

Company and technology

Digestate evaporation - DV and MVR series

MKR evaporator systems

Robust. Safe. Flexible. Efficient.

History

MKR Cleanwater GmbH

Timeline

- 1990** **Foundation of MKR Metzger GmbH**
Industrial recycling technologies
- 1997** **First evaporators**
Industrial applications
- 2009** **Start of digestate processing**
Pilot basis from industrial evaporators
- 2012/13** **First practical plants**
Single-stage, approx. 2,000 m³ reduction
- 2016/17** **Multi-stage evaporators**
Up to 20,000 m³/a reduction per line
- 2021** **MKR Cleanwater GmbH**
Digestate and slurry processing bundled
- 2024** **Electric MVR evaporator**
Adaptation to pig slurry and thin media
- Today** **Active across Europe**
Focus on slurry, residues, food waste

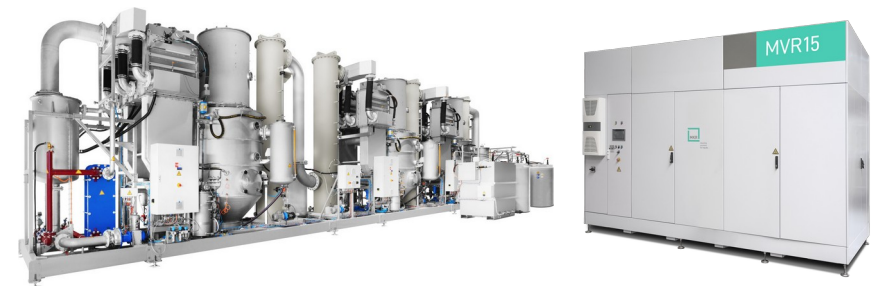
MKR Cleanwater GmbH

Headquarters in Monheim (Germany).

Industrial evaporation technology since 1997, digestate evaporation since 2009 (pilot), on digestate plants since 2013. Spun off from MKR Metzger GmbH in 2021 as the specialist for digestate and slurry.

Focus on food waste, residue and slurry plants. Active worldwide.

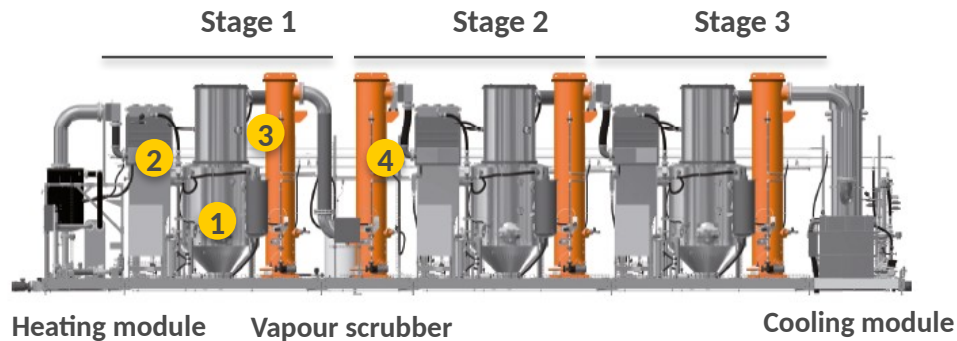
PLC programming and control cabinet construction in-house.



Operating principle thermal evaporators

Multi-stage heat utilization under vacuum with vapour scrubber

- At the heating circuit module, heat is extracted from the heating circuit and evaporator stage 1 is already heated with vapour (65 °C) under vacuum.
- Digestate from the process vessel (1) is circulated via the heat exchanger (2) of stage 1. The added energy exceeds the boiling point and generates water vapour.
- This is fed via the vapour scrubber (3) for nitrogen fixation (ASL) to the heat exchanger (4) of stage 2. Here the vapour heats the digestate from stage 2; the water vapour condenses and is extracted from the system as distillate.
- From here, the steps repeat up to the cooling circuit module, where the vapour of the last stage condenses out. The lower pressure at each stage allows multiple use of the heat.



