SULZER

Sulzer Chemtech

Separation Technology
for the Hydrocarbon Processing Industry

Technology Leadership

Sulzer Chemtech produces a wide array of tower internals. With this broad spectrum of custom-designed fractionation trays, random and structured packing we can meet any process requirement in any size tower throughout the chemical, refining, petrochemical, and gas processing industries. For over 50 years, Sulzer Chemtech has been serving these industries with our innovations, which set a new standard in many applications.

Sulzer Chemtech Achievements:

1956 Nutter Float Valve trays in an olefin plant, among others for a 120" i.d. C2 Splitter

1964 BX gauze packing for Distillation of heat sensitive fragrances

1975 BX plastic gauze packing for HCl Absorption towers

1977 Nutter V-Grid trays for C3 Splitters

1985 Nutter Ring for Demethanizer

1985 Mellapak for Water Quench towers

1988 Design of Heat Pump systems

1988 Mellapak for Ethylene Oxide towers

1995 Mellagrid for Water Quench towers

1997 Katapak for Reactive Distillation of Methylal

2000 MellapakPlus for various applications

For classical column operations such as distillation, absorption, stripping and extraction, and for alternatives such as crystallization, membrane permeation and reactive distillation, we are continuously developing new product ideas to meet the economical and technical objectives of our customers. For numerous applications Sulzer Chemtech provides superior plant performance, improved product quality, increased capacity, and reduced energy consumption.

Sulzer Chemtech offers the full range of column internals with trays, random and structured packings optimized through column simulation, process design, basic engineering and field services.

Sulzer Chemtech is a worldwide leading supplier for separation technology; thanks to our customers and the confidence they instill into our products and capabilities.
From the very first to the very last of our more than 30,000 columns in operation we have never stopped listening to our customers about their needs. At Sulzer Chemtech, we are eager to develop a successful application for your needs.

Industrial Applications from A to Z

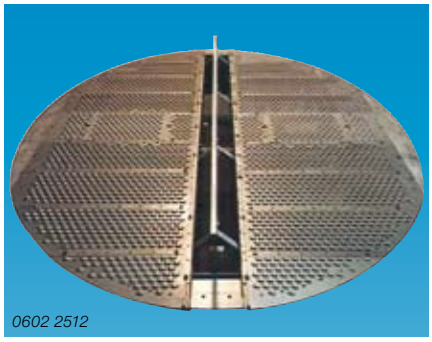
Color index of the diagrams

- Structured packing
- Trays
- Random packing

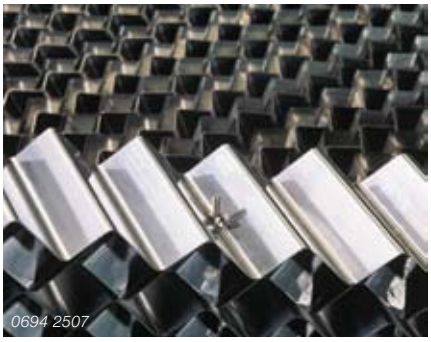
Application Know-How and Service are our Driving Force

Sulzer Chemtech has 50 years of accumulated application know-how and experience in developing, designing, supplying and servicing mass transfer equipment in the Chemical, Petrochemical, Refining, Gas Processing and Speciality industries. Only the very best technical solutions can secure the competitive advantages which our customers need in today's highly demanding conditions. Leadership in technology and application know-how is fundamental to our success.

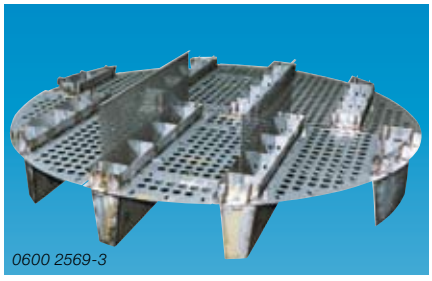
Structured packings



Trays



Grids

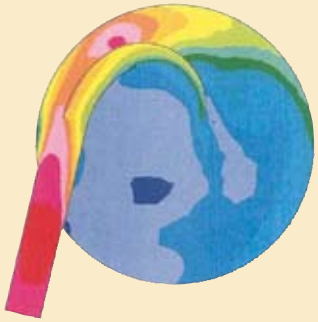


Shell trays

Random packings

Technical and Process Support

- Column simulations and design
- Process simulations and plant optimization
- Feasibility studies for capacity and/or purity improvements
- CFD modelling
- Pilot plant testing



Replacement Service

Reliable and fast supply through a world-wide manufacturing network of:

- any hardware
- most valves
- most tray decks
- complete trays

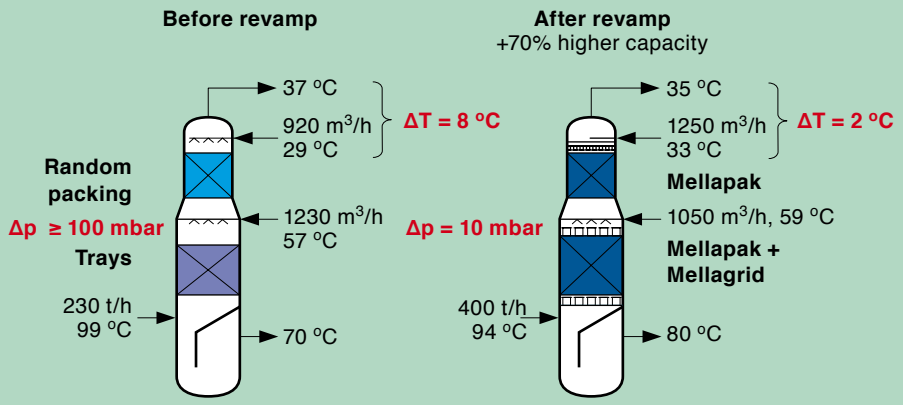
Field Services

- Installation consulting, inspection or supervision
- Full installation services
- Trouble shooting assistance
- Scanning
- Start-up assistance

Ethylene / Propylene Plants

Whatever your plans are, we have the right solution for every service

Water quench tower with Mellapak/Mellagrid

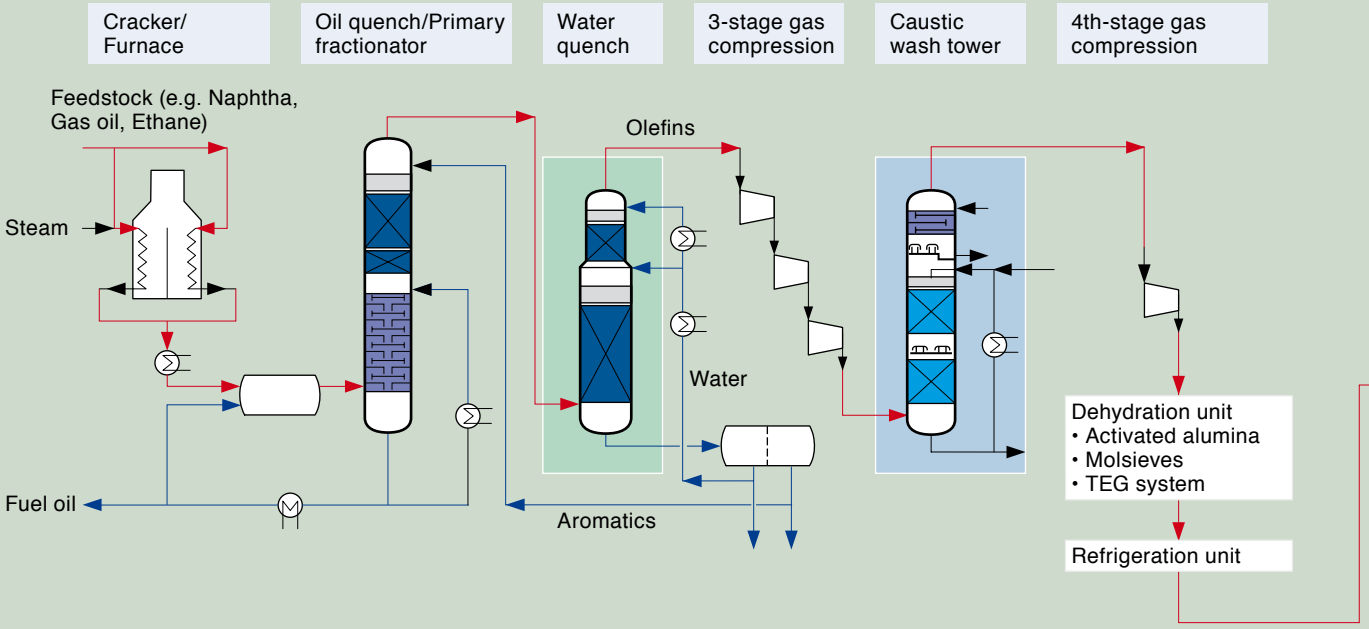


Benefits:

