

MIST ELIMINATION
OIL AND GAS INDUSTRY

The right places.
At the right time.

Mist eliminators
in the oil and gas industry

Optimization through elimination

The need to remove and separate liquids as well as contaminants is fundamental to the oil and gas industry; from exploration through production, transportation, refining right up to point of sale. Without this function, processes stop, product quality drops, plant and equipment gets damaged and things could just grind to a halt.

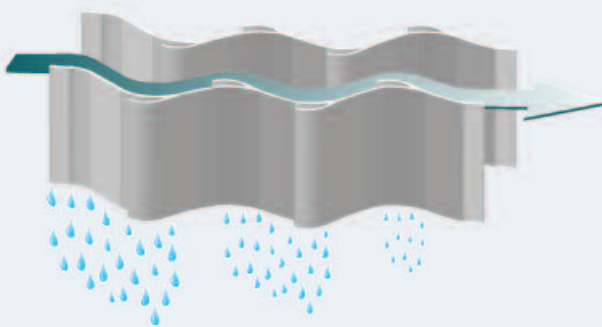
Mist elimination within the process design is essential to effective removal and recovery or disposal, of all types of liquids or contaminants. It protects downstream equipment and processing systems without constraining processing performance and introduces a vital level of controllability before each subsequent stage of the process. Performing these tasks dependably involves choosing the right mist elimination configuration for the application, making sure it suits the processing equipment, the location, the loading and the application. Correct choice of the mist elimination component requires accurate matching of the eliminator vane to the



characteristics of the gas flow. This in turn requires an in-depth understanding both of the oil and gas processing involved and of the physics of the mist elimination itself.

Mist elimination applications in oil and gas:

- Removal of liquid carry-over
- Removal of condensed liquid
- Removal of contaminants



Mist eliminators are “guards” of your process plant. In all stages of the production, transportation or refineries and gas processing plants, mist eliminators separate liquids from gas streams and thereby contribute to the correct mass and heat balance of the process.

Mist elimination principle with DH 5000 for horizontal flow.

Removal of liquid carry-over

Liquid carry-over can be derived from inadequate process design, high gas velocities, as well as from liquid slugs from wells, riser or pipeline derived conditions. It results in parts of the liquid phase present in the gas stream being carried over downstream into subsequent plant components. Depending on the process, carry-over can cause severe problems such as loss of product quality, and can do damage to downstream components – it also leads to additional energy usage.

Process

Carry-over in these process conditions typically occurs in thermal separation or gas outlet scrubbing processes. High gas velocities or too much liquid for the design of the existing equipment – especially in older developments – can cause carry-over of the entrained liquid and poor process performance.

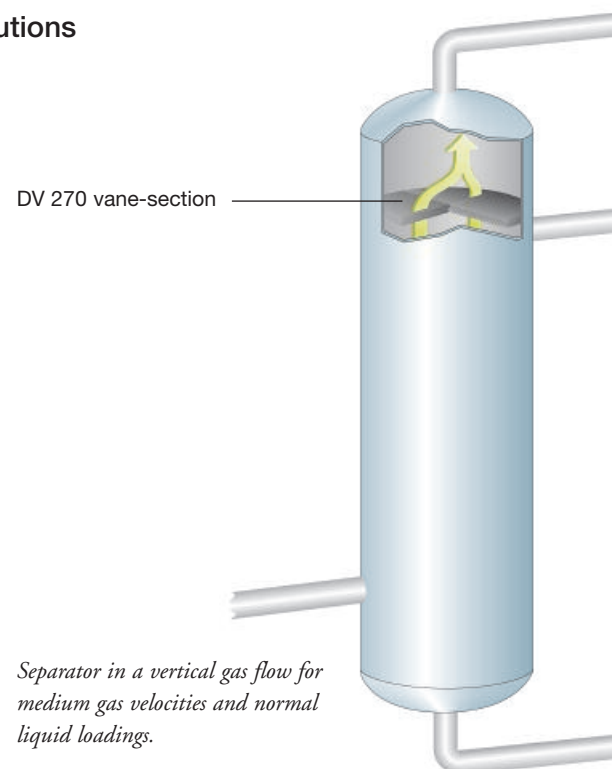
Properly designed mist eliminators allow plant designers to apply higher gas velocities and to cope with expected and unexpected process conditions such as high turn down factors thus minimising process plant cost and producing better product separation.

