

# LABORATORY AND PILOT PLANTS

*WIPED FILM AND SHORT PATH DISTILLATION*

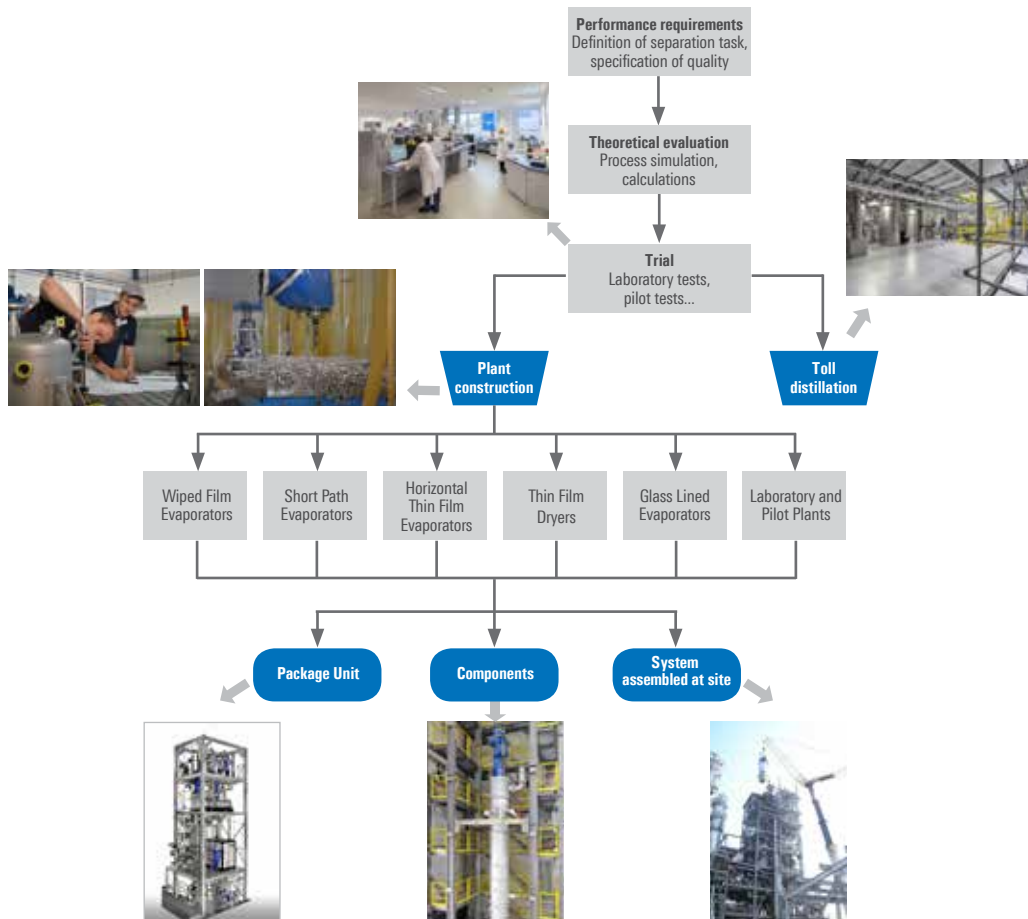


## Company Profile and Services

**VTA Verfahrenstechnische Anlagen GmbH & Co. KG**, based in Niederwinkling, is a wholly-owned subsidiary of MAX STREICHER GmbH & Co. KG aA and specialised in the field of thermal process engineering. The main focus of production is on wiped film and short path distillation plants at laboratory, pilot and industrial scale as well as the manufacturing of related components.

These distillation plants are operated for purification, concentration, removal of low boilers, colour improvement and drying of products in various industries. Highly qualified and responsible professionals ensure the highest quality standards. They are the foundation of the sustainable development of VTA.