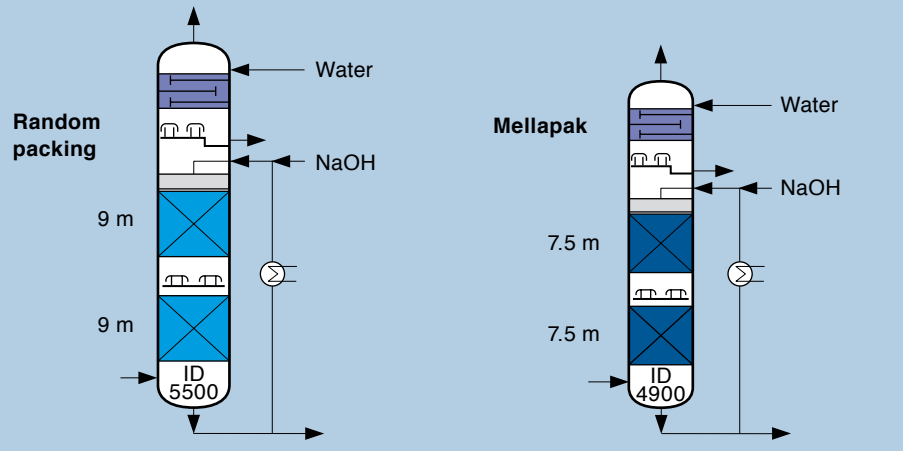
The revamp of the water quench tower trays and random packing to structured packing Mellapak® led to improvements in capacity and in efficiency. In addition, energy costs were reduced considerably due to the following reasons:

- Less cooling energy requirements and no steam consumption for the reboiler of the C3 Splitter, due to better efficiency of structured packing.
- Less energy requirements for the compression stage due to low pressure drop in the packed bed.

Hot section



Caustic wash tower with Mellapak

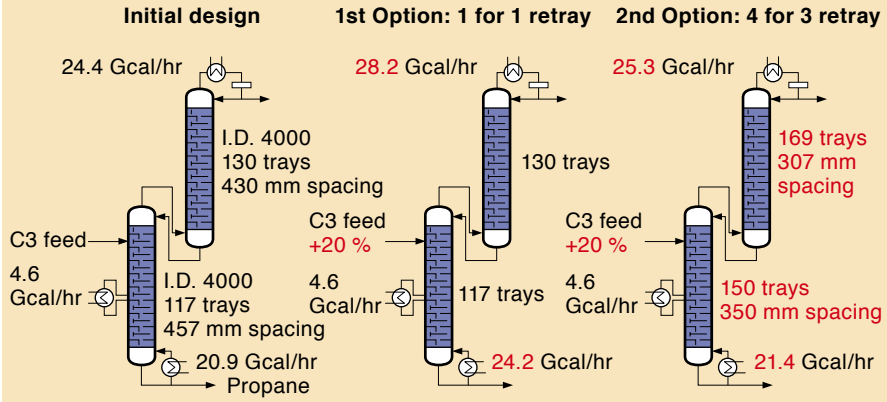


Benefits of structured packing:

- Smaller column diameter, due to higher capacity
- Reduced packing height, due to higher separation efficiency
- Lower pressure drop
- Reduced foaming tendency, due to less turbulences
- Less entrainment
- Higher fouling resistance

C2 Splitter and/or C3 Splitter with Shell HiFi trays

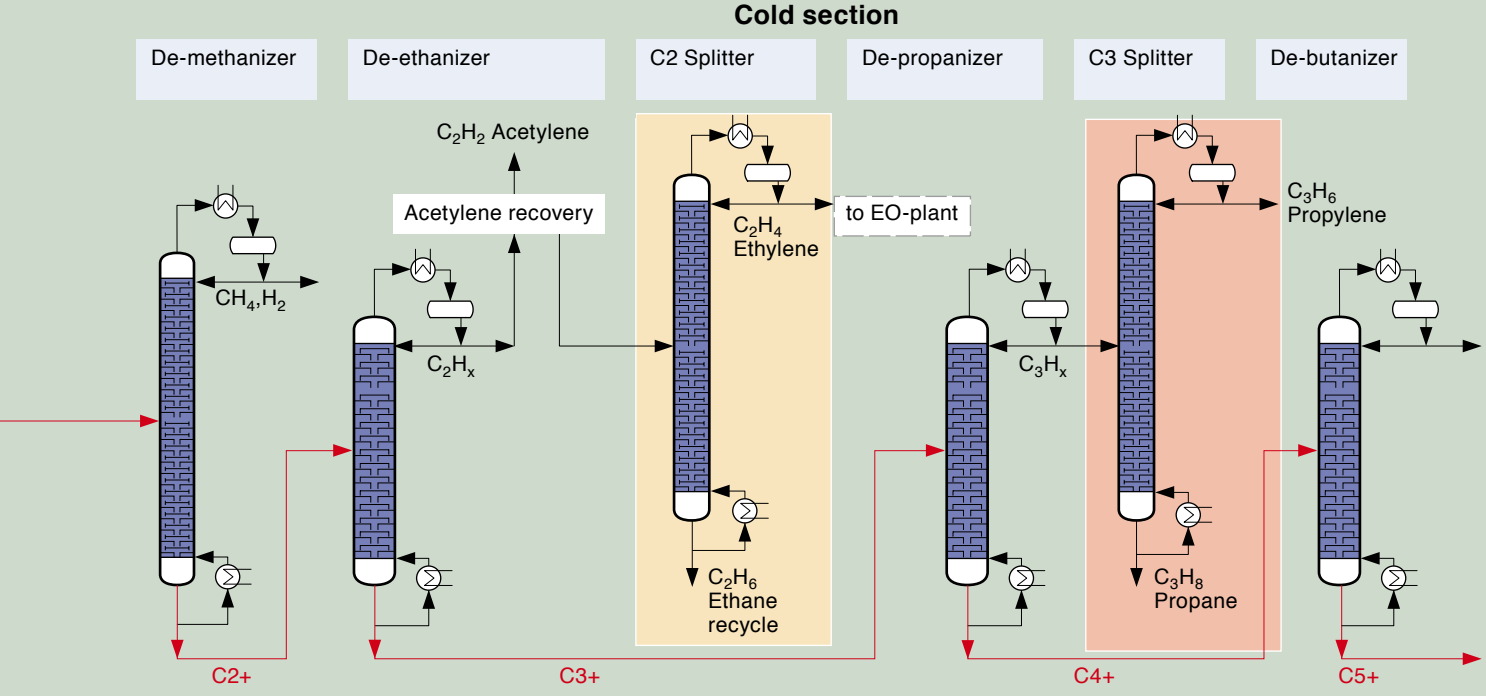
Objectives: +20 % feed rate, same product specification



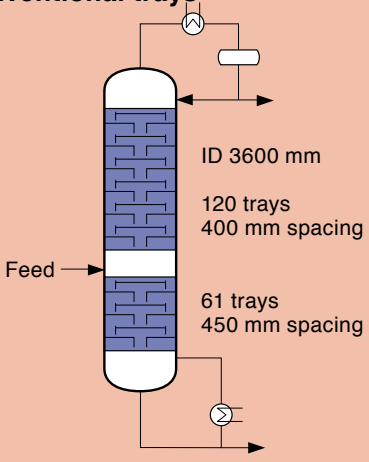
Benefits:

- For higher capacity:
  Replacement of existing trays enables handling of increased column loads at higher exchanger duties.
- For higher capacity and / or higher efficiency:
  Replacement of existing trays by a higher number of new high capacity trays enables a reduction in reflux and load requirements, but puts more emphasis on tray capacity and efficiency at low tray spacing.
- For new columns:
  Technology can be used to minimize dimensions of new columns, such as the diameter and height.

