Internals for Glycol Dehydration Systems

HAT International supplies a comprehensive range of column internals for the effective dehydration of gas using glycol desiccant, proven in dozens of column installations world-wide.
The water saturated gas feed enters the Gas/Glycol Contactor Column in the bottom section via a suitable vapour distributor. If the gas contains free liquid impurities it can be cleaned in a pre-treatment KO drum (either integrated within the Column or an external vessel) using a good quality mist eliminator.

From here it rises up into the Column (through a chimney tray if necessary) where it is counter-currently scrubbed by the triethylene glycol on either special types of structured packing or on bubble cap trays to achieve the desired degree of dehydration. The performance of the Column in relation to the process requirements (dew point) is determined by carefully selecting the following parameters:

(a) Height of packing (or # of trays)  
(b) Packing or Tray Design  
(c) Glycol Concentration  
(d) Glycol Circulation rate

After leaving the mass transfer section of the Contactor, the gas passes through a horizontal demister arrangement to minimise glycol carryover from the system. The dry gas then leaves the vessel as product.

Lean (regenerated) glycol is introduced into the top of the column via a suitable liquid distributor to ensure a good flow of TEG across the entire column area. Rich glycol is collected on the chimney tray or in the Column sump and led away for regeneration.
Contactor Internals

AlphaMIST WM/VME/SME Mist Eliminators

In clean glycol/gas service wire mesh pads give excellent performance in most applications, with vane packs used for higher capacity and swirl tubes for highest capacity and pressure. Special high efficiency designs offer low losses to 0.05 USG/MMSCF (0.007 Litres/M Sm$^3$) or less and droplet capture to below 5 microns.

AlphaPLUS distributors offer excellent distribution of TEG across the full vessel area via fouling resistant drip tube assemblies (Trough Distributor) or laterals (Pipe Distributor) for FPSO applications. Designs with typically 100 drip points per m² and liquid flux rates between 1-10 m³/m².h will suit all TEG applications.

AlphaPACK SP Structured Packing

Most commonly D-250-S (250 m²/m³) structured packing is used for TEG systems, but high capacity DHC-252, or high performance D-350 and 450 can be used to reduce the diameter or packed height. Suitable for bed heights to around 7m and 100% turndown.

AlphaTRAY BC Bubble Cap Trays

A traditional solution in TEG systems, these trays give reliable performance over a wide range of flows with virtually zero maintenance.

AlphaTRAY ST Swirl Trays

A very high capacity, high performance tray with excellent capabilities for new, retrofit or FPSO applications, offering compact solutions and turndown to 50% gas flow.

AlphaPLUS VD Vane Inlet Distributor

AlphaTRAY CT Chimney Tray

A well designed gas inlet arrangement will give excellent distribution of vapour across the full vessel area and reduce the height required to the packing or mist eliminator above. Chimney trays can be used to provide an integral KO section inside the contactor and enable the removal of free liquid in the feed gas using a suitable mist eliminator.
The chart below illustrates the relative gas capacity of our range of trays and structured packings through a TEG contactor column, from the high-capacity swirl tube design through to conventional bubble caps. To determine the number of trays or packed height, please refer to HAT.

The basis of this comparison is saturated natural gas of 20 MW at 30°C, using 99.5% wt Triethylene Glycol.

Figure 1. Gas capacity per m² contactor cross section

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**How much TEG?**

Guideline range is 15-50 kg TEG/kg H₂O removed (2-6 USG/lb H₂O). The selection of glycol circulation rate and concentration is a balance between dew point, contactor height and reboiler heat duty.

**What concentration?**

A reboiler operating at 204°C and 1.00 bara will regenerate glycol to 99.1% wt. If there is back-pressure on the regenerator this reduces to 99.0% wt at 1.03 bara and 98.9% wt at 1.05 bara.

If TEG is needed above these concentrations then additional stripping of the water is required using dry, pre-heated gas in a packed stripping column. This can achieve up to 99.9%+ wt.

**What packed height?**

As a rule of thumb, use these guidelines for one theoretical stage:
- Structured packing in the absorber – 1800mm for D-250-S
- Pall Rings in the Regeneration Columns – 650mm for P+25, 800mm for P+40.
Regenerator Column Internals

The table below illustrates typical regeneration column diameters at various glycol flow rates, using standard AlphaPACK P+ Pall Ring packing. Larger diameters can be reduced using either a bed of high capacity I+ Rings or D-500 / D-750 Structured Packing.

<table>
<thead>
<tr>
<th>TEG Circulation Rate</th>
<th>Stripping Column ID</th>
<th>Still Column ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.5 m³/h</td>
<td>150mm</td>
<td>200mm</td>
</tr>
<tr>
<td>1.0 m³/h</td>
<td>200mm</td>
<td>250mm</td>
</tr>
<tr>
<td>2.5 m³/h</td>
<td>250mm</td>
<td>400mm</td>
</tr>
<tr>
<td>5.0 m³/h</td>
<td>300mm</td>
<td>500mm</td>
</tr>
<tr>
<td>7.5 m³/h</td>
<td>400mm</td>
<td>550mm</td>
</tr>
<tr>
<td>10.0 m³/h</td>
<td>450mm</td>
<td>600mm</td>
</tr>
<tr>
<td>15.0 m³/h</td>
<td>500mm</td>
<td>650mm</td>
</tr>
<tr>
<td>20.0 m³/h</td>
<td>600mm</td>
<td>750mm</td>
</tr>
<tr>
<td>25.0 m³/h</td>
<td>650mm</td>
<td>800mm</td>
</tr>
</tbody>
</table>

**AlphaPLUS OD Orifice Pan Distributors**

In the Still Column, TEG is introduced at its flash point into mid-column, requiring simultaneous release of steam to the rectifying section above, re-distribution of reflux and distribution of new glycol to the stripping section below. Our OD distributors are specifically designed to accommodate these needs effectively. The OD is also used at the top of the Stripping Column.

**AlphaPACK RP Random Packing**

Commonly used packing for Still Columns and Stripping Columns include our P+ Pall Rings (standard services), I+ I-Rings (low pressure drop) and C+ Compact Rings (low profile for higher efficiency). Normal size packing is 25mm for columns up to 400-500mm ID and 40mm above that, or alternatively structured packing.

**AlphaPACK SP Structured Packing**

In the regenerator Still Column, very high efficiency is obtained using our D-500 and D-750 structured packing, reducing the column heights whilst providing a high number of stages for glycol stripping and loss reduction.

**AlphaPLUS PSP/G Packing Support Plates/Grids**

A specially designed support plate offering 100% free flow area to eliminate a traditional column flooding bottleneck when previously simple perforated plates or gratings were used. Structured packing is supported on our open PSG grid.

For full details of all the internals mentioned in this leaflet, please refer to the individual product bulletins.
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