

ALWAYS ADVANCING

SUNTECO



PILLER

Blowers & Compressors

MULTI-STAGE STEAM REGENERATION

WE ARE WORKING ON THERMAL ENERGY



INCREASED COMPETITIVENESS: SAVE ENERGY COSTS USING STEAM REGENERATION



Steam plays a key role in many industrial production processes – especially when it comes to thermal separation processes such as distillation, stripping, or evaporation. In spite of this, many businesses only use steam once and allow it to condense to control process pressure. This is throwing away energy in the heat of vaporization and required cooling water. There is however a solution: Energy recovery through steam regeneration!

Table 1: Our Achievements in the MSSR the Market

	Projects	Year	Steam (ton/h)	Electricity (KWh)
1	First 3-stage MVR + TVR system	2008	6.5	466
2	First 4-stage MVR system	2010	12.9	1,138
3	Stripper 4-stage MVR system	2012	15.1	1,424
4	Reactor 4-stage MVR system	2012	28.2	2,150
5	Evaporator 4-stage MVR system	2012	9.2	953
6	First 6+4-stage MVR system	2013	23.0	2,840
7	6+4-stage MVR system	2015	23.0	2,840
8	First 7+1-stage MVR system	2015	37.0	4,002
9	7+1-stage MVR system	2016	21.3	2,128
10	Evaporator 4-stage	2016	18.0	1,680
11	Batch 6-stage	2015	20.0	2,610
	Total utility consumption	hourly	214.2	22,231
	Total utility cost (@ \$30 / \$0.08 / 8000h)	yearly	\$ 51,408,000	\$14,227,00

**HIGH INVESTMENT RELIABILITY:
ROI ACHIEVED WITHIN A MAXIMUM
OF TWO YEARS**

How does it work? Quite simply: by using our Multi-Stage Steam Regeneration (MSSR) technology. It compresses lower energy steam using state-of-the-art high performance radial blowers from PILLER, thereby elevating the saturation temperature of the steam before feeding it back into the same or a different production process.

That means hard cash for industrial firms. After all, the drop in energy costs is so significant that return on investment (ROI) is achieved within a short period of time. It follows after the pay-back time that companies will see a permanent increase in profits by using the MSSR system, enabling them to further boost their competitiveness. But that's not all. It will also give them the opportunity to counteract the greenhouse effect and prepare themselves ahead of time for a future with stricter environmental regulations, thereby gaining an important advantage in the face of upcoming regulations implemented within the context of corporate social responsibility (CSR).



PILLER blowers for 8-stages MSSR system prior to delivery

ADVANTAGE FOR ENVIRONMENT AND INDUSTRY

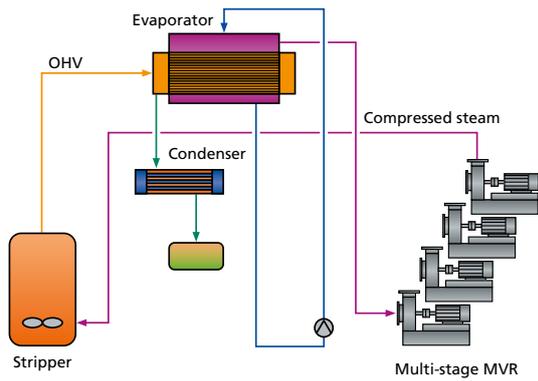
MSSR system with PILLER blowers connected in series: Steam regeneration is designed to save so much on energy costs for the ROI within two years.

MSSR SYSTEMS ARE AVAILABLE CURRENTLY WITH UP TO EIGHT STAGES

Our engineering specialists now have experience of their own regarding steam regeneration. They have installed MSSR systems of varying sizes in industrial companies worldwide. The largest system was implemented in a stripper and features eight compression stages.

RAPID AND COST-EFFECTIVE INTEGRATION INTO EXISTING PLANT FACILITIES

Our MSSR systems can be easily integrated into your existing plant facilities. Companies throughout the world have already seized the opportunity and are now benefiting from the energy recovery potential offered by steam regeneration. For example one company that runs a stripper that used to spend \$4,832,000 annually on steam generation. In 2013, it ordered the installation of an MSSR system with four blowers from PILLER for \$6,370,000, an ROI of just 1.3 years.

