



Ventilation Drying

Prevention of Condensation
Damage in Hydraulic Units

Content

GIEBEL FilTec GmbH

Formation of Condensation

Prevention through Dehumidification

Operation on Hydraulic Power Packs

Use Cases and References

Products and Services

Areas of Application



Hydraulic Power Packs



Gears



Storage Tanks



Barrels & IBC



Transformers



Closed Systems

Specialisation



Team



Heinrich Laas

Projects & Consulting

"I am here for you, for all technical questions regarding the use of an adsorber as well as project inquiries."

heinrich.laas@giebel-adsorber.de
+49 176 43554437
Microsoft Teams



Marina Laas

Request Desiccants

"I take care of all your questions and requests about desiccants and prepare the offer for you."

marina.laas@giebel-adsorber.de
+49 7946 94440112
Microsoft Teams



Katja Haase

Order Management

"I am here for you, for all questions regarding your order."

katja.haase@giebel-adsorber.de
+49 7946 94440113
Microsoft Teams



Daniel Zinic

Product Design

"I am here for you, for all questions regarding CAD, development, quality management and customer solutions."

daniel.zinic@giebel-adsorber.de
+49 160 8948037
Microsoft Teams



Yannik Wurmbrand

Production Planning & Purchasing

"It's my job to make sure there's always enough adsorbents for you in our warehouses and keep production running smoothly."

yannik.wurmbrand@giebel-adsorber.de
+49 7946 94440116
Microsoft Teams



Elisabeth van Bezooijen

Media & Communications

"I am here for you, for all questions concerning website, social media, brochures, images & merchandise."

elisabeth.vanbezooijen@giebel-adsorber.de
+49 7946 94440115
Microsoft Teams

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Formation of Condensation

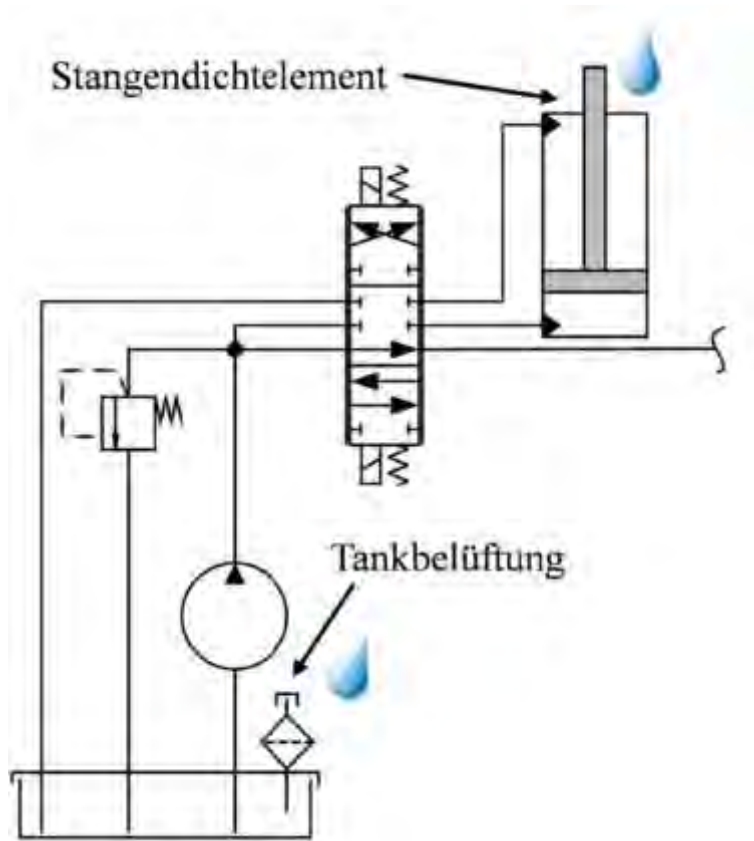
Prevention through Dehumidification

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Products and Services

Water Entry



Source: Tobias Mielke, RWTH Aachen in O+P Fluidtechnik 7-8/2018

Access points of water in hydraulic systems

- Break in the cooling system
- Leaky screw connections
- Water content in the fresh oil
- Lubricating film of the piston rod
- **Splashes and humidity due to ventilating filter**

Functionality

Transmission of forces, torque and energy by hydraulic pressure fluids! →
Pressure equalization with ambient air