Problem

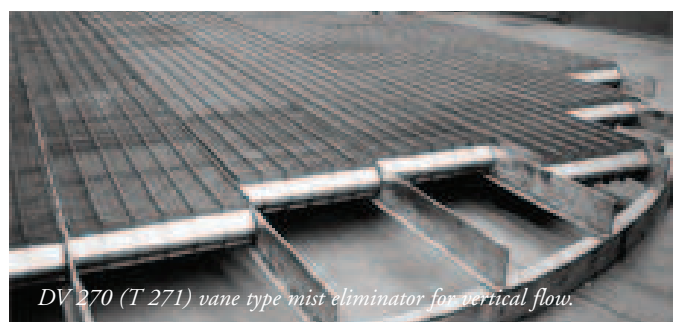
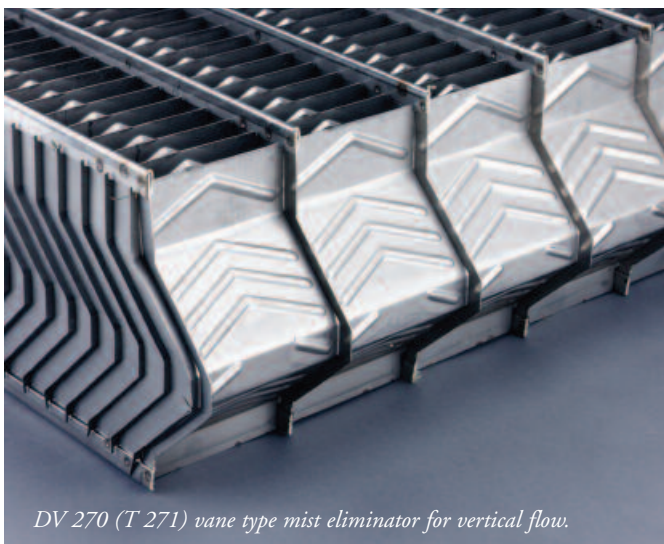
Liquid carry-over can cause:

- Loss of product quality
- Damage to downstream components
- Higher energy cost

Solutions



For more product information, please see the technical leaflets for **DH 5000 (TS-5)** and **DV 270 (T 271)**.

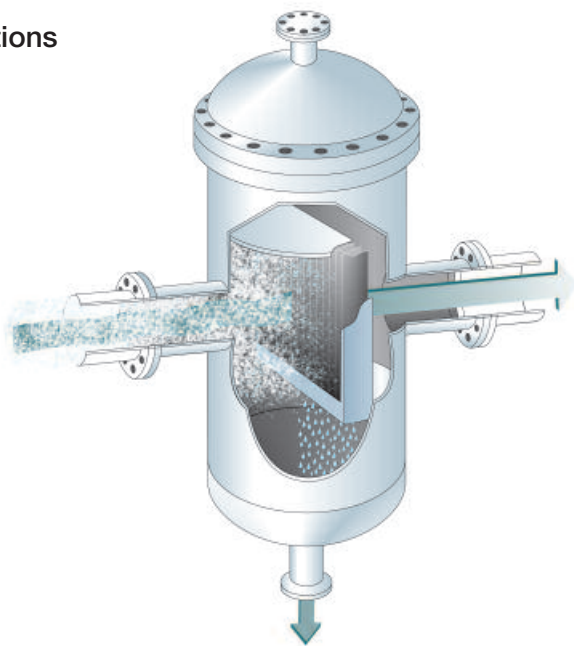


Removal of condensed liquid

If conditions are right, temperature and pressure changes occurring in a process can cause condensation of liquid or drop out. This condensed liquid can either be a fractionated product, such as that occurring in a refinery, or it can be an unwanted component that needs to be removed prior to further processing, such as water in a gas stream.

