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MKR Evaporation Systems

ROBUST. SAFE. FLEXIBLE. EFFICIENT.

- → Heat driven Systems
- → Hybrid Systems with Heat Pump
- → Electric MVR Evaporators

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Digestate and slurry is a valuable organic fertilizer, but it incurs high transport and storage costs and affects the nutrient balance of soils. Evaporators are an innovative and ecological solution for the treatment of digestate from biogas plants, pig slurry or any liquid media.

With MKR Cleanwater's evaporators, you can solve these problems and obtain clean water and a mineral fertilizer at the same time.

Waste heat and hybrid system DV:

Two sizes: 180 kW_{th} and 500 kW_{th}, with 1–4 stages each.

Maximum efficiency of 4 stages: 4.3 litres of distillate per kWh of heat.

Electric evaporators (Mechanical Vapour Recompression):

Several sizes, with distillate production rates ranging from 0.3 to 2.0 m^3/h.

Power consumption is approx. 40 kWh_{el} per m^3 of distillate.

History

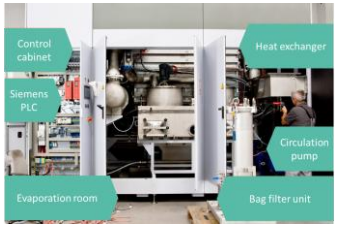
MKR Metzger develops industrial recycling technology since 1990

2009/10 Project start digestate evaporator

First pilot projects based on existing industrial evaporators

2012/13 first practical plants single-stage, approx. 2000 m^3 reduction

Since 2016/17 multi-stage evaporators with >20,000 m^3/a reduction per line



Starting in 2024 adapting electrical MVR evaporation systems for pig slurry and other thin organic media with ammonia recovery

Today

Active throughout Europe, mainly residual /food waste plants and farm manure plants.

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→ Hybrid Systems with Heat Pump
→ Electric MVR Evaporators

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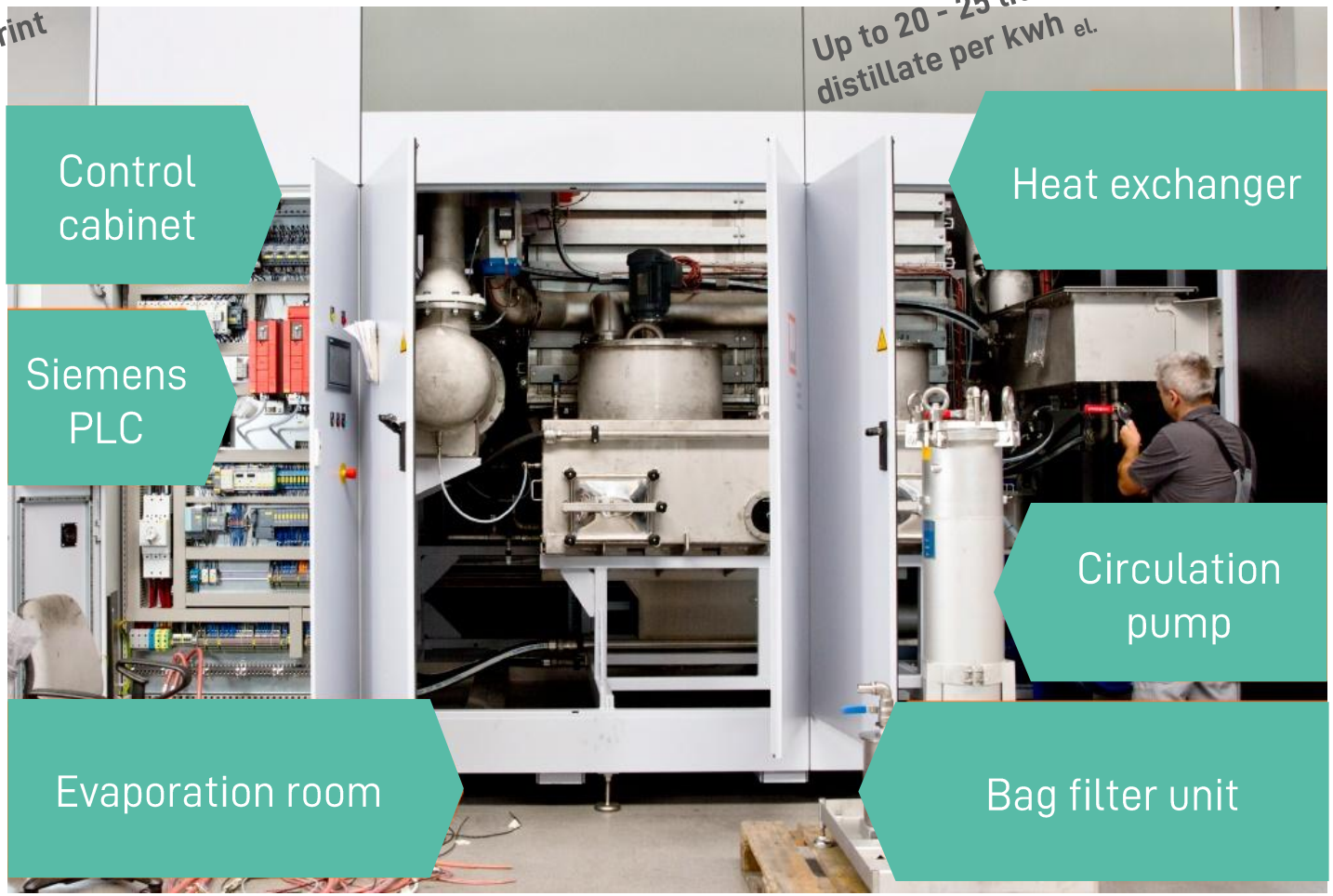
Electrical Driven Evaporators (Mechanical Vapour Compression)