Air intake from the environment

Passive air exchange
due to temperature fluctuations

Active air exchange
by oil extraction and
-supply



Humidity

Absolute Humidity

Content of water vapor

Relative Humidity

Percentage to maximum humidity

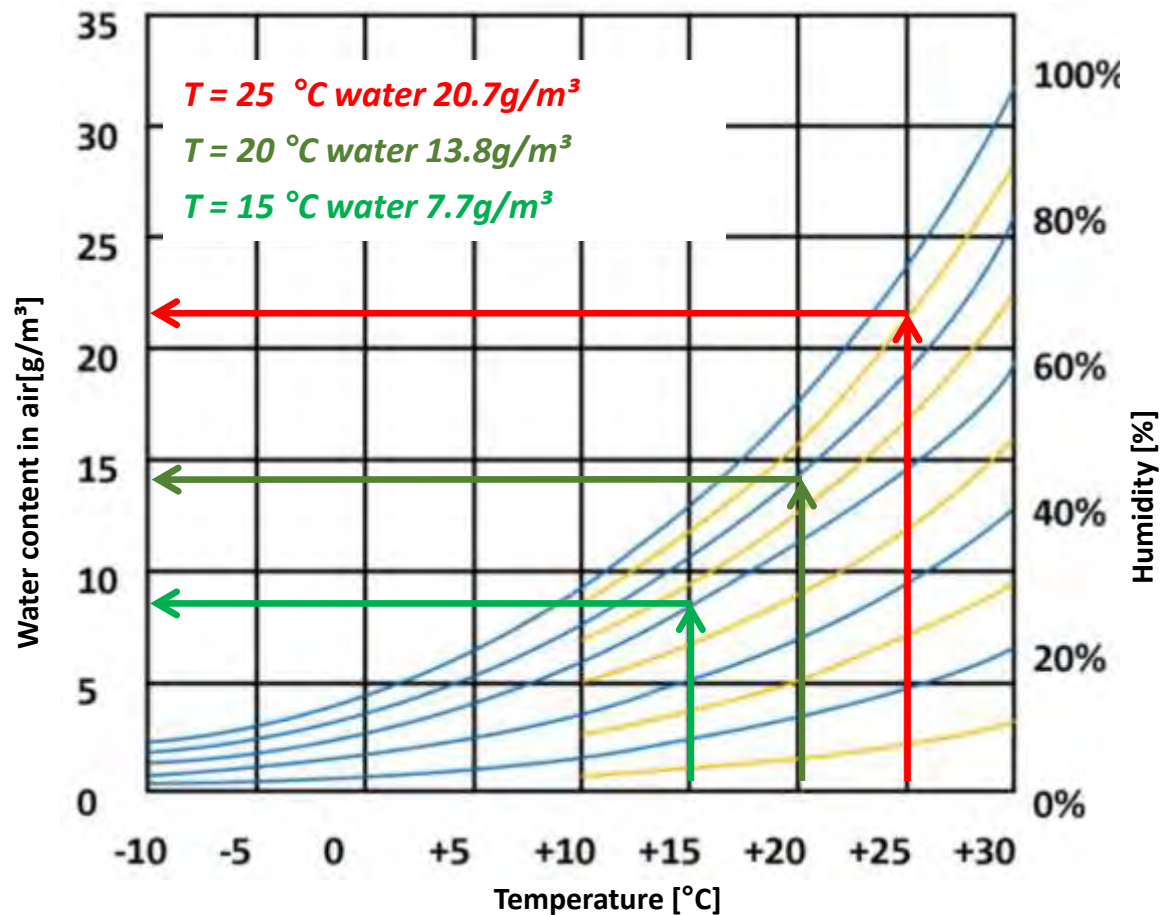


Content of water:

At 25 °C and 90% rF → 20,7 g/m³

At 20 °C and 80% rF → 13,8 g/m³

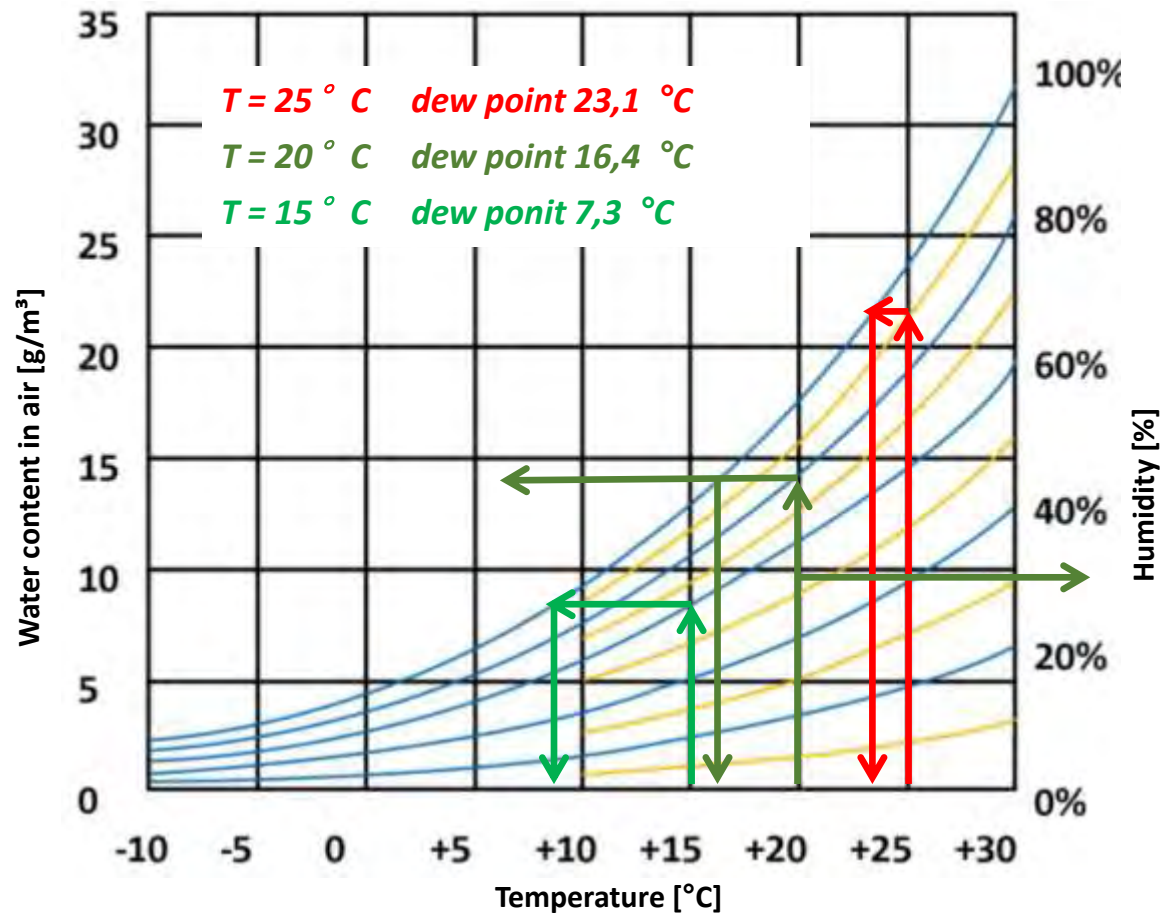
At 15 °C and 60% rF → 7,7 g/m³



Dew Point



The temperature at which the humidity will condensate



Dew point in the ambient air

At 15 °C and 90% rF → 23,1 °C

At 20 °C and 80% rF → 16,4 °C

At 15°C and 60% rF → 7,3 °C

dT = 1,9° C

dT = 3,6° C

dT = 7,7° C

Operation Conditions Adsorber

Environment with ...

