Legal regulations, directives and international standards demand that industry minimises toxic emissions, so as to protect both people and the environment. To reduce toxic emissions the use of absorption technology is often used.

**Circulation pumps:** Increased absorption effectiveness is possible by using more than one “scrubbing” stage. End-suction, chemical norm centrifugal pumps with seal-less magnetic drive are often used to circulate the media.

**Discharge pumps:** Discharge pumps transfer the product from the sump of the absorption process to other stages in the process or into tanks where it is stored. While this process can be quite aggressive, and operates under vacuum, these pumps are usually chemical standard centrifugal pumps made from suitable materials.

**Feed pumps:** Feed pumps transfer the liquid to the absorber and the washing liquid to the gas washer. The construction of these pumps vary depending upon size, flooded suction or self-priming, flammability, and acidic nature of the mixture. Generally, they are end-suction pumps according to chemical standards.
### Vacuum pumps
Vacuum pumps at the top of the gas washer are used to draw off the flue gas. This gas is transferred to other stages in the process or to waste for disposal. Dry running vacuum pumps offer a highly efficient means of pressure reduction and are an effluent-free solution. Liquid ring vacuum pumps are extremely robust and can be used as part of the condensation process. Air-ejectors can be integrated in order to get lower pressures.

### Solvent recovery systems
Membrane separation modules are used effectively to clean the vent stream and recover the solvent in order to deliver a clean gas to the atmosphere. This small compact unit is located downstream of the vacuum pump and uses the negative pressure for recovery and recycling.

### Pumps

<table>
<thead>
<tr>
<th>Pumps</th>
<th>Pump type</th>
<th>Pump execution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Circulation pumps</td>
<td>Chemical process pumps</td>
<td>Capacity: Max. 2200 m³/h Shaft sealing: Mechanical seal, magnetic drive Material: Ductile iron, stainless steel, special materials on request</td>
</tr>
<tr>
<td>2 Discharge pumps</td>
<td>Chemical process pumps</td>
<td>Capacity: Max. 2200 m³/h Shaft sealing: Mechanical seal, magnetic drive Material: Ductile iron, stainless steel, special materials on request</td>
</tr>
<tr>
<td>3 Feed pumps</td>
<td>Chemical process pumps</td>
<td>Capacity: Max. 2200 m³/h Shaft sealing: Mechanical seal, magnetic drive Material: Ductile iron, stainless steel, special materials on request</td>
</tr>
<tr>
<td>4 Vacuum pumps and gas ejectors</td>
<td>Liquid ring vacuum pumps Type LPHX/LPH</td>
<td>Capacity: Max. 10700 m³/h Shaft sealing: Packed gland, mechanical seal Material: Cast iron, stainless steel</td>
</tr>
<tr>
<td></td>
<td>Dry running vacuum pumps Type SIHIdry</td>
<td>Capacity: Max. 1000 m³/h Suction press.: &gt; 0.001 mbar abs Material: Ductile iron / steel</td>
</tr>
</tbody>
</table>

### Solvent recovery systems
- Vacuum pumps
- Compressors
- Membrane modules
- Liquid pumps
- Control systems
EUROPE
Sterling Fluid Systems (Austria)
Wien
Tel. +43 (0) 1 680 050
sales_austria@sterlingsihi.de
Sterling Fluid Systems (Belgium)
Groot-Bijgaarden
Tel. +32 (0) 2 811 7711
sales_be@sterlingfluid.com
Sterling SIHI (Bulgaria)
Sofia-liindien
Tel. +359 (0) 2 8423311
office@sterlingsihi.bg
Sterling Fluid Systems
(Czech Rep.) Olomouc
Tel. +420 587 433 651
sterling@sterling.cz
Sterling Fluid Systems (France)
Trappes
Tel. +33 (0) 1 34 823 900
sales.france@sterlingfluid.com
Sterling SIHI (Germany)
Itzehoe
Tel. +49 (0) 4821 771 04
sales@sterlingsihi.de
Sterling Fluid Systems (Hungary)
Veszprem
Tel. +36 (0) 8 406 633
info@sterlingsihi.hu
Sterling Fluid Systems (Italy)
Monza, Milan
Tel. +39 039 282 41
sterlingitaly@sidro.it
Sterling Fluid Systems
(Netherlands)
Beverwijk
Tel. +31 (0) 251 263 232
info@sihi.nl
Sterling Fluid Systems (Poland)
Warszawa
Tel. +48 (0) 2 235 2480/81
sterling@sterling.pl
Sterling Fluid Systems (Romania)
Bucuresti
Tel. +40 (0) 21 610 7188
office@sterlingsihi.ro
Sterling Fluid Systems (Spain)
Madrid
Tel. +34 91 709 1310
sihi@sihi.es
Sterling Fluid Systems (Schweiz)
Schaffhausen
Tel. +41 (0) 52 644 0606
info@sterling.ch
Sterling Fluid Systems (UK)
Altrincham, Cheshire
Tel. +44 (0) 161 928 6371
uksales@sterlingfluid.com
ASIA
SIHI Pumps (Singapore)
International Business Park
Tel. +65 65 62 83 00
info.singapore@sihipumpsasia.com
SIHI Pumps SDN BHD (Malaysia)
Selangor Darul Ehsan
Tel. +60 3 8942 6877
info.malaysia@sihipumpsasia.com
SIHI Pumps (China)
Shanghai
Tel. +86 21 621 88068
info.china@sihipumpsasia.com
SIHI Pumps Ltd (Thailand)
Bangkok
Tel. +66 2 319 2567
info.thailand@sihipumpsasia.com
SIHI Pumps (Taiwan) Taipei
Tel. +886 2 2808 4675
info.taiwan@sihipumpsasia.com
SIHI Pumps (Korea) Seoul
Tel. +82 2 553 2592
info.korea@sihipumpsasia.com
AMERICAS
SIHI Pumps Limited (Canada)
Guelph Ontario
Tel. +1 519 824 4600
mail@sihi.com
SIHI Pumps Inc. (USA)
Grand Island, New York
Tel. +1 716 773 6450
mail@sihi.com
SIHI Ltda. (Chile)
Quilicura, Santiago
Tel. +56 2 756 5900
ventas@sihi.cl
SIHI do Brazil (Brazil)
Campinas
Tel. +55 19 3773 6057
info@sihi.com.br
SIHI Pumps (Colombia)
Bogota
Tel. +57 1 364 92 64
info@siihicolombia.com
SIHI (Peru) Lima
Tel. +51 1 421 7411
ventas@sihiperu.com.pe

For further address details please visit:
www.sterlingSIHI.com

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