Small footprint

Up to 20 - 25 litres distillate per kwh el.



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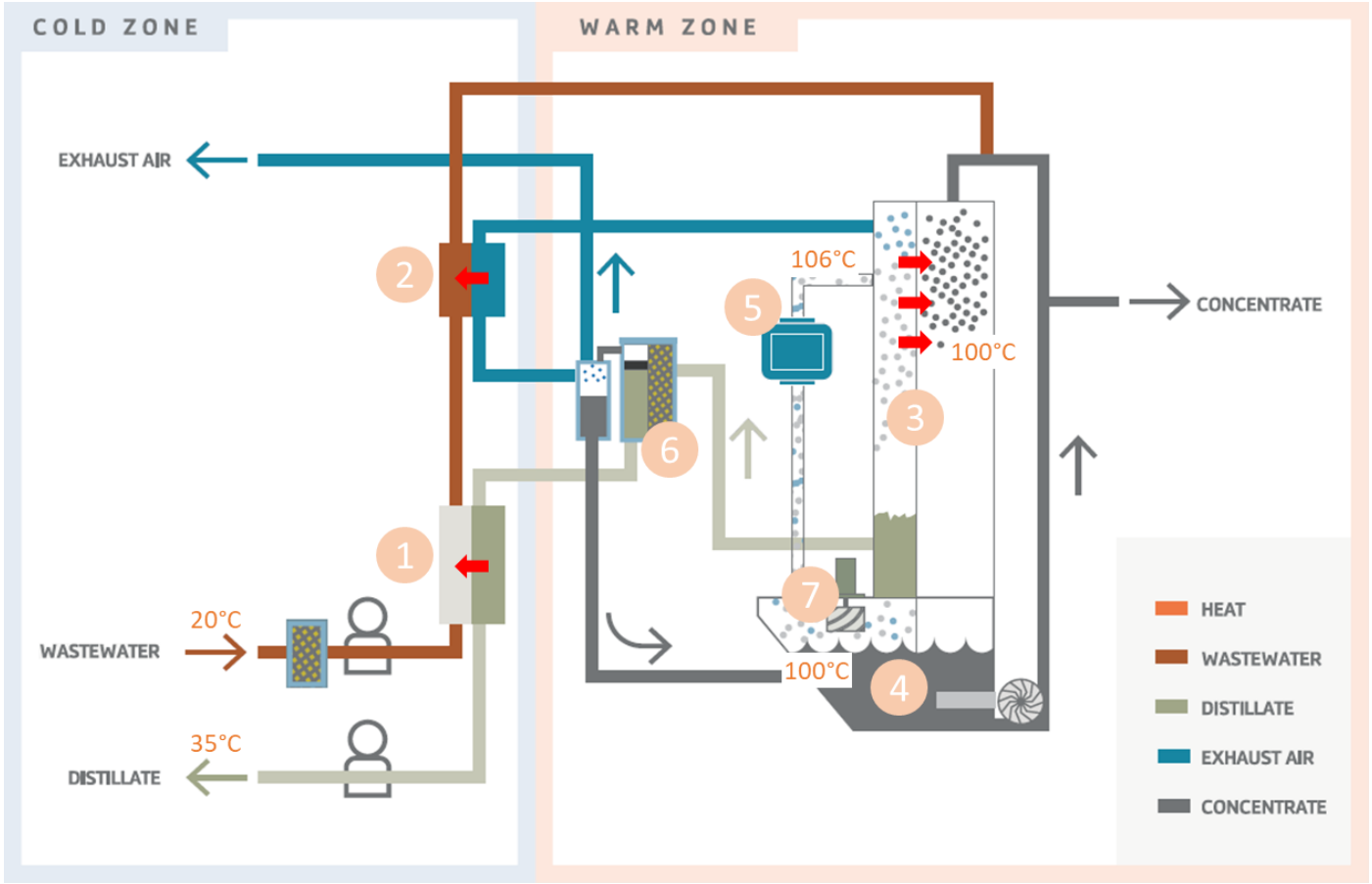
Operating Principle