... high humidity > 70% rF

... high temperature > 25°C

... high temperature fluctuations ca. 10°C

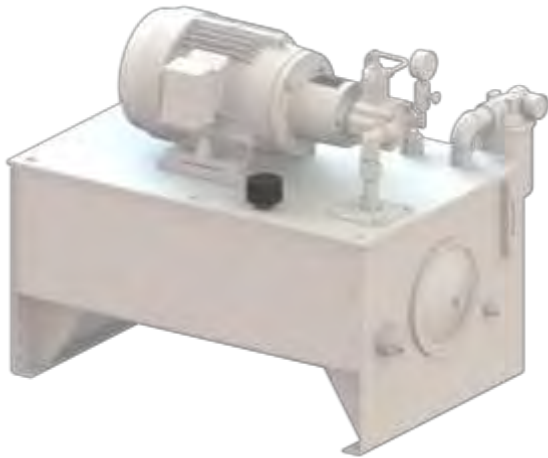
Systems...

... with a hygroscopic hydraulic fluid

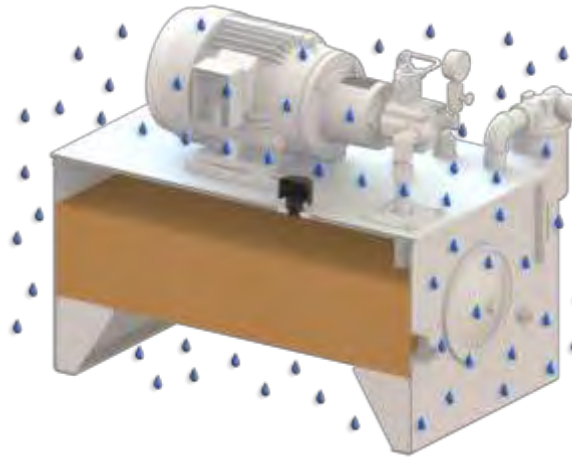
... of high importance



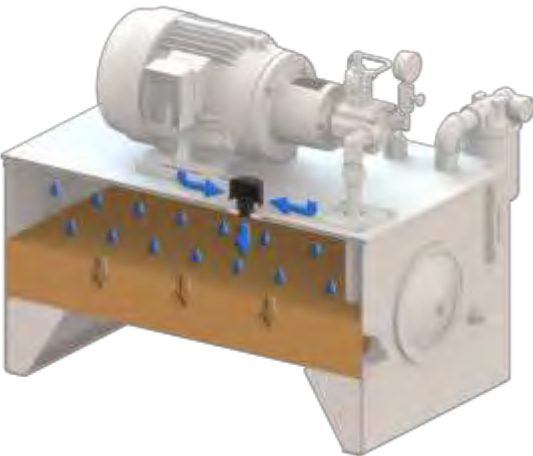
Process Water Entry



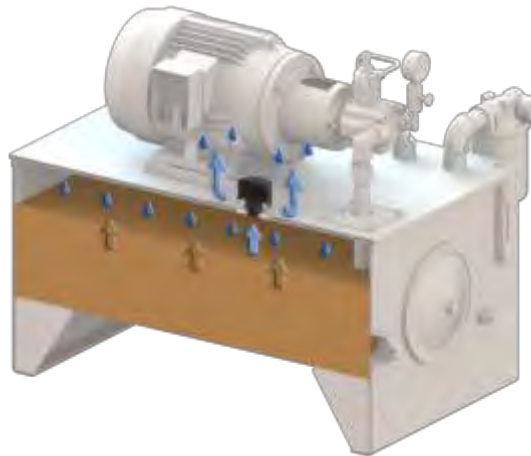
1. Hydraulics WITHOUT Adsorber



2. Environment with humid air

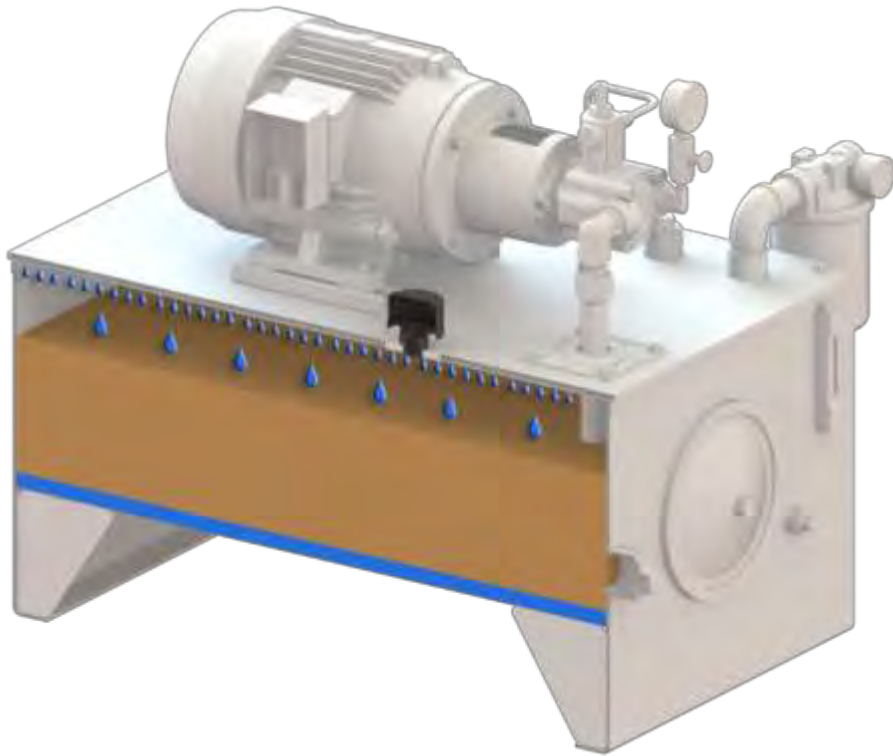


3. Sucking in humid air



4. Pressing out humid air

Formation Condensation Water



5. Condensation from dew point

→ Formation of condensation water inside

Water content must be below the saturation point of the oil.

