loop.
FACTS ABOUT THE TECHNOLOGY

**Heat supply capacity:** 0.5MW to 100MW

**Temperature range:** Max supply 150°C, min. source temperature 50°C (if glide, then 50°C is return source temperature). Temperature lift is flexible, however considered versus capacity / return of investment.

**Working fluid:** Water in closed loop

**Compressor technology:** High-pressure Centrifugal fan; positive displacement blower.

**Specific investment cost for installed system without integration:**

- Lower capacity range of 1-3MW, MVR-HP temp. lift of 30-60grdC, specific price 400€/kW.
- Higher capacity range, 10-30MW, MVR-HP temp. lift of 30-60grdC, specific price 200€/kW.

**TRL level:** 9

**Expected lifetime:** 25 years

**Size:** Depends upon capacity / type of MVR machines and temperature lift / number of MVR machines in series. Possible to reduce footprint by stacking MVR machines in 2 or more building levels.

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**Project example**

An MVR-HP was integrated into an existing distillation process in pharmaceutical industry. Top vapor / alcohol vapor latent heat was used as energy source, while the distillation column bottom reboiler was the energy sink. The MVR-HP was a closed loop system with water as refrigerant. EPCON also supplied the energy recovery- as well as energy supply HX systems.

The commissioning period was very efficient, the MVR-HP start-up and shut-down sequence are smooth and fast, the distillation process operational specifications are not influenced negatively by the MVR-HP. The end-user main performance indicators - energy saving / COP - was achieved from first day of operation. Since the MVR-HP was set in operation, extensions in two steps have been done both to optimize the integration and further to increase the capacity by installing a 2nd similar MVR-HP for another distillation process.

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All information were provided by the supplier without third-party validation. The information was provided as an indicative basis and may be different in final installations depending on application specific parameters.