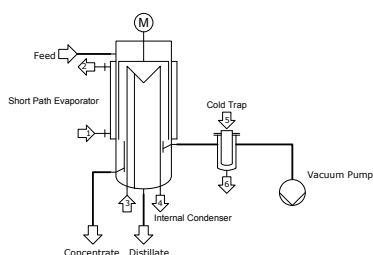
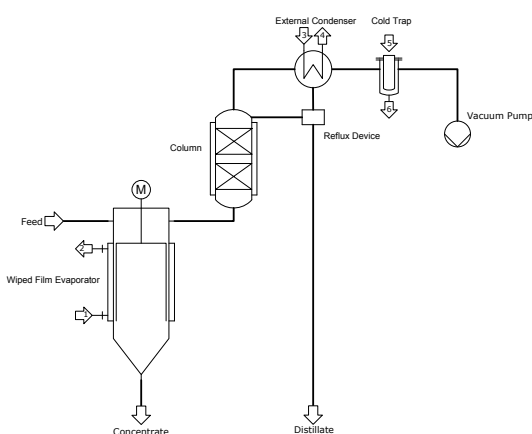
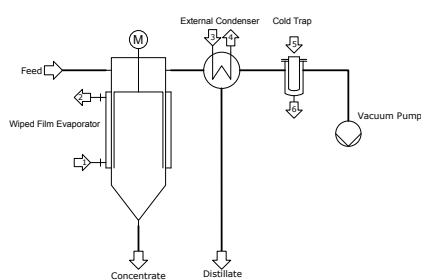
From process development, via trials to the finished plant or the execution of a toll distillation, everything comes from one single source at VTA. The close coordination of process development, design and manufacturing enables VTA to quickly respond to customer requests even during the manufacturing phase. Thus, the best possible solution even for complex problems is achieved for customers. VTA is a problem solver!





## Distillation Methods

### General Set-up of Wiped Film and Short Path Distillation Units



Key:  
 1 = Inlet Heating Media  
 2 = Outlet Heating Media  
 3 = Inlet Cooling Media  
 4 = Outlet Cooling Media  
 5 = Refrigerant, LN<sub>2</sub>, Dry Ice  
 6 = Condensate Cold Trap

### Wiped Film Distillation

In a wiped film evaporator a rotating wiping system distributes the crude product to a thin film on the inner surface of a heated cylindrical shell. The wiping system speeds up the evaporation process by keeping the product film thin and turbulent so that the heat transfer and mass transfer are optimised. The condenser is located outside of the evaporator body. The minimum achievable operating pressure is limited by the pressure drop of the vapors passing through the vapor nozzle. For high distillate ratios the operating pressure is usually limited to 1 mbar. With suitable wiping systems it is possible to distill heat sensitive as well as low or high viscosity products; it is also possible to process mixtures of materials to dry powders.

In some cases, the separation efficiency of a single stage wiped film distillation unit is not sufficient to achieve decent product qualities. In such cases wiped film evaporators (as reboiler) combined with a **rectification column** with several separation stages (theoretical plates) are used to increase the separation efficiency.

### Short Path Distillation

A short path evaporator combines a wiped film evaporator with an internal condenser in a single apparatus. A wiping system spreads the feed material onto the heated internal evaporator surface just like in a wiped film evaporator. Unlike in a wiped film evaporator, in a short path evaporator the vapors are condensed on a condenser located inside the evaporator. The distance between the heated surface and the condenser surface is very short. The pressure drop in the vapor nozzle does not apply as it does in wiped film distillation. Distillation pressures down to 0.001 mbar are achievable in laboratory as well as industrial scale equipment.



## Laboratory Plants – General Description

### Wiped Film and Short Path Distillation units for laboratory use

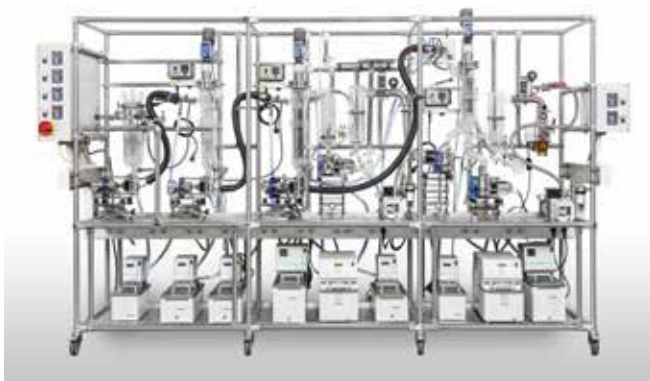
With laboratory units, reliable conclusions about the feasibility of a separation process can be made by using only small product amounts. The set-up and design of the lab units VTA offers to customers, are based on many years of experience gained in our own VTA test center.