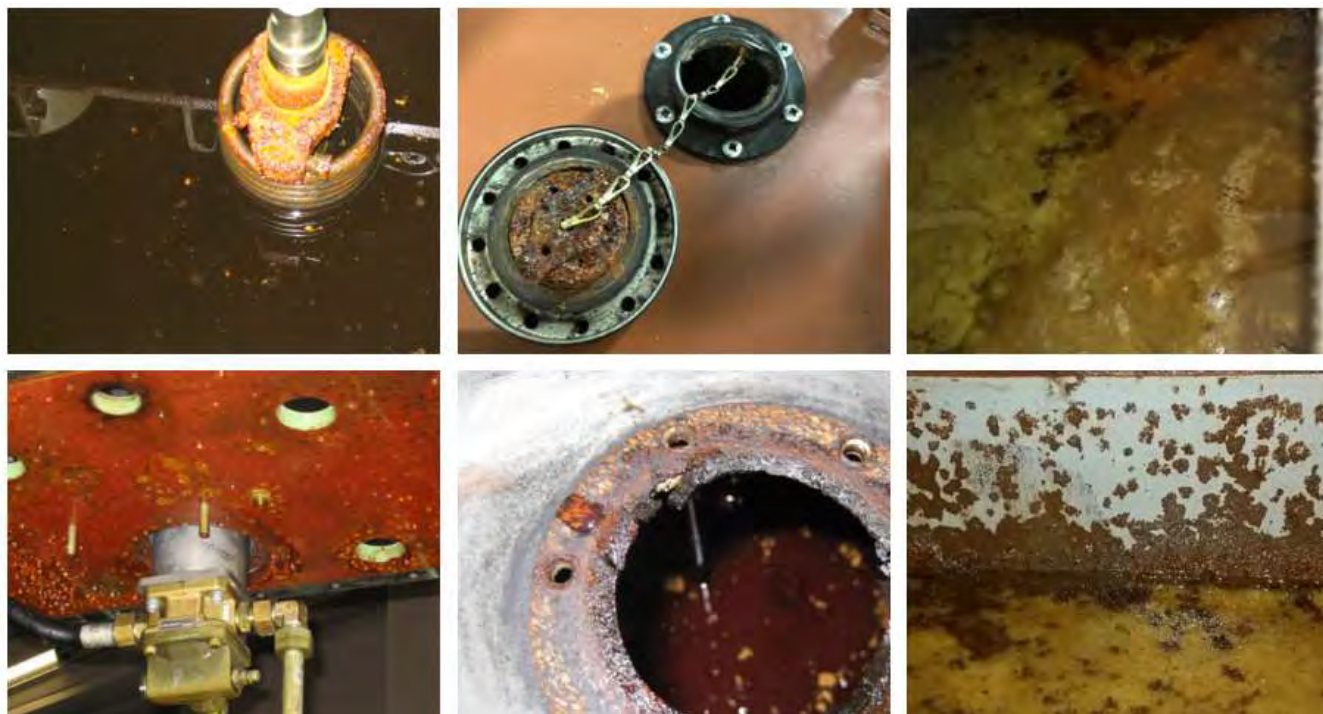
Moisture limit

0,1 Extend-%

1000 mg/kg



Damages as a Result



„Particles and water are the cause of 80% of malfunctions and damage in hydraulic systems, gearboxes and rolling bearings.“

Consequences:

- **Hydrolyse:** Rapid aging and degradation of additives
- Promotion of **corrosion**
- Worse **lubrication**

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Troubleshooting Adsorber

Adsorption of water, thereby lowering the humidity and the dew point.

