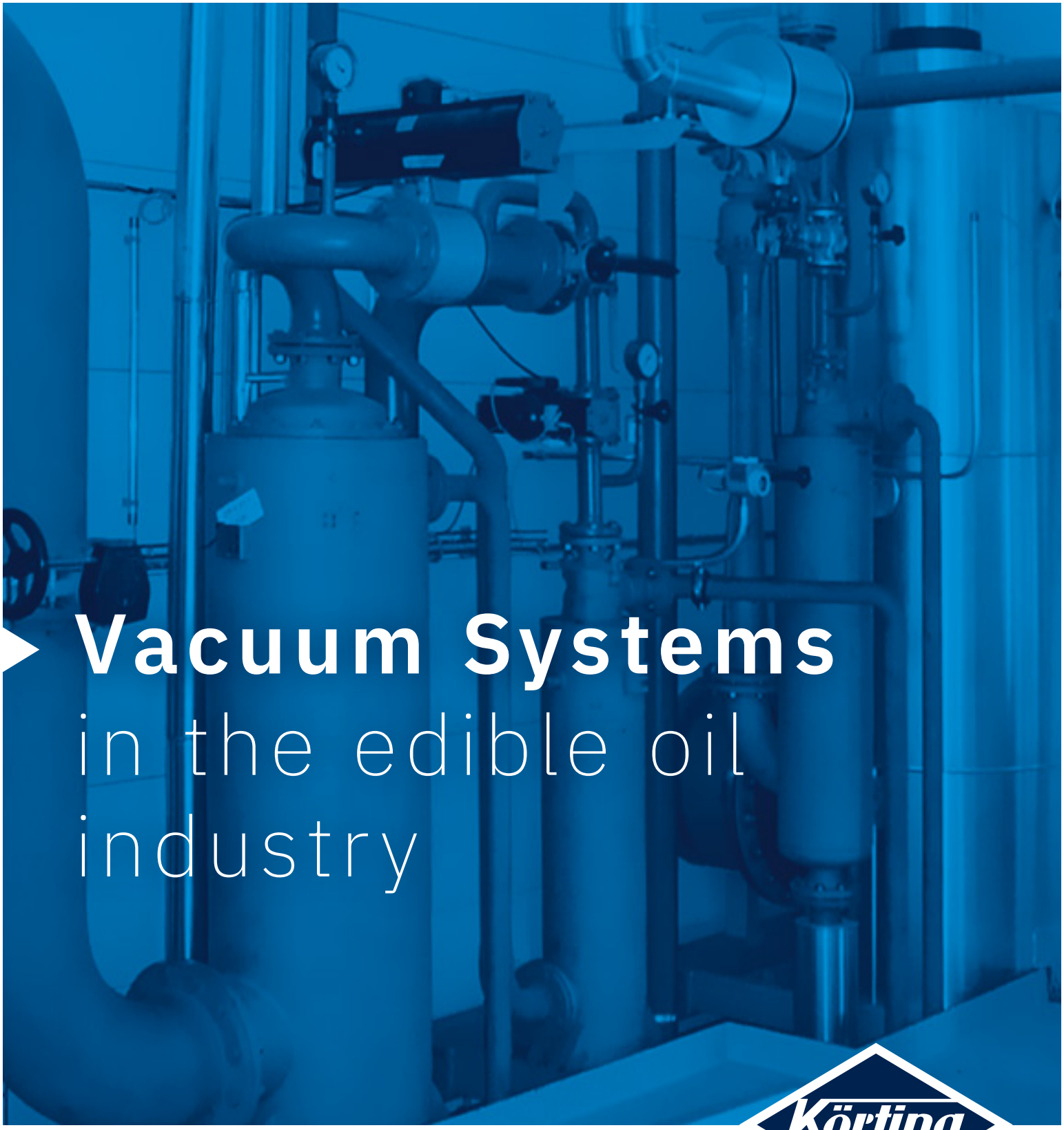


Vacuum Systems in the edible oil industry

Körting

THE EJECTOR COMPANY

Körting vacuum systems

for drying, neutralising and bleaching edible oil

Mixing (direct contact) condenser

Ensuring direct contact between the process vapours and the cooling medium is the most efficient way of condensing vapour and steam.

Which is why conventional vacuum systems operating with mixing condensation are still very popular for this application. These vacuum systems deliver low operating costs combined with reliable operation.