### Lab units are used for

- verifying the feasibility of a separation task
- performing first process development steps
- producing small sample amounts of final products
- optimising existing processes

Since the evaporator body is made of glass, the product performance can be visually assessed during the distillation.

Features of laboratory units	
Typical feed rates	20 g/h up to approx. 12 kg/h
Material main components	Borosilicate glass
Max. heating temperature	350 °C
Evaporator size	0.01 up to 0.40 m <sup>2</sup>
Achievable pressure in wiped film evaporator	0.1 mbar
Achievable pressure in short path evaporator	0.001 mbar





## Pilot Plants – General Description

### Pilot Plants for Wiped Film and Short Path Distillation

Main target is to generate scalable data and results during the pilot tests (with small sample quantities) to enable a later scale up to industrial systems. Furthermore, these pilot systems can be used for distillation or drying of small product quantities. Experience, gained by experiments with a variety of products in our own pilot plants, has influenced the design and improves the quality and performance of the systems continuously.

### Pilot plants are used for

- generating the scalable data for industrial systems
- producing certain sample quantities
- optimisation of existing processes

### Features of pilot plants

Typical feed rates	5 kg/h up to approx. 50 kg/h
Material main components	Stainless steel or special materials
Max. heating temperature	350 °C (Thermal oil) For higher heating temperatures: Inductive and electrical heating possible
Evaporator size	0.06 up to 0.50 m <sup>2</sup>
Achievable pressure in wiped film evaporator	0.1 mbar
Achievable pressure in short path evaporator	< 0.001 mbar
Small product hold up in pipes and vessels	

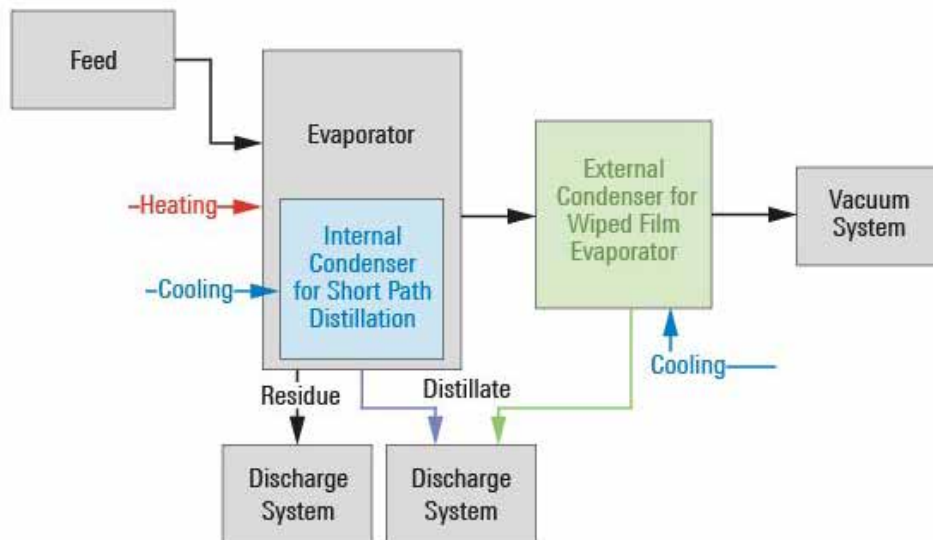




## Laboratory Plants – Set-up

The plants are assembled according to the individual requirements (product features, tasks etc.) of the customer.