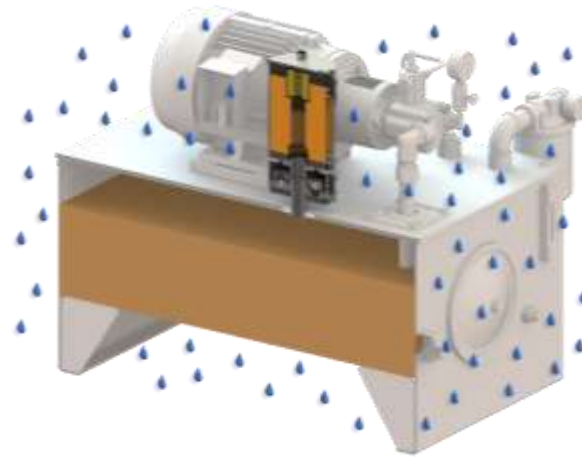
→ **Prevention of condensation!**



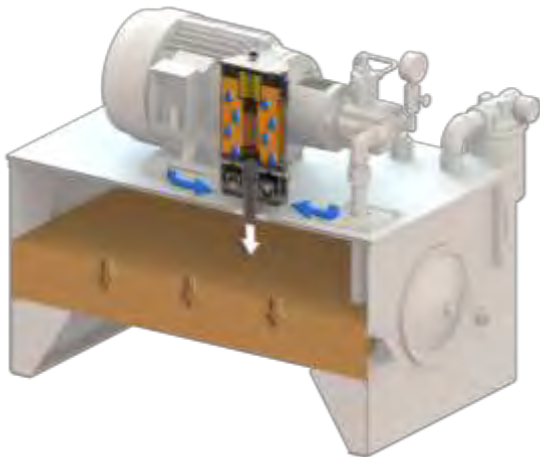
Avoid Water Ingress



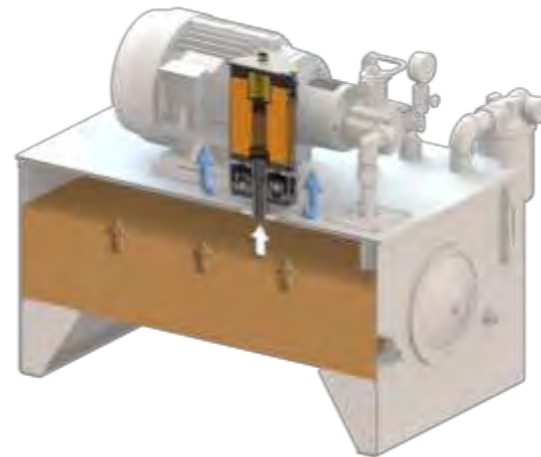
1. Hydraulics WITH Adsorber



2. Environment with humid air

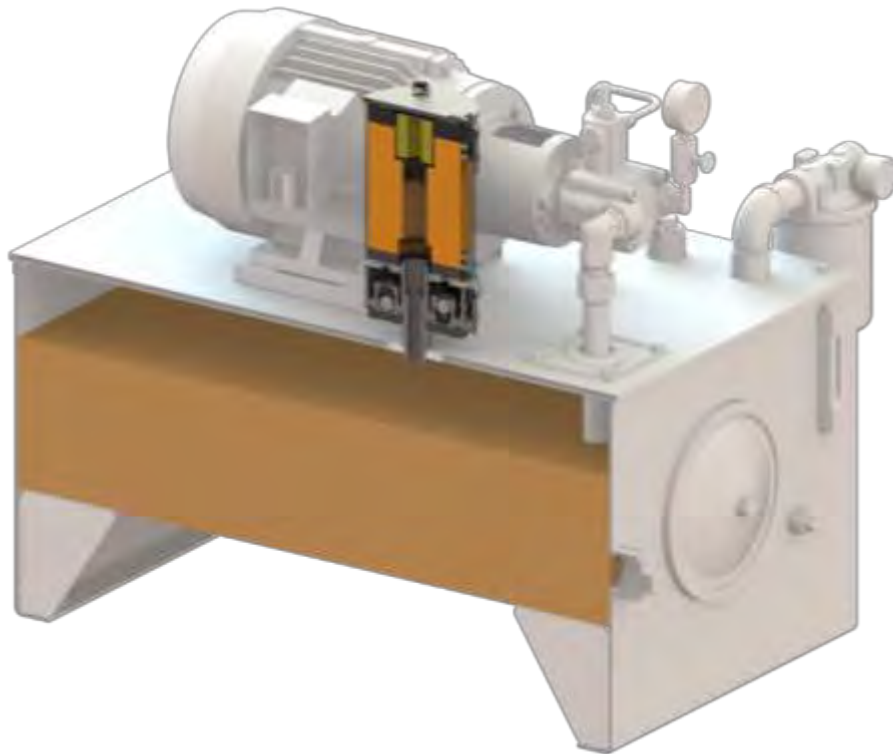


3. Drying the sucked humid air



4. Regeneration with dry air

Dry Oil



5. Dew point not reachable, no water
 → No condensation inside, dry oil

ANALYSENERGEBNISSE			Aktuelle Probe	Frühere
LABORNUMMER			3812201	3950498 3812199
GESAMTBEWERTUNG			!	!
Untersuchungsdatum			27.01.2020	29.11.2019 28.06.2019
Datum Probenentnahme			23.01.2020	26.11.2019 24.06.2019
Datum letzter Ölwechsel			26.11.2019	16.07.2019 18.12.2013
Nachfüllmenge seit Wechsel			-	- 20
Laufzeit seit Wechsel			-	-
Laufzeit gesamt			-	-
Öl gewechselt			Ja	- Ja
VERSCHLEIß				
Eisen	Fe	mg/kg	4	16 38
Chrom	Cr	mg/kg	2	9 27
Zinn	Sn	mg/kg	0	0 0
Aluminium	Al	mg/kg	0	1 1
Nickel	Ni	mg/kg	0	0 0
Kupfer	Cu	mg/kg	1	2 7
Blei	Pb	mg/kg	0	0 0
Molybdän	Mo	mg/kg	0	0 1
Antimon	Sb	mg/kg	1	- -
Mangan	Mn	mg/kg	0	0 1
PQ-Index	-		< 25	< 25 < 25
VERUNREINIGUNG				
Silizium	Si	mg/kg	1	3 11
Kalium	K	mg/kg	1	4 15
Natrium	Na	mg/kg	2	0 12
Wasser K. F.	ppm		33	67 118