In the case of intentional condensation, the gas stream will still have a significant proportion of the product entrained and needs to be removed for economic reasons. In the case of an unwanted component, the condensed liquids must be removed to prevent possible physical damage to subsequent components in the process or corrosion and unless removed can reduce the process efficiency. Depending on the composition of the gas phase and the temperature and pressure changes, the amount of condensed liquids can be significant.

Solutions



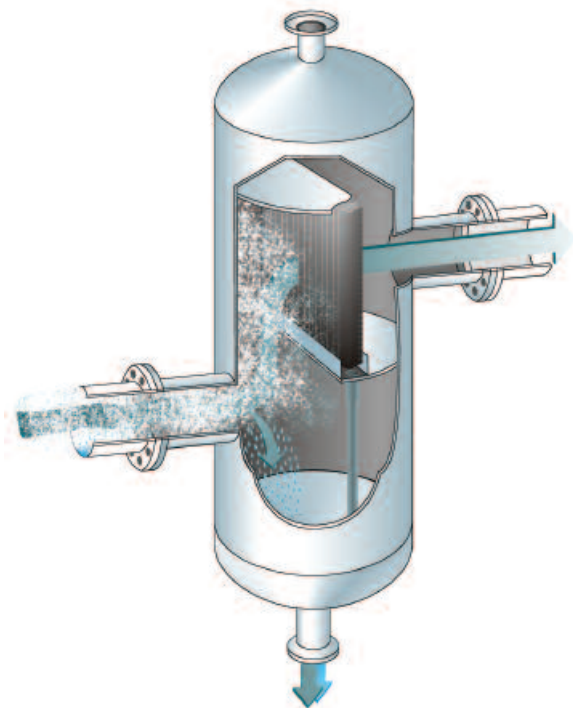
Separator for lower condensate loads and horizontal gas flows. Suited for both low and high velocity ranges with high turn down capacities.

Problem

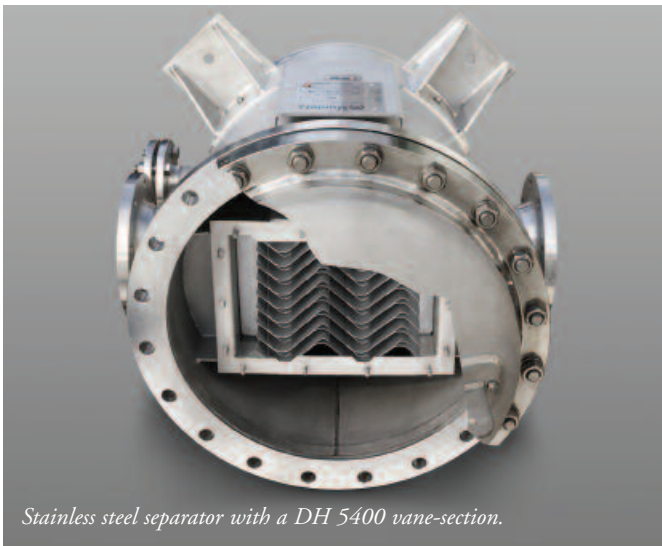
Condensed liquid causes:

- Far lower process efficiency
- Corrosion problems thus reduced lifetime of equipment (especially in compressors)
- Physical damage of subsequent process equipment
- Loss of energy

For more product information, please see the technical leaflets for **DH 5000 (TS-5)** and **DV 270 (T 271)**.