### Example: Single Stage Distillation Unit

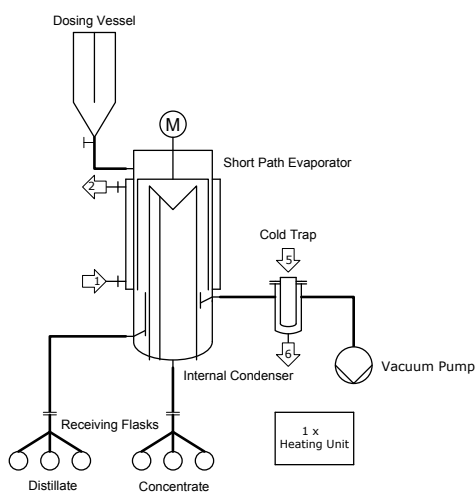


Component and Design	Options
Feed	<ul style="list-style-type: none"> <li>• Dosing vessel*</li> <li>• Gear pump*</li> <li>• Dosing pump</li> </ul>
Discharge	<ul style="list-style-type: none"> <li>• Glass flasks</li> <li>• Triple split distributor</li> <li>• Intermediate buffer vessel*</li> <li>• Gear pump*</li> </ul>
Vacuum system	<ul style="list-style-type: none"> <li>• Rotary vane pump</li> <li>• Oil diffusion pump</li> </ul>
Skid	<ul style="list-style-type: none"> <li>• Moveable skid</li> <li>• Installation on bench (e.g. fume hood)</li> </ul>
Electrical equipment	<ul style="list-style-type: none"> <li>• Standard version for manual operation</li> <li>• PLC control and process visualisation</li> </ul>
Material	<ul style="list-style-type: none"> <li>• Borosilicate glass</li> <li>• Stainless steel</li> <li>• Other special materials</li> </ul>
Configurations	<ul style="list-style-type: none"> <li>• Single stage</li> <li>• Multi stage</li> <li>• Wiped film evaporator with column</li> </ul>

\*) Trace-Heating for higher-melting or viscous products possible



### Standard Design / Short Path Distillation Unit



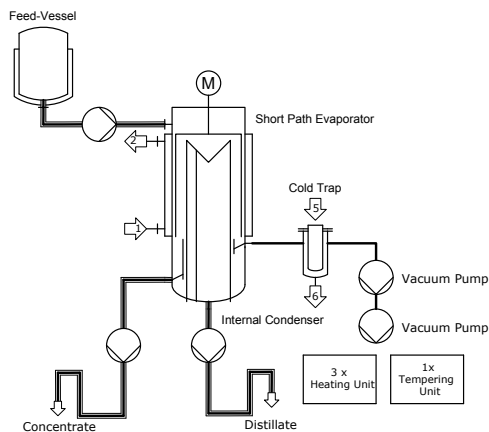
#### Suitable for

- Feasibility studies
- Simple separation tasks
- Low melting products
- Discontinuous operation

#### Features

- Dosing vessel
- No trace heating
- Flasks for residue and distillate discharge

### High-end Design / Short Path Distillation Unit



#### Suitable for

- Production of samples up to several kilograms
- Complex separation tasks
- High melting products
- Continuous operation

#### Features

- Feed vessel
- Fully trace heated system
- Pumps for feed supply, residue and distillate discharge

Key:  
 1 = Inlet Heating Media  
 2 = Outlet Heating Media  
 5 = Refrigerant, LN<sub>2</sub>, dry ice  
 6 = Condensate Cold Trap



## Laboratory Plants – Standard Sizes

With laboratory units, reliable conclusions about the feasibility of a separation process can be made by only using small product amounts.