All systems are designed to run with pre-condensers, but an additional booster can be installed upstream of the condenser. This installation makes a vacuum level below 40 mbar easy to achieve.

1/2) Conventional vacuum systems operating with mixing condensers

VACUUM SYSTEMS CONSISTING SOLELY OF EJECTORS

WITHOUT A BOOSTER

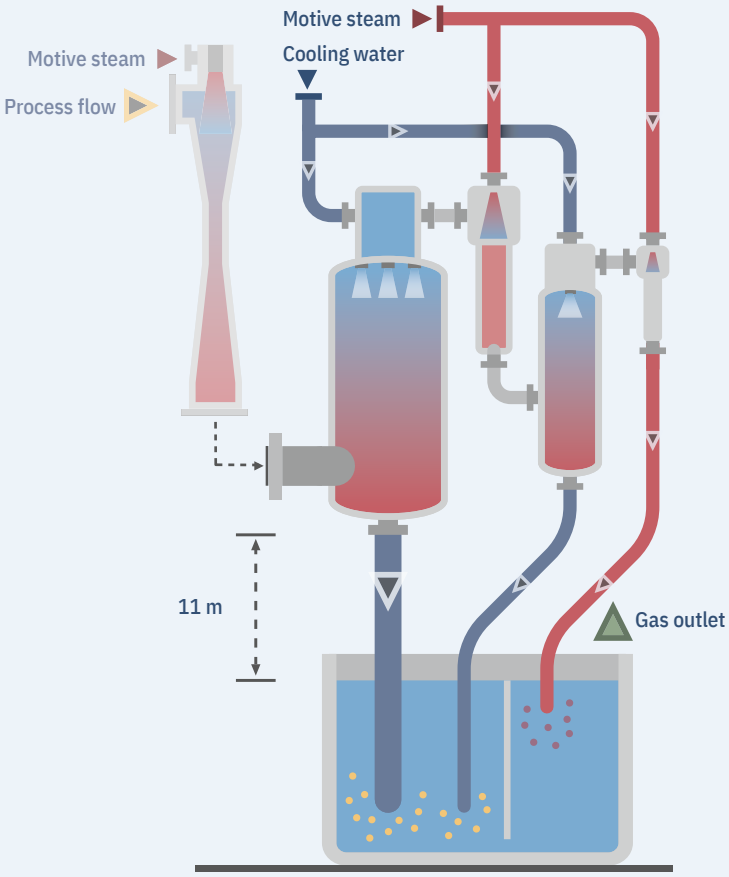
- Design parameters: 100 kg/h water vapour + 10 kg/h air @ 70 mbar and 80°C
- motive steam pressure 9 bar (abs)
- cooling water inlet temperature 32°C

MOTIVE STEAM (kg/h)	COOLING WATER (m^3/h), 32°C => 37.5°C	ELECTRICITY (kW)
78	14.5	–

WITH A BOOSTER

- Design parameters: 100 kg/h water vapour + 10 kg/h air @ 40 mbar and 80°C
- motive steam pressure 9 bar (abs)
- cooling water inlet temperature 32°C

MOTIVE STEAM (kg/h)	COOLING WATER (m^3/h), 32°C => 37.5°C	ELECTRICITY (kW)
135	21.5	–



HYBRID VACUUM SYSTEMS (COMBINED WITH A LIQUID RING VACUUM PUMP)