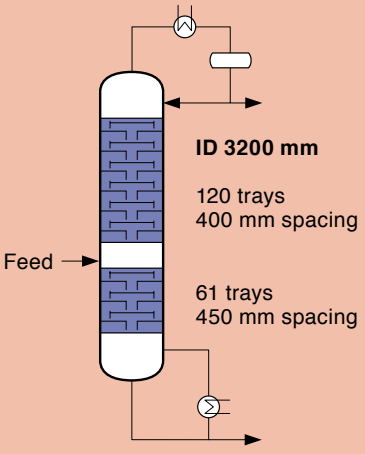
Cold section



New C3 Splitter with conventional trays



Reuse of existing C3 Splitter with VGPlus trays



High performance VGPlus trays allow the reuse of the existing tower without replacing it by a new one.

The advantages of VGPlus:

- Higher capacity at same efficiency
- Tray spacing can be kept
- No welding to column shell, as existing attachments can be reused
- Minimized plant shut down time
- Lower revamp costs

Ethylene Oxide and Derivates

EO

67% Ethylene Glycols

- Antifreeze agent
- PET production
- Polyester production
- Heat transfer liquid
- Plastizicer / softener
- Solvent

7% Ethanolamines

- Textile finishing
- Cosmetics / Soaps
- Detergents
- Gas purification

5% Glycol Ethers

- Brake fluid
- Solvent for paint
- Detergents
- Gas purification

21% other Ethoxylates

- Detergents
- Surfactants
- Emulsifiers

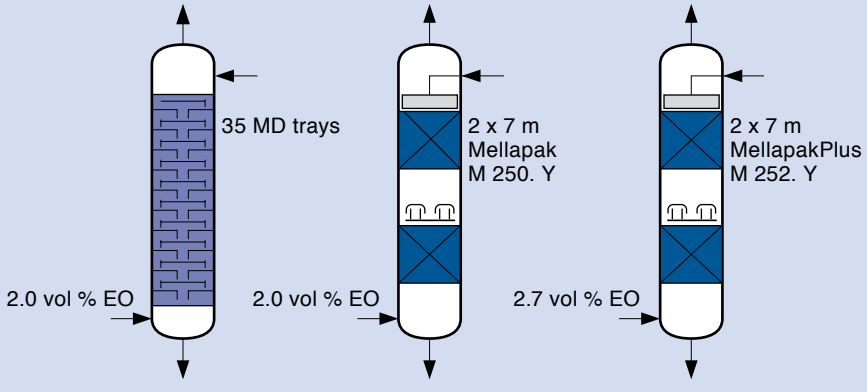
Know-how

- Distillation of Ethylene Oxide (EO)
- Technologies and key components for:
  - Ethylene Glycols
  - Ethanolamines
  - Glycol Ethers
  - Alkylethanolamines

For various reaction technologies cooperating with experienced partners

Upgrade with Mellapak and MellapakPlus

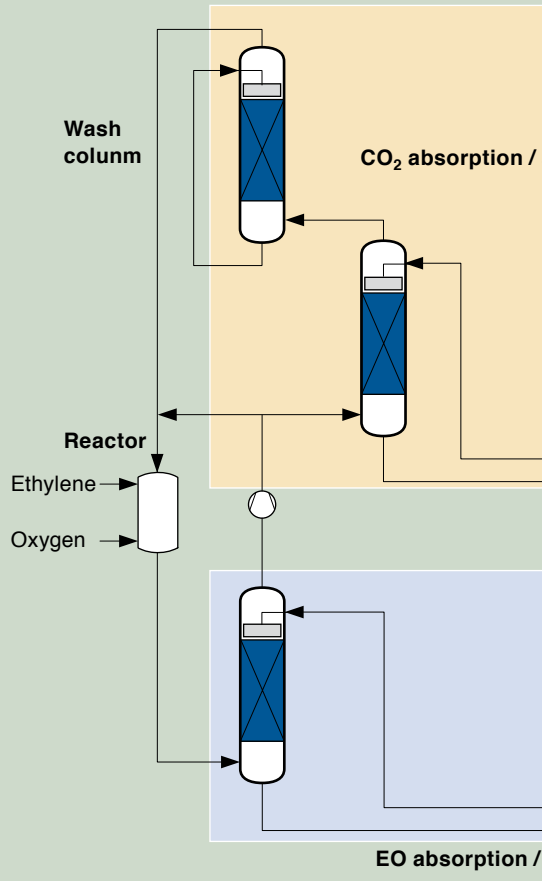
Gasload	100 %	100 %	137 %
EO production	100 %	100 %	185 %
EO in outlet gas	250 ppm	22 ppm	100 ppm
Pressure drop	170 mbar	52 mbar	73 mbar



Revamp of a CO_2 absorption column from high capacity trays to Mellapak

	Bevore revamp
Gas quantity (t/h)	110
CO_2 at entry (vol. %)	4.7
CO_2 at exit (vol. %)	1.4
CO_2 absorption (t/h)	7.1