### Standard Sizes of VTA Wiped Film Evaporators for laboratory use

Type	Evaporator surface [m <sup>2</sup> ]	Feed rate [kg/h]	Required crude amount [kg]
VDL 70-4	0.04	0.1 - 1.5	1.0
VDL 70-5	0.05	0.1 - 1.5	1.0
VDL 70-7	0.07	0.2 - 2.0	2.0
VDL 125-15	0.15	0.3 - 5.0	5.0
VDL 200-30	0.30	0.5 - 9.0	10.0
VDL 200-40	0.40	0.8 - 12.0	12.0

Larger laboratory-evaporator sizes on request



### Standard Sizes of VTA Short Path Evaporators for laboratory use

Type	Evaporator surface [m <sup>2</sup> ]	Feed rate [kg/h]	Required crude amount [kg]
VKL 38-1	0.01	0.02 - 0.3	0.1
VKL 70-4	0.04	0.10 - 1.2	2.0
VKL 70-5	0.05	0.10 - 1.5	2.0
VKL 125-10	0.10	0.30 - 3.0	4.0
VKL 125-15	0.15	0.30 - 5.0	5.0
VKL 125-20	0.20	0.30 - 6.0	6.0
VKL 200-30	0.30	0.50 - 9.0	10.0

Larger laboratory-evaporator sizes on request



### Technical Data

Wiped Film Evaporator	Wiped Film Evaporator with Rectification Column	Short Path Evaporator
Operating pressure: 1,000 - 0.1 mbar	Operating pressure: 1,000 – 0.5 mbar (column head); min. 1.5 mbar in the evaporator (depending on evaporation rate and reflux ratio)	Operating pressure: 1,000 - 0.001 mbar
Max. melting point of the material to be processed up to 200 °C		
Max. heating temperature of jacket: 350 °C		
Max. viscosity of the residue at operating temperature: 15,000 mPas (cP)		
Numbers of theoretical plates are selected based on customer requirements. Standard: approx. 10		





## Pilot Plants – Standard Sizes

With pilot wiped film and short path distillation units, proper and reliable tests can be performed with only 30 kg of crude material.

### Pilot Plants with Wiped Film Evaporators

#### Standard Sizes of VTA Wiped Film Evaporators in pilot scale

Type	Evaporator surface [m <sup>2</sup> ]	Feed rate [kg/h]	Required crude amount [kg]
VD 83-6	0.06	5.0 - 12.0	30.0
VD 125-20	0.20	15.0 - 40.0	100.0
VD 200-50	0.50	40.0 - 100.0	300.0



### Pilot Plants with Short Path Evaporators

#### Standard Sizes of VTA Short Path Evaporators in pilot scale

Type	Evaporator surface [m <sup>2</sup> ]	Feed rate [kg/h]	Required crude amount [kg]
VK 83-6	0.06	3.0 - 10.0	30.0
VK 100-10	0.10	3.0 - 15.0	30.0
VK 125-15	0.15	8.0 - 30.0	80.0
VK 200-40	0.40	25.0 - 80.0	200.0



### Technical Data

Wiped Film Evaporator	Wiped Film Evaporator with Rectification Column	Short Path Evaporator
Operating pressure: 1,000 - 0.1 mbar	Operating pressure: 1,000 – 0.5 mbar (column head); min. 1.5 mbar in the evaporator (depending on evaporation rate and reflux ratio)	Operating pressure: 1,000 - 0.001 mbar
Max. melting point of the material to be processed up to 200 °C		
Max. heating temperature of jacket: 350 °C		
Max. viscosity of the residue at operating temperature: 100,000 mPas (cP)		Max. viscosity of the residue at operating temperature: 15,000 mPas (cP)
Numbers of theoretical plates are selected based on customer requirements. Standard: approx. 10		