Probe und Deckel



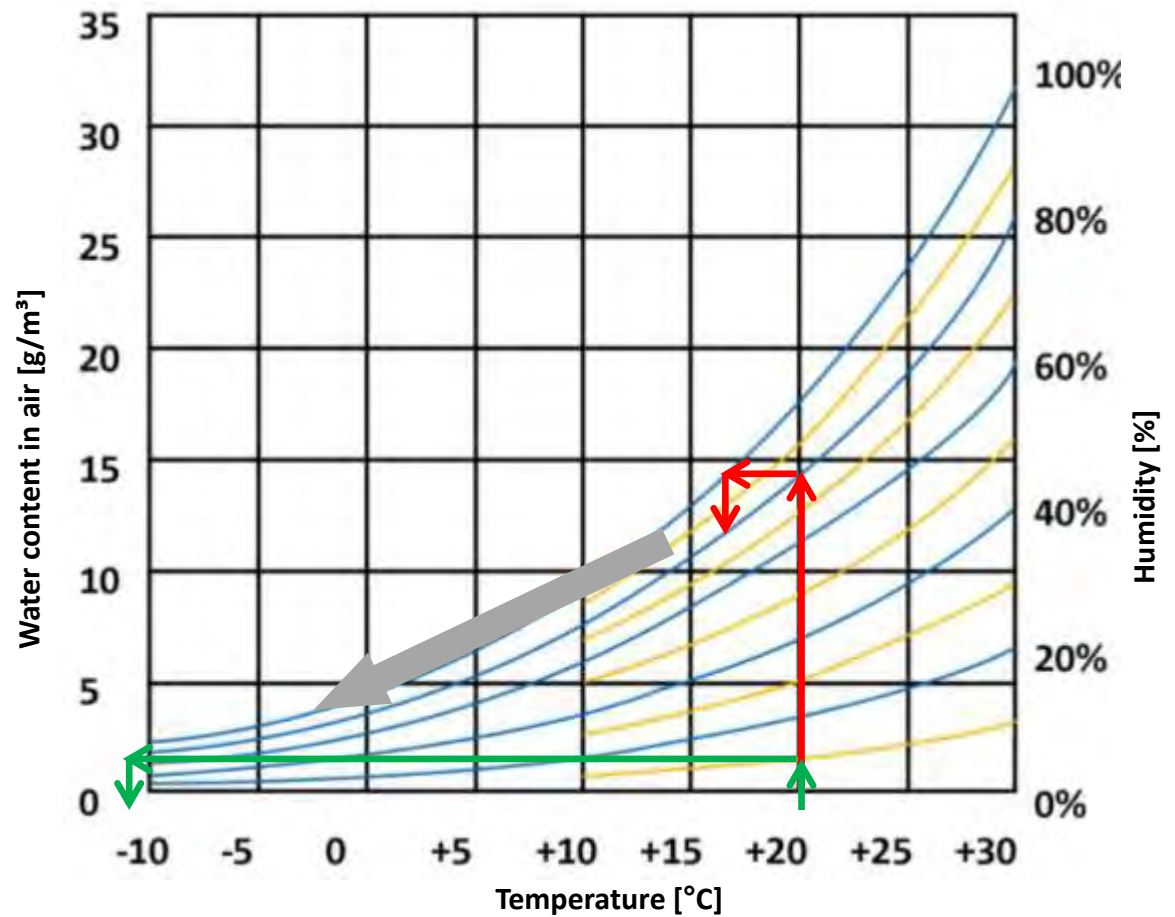
Mode of Action



Humidity after Adsorber

average 10% rH

- Water content: **1,7 g/m³**
- Dew point: **-12,5 °C**



Content

GIEBEL FilTec GmbH

Formation of Condensation

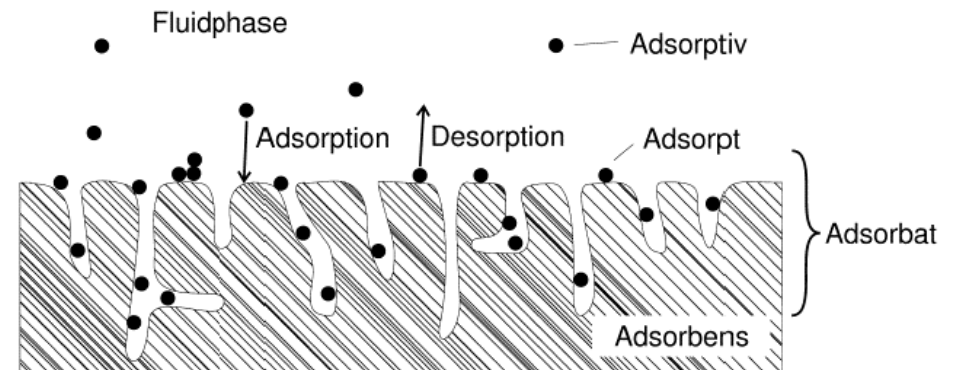
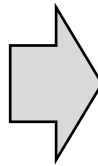
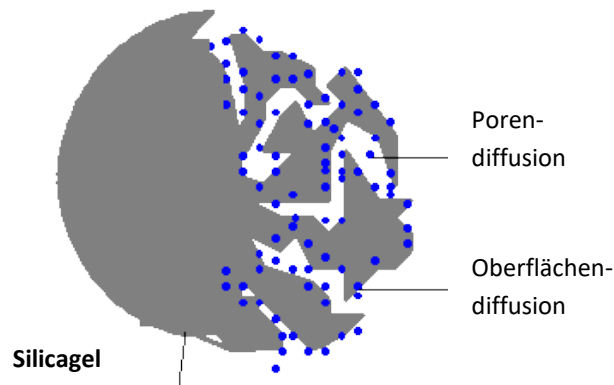
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Adsorption



- Wasser molecules are bound **in the pores**
- Adsorption is based on **attractions** (Van der Waals forces)
- Van der Waals forces are **solvable again** → Desorption
- Maximum load, until **equilibrium**!