Configuration

4-stage

Thermal vacuum evaporator

65-85 °C

Process temperature

4.3 l/kWh th

Design value, heat-driven

DV4000

4,300 l/h intake per line

Stainless steel

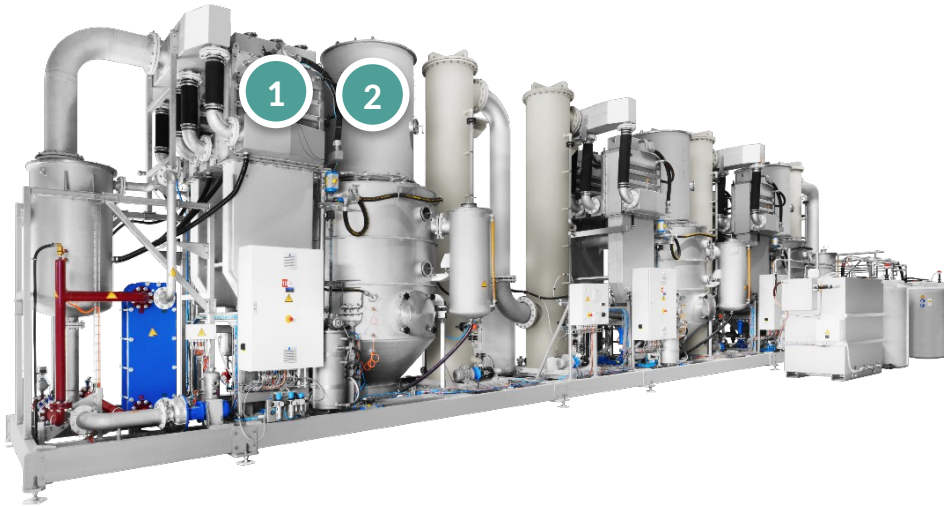
all media-contact parts

Siemens PLC

Control and visualisation

Heat exchangers and demister

Two years in operation - absolutely clean



MKR evaporator plant - markers show position of detail shots

1



Heat exchanger, 2 years operation, no fouling

2



Demister, mist eliminator, 2 years operation

What does this mean?

**Low
maintenance
costs**

and high availability

- **Stainless steel**

all media-contact parts

- **No brushes**

no moving parts in the digestate

- **CIP cleaning**

automatic, preventive

- **PE/PP components**

in the ASL section, corrosion-free

Our benefits

Construction and operation

Construction

● Stainless steel

All media-contact components in stainless steel

● No moving parts

No brushes or rotating parts in the digestate - low maintenance costs

● PE/PP

Components for sulphuric acid and vapour scrubber are corrosion-free

● PLC and cabinet construction

Fully in-house, Siemens platform

● Distillate for reuse

Process or recirculation water; discharge after site-specific finishing



Operation

● Heat-flexible

65-85 °C process temperature, gentle on material

● Adaptive

Plant adapts to available heat

● Modular

1- to 4-stage, multiple lines scalable in parallel

● Robust

More than 25 years of evaporation technology, digestate since 2009

● Low OPEX

Low maintenance, no CHP required (hybrid variant)