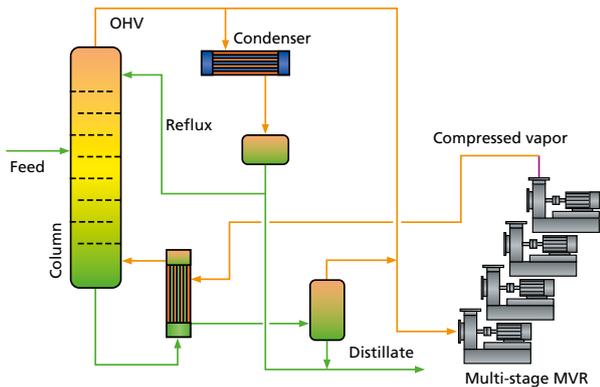


A schematic of an MSSR system with PILLER compressors integrated in one stripper and a MSSR system with four PILLER compressors for the second stripper. ROI achieved within just one year.

INCREASED FLEXIBILITY WITH DIRECT AND INDIRECT ENERGY RECOVERY

Various methods of steam regeneration are possible with MSSR systems – indirect energy recovery, for example, which is used for contaminated steam. The centerpiece is an invention from Sunteco, which received the award for best Korean patent of 2015 from the Korean Institute of Patent Information (KIPI). Using heat exchangers it extracts energy from the cooled contaminated steam in order to generate new pure steam. The PILLER blowers connected in series, compress the steam to the required higher pressure level before feeding it back into the production process.

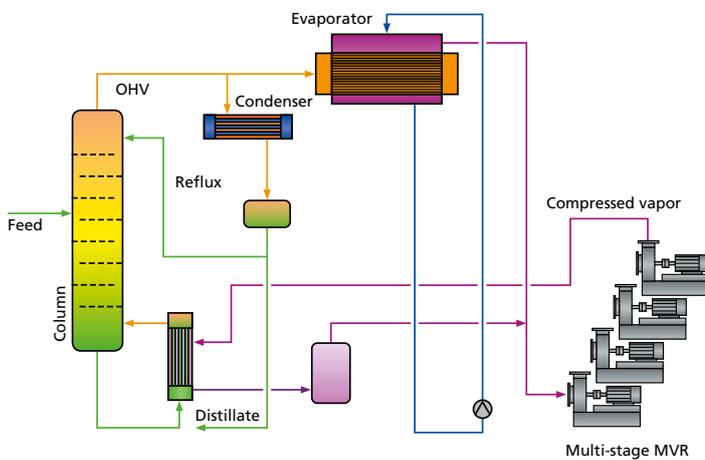
Distillation column OHV direct compression



MSSR SYSTEM WITH DIRECT STEAM REGENERATION

PILLER blowers are characterized by their high flexibility. They are suitable for both direct and indirect energy recovery.

Distillation column OHV indirect compression



The blowers are also suited to the direct method of energy recovery. In this case the contaminated steam can be compressed directly without heat exchangers and feed back into the production sequence.



BLOWERS ARE MORE FLEXIBLE THAN CLASSIC COMPRESSORS IN MANY ASPECTS

PILLER was the first company in the world to develop high performance radial blowers for multi-stage mechanical vapor recompression (MVR). The advantage in comparison to classic compressors: The blower can be easier integrated in existing plant facilities, are more flexible, faster, and less expensive.

PILLER blowers reach an efficiency level up to 82 percent. They are more flexible, more reliable, require less maintenance, are not so sensitive against sub-optimal process conditions and are more robust than classic compressors.

The housing of the blowers has also been optimized to be especially resistant to water and contaminated steam and to be largely maintenance-free. MVR blowers are impressively powerful in spite of their compact nature. They run with shaft powers of up to 5 MW with impellers tip speeds of up to 320 meters per second. Depending on the application, steam can be compressed to a pressure up to 6 bar – at an efficiency up to 82 percent. Currently we have connected eight blowers in series. PILLER is the only manufacturer in the world that offers this opportunity.