The slurry goes through three heat exchanger (1,2 & 3) to the process tank (4). Here it is circulated and heated by the main heat exchanger (3).

The steam (7) is compressed (5) (approx. +200mbar) and has now a temperature of about 106°C.
On contact with the heat exchanger (3) the steam condensates and becomes distillate(6).

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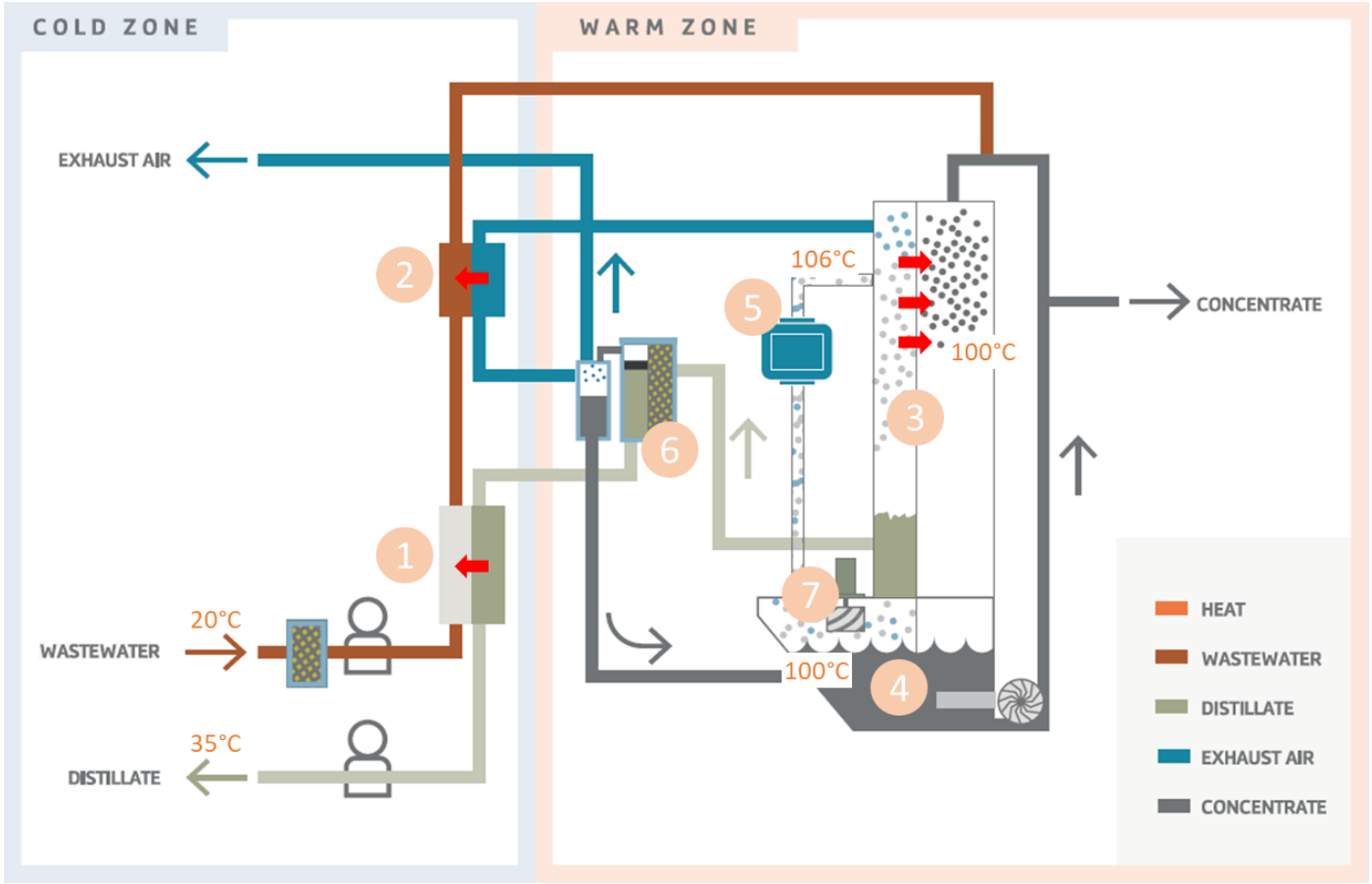
Operating Principle