Silica gels



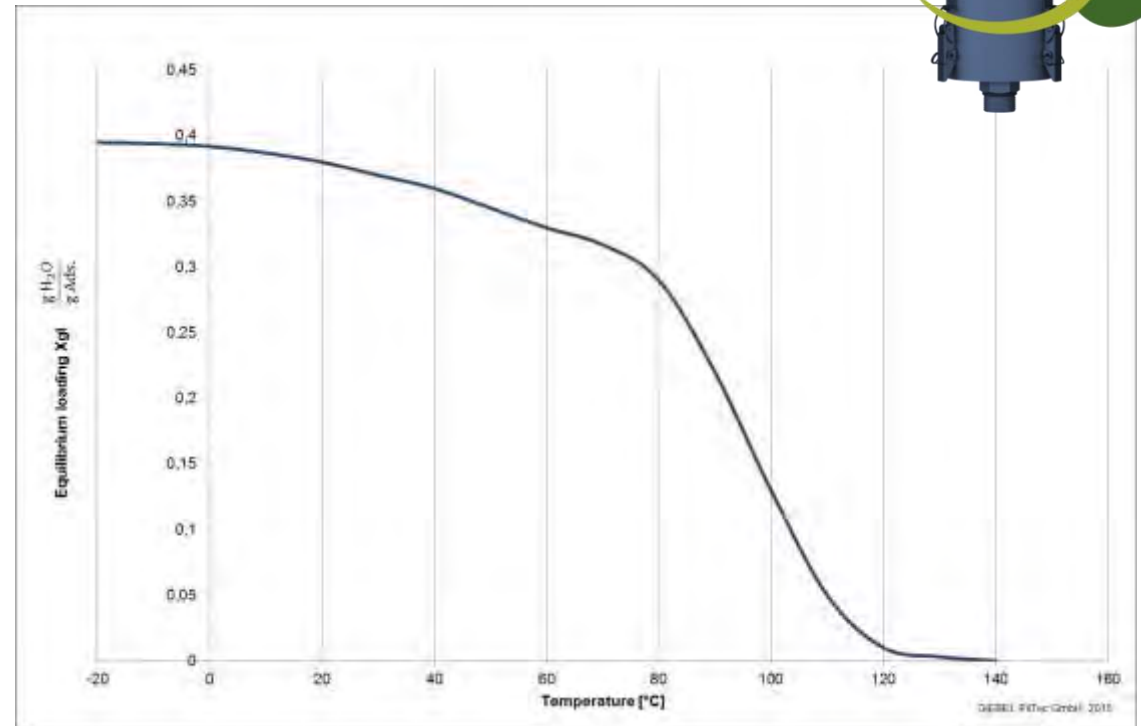
Regeneration Silica gel



Regeneriert bei 120°C



Regeneriert bei 250°C

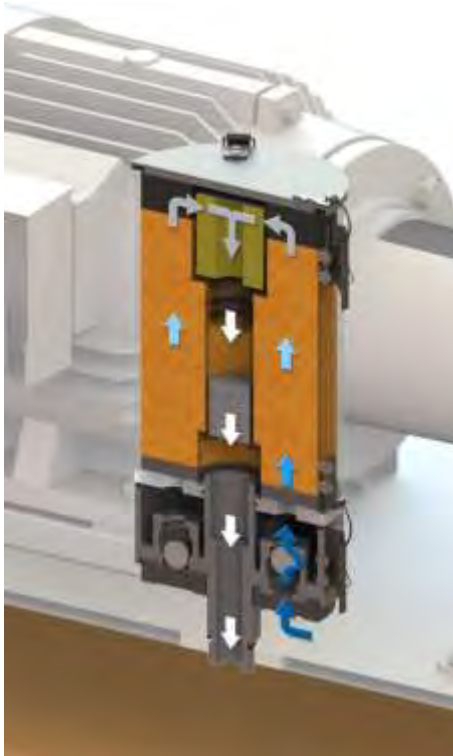


Test data GIEBEL FilTec GmbH

Funktion on Hydraulik Tank

Oil level drops:

- Humid supply air from the environment
→ **Dehumidification**



Oil level rises:

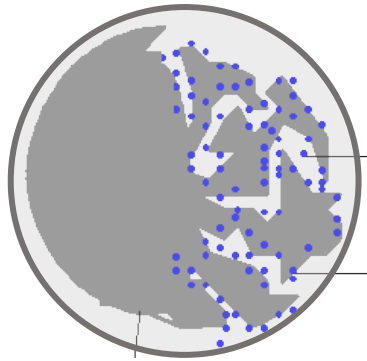
- Oil-containing exhaust air from the system
→ **Self-regeneration**



Protection from Oil

Oil-containing exhaust air:

- Without activated carbon, an impregnation would take place
- Block the water-absorbent pores
- Prevent further color change



Visibility Tank Condition



Moisture present in the tank!

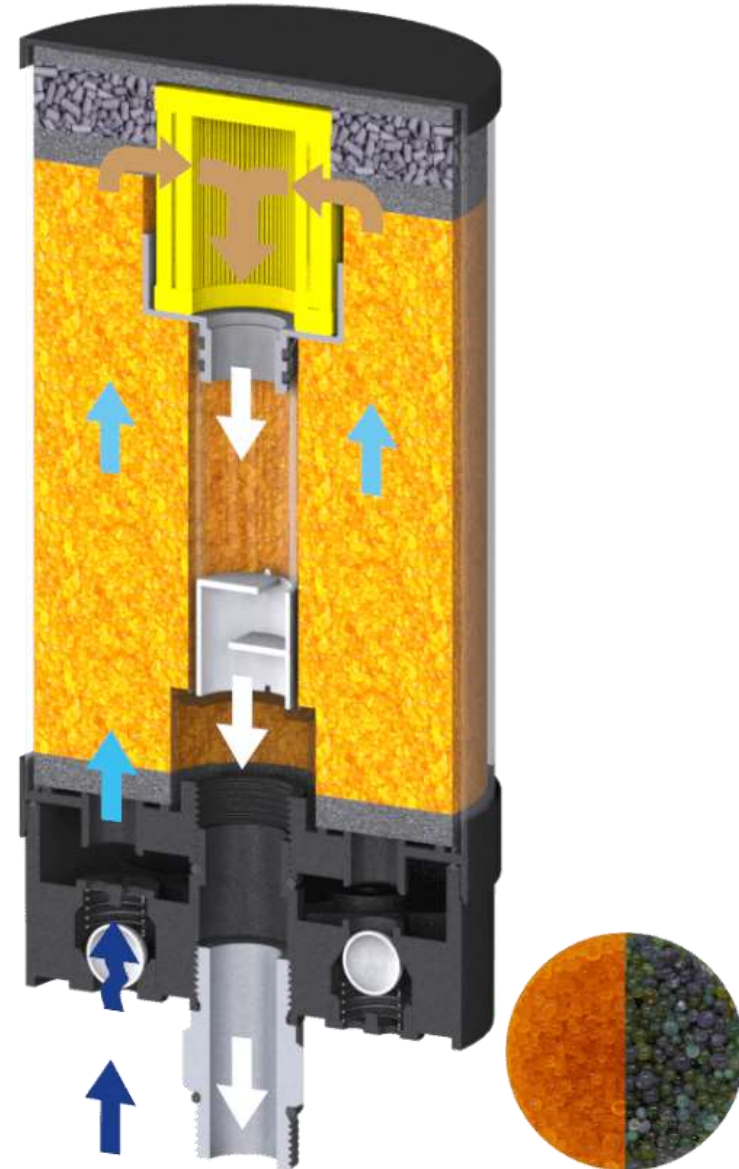


Tank inside dry!