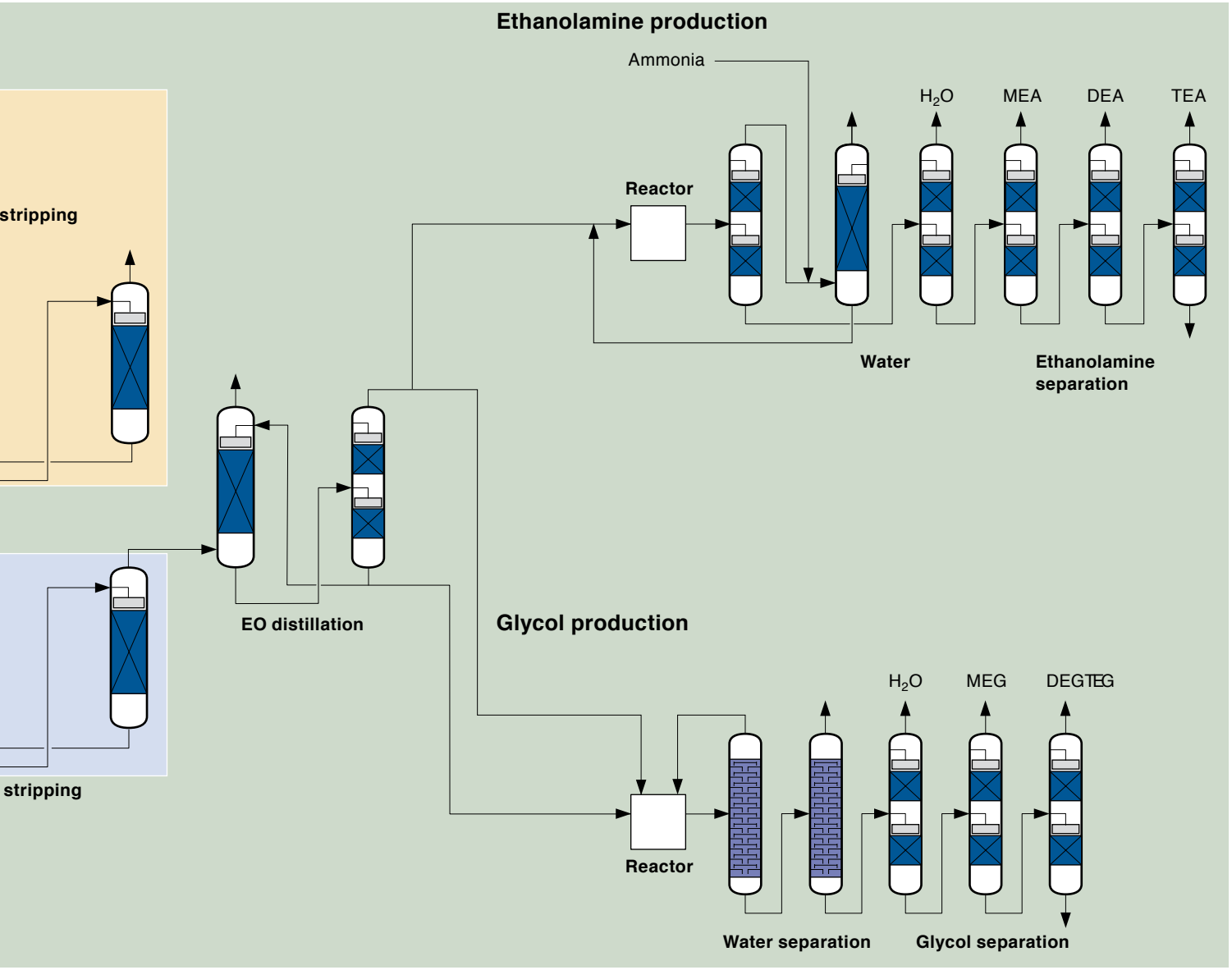
EO production



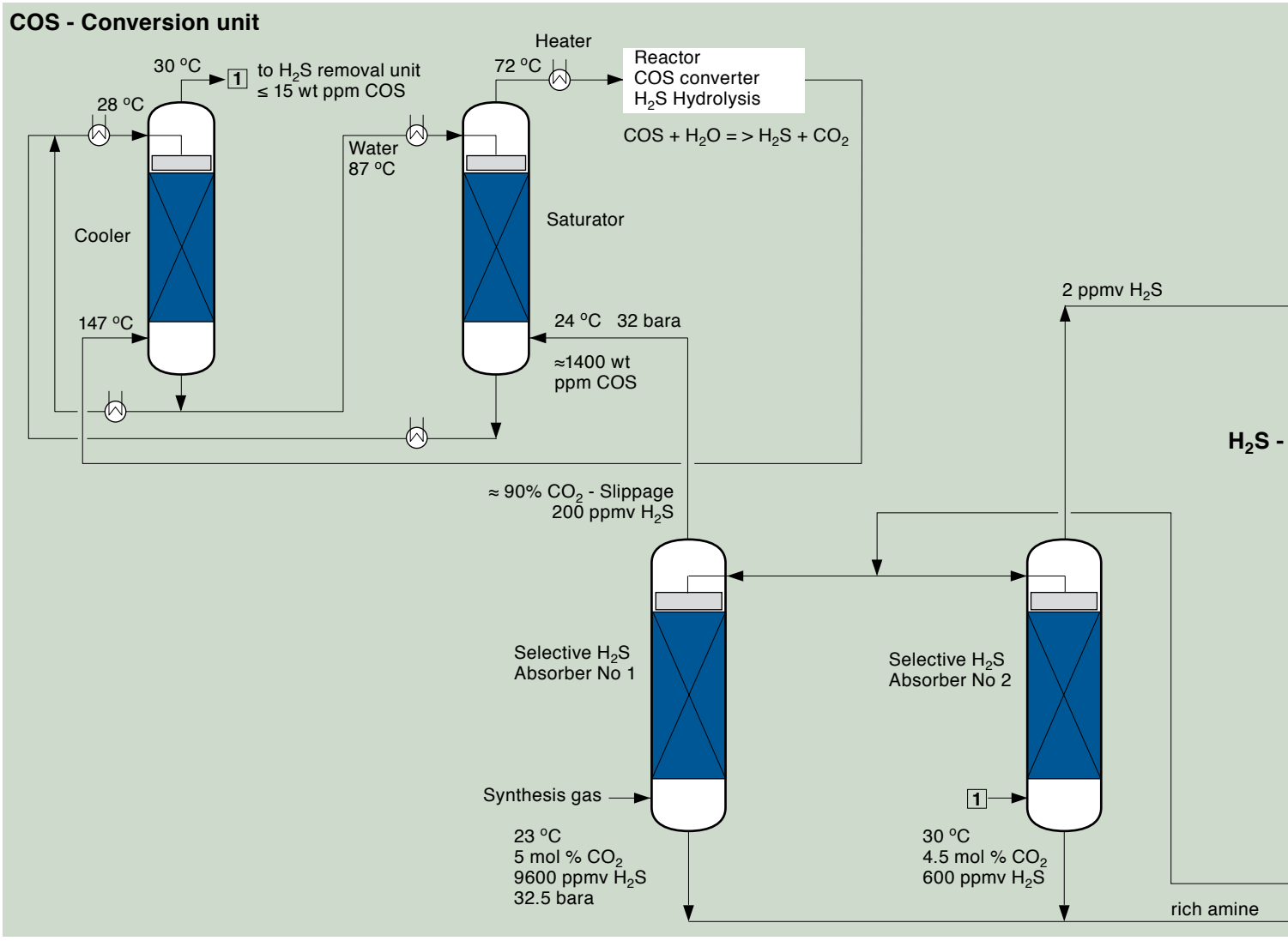
After revamp
168
5.1
0.3
14.0

Process Features

- Continuous process
- Low by-product formation
- Flexible product ratio
- High yields on raw materials
- High recovery rates
- Low energy consumption
- Extremely low pressure drops in the distillation section
- High product purity
- Joint developments



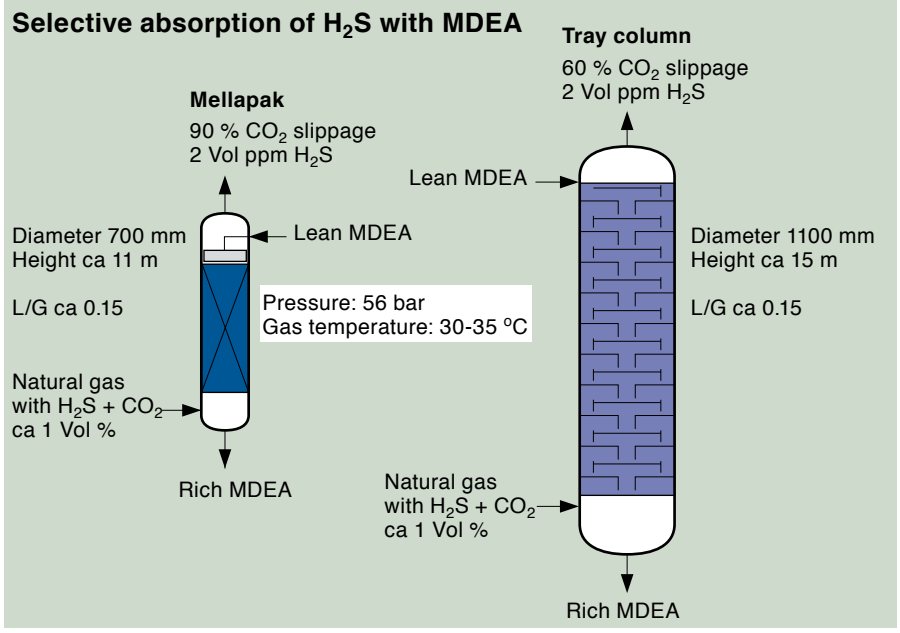
Synthesis Gas Application



Compact Column Size

Sulzer packings permit high gas and liquid throughputs resulting in small column diameters (important factor for pressurized columns or when upgrading existing columns). High separation efficiency also allows the use of short-height columns. New columns incorporating these features result in large savings, both in weight, volume and in investment costs.

