The separation of gases from the interfering liquid portions is an important process step in the extraction and cleaning of natural gas. Shell Global Solutions International has a great deal of experience with the separation of gas-liquid mixtures and features a portfolio of high-quality products developed in Shell’s Amsterdam research facilities. The strategic alliance enables Sulzer Chemtech to expand its product portfolio with high-performance separators of the latest generation and make them available to all Sulzer customers.
A mist collector/separator is an arrangement that retains the drops of liquid that are carried along in a flow of gas and in this way effects a separation between the gaseous and liquid phase. In order to be able to remove droplets from the gas, the particle trajectories of the liquid must deviate from the flow pattern of the gas.

High Efficiency Separators

The alliance between Shell and Sulzer Chemtech includes the worldwide and exclusive sale of internals from the Shell high-performance separator product range. Depending on the combination of the individual components, the separator systems are known as:

<table>
<thead>
<tr>
<th>SMS™</th>
<th>SVS™</th>
<th>SMSM™</th>
<th>SMMSM™</th>
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<tr>
<td>Schoepentoeter</td>
<td>Schoepentoeter</td>
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<tr>
<td>Mesh-demister</td>
<td>Vane Pack</td>
<td>Mesh-demister</td>
<td>Mesh-demister</td>
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<tr>
<td>Swirleck</td>
<td>Swirleck</td>
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The Shell SMS technology for the separation of gas-liquid phase mixtures is based on the patented combination of Schoepentoeter™, Mesh-demister and Swirleck™. The Schoepentoeter (Fig. 1) separates at the early stage a significant portion of the entrained liquid.

Separators made of wire mesh (mesh-demisters) form the subsequent agglomeration stage. These are operated at high gas load factors, which bring about flooding of the mesh packing (Fig. 2). During this coalescence stage, agglomeration of very fine drops results in larger drops that can then be separated without problem in the next Swirleck stage (Fig. 3). The separated liquid is collected and led into the column sump through drain pipes.

Good Performance at High Loading

Even at very high gas loads, the SMS separators achieve an outstanding liquid separation performance. In comparison with conventional wire mesh separators, up to 2.5 times more gas throughput can be processed. Even operation at reduced loads of up to one tenth of the nominal gas flow are also efficiently handled due to the fact that at least one of the three equipment components provides a high separation efficiency at any operating condition.

Comprehensive Range of Products

In addition to the basic SMS separator model, the product family from Sulzer Chemtech also includes other Shell separator types. In the SVS separator, a package of guide plates (the vane pack) is used as the coalescence stage instead of a wire mesh. This type is always used wherever excessive pollution with solids is expected.

If a higher separation performance is necessary, the SMSM separator is used. In this case, the so-called secondary gas, which escapes with the separated liquid through the slits in the swirl tube, is cleaned by an additional wire mesh separator fitted above the Swirleck.

The application area of the SMMSM separator is in critical separation processes with two very different condensate components, such as hydrocarbons and glycols. The separation performance is improved even further by using two mesh-demisters with different wetting characteristics tuned to the liquids that are to be separated to provide coalescence stages before the Swirleck.

1. The Schoepentoeter—“Schoep” means “turbine blade” in Dutch—is a gas inlet system with curved guide vanes. These and other modern technologies for the separation of gases and liquids are now offered by Sulzer Chemtech through the alliance with Shell Global Solutions.
Liquid Separation Prevents Damage

The main application areas for the high-performance separators from Sulzer Chemtech are the supply chain of natural gas, low temperature separation (LTS), Liquefied Natural Gas (LNG) and natural Gas to Liquid conversion process (GTL). In the LNG process, for example, the gas has to be freed from condensate at almost every process stage, as operational problems or even serious damage to individual components such as the compressors could otherwise occur.

Natural gas, which is not yet liquefied, requires also a high separation efficiency at several stages of the gas processing before the dried and cleaned gas can be sent to the end user. The water is normally removed from the natural gas in drying plants through absorption with glycols to the point that no more water can be condensed, even at gas temperatures below the freezing point. New glycol drying columns equipped with the high-capacity Sulzer MellapakPlus® packing require the use of mist separators which can limit the loss of glycol through entrainment to a minimum even at high gas speeds. An optimal solution in this case is offered by a Shell separator unit consisting of a mesh-demister as the coalescence stage, a Swirldeck as the main separator, and a second mesh-demister for the post-cleaning of the secondary gas.

High Efficiency Under Difficult Conditions

Numerous separators, some of which with high efficiency, are also found in the LTS process, where wet natural gas is depressurized to the required pipeline pressure. The wet feed gas is pre-cooled in a gas heat exchanger with the cold dry pipeline gas prior to being depressurized. If there is no natural gas drying upstream of the process, glycol is added to the gas as an inhibitor, in order to avoid the formation of hydrates. Higher hydrocarbons become condensed during the depressurization. In order to achieve the required dew point of the pipeline gas—the dew point describes the temperature at which the liquid starts to condense at a certain pressure—the wet condensate mixture of hydrocarbons and glycol must be separated in the Cold Separator to often more than 98%. Losses in the separation efficiency are unwelcome, as the feed gas will otherwise have to be depressurized at lower temperatures in order to be able to reach the required dew point. Even with such critical requirements, the Shell SMMSM unit offers impressive performance through its high level of separation efficiency and currently offers the best gas-liquid separation technology on the market.

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