Separator for **heavy liquid loading** and horizontal gas flows. Suited for both low and high velocity ranges with high turn down capacities.



Stainless steel separator with a DH 5400 vane-section.

Removal of contaminants

Contaminants are present throughout the whole process-chain from production to final processing. Oil and natural gas at the wellhead contain contaminants such as water, salt, sulphur compounds, carbon dioxide, sand and varying amounts of undesirable hydrocarbons such as waxes, paraffin and aromatics. In later stages of the process other solid particles such as rust from metal components are present. Removing these items is essential as their presence can lead to complete component failure.

Problem

Contaminants cause:

- Corrosion of pipe work and compressor stations
- Physical damage to downstream components
- Higher energy cost

Some typical processes

- Removal of water and produced solids
- Removal of mineral and metal (rust)
- Removal of sulphur

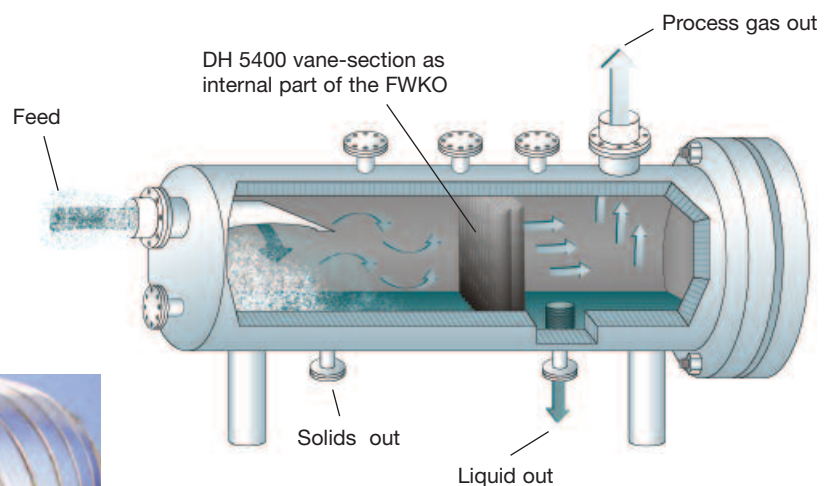
Free water knockout (FWKO)

Water entrained in the gas phase, as opposed to free water, is mostly removed by the trusted and well known glycol process. The gas from the high-pressure contactor tower contains glycol and stringent mist elimination is required to ensure that any of the glycol is not in the discharged gas stream. Gas sweetening systems utilise a similar method of removal and require the removal of the chemical from the discharged gas streams.

The first step in most processing plants is a 3-phase (or in the case of sand being present in the fluid, 4-phase) gravity separator – often called a free water knockout vessel. The water is removed and the rest of the fluids passed for further treatment – note the vane type mist eliminator as an integral part of the unit. Sand is trapped in the water phase and removed separately, often with specialist cyclonic systems.

Mineral scale and rust are often removed in a similar manner to the above.

Free water knockout drum with a DH 5400 vane-section.



