Optimizing EPDM Plants: Waste heat recovery in thermal separation processes through steam generation using MVR Blower Technology

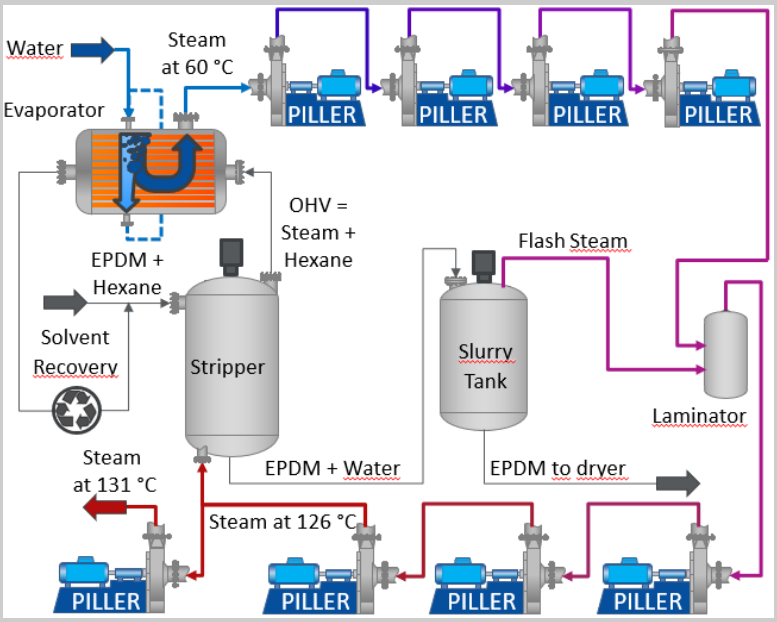

Figure 1: SSBR Strippers, EPDM Plants, Flash Vapor Recovery and Cumene Columns – all these chemical and petrochemical processes were optimized with state-of-the-art PILLER MVR Blowers. Benefitting from Heat Pump Systems based on MVR Blower Technology not only means reducing operational costs, CO2 emissions also are significantly reduced using a waste heat recycling process.

Summary of demonstration case

As the expert in design and manufacture of customized, efficient, and high-performance blowers, PILLER offers unique solutions for every project. After analyzing and rating potential savings for customers in a feasibility study, individual heat pump systems are engineered to optimize CO2 and energy savings. We started with a recovery rate of 6.5 tons per hour, eventually reaching 31.7 tons (usable) steam per hour.

In the case of an EPDM Plant, a steam generating Industrial Heat Pump was built in 2017.
Steam generation here is used for stripping units where solvents from the reaction process are separated from the product. By introducing steam into the stripping unit, a mixed overhead vapor (OHV) containing steam and solvent vapor evaporates. The OHV is then condensed to recover the solvent.

"Together with our customers, we are striving for reduced greenhouse gas emissions – implementing industrial heat pump systems based on MVR blower technology."

Dr. Steffen Kuberczyk, Global Sales Director of Piller Blowers & Compressors

Instead of transferring the heat released by condensation into the environment through cooling towers, it is reused to produce low pressure steam in an evaporator. With a multi-stage mechanical vapor recompression (MVR) system, the steam is compressed back to the pressure level that supplies the stripping unit:

The Industrial Heat Pumping Technology allows integration of additional heat sources between the stages. In this project, flash vapor was fed into the system in the middle of the Steam Compression Cycle.

Operating experiences

A special evaporator design and the high flexibility of PILLER Blowers guarantee reliable heat recovery, saving over 80 % in energy consumption and reducing CO2 emissions by 62 % in this single retrofitting project.

In addition to the reduction in steam consumption, the Heat Pump System also reduces cooling water demand, decreasing the overall energy consumption on site.

Saving more than 4 Million € annually by retrofitting their existing plant with the Industrial Heat Pump solution by PILLER has provided our customer with a payback period of 1.7 years.

With more than a dozen installations, PILLER established its position as the pioneer for large scale steam generating heat pumps.

FACTS ABOUT THE CASE

Intallation year: 2017
Operating hours: ~8000 hours/a
Working fluid used: R718 (water)
Compressor technology: Turbo
System manufacturer: Piller Blowers & Compressors
Performance in design point:

- **Heat source:** 92°C n-Hexane, Water → 60 °C Water
- **Heat sink:** 126 °C / 131 °C reintroduced for process heating
- **Heat supply capacity:** 10 MW
- **$COP_{Heating}$:** 4,4

Investment cost: 6,800,000 €
Savings: 4,000,000 €/a
Estimated annual CO_2 savings: 12,400 t/a
Link to webpage or report:

https://www.piller.de/fileadmin/media/pdf-files/product-sheets/steam-regeneration-epdm.pdf

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