MVR Specifications

Medium	Steam
Shaft power	up to 5 MW
Temperature increase	up to 10 K single stage
Impeller speed	up to 320 m/s
Efficiency	up to 82 %

THE BENEFITS OF MVR BLOWERS AT A GLANCE

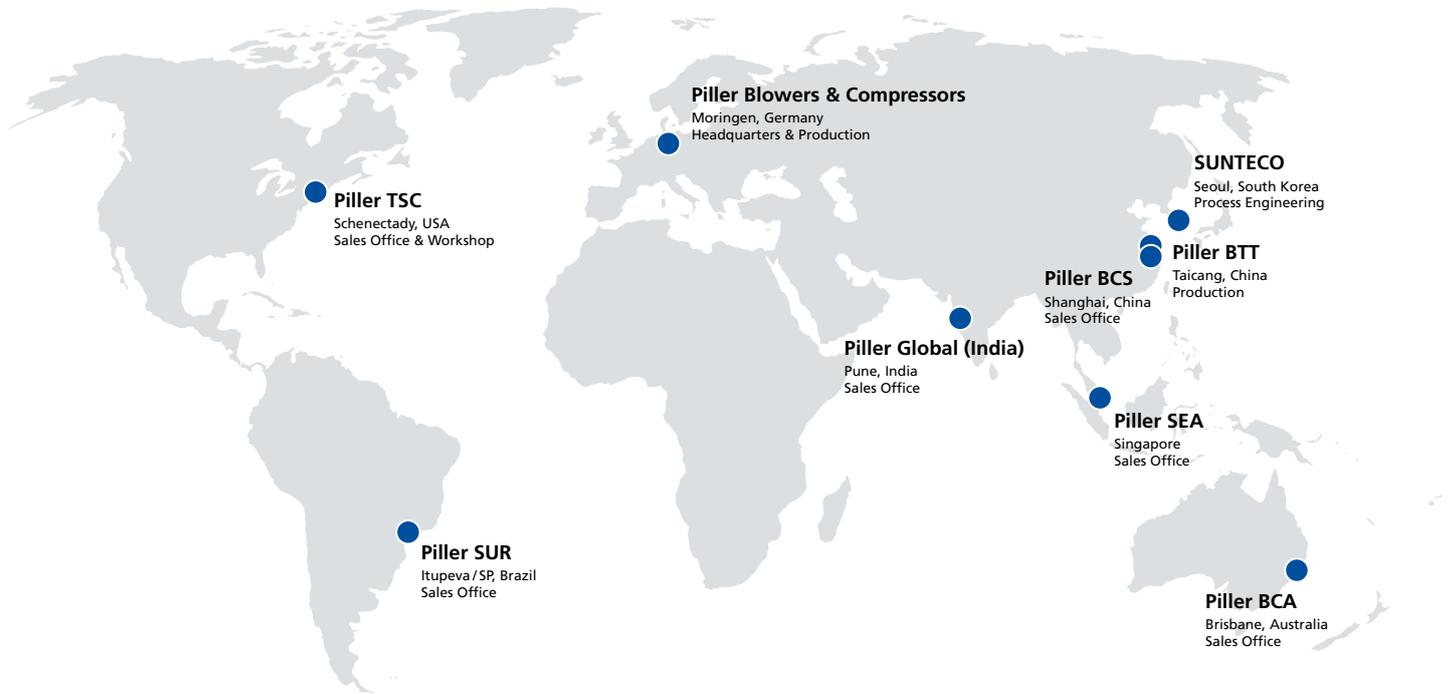
- Flexible and cost-effective to integrate in existing plant facilities (even on roof top) thanks to compact and robust design
- Long service life with low maintenance cost
- Efficiency up to 86 percent
- A world first: series connection of eight blowers

TOP “MADE BY PILLER” PRODUCT QUALITY

With more than 30 years of experience the German company PILLER counts among the leading international technology providers for high performance blowers and compressors. Experienced engineers and technicians offer process expertise and assure the highest “MADE BY PILLER” product quality.

The in-house R&D division in Moringen, Germany is home to designers, mechanical engineers and electrical engineers working with the latest in measurement, testing, simulation technology and working in close collaboration with universities and non-university research institutions PILLER continues to push the boundaries of technology every day.

PILLER is working worldwide together with partners which have specialized in energy recovery and we can supply basic and detail engineering for applications particular for the chemical, petrochemical and process industry.



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