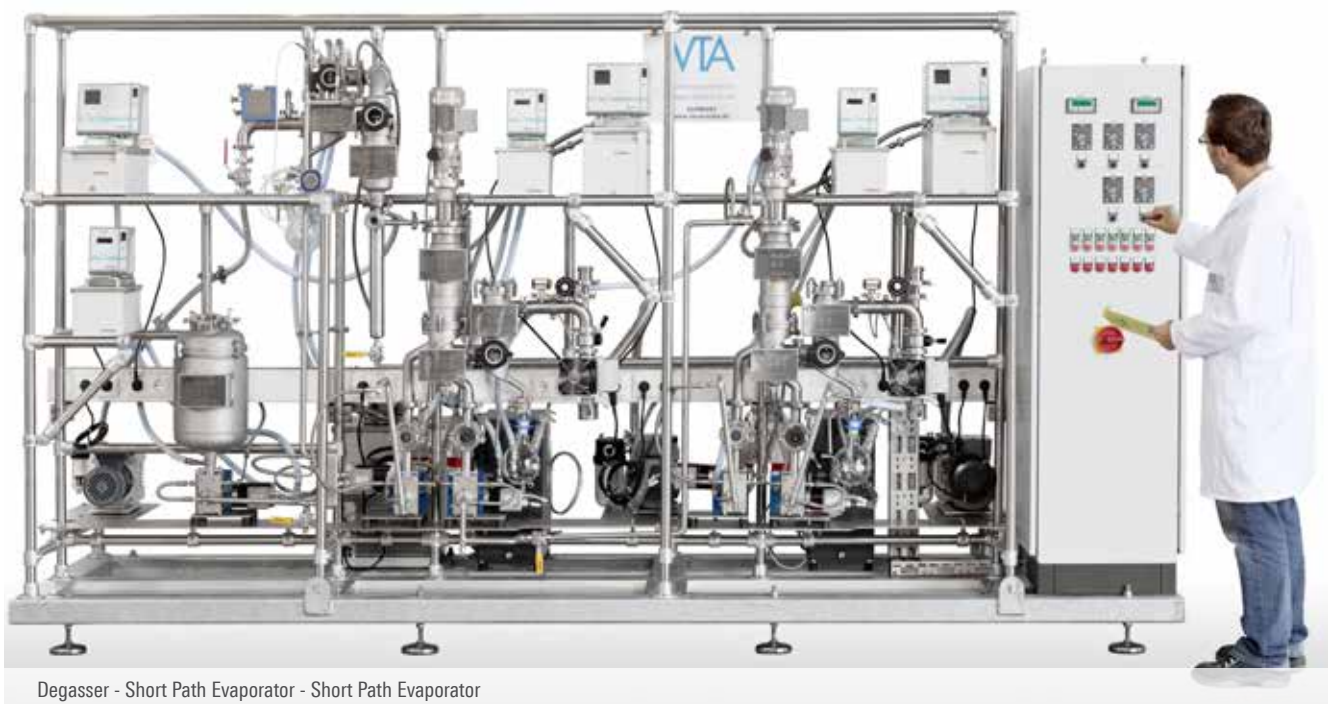


## Pilot Plants – Set-up

### Available options

The systems are individually adapted to customer requirements, based on product properties and frequency of use. Besides the basic configuration the following options can be selected:

- Trace heating of individual sections (feed, residue and distillate) for melting or viscous products
- Selection of product wetted parts in stainless steel or special materials and alloys
- Combination with other evaporation stages
- Extension set for the plant for rectification; Wiped Film Evaporator as reboiler
- PLC and visualisation
- Continuous operation