For media containing ammonia, a vapor scrubber is installed to remove ammonia from the vapor before condensation at the heat exchanger (3).

The exhausted air (via heat exchanger 2) and the distillate (via heat exchanger 1) leave the evaporator.
The concentrate (from tank 4) is pumped regularly out of the machine.

Some Insights: Energy Efficiency

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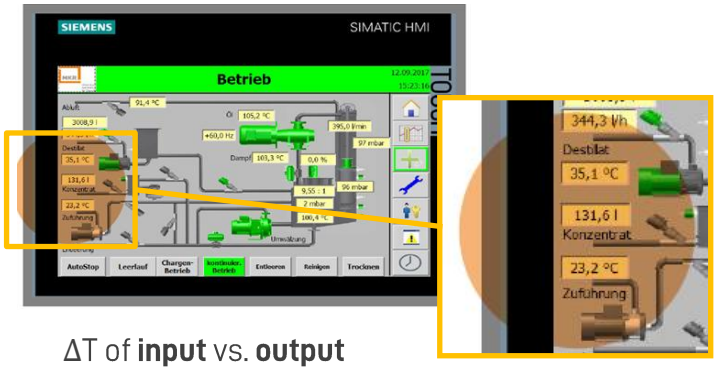
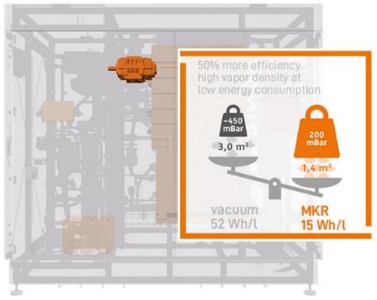
HIGH ENERGY RECOVERY
A 3-stage recuperation paired with the largest heat exchanger in its class enables a smooth and energy-saving evaporation.



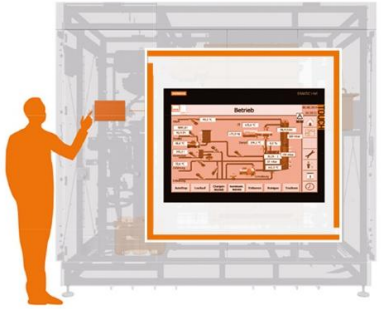
ΔT of **input** vs. **output**

- **MKR** Evaporator just ~ **+ 12-15 °C**

⇒ **ΔT** is equivalent to the **losing energy** during the process



50% LESS ENERGY CONSUMPTION
The highest steam density requires less compressor capacity and thus a lower energy demand. (< 50%)



20 % MORE PERFORMANCE DUE TO INTELLIGENT CONTROL
An intelligent and simple system control enables the maximum utilization of the energy used.