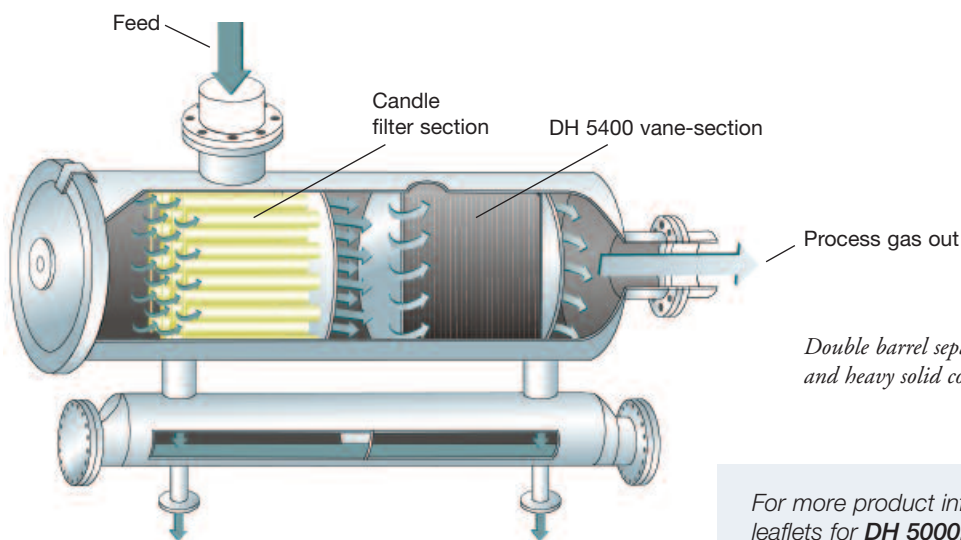
*For more product information, please see the technical leaflets for **DH 5000**, **DV 270** and **2-stage Filter and Coalescer** – systems*

Water removal at the wellhead or processing station

Of particular importance is the removal of excess water at the well head prior to transportation as water in pipeline, in the presence of sour gases, can generate acids that can cause corrosion. Also, under the right conditions, water can combine with the gas leading to ice-like “gas hydrates” that can completely plug the pipeline – with potentially catastrophic consequences. This is why operators of pipelines give processing plant gas pipeline specifications for water, CO₂ and/or H₂S content.

Even so, some water is still present and transportation along a pipeline can cause water drop out. Pipelines are never perfectly level mainly because of geographic consid-

erations. Variation of even a few degrees from the horizontal can allow liquids to condense and collect in lower lying areas. This pooled liquid has the potential to be propelled along the pipeline as a highly gas-charged liquid “slug” and can cause severe plant damage if not contained. It is therefore normal at the receiving terminus to have a “slug catcher” of sufficient capacity to cope with the volume of liquid and gas under these slugging conditions. It is very difficult to predict the occurrence and severity of these slugs, even with computer based flow assurance, and the slug catcher must be designed to cope with the liquid content and high gas velocities.

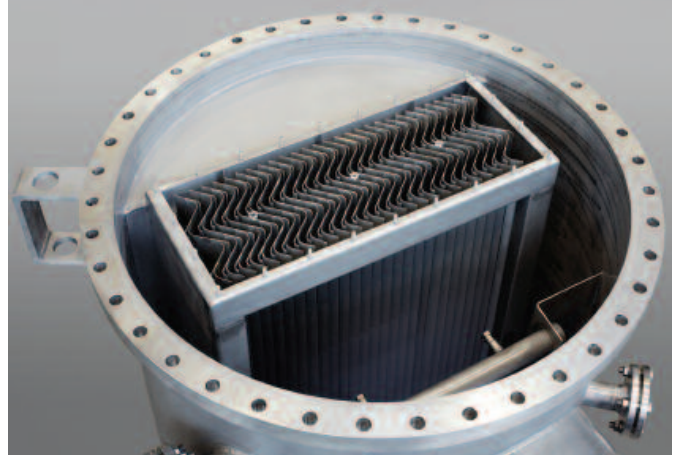


Double barrel separator for very fine droplets and heavy solid contaminants.

*For more product information, please see the technical leaflets for **DH 5000**, **DV 270** and **2-stage Filter and Coalescer** – systems*