Degasser - Short Path Evaporator - Short Path Evaporator



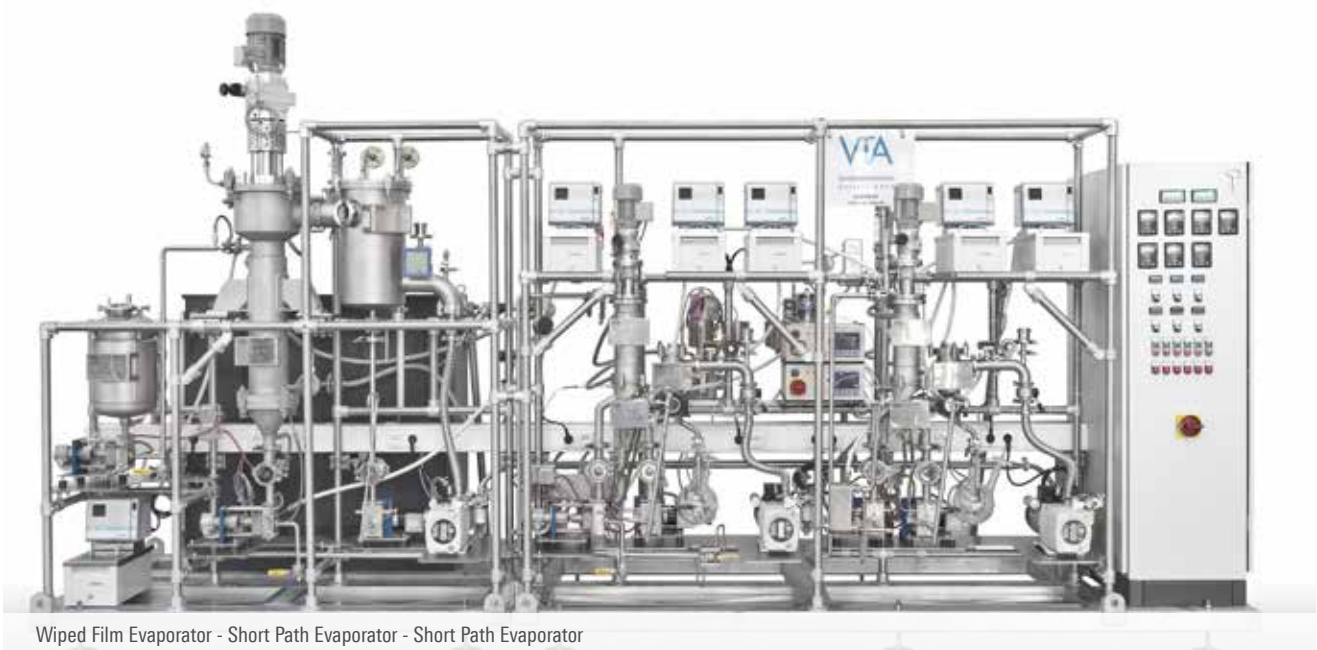
In multi-stage systems complex product mixtures can be separated in the individual fractions with the desired quality.

**Multi-stage system configurations for example are:**

- 1st stage wiped film evaporator
- 2nd stage short path evaporator
- 3rd stage short path evaporator
  
- 1st stage degasser
- 2nd stage short path evaporator
- 3rd stage short path evaporator
  
- 1st stage degasser
- 2nd stage short path evaporator
- 3rd stage short path evaporator
- 4th stage short path evaporator



Wiped Film and Short Path Evaporator with control system/visualisation



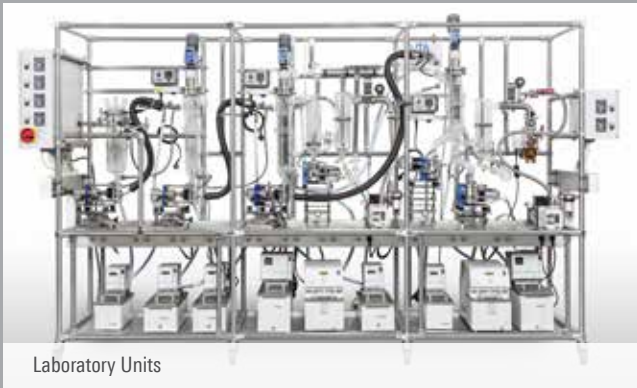
Wiped Film Evaporator - Short Path Evaporator - Short Path Evaporator



Laboratory and Pilot Tests (Test Center)



Contract Manufacturing



Laboratory Units



Pilot Units



Package Units & Plant Components



Service

### VTA Verfahrenstechnische Anlagen GmbH & Co. KG

Establishment	1994
Number of employees	90
Locations	Niederwinkling/Germany Subsidiary Beijing/China: VTA PROCESS EQUIPMENT BEIJING Co., LTD Branches: Rock Hill/US Seri Kembangan/Malaysia

Visit us online:  
[www.vta-process.de](http://www.vta-process.de)



### STREICHER Group

Establishment	1909 (MAX STREICHER GmbH & Co. KG aA)
Number of employees	approx. 3,500
Locations	Headquarters: Deggendorf/Germany more than 30 locations worldwide