Operating Data

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	MVR05	MVR10	MVR20
Intake Volume Flow	500 l/h	1000 l/h	2000 l/h
Distillate Flow (max.)	450 l/h	900 l/h	1800 l/h
Vaporisation Performance	25 l/kWh_{el}	25 l/kWh_{el}	25 l/kWh_{el}
Unladen Wight	4,8 t	8 t	14 t
Length	4,45 m	4,45 m	5,6 m
Width	2,35 m	2,8 m	2,8 m
Hight	3,1 m	3,1 m	3,1 m
Operating Voltage	3/400 V N PE 50 Hz	3/400 V N PE 50 Hz	3/400 V N PE 50 Hz
Dry Matter Content (Input)	< 2 % TS	< 2 % TS	< 2 % TS

Intermediate sizes available too.

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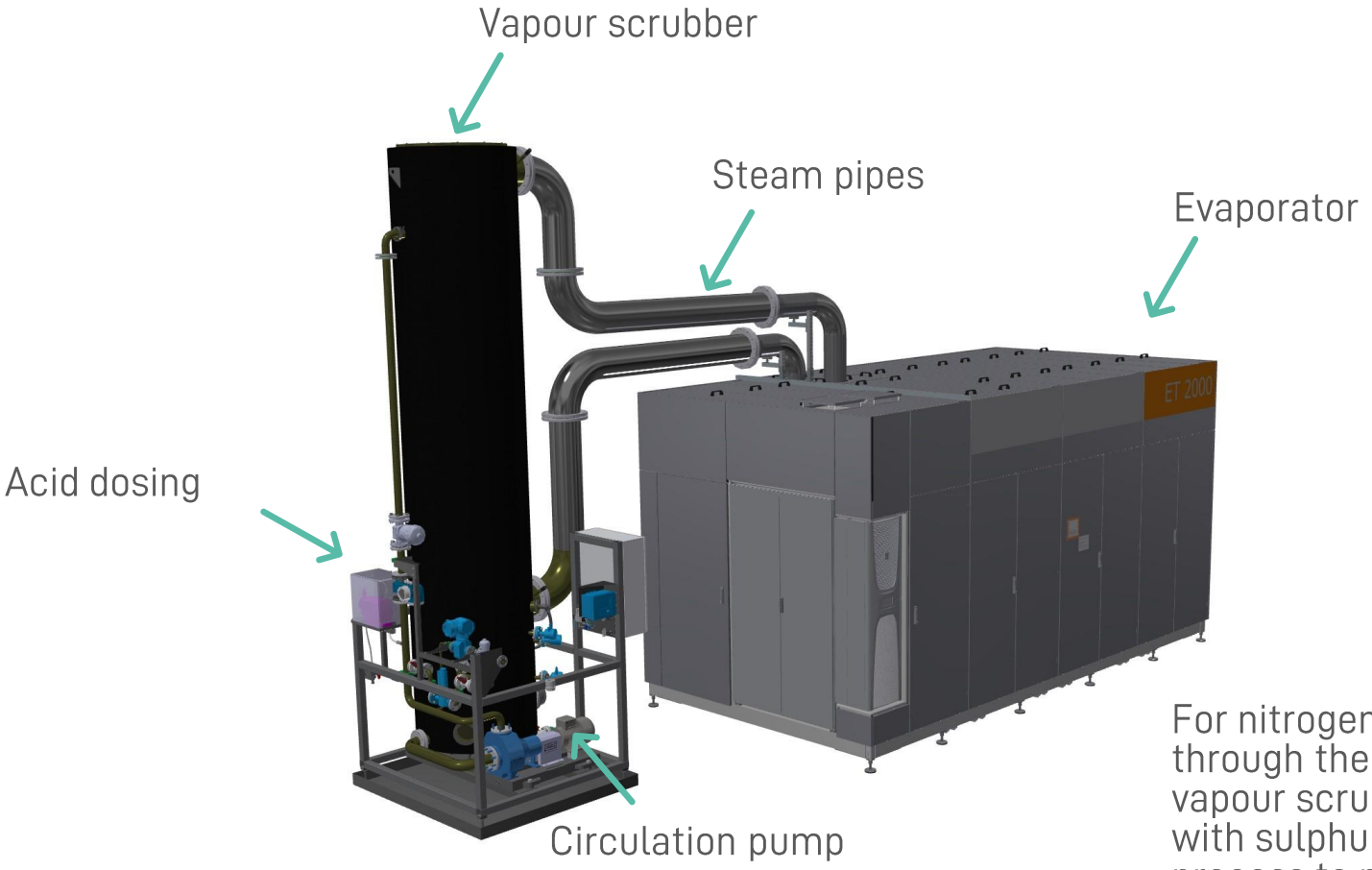
MVR Evaporator with Vapour Scrubber



For nitrogen binding, the steam is fed through the steam pipes into the vapour scrubber, where it is washed with sulphuric acid in a counterflow process to produce ASL.