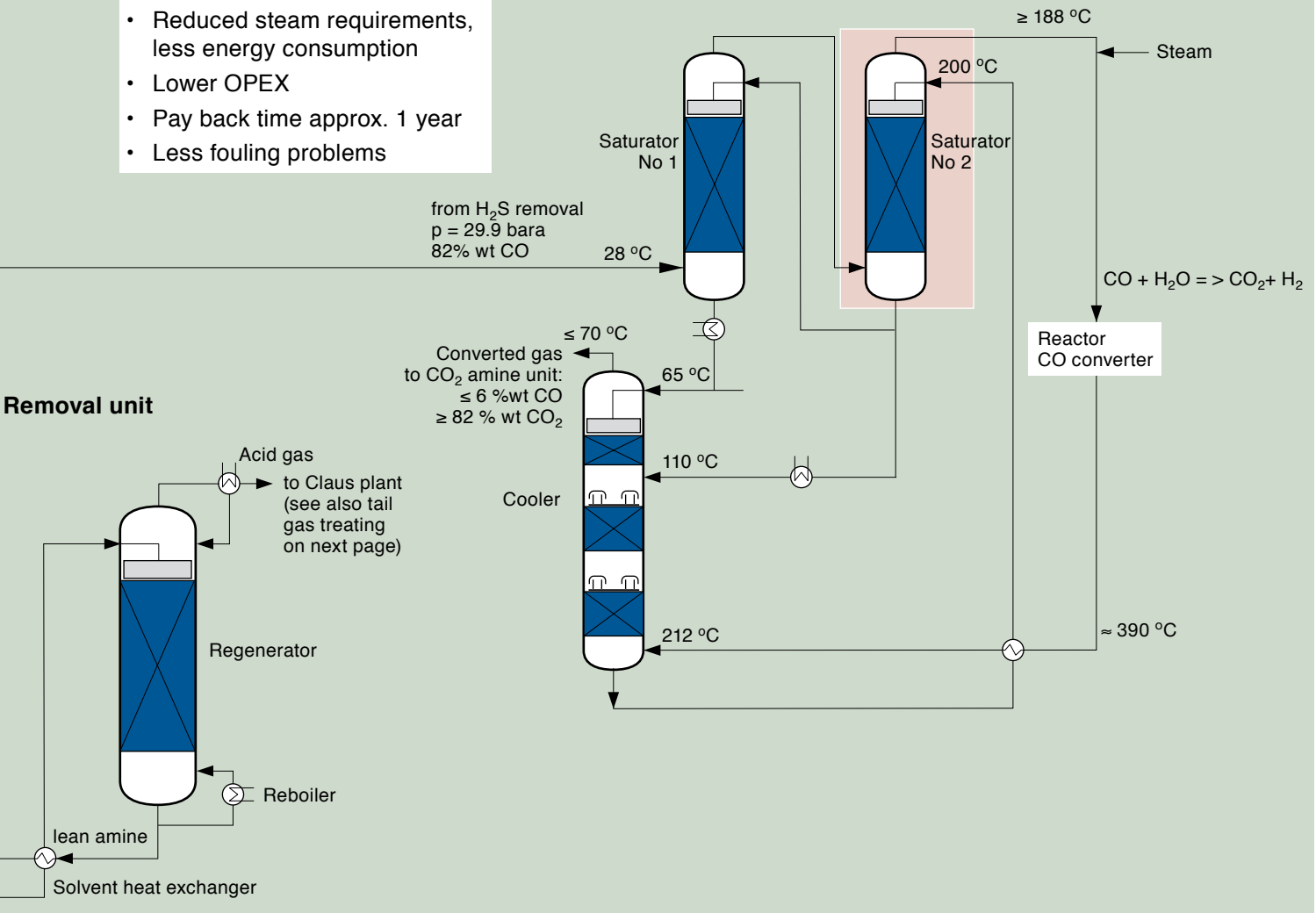
The increased selectivity leads to a higher CO_2-slippage in the treated gas and to a lower CO_2 content in the acid gas which leads to a higher capacity of the existing Claus plant or to lower CAPEX in case of a new plant.



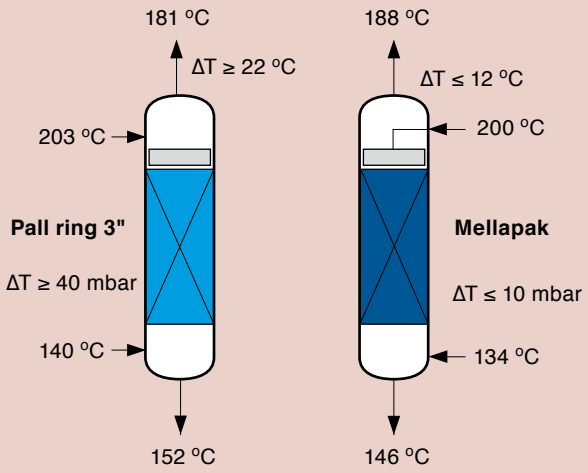
Benefits for Conversion Units

- Reduced steam requirements, less energy consumption
- Lower OPEX
- Pay back time approx. 1 year
- Less fouling problems