WITHOUT A BOOSTER

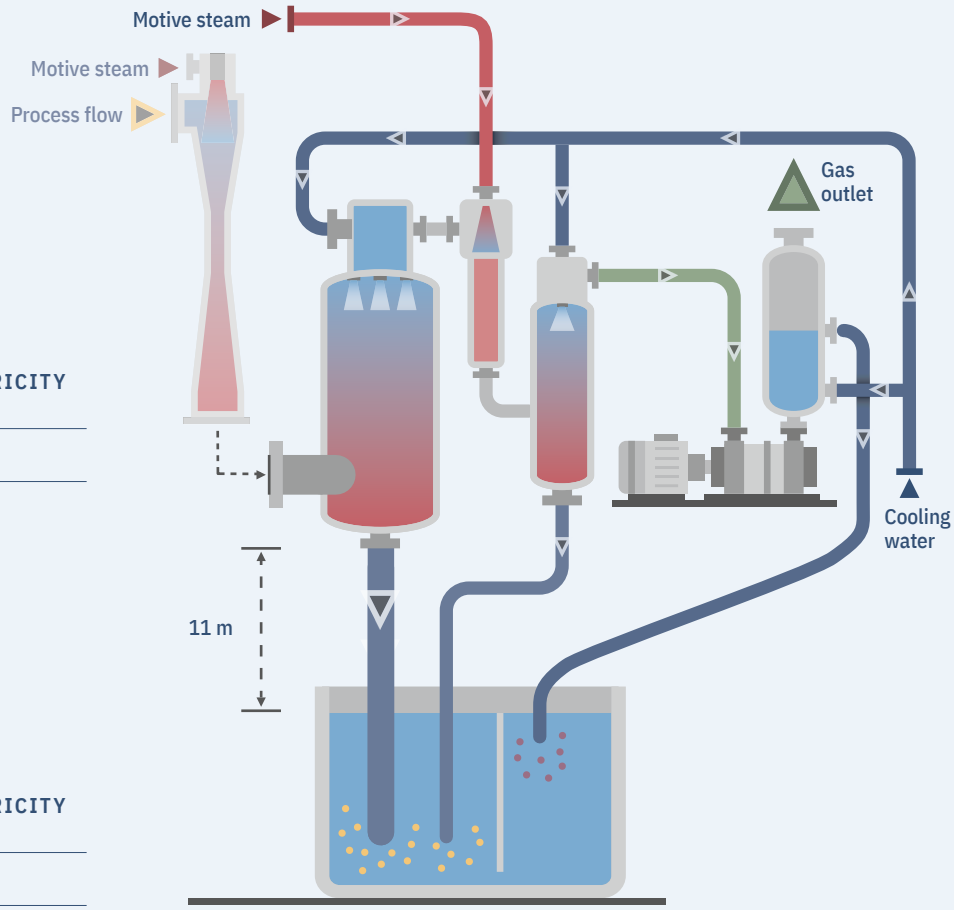
- Design parameters: 100 kg/h water vapour + 10 kg/h air @ 70 mbar and 80°C
- motive steam pressure 9 bar (abs)
- cooling water inlet temperature 32°C

MOTIVE STEAM (kg/h)	COOLING WATER (m^3/h), 32°C => 37.5°C	ELECTRICITY (kW)
17	12.5	3.5

WITH A BOOSTER

- Design parameters: 100 kg/h water vapour + 10 kg/h air @ 40 mbar and 80°C
- motive steam pressure 9 bar (abs)
- cooling water inlet temperature 32°C

MOTIVE STEAM (kg/h)	COOLING WATER (m^3/h), 32°C => 37.5°C	ELECTRICITY (kW)
74	20.5	3.5



1/2) Vacuum system with indirect condensation

Surface condenser

The initial reason for developing a vacuum system with indirect condensation was the demand for environment-friendly systems in a barometric and non-barometric design.

Compared to conventional systems – with mixing (direct contact) condensers – the return on the somewhat higher investment for these types of systems is quick because they are more environmentally friendly and reliable to operate.

All systems are designed to run with pre-condensers, but an additional booster can be installed upstream of the condenser. This installation makes a vacuum level below 40 mbar easy to achieve.