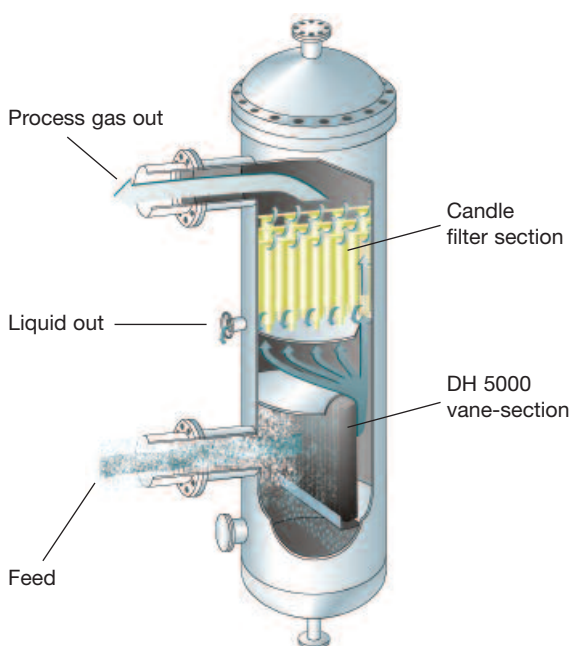
Munters pressure vessel with a DH 5400 vane-section, quick opening and integrated cleaning system



Solutions

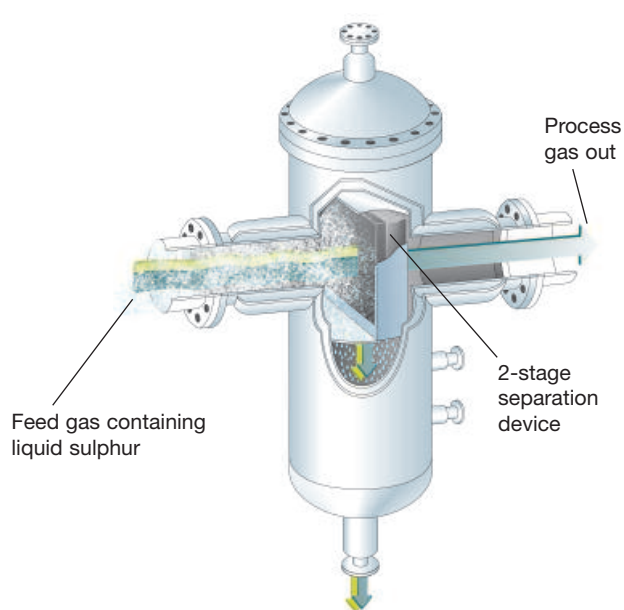
Many systems used in the area of removal of contaminants have two separation stages. Depending on the composition of the contamination, both liquids and solids need to be removed. The first stage can either be a filter / coalescer or a vane separator. The objective of any Munters' 2-stage

separation system is the intelligent combination of two separation technologies with the goal of maximizing the life time of the filters / coalescers and of using the higher design velocity range of the vane separation technology.



Munters' vertical two-stage separators provide efficient liquid/solid removal at high gas capacities. They remove the heavy liquid loads from the feed gas. The subsequent candle filter section removes liquid and finest solid particles.

For the vane-section, Munters use the DH 5000 series to maximize gas throughput and thus minimize the vessel diameter. Typically, separator units come with quick opening devices for accessing the candle filter section. Two-stage separators are used for natural gas transportation in front of compressor stations.