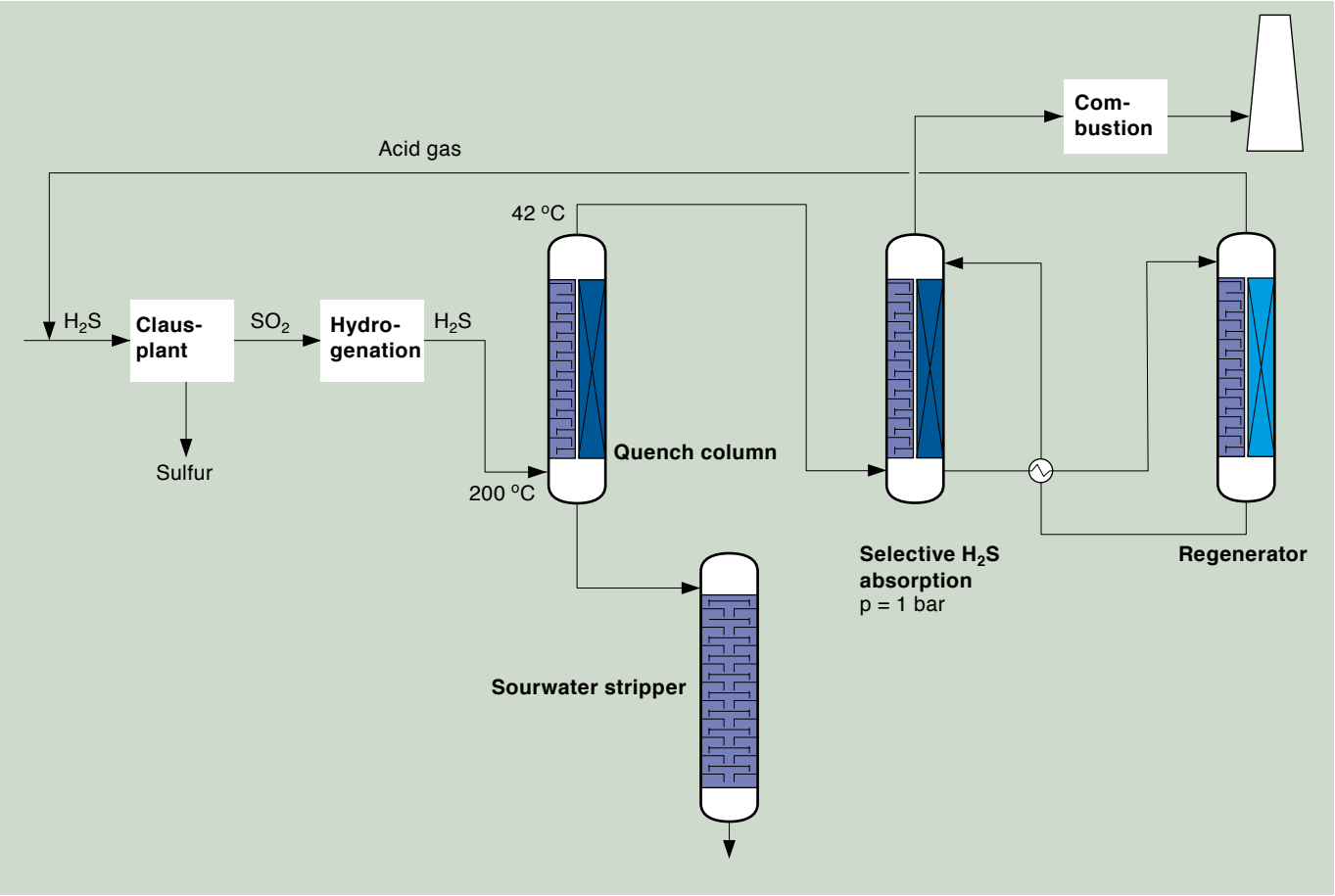
CO - Conversion unit



Saturator No. 2 Diameter: 2.94 m



Tail Gas Treating



Low Pressure drop with Mellapak

Means smaller blowers or compressors power compared with trays and random packing, as well as advantages for the upstream Claus process stages.

High Selectivity

The higher selectivity of structured packing over other components results in the following advantages:

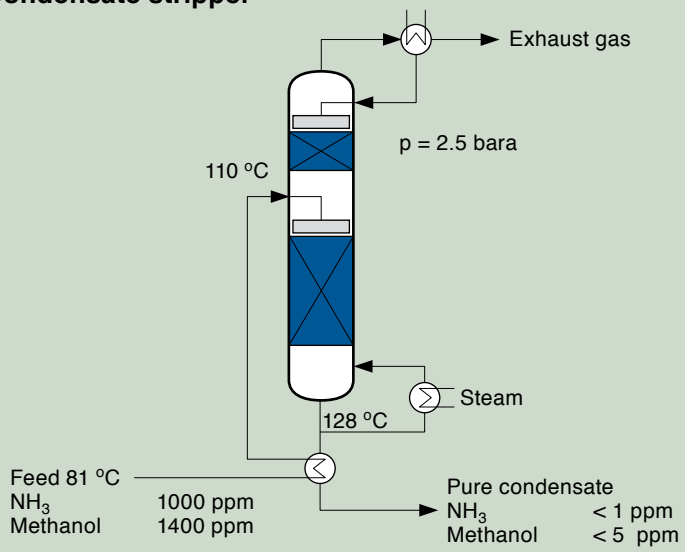
- Reduction of CO_2 concentration in acid gas which leads to
- Reduction of pressure drop of the Claus plant which leads to
- Increase of capacity of the Claus plant

Quench for tail gas treating unit

Column diameter	6.1 m		
Pressure	Atmospheric		
Gas flow rate	260,000 kg/h		
	Trays	Random packing	Mellapak
Pressure drop (mbar)	70	25	9
Energy savings (milions kWh/year)	-	2.8	3.9
Cost reduction (US$/year)	-	180,000	260,000

Applications in Ammonia and Fertilizer Production

Condensate stripper



	Original column	Revamp
Type of packing	Pall ring 2"	Mellapak
Flow (t/h)	65 - 75	65 - 75
NH_3 outlet (ppm)	10 - 30	<1
Methanol outlet (ppm)	50 - 100	<5
Reuse of condensate	no	yes

- Revamping of process condensate strippers (improving of efficiency)
- High pressure ammonia absorbers
- Waste water strippers
- Ammonia strippers in ammonium nitrate production

Formaldehyde Production

- Mellapak in the pump-around sections for the removal of the considerable amount of absorption heat
- Trays or plastic gauze packing for top part (final absorption with low water flow)

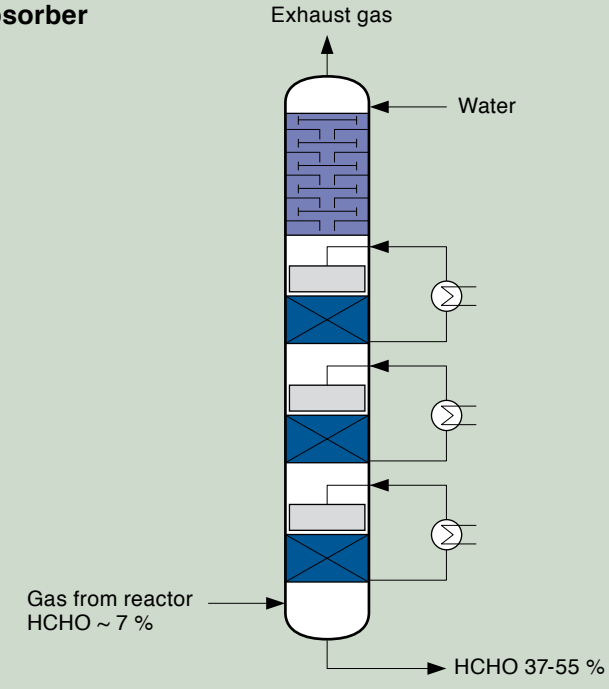
Further Process Technologies:

Katapak for Methanol separation from bottom formaldehyde product

Katapak for production of acetals

Katapak-SP® structured packing containing catalyst

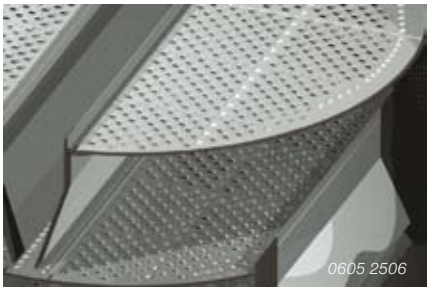
Formaldehyde absorber



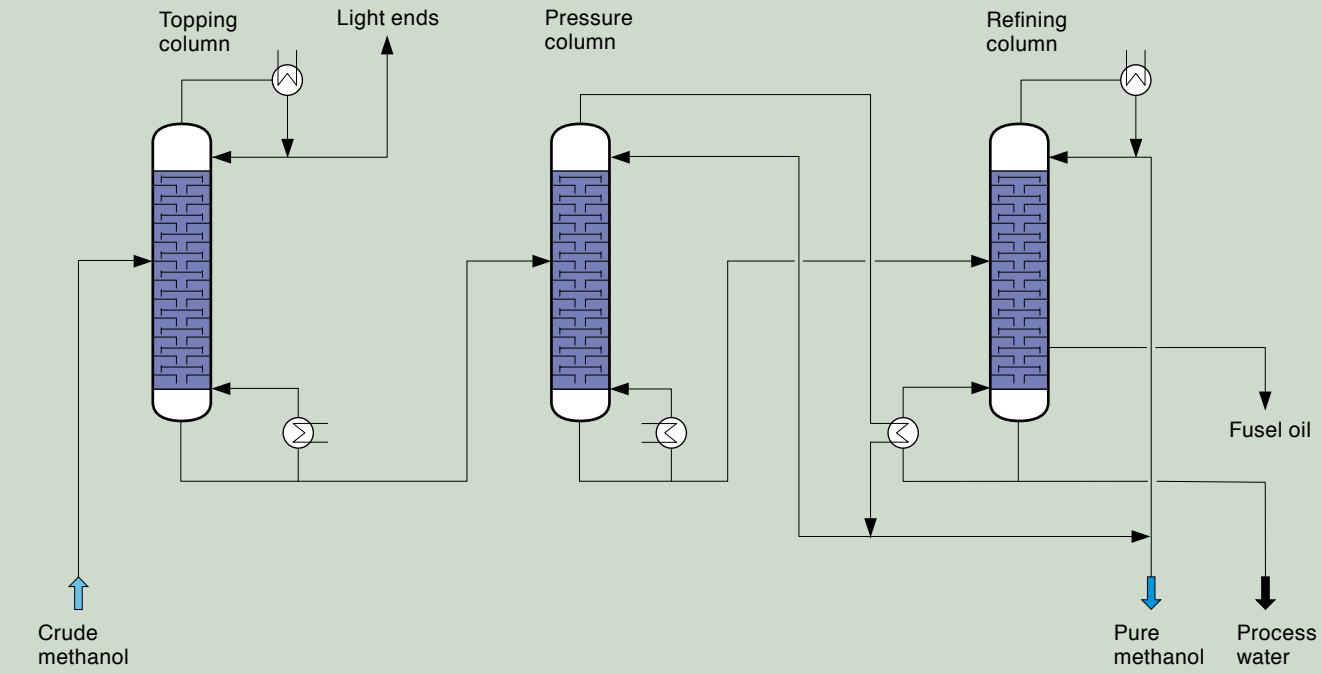
Methanol

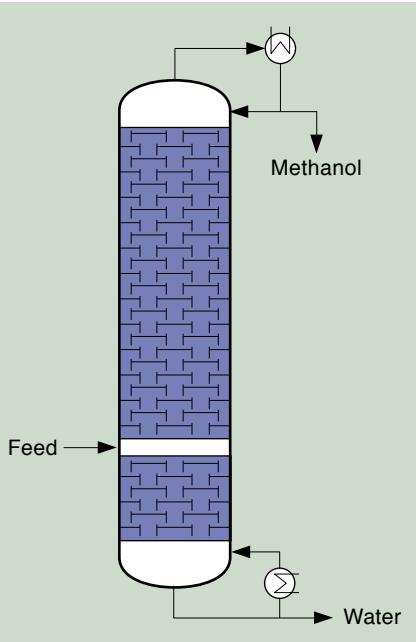
Applications

- Methanol splitters with fixed valve trays
- Methanol absorption columns with structured packing
- Gas saturators with random or structured packing



Methanol distillation unit





Design	Conventional tray	High performance tray
Column diameter	8’300 mm	7’300 mm
Number of trays	85	85
Tray spacing	650/700 mm	600/650 mm
Pressure drop	760 mbar	565 mbar
Valves	movable	MVG
Downcomer	standard	ModArc
Redirecting devices	–	Push valves

Benefits with Sulzer high performance VGPlus trays in methanol splitters:

- Reduced column diameter due to greater capacity, compared to sieve or valve tray
- Great fouling resistance
- Minimize vapor cross-flow channeling by improved liquid flow and vapor/liquid contacting through lateral vapor release

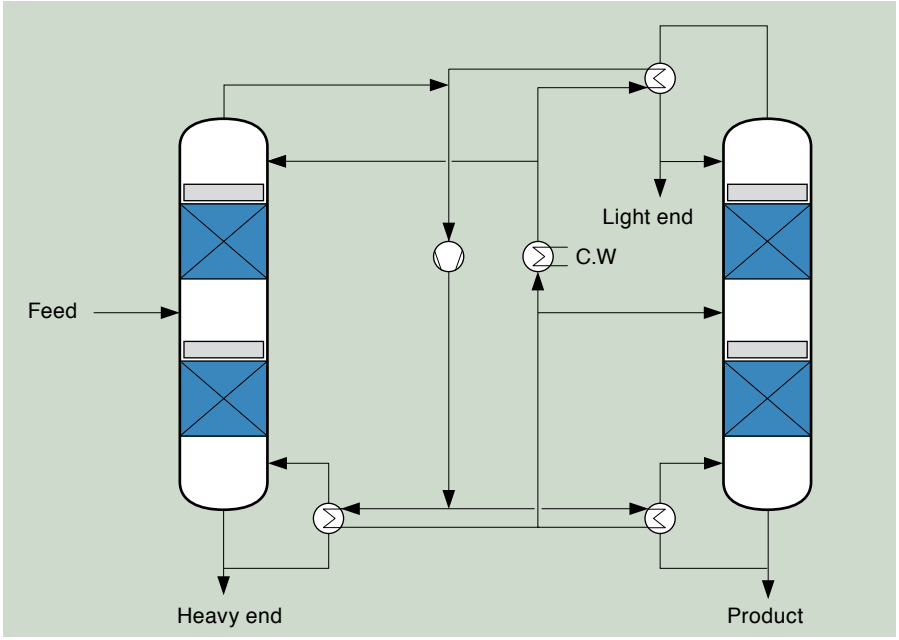
DMF / DMAc Recovery and Heat Pump / Heat Integration

Butene-1 plant with heat pump system

Multi-effect distillation systems:

- Reduced energy consumption due to high efficiency structured packings
- Increase of capacity with MellapakPlus
- Low consumption of cooling water

DMAc recovery plant



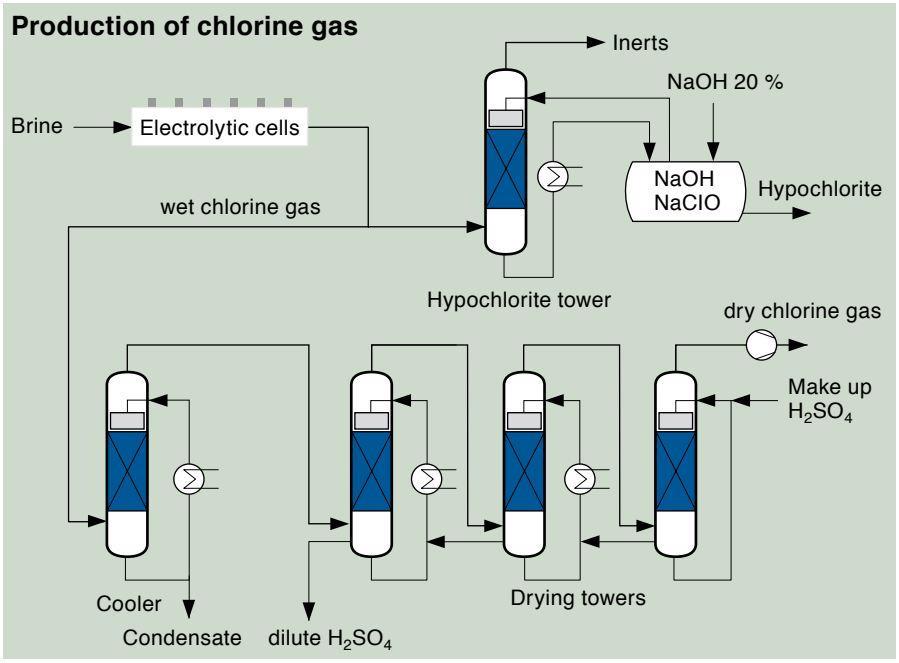
Heat pump technology allows:

- 90% energy saving
- No steam consumption
- Higher cooling water temperature

We deliver:

- Key-components such as column internals, compressors and heat exchangers
- Studies and basic engineering for revamping existing units
- Basic engineering for new units
- Commissioning and start-up services

Treatment of Corrosive Products e.g. Cl_2 and HCl



Features of Corrosion Resistant Packings

- High efficiency even at low liquid loads
- High capacity
- Over 200 columns in operation

Plastic gauze packing BX enabling low specific liquid loads due to good wetting properties