VACUUM SYSTEMS CONSISTING SOLELY OF EJECTORS

WITHOUT A BOOSTER

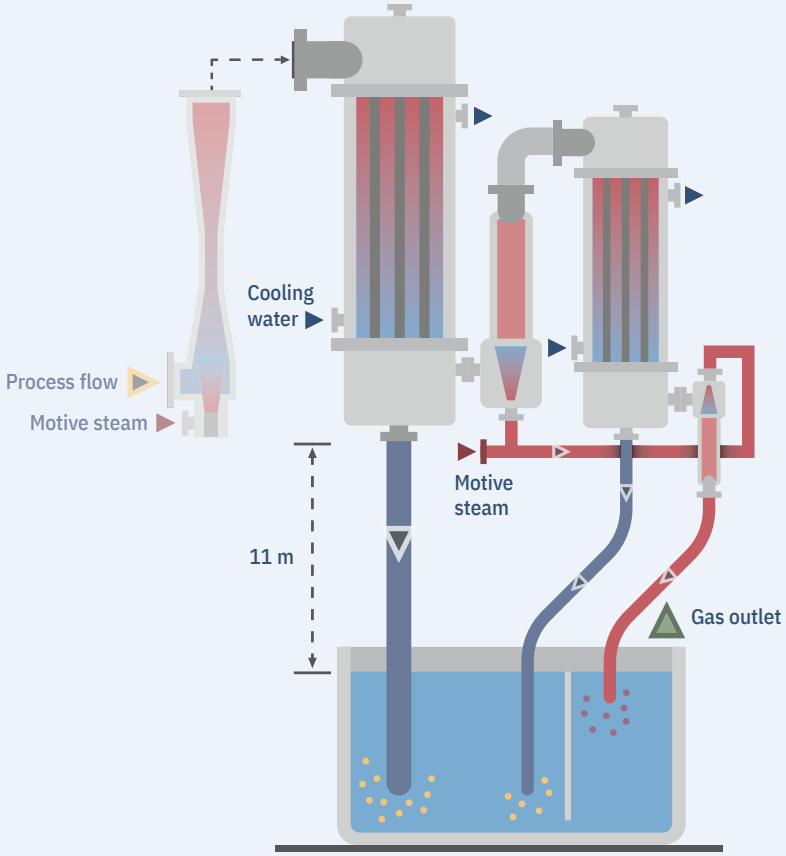
- Design parameters: 100 kg/h water vapour + 10 kg/h air @ 90 mbar and 80°C
- motive steam pressure 9 bar (abs)
- cooling water inlet temperature 32°C

MOTIVE STEAM (kg/h)	COOLING WATER (m³/h), 32°C => 37°C	ELECTRICITY (kW)
72	20	–

WITH A BOOSTER

- Design parameters: 100 kg/h water vapour + 10 kg/h air @ 40 mbar and 80°C
- motive steam pressure 9 bar (abs)
- cooling water inlet temperature 32°C

MOTIVE STEAM (kg/h)	COOLING WATER (m³/h), 32°C => 37°C	ELECTRICITY (kW)
168	33.5	–



HYBRID VACUUM SYSTEMS (COMBINED WITH A LIQUID RING VACUUM PUMP)

WITHOUT A BOOSTER

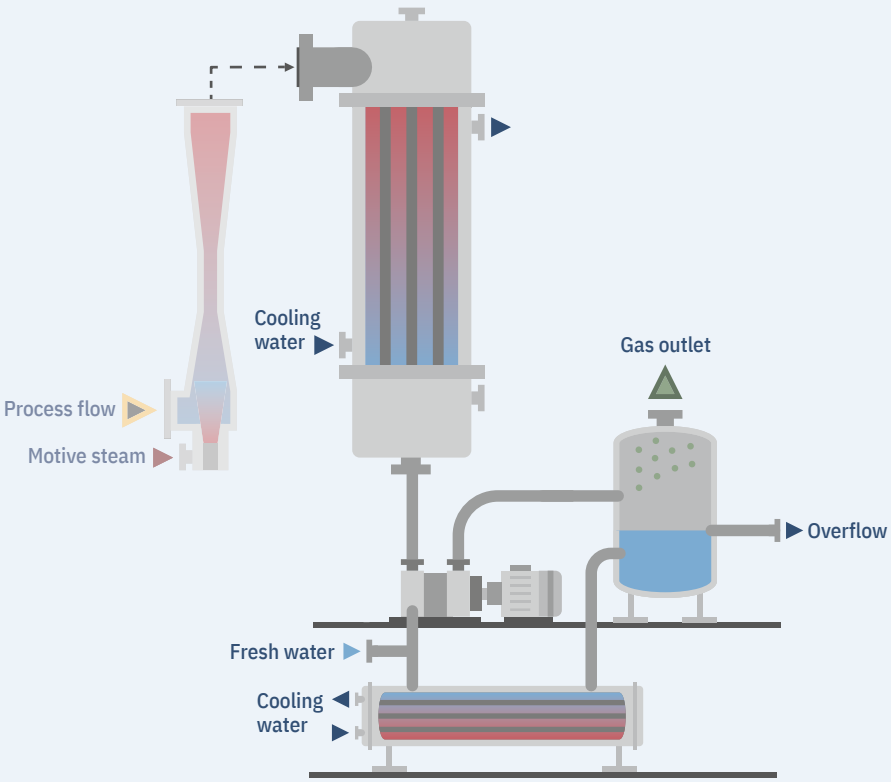
- Design parameters: 100 kg/h water vapour + 10 kg/h air @ 90 mbar and 80°C
- motive steam pressure 9 bar (abs)
- cooling water inlet temperature 32°C