→ *Integrated steam stripping*

Application Case:
Pig Slurry Evaporation

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Farm level or decentralised

MVR Evaporator

Optional:
Phosphorous removal

Pig slurry

Pig stables
-> Secured slurry export / pickup

Nitrogen as „green“
Ammonia sulphate or Aqueous ammonia
-> high concentrated, transportable and useable in other industrial branches

Concentrated slurry – input for AD
-> only approx. 20% volume but with same energy content and lowered ammonia content

AD plant

Bio-Methane or Biogas-CHP plant
-> easy to handle nitrogen lowered feed with attractive CO2 certificate options
-> much less fermentation volume is required

Application Case:
Pig Slurry Evaporation

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Pig slurry

Pre-treatment (if necessary)

100%

MVR Evaporator

~90%

Vapor and/or distillate post-treatment

2 - 3%

Ammonium sulphate liquid

~8%

Concentrate

~ 97%

Canalisation / sewage water system / irrigation etc.

Application Case:
Excrement Separation with Evaporation

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Urine
Wash water
Liquid phase faeces

Thick phase faeces

Biogas plant
Field Fertiliser /
Export

Distillate returns as
process water

Exhaust air

MVR Evaporator

ASL

Field Fertiliser /
Export

Distillate

Concentrate

Application Case:
Evaporation of other Media

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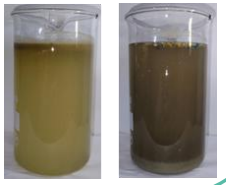
Grease separator



Ammonium sulphate liquid

2 - 3%

MVR Evaporator

Pre-treatment (if necessary)

STORAGE TANK | PH SETTING | PUMPING STATION | BELT FILTER / TRAMP OIL SEPARATORS | BAG FILTER

100%

~90%

Vapor and/or distillate post-treatment

DISTILLATE POST-TREATMENT | DISTILLATE TANK

~8%

Concentrate

~ 97%

Canalisation / sewage water system / irrigation etc.

Advantages

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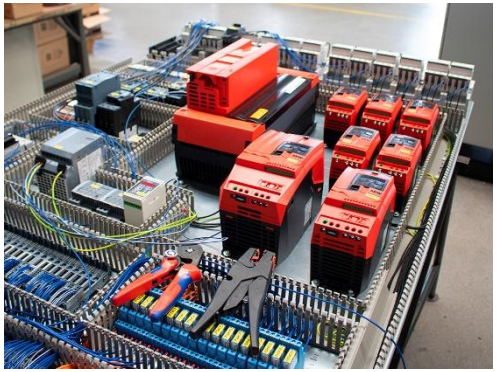
Parts in contact with digestate are made of **stainless steel**.

No brushes or moving parts in the media, means low maintenance costs!



PLC programme and control cabinet construction **completely from MKR**.

Components for sulphuric acid and vapour scrubbers made of **stainless steel** as well, thus durable and no corrosion.

Know-how for odourless and dischargeable distillate.

Find more:
www.mkr-cleanwater.com

Advantages

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- Ideal for media with low solid content
- Parts in contact with media in **stainless steel -** higher grades possible for chloride-containing wastewater
- **Modular design**, no up and down scaling of technology just more modules
- No moving parts such as brushes in the digestate - thus significantly **lower maintenance** requirements.
- **Regular automatic acid/alkaline rinsing** removes even the finest organic as well as mineral deposits
- mechanical foam breakers
- **Highest electrical efficiency** (up to 20 - 25 Liters / kwh $_{el.}$)
- **Lowest operating costs** per m^3 distillate
- Only little amount of digestate in the system, approx. 500 litres per module, therefore a **quick heat-up phase / start-up phase** for evaporators

Why should you choose MKR Evaporation Technology?

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- **Robust, durable technology** made of stainless steel
- **Energy-efficient** four-stage heat driven and electrical driven systems.
- **Modular and compact design**
- The technology is based on **25 years of experience** and know-how with evaporation technology and 15 years of experience with digestate.

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Thank you for your interest so far.

For more information, mass balances, offers
just get in touch:

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