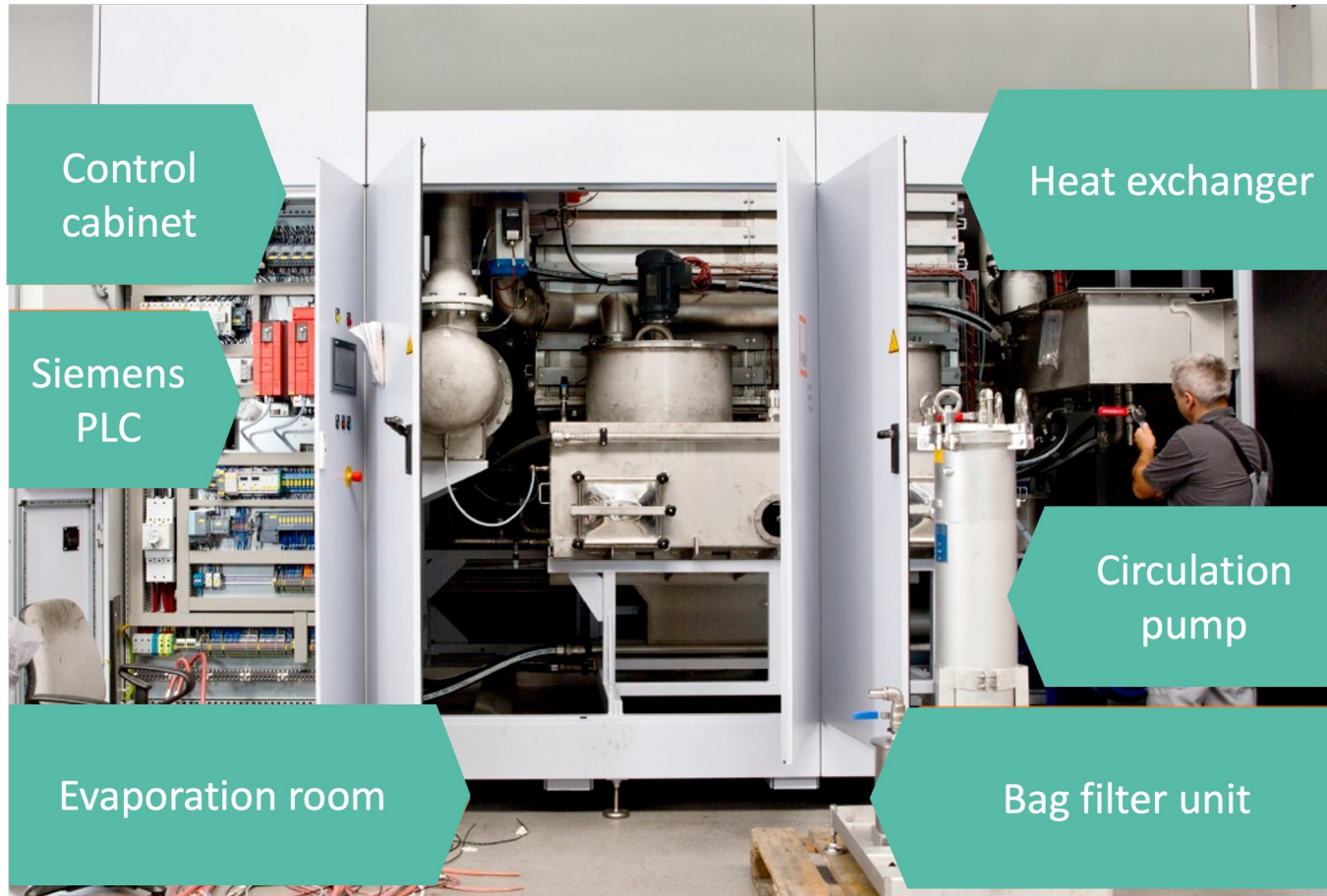
Core message

**Robust. Safe. Flexible.
Efficient.**

MKR evaporators have been used for digestate since 2009 (pilot), on digestate plants since 2013 and in industrial evaporation for more than 25 years.

Operating principle MVR evaporator

Vapour compression - compact design, fully electric



Configuration

MVR20

fully electric MVR evaporator

22.5 l/kWh el.