MOTIVE STEAM (kg/h)	COOLING WATER (m³/h), 32°C => 37°C	ELECTRICITY (kW)
–	13	7.7

WITH A BOOSTER

- Design parametesr: 100 kg/h water vapour + 10 kg/h air @ 40 mbar and 80°C
- motive steam pressure 9 bar (abs)
- cooling water inlet temperature 32°C

MOTIVE STEAM (kg/h)	COOLING WATER (m³/h), 32°C => 37°C	ELECTRICITY (kW)
98	28.5	7.7



Hybrid vacuum systems as skid-mounted units

In drying applications, a vacuum system comprising a small booster, a surface condenser and a liquid ring vacuum pump as the final stage, installed as a skid-mounted unit is very popular.

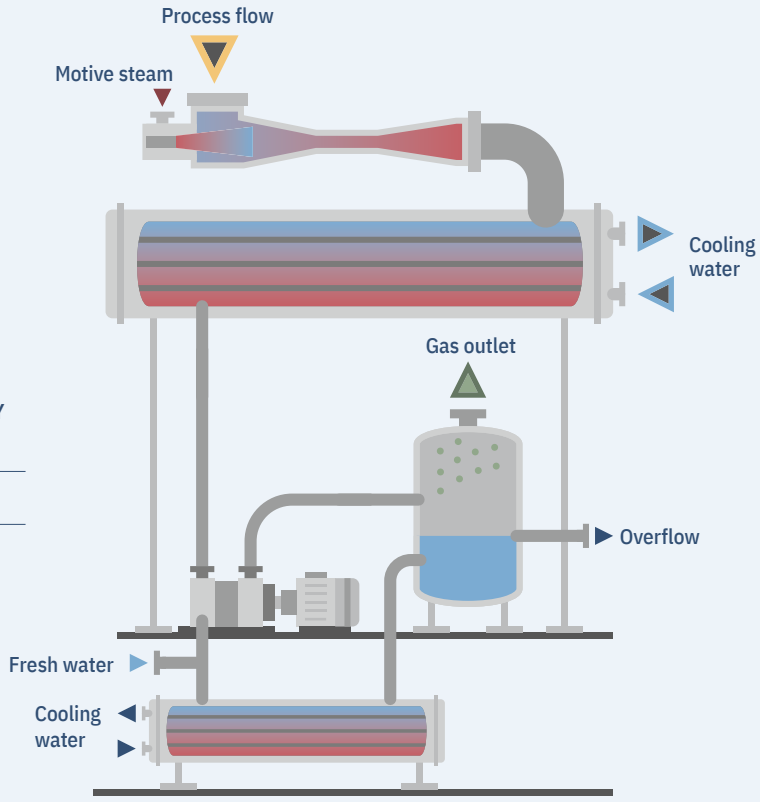
This is a hybrid system and a customised solution. This design also enables non-barometric installations. Installing the surface condenser horizontally increases the pollution risk.

Hybrid system consisting of two steam jet vacuum pumps with surface condenser and a liquid ring vacuum pump

DESIGN PARAMETERS

- 100 kg/h water vapour + 5 kg/h air @ 50 mbar and 80°C
- motive steam pressure 9 bar (abs)
- cooling water inlet temperature 32°C

MOTIVE STEAM (kg/h)	COOLING WATER (m^3/h), 32°C => 37°C	ELECTRICITY (kW)
36	12	3.3



ADVANTAGES OF THE VACUUM SYSTEM OPERATING WITH MIXING (DIRECT CONTACT) CONDENSERS

- very efficient due to direct contact between the process medium and the cooling medium
- low investment costs compared to indirect cooling
- simple and easy operation
- proven technology

ADVANTAGES OF THE VACUUM SYSTEM OPERATING WITH SURFACE CONDENSERS – COMPARED TO THE CONVENTIONAL ONES USING MIXING (DIRECT CONTACT) CONDENSERS

- strict separation of cooling water and process medium
- environmentally friendly, e.g. low air pollution, clean cooling tower and less waste water
- easy cleaning during operation
- proven technology

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