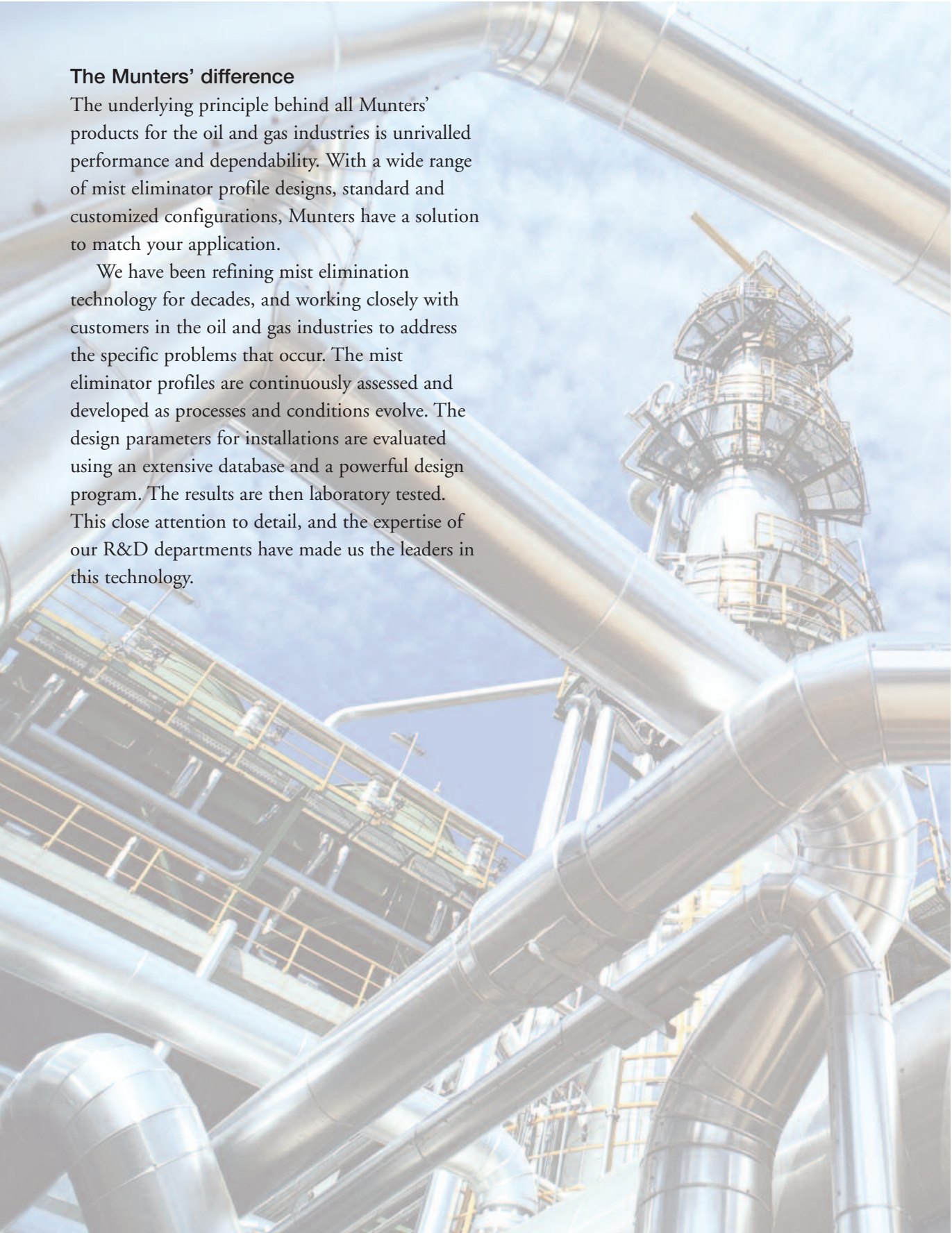


Munters' double shell steam heated pressure vessel with a 2-stage separation device for very fine droplets. Typically used in the Claus process for keeping the sulphur in liquid phase. The first stage coalesces the fine droplets while the second vane stage removes the liquid fully from the gas stream.

Customer benefits

- High gas capacity with a compact vessel diameter
- High level of protection for downstream components and processes
- Plugging free operations in the vane section





The Munters' difference

The underlying principle behind all Munters' products for the oil and gas industries is unrivalled performance and dependability. With a wide range of mist eliminator profile designs, standard and customized configurations, Munters have a solution to match your application.

We have been refining mist elimination technology for decades, and working closely with customers in the oil and gas industries to address the specific problems that occur. The mist eliminator profiles are continuously assessed and developed as processes and conditions evolve. The design parameters for installations are evaluated using an extensive database and a powerful design program. The results are then laboratory tested. This close attention to detail, and the expertise of our R&D departments have made us the leaders in this technology.



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