Spec. distillate output

80 kW el. / line

Connected load

up to 10x

Concentration factor

compact, stainless steel

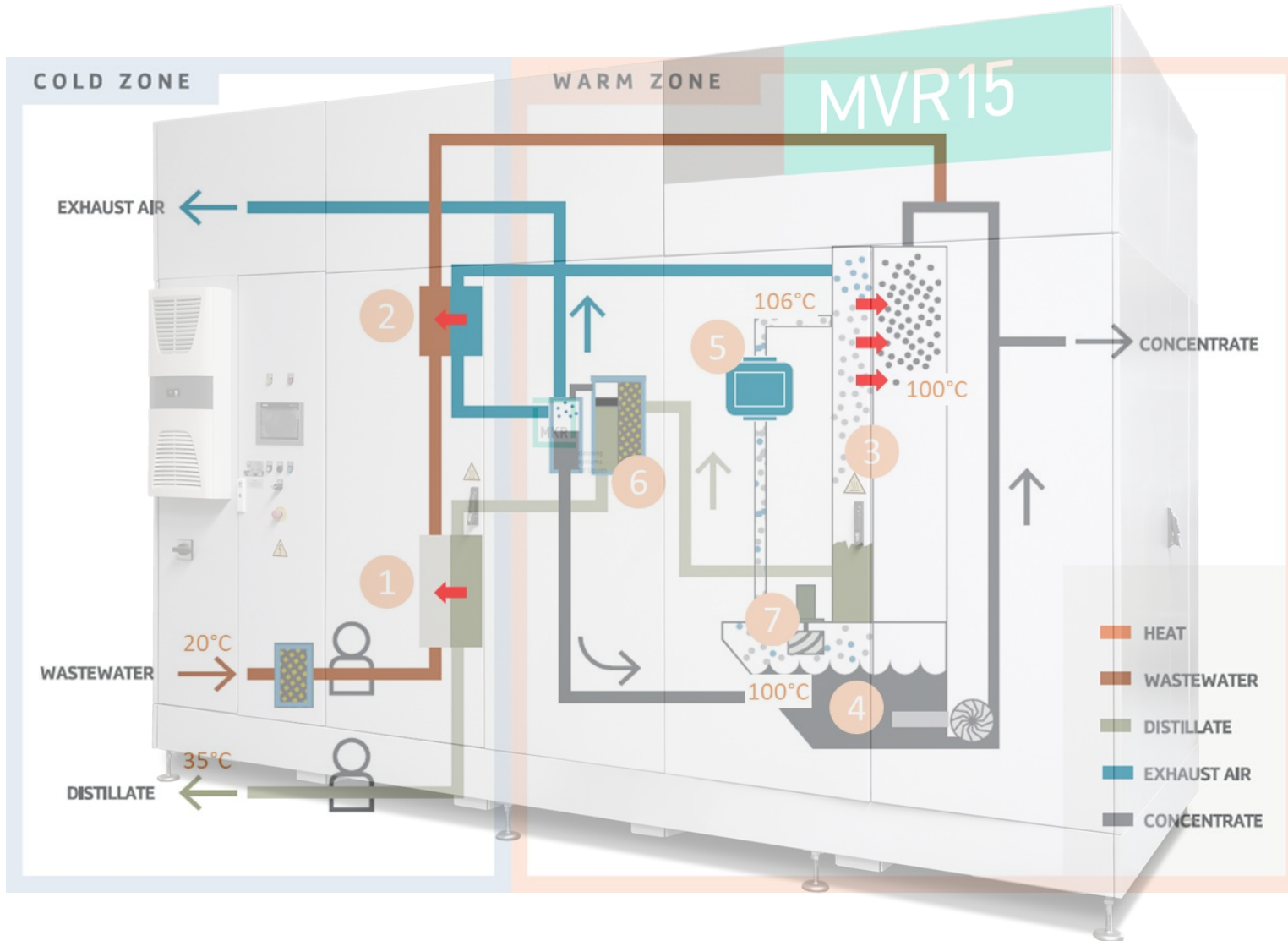
Size & material

Siemens PLC

Control & visualisation

Operating principle MVR evaporator

Compressor replaces external heat source



Operating principle

The medium enters via three heat exchangers (1, 2, 3) into the atmospheric working tank (4). There it is circulated and heated by the main heat exchanger (3).

The vapour (7) is compressed (5) (approx. +200 mbar) and is now at approx. 106 °C. Through contact with heat exchanger (3) the vapour condenses into distillate (6).

For ammonia-containing media, a vapour scrubber is installed upstream of condensation at heat exchanger (3).

Exhaust air (via HX 2) and distillate (via HX 1) leave the evaporator.

Built for digestate

Five arguments for digestate evaporation

Robust & durable

Stainless steel, PE/PP (DV) or super duplex (MVR) in the scrubber, no mixing of sulphuric acid with digestate, no brushes or moving parts in the digestate, indirect heating, automatic CIP

Energy efficient

4.3 l/kWh th design value (DV, 4-stage, 4.7 measured in operation) or 22.5 l/kWh el (MVR); hybrid with heat pump where waste heat is limited

Scalable

DV4000 lines and MVR20 modules in parallel, independent operation; expansion easily possible

Proven

Digestate evaporation since 2009 (pilot), on plants since 2013; references on food waste, slurry and residues

Complete service

PLC, control cabinet construction, commissioning, training and service - all from one source

Core message

Specialist for digestate

MKR Cleanwater has been supplying evaporators for biowaste, food waste and slurry plants since 2013.

Nitrogen is bound in the vapour scrubber as ASL, never by acidifying the digestate.

Complete plant from one source, manufactured in Germany.

Reference in operation

Measured operating data, food-waste AD plant



4-stage DV evaporator on CHP waste heat, in operation for more than 5 years on a food-waste AD plant in Central Europe. Distillate is reused as process water in the depackaging line. Concentrate and ASL are taken over by a service provider for fertiliser production.

Basis: 48 fully documented operating days, Jul to Sep 2026, 10-minute values from the plant control system.

Measured

4.7 l/kWh th

median while evaporating
design value 4.3 l/kWh th

87 %
of the time evaporating

1,580 l/h
distillate output

74 %
less volume to store and spread

Project process

From the first inquiry to operation

1 Framework concept and budget offer

Based on your data: medium, annual volume, dry matter, ammonium and available heat. Variant selection DV, MVR or hybrid.

2 Laboratory trial evaporation

Trial evaporation of your own digestate or slurry in our laboratory. Sample volume and shipping are agreed in advance.

3 Binding offer

Project-specific offer with performance guarantees based on the trial results and agreed feed parameters.

4 Delivery and commissioning

Delivery approx. 7 to 9 months ex works, installation approx. 4 weeks, commissioning 1 to 3 weeks.

5 Training and service

Operator training, service contracts and remote maintenance via VPN.

First step

Framework concept

For the framework concept we need:

medium and annual volume

dry matter of the liquid phase

ammonium (NH₄-N)

available heat

Thank you for your interest

We look forward to the conversation

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