

# VAPOR COMPRESSION HEAT PUMP TECHNOLOGY – ECONOMICAL AND ENVIRONMENTAL BENEFITS

The combination of limited energy resources with increasing prices and the goal to reduce greenhouse gas emissions are pushing the industry to find more efficient solutions for its energy demand.

Thermal energy represents a significant portion of total energy use in industrial processes, so careful management is a key factor in developing energy efficiency systems that build a foundation for climate protection.

## VALUABLE INDUSTRIAL WASTE HEAT – ENERGY EFFICIENCY AS A SUCCESS FACTOR

The use of waste heat in industrial processes has great potential in terms of energy efficiency. Excess waste heat from thermal separation and other industrial processes is often unused and released into the environment.



## VAPOR COMPRESSION HEAT PUMP TECHNOLOGY

Heat pumps are essential, when classic methods of waste heat utilization are no longer possible or sufficient.

Utilization of waste heat flows by using Vapor Compression Heat Pump Technology reduces the process steam demand and optimizes energy consumption.

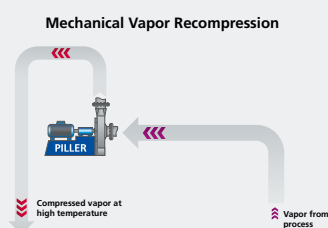
In contrast to conventional heat pumps, that use chemical refrigerants, the heat pump solutions made by PILLER can compress process vapors directly or the steam generated using the given waste heat source.

Our heat pump solutions are capable of producing more than 90 K temperature rise in a single train and a discharge pressure up to 20 bar (g).

**Our blowers and compressors deliver the heating demand necessary by lifting the pressure and temperature. There are two main options to apply the heat pump solutions made by PILLER:**

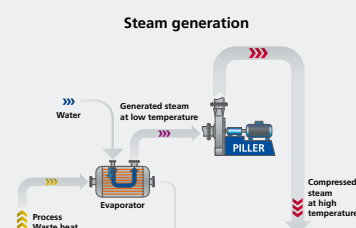
### 1. The direct vapor compression cycle

The waste heat source is a vapor that can be compressed directly and then used for heating. The basic principle corresponds to the classic Mechanical Vapor Compression (MVR) process. In addition to being used for process heating, the compressed vapor can also be used in another process, or for generating of steam or hot water.



### 2. The steam generation cycle

If the waste heat source is a liquid or a vapor that cannot be compressed, the heat pump cycle with evaporator can be used. For this, water is used as a working fluid generating steam in the evaporator at a low pressure and temperature.



**PILLER'S SYSTEM ENGINEERING SERVICES**

PILLER offers engineering services for feasibility assessment including conceptual design and/or support in the Pre-FEED phase.



**CONCEPTUAL DESIGN – MAKING THE PROJECT FEASIBLE**

PILLER will develop a Conceptual Design Document (CDD), taking a close look at the feasibility for your process.

**Data sampling**

Gathering data on energy flows and other parameters, PILLER will select a subset of data for subsequent evaluation. This is done in close cooperation with the plant operator.

**Process simulation**

Heat and mass balances by process simulation are the starting point for the evaluation. Our services include identifying usable waste heat sources and heat sinks in the process, and defining the waste heat potentials per temperature level.

**Process description**

We will outline how the process of vapor compression heat pump technology runs and visualize a proposed solution in a Process Flow Diagram (PFD).

**Evaluation of case studies**

To identify the best concept for heat recovery with PILLER's Mechanical Vapor Compression (MVC) technology, different case studies are analyzed and evaluated.

**Sizing of equipment**

The main plant components such as blowers and compressors engineered for steam compression – the PILLER VapoLine – are preliminarily sized and priced.

**Cost estimation and benefit factors**

In this phase of the project planning, we provide a preliminary cost estimation and assessment of benefit factors, including energy savings, energy cost savings and CO<sub>2</sub> emission reduction. This interim result supports the decision if the project shall be continued before focusing on the ongoing detailed planning.

**BEYOND CONCEPTUAL DESIGN**

We actively participate in our customers Pre-FEED (Front-End Engineering & Design) phase, where we work with the plant operator and EPC contractors to further develop and optimize project and technology integration.

The outcome of the Pre-FEED can be used as the design basis for the next level of work FEED or basic engineering. In case of interfaces to the key system components, the Blowers and Compressors, we also provide support during the entire engineering phase right through commissioning.

**VAPOLINE – BLOWERS AND COMPRESSORS FOR MECHANICAL VAPOR COMPRESSION**

Our Vapor Compression Heat Pump Technology is based on high performance, engineered Blowers and Compressors for Mechanical Vapor Compression.

With the VapoLine product portfolio, PILLER provides the perfect range of options to save energy and reduce carbon emission, demonstrating its competence as an expert in Vapor Compression Heat Pump solution.



*PILLER VapoLine – Blowers and Compressors specially engineered for Vapor Recompression*

Contact PILLER to find out more about your MVR options for integrating Vapor Compression Heat Pump Technology into your process.

Visit our website to find worldwide sales & service contacts

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