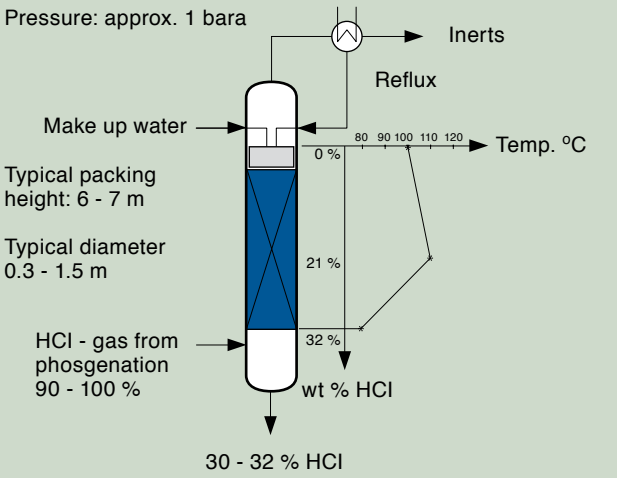
Use of Packing and Internals in a highly corrosive milieu, e.g. in chlorine and HCl-columns.
Sulzer Packings and Internals are available in the following corrosion resistant materials:

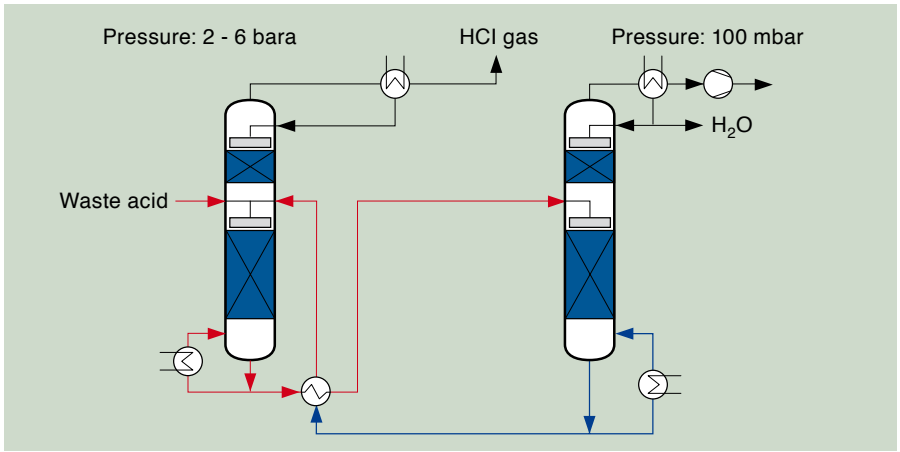
Plastics:	PP, PVDF, PVC-C, PFA, Halar, PEEK
Mellacarbon:	Graphite
Mellapak:	High-alloy steels, Hastelloy, Nickel, Tantal, Zirconium, Titanium etc.

The pressure swing distillation system for hydrochloric acid produces pure HCl gas without any contamination through by-products

The Mellacarbon® packing is a key component in the HCl distillation column

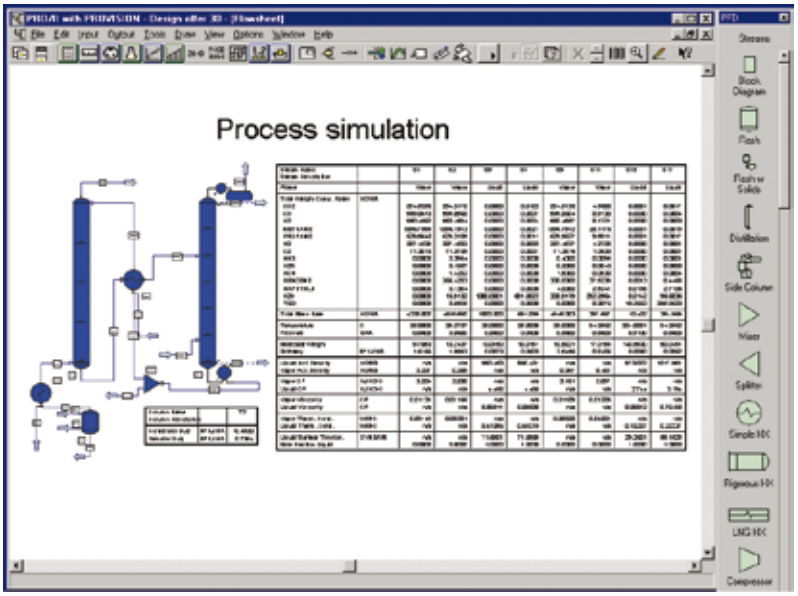
HCl - recovery from phosgenation



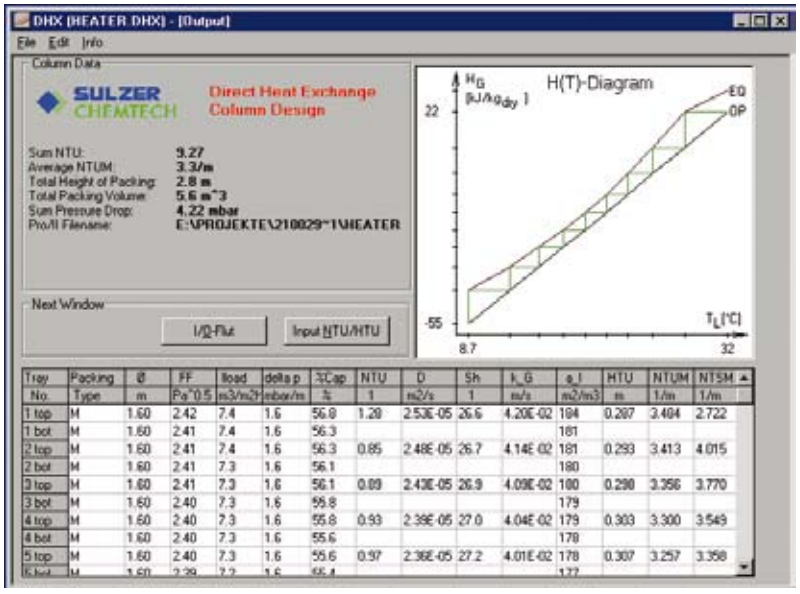


Column Design and Process Simulation

Sulzer Chemtech is your ideal partner for the design of your separation columns. We are able to assist you in the calculation of a new column, or determine potential advantages of a revamp for higher capacity, higher purity or new process conditions. The study is carried out with modern simulation tools based on data from our laboratory, literature, databank and field data.



The calculated number of theoretical stages will then be converted into a packing height or number of trays. In addition to Sulzer's high capacity trays, further capacity is achievable through our alliance with Shell Global Solutions. The result of a study is of course not only the number of trays but also a design of column internals or special recommendations for the running of the plant.



Our main applications for which we offer our advantages of a theoretical study, based on special knowledge from field experiences and pilot tests, are as follows:

- Columns for Olefin Plants
- Recovery of Ethylene Oxide
- Columns for Ethylene Glycols, Ethanolamines and Glycolethers
- Direct Heat Exchange
- Columns for DMF and DMAc Recovery
- Waste Water Treatment
- Absorption of Formaldehyde
- Formaldehyde, Methanol, Methylal Purification
- Recovery of HCl
- Removal of CO_2 and H_2S

Do not hesitate to ask for design possibilities or for our Engineering Services brochure. If there are no data available for the design of the column, we are also able to offer experimental tests in our laboratory or in cooperation with external consultants and universities.

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Sulzer Chemtech Ltd, a member of the Sulzer Corporation, with headquarters in Winterthur, Switzerland, is active in the field of process engineering and employs some 2500 persons worldwide.

Sulzer Chemtech is represented in all important industrial countries and sets standards in the field of mass transfer and static mixing with its advanced and economical solutions.

The activity program comprises:

- Process components such as trays, structured and random packings, internals for separation columns and reaction technology
- Engineering services for separation and reaction technology such as optimizing energy consumption, plant optimization studies, pre-engineering for governmental approval, basic engineering
- Separation and purification of organic chemicals by means of crystallization and membranes
- Mixing and reaction technology with static mixers
- Mixing and Cartridges Technology
- Tower field services

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