Life Cycle Extension

Protection during downtimes. No unnecessary loading

→ **Extension of the maintenance intervals!**



Particle Filter

Standard version 3 μ m filter in every GIEBEL Adsorber

→ **Protection from moisture and dirt!**



3 μ m paper



3 μ m / 1 μ m
glas fiber



0,3 μ m
ePTFE membrane



Easy Maintenance - Reusable

- No oil template to replace
- No tools necessary
- Performed by one person
- No cleaning of several glass vessels



Recycling Cycle - Disposable



Returning to **GIEBEL** the loaded cartridge



Renewed use of the **reconditioned** cartridge



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Example Lift Bridge



Hydraulic tank: 5000l
Öl: synthetic Ester

Task: lifting the bridge

Operation: approx. 10x per day,
filling of cylinders

→ **Application**
Adsorber VV 5XL-RV



Example Hydropower Plant



Hydraulic tank: 1000l

Öl: synthetic Ester

Task: turbine lubrication

Operation: continuous operation, circulation oil lubrication

→ **Application**

Adsorber VV 5M-RV



Example Paper Machine



Hydraulic tank: 800l

Oil: mineral oil HLP46

Task: central lubrication system

Operation: continuous operation, circulating oil lubrication

→ **Application**

Adsorber VV 5M-R

Example Lock



Hydraulic tank: 600l

Oil: mineral oil HLP46

Task: moving the gates

Operation: ca. 20-40x per day,
filling of cylinders

→ Application

Adsorber VV 3L-DV



Example Test Bench



Hydraulic tank: 150l

Oil: mineral oil HLP46

Task: lubrication of test gearboxes
automotive

Operation: continuous operation,
protection against oil mist

→ **Application**

Adsorber VG 3L-D

Example Straddle Carrier



Hydraulic tank: 55l

Oil: mineral oil HLP46

Task: brake cooling and steering

Operation: shift operation,
outdoor use, pendulum
movement

→ **Application**

Adsorber VV 2L-DV

Example Tunnel Drilling Machine



Hydraulic tank: 400l

Oil: mineral oil HLP46

Task: feed drill head

Operation: during use,
continuous, low pendulum

→ **Application**

Adsorber MA 3M-DV



Example Tunnel Drilling Machine



Hydraulic tank: 10l

Oil: mineral oil HLP46

Task: training / presentation

Operation: rarely, during training

→ Application

Adsorber VV 2L-DV



Example Cruise Ship



Hydraulic tank: 60l

Oil: biodegradable oil

Task: lowering the lifeboats

Operation: "never" - only during tests and possibly in an emergency

→ **Application**

Adsorber VV 1L-DV



Example Injection Moulding Machine



Hydraulic tank: 6000l

Oil: Mineral oil HLP46

Task: closing the casting tools

Operation: continuous
operation, cycle approx. 100 sec.



→ **Application**

Adsorber VV 5XL-R

Beispiel Excavator



Hydraulic tank: 200l

Oil: biodegradable oil

Task: earthmoving machine,
cylinder strokes

Operation: continuous use,
outdoor use, harsh conditions

→ **Application**

**Adsorber MA 3M-R with valve
adapter 0,5bar**

More Examples



IBCs



Barrels



Transformers

Gears



Mobile Machines



Storage tanks



References



... and many more!!

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Products and Services

Selection Criteria Hydraulics

- System
 - Tank volume [l]
 - Pendulum volume [l/min]
 - Hydraulic fluid
 - Oil movement
- Environment
 - Humidity
 - Temperature

Find the right size

Adsorber for drying the supply air

Please click on the tank/shuttle volume below

0 - 50 ltr. (up to 10 l/min - max. 30 l/min)	<input type="checkbox"/>
50 - 100 ltr. (up to 20 l/min - max. 300 l/min)	<input type="checkbox"/>
100 - 400 ltr. (up to 40 l/min - max. 360 l/min)	<input type="checkbox"/>
400 - 800 ltr. (up to 80 l/min - max. 490 l/min)	<input type="checkbox"/>
800 - 1600 ltr. (up to 160 l/min - max. 810 l/min)	<input type="checkbox"/>
1600 - 3600 ltr. (up to 360 l/min - max. 830 l/min)	<input type="checkbox"/>
3600 - 8400 ltr. (up to 840 l/min - max. 1230 l/min)	<input type="checkbox"/>

Adsorbers for the separation of pollutants

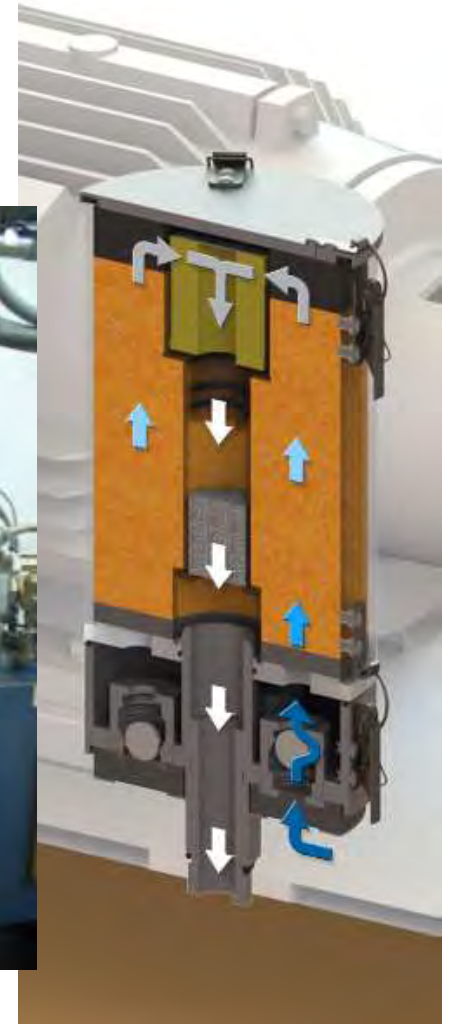
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400 - 800 ltr. (up to 80 l/min - max. 490 l/min)	<input type="checkbox"/>
800 - 1600 ltr. (up to 160 l/min - max. 810 l/min)	<input type="checkbox"/>

Breather Dryer

VV, MA and **ME** series
aeration dryers protect the
hydraulic power unit from
moisture.

Optimally designed and
optimized to the hydraulic
systems solution with a high
amount of desiccant.



Standard Breather Dryers



Adsorber	VV-D	VV-DV	VV-R	VV-RV
Operating fluids	All common hydraulic oils, mineral oils, biodegradable oils, insulating oils			
Rechargeable	✗	✗	✓	✓
Valves	✗	✓	✗	✓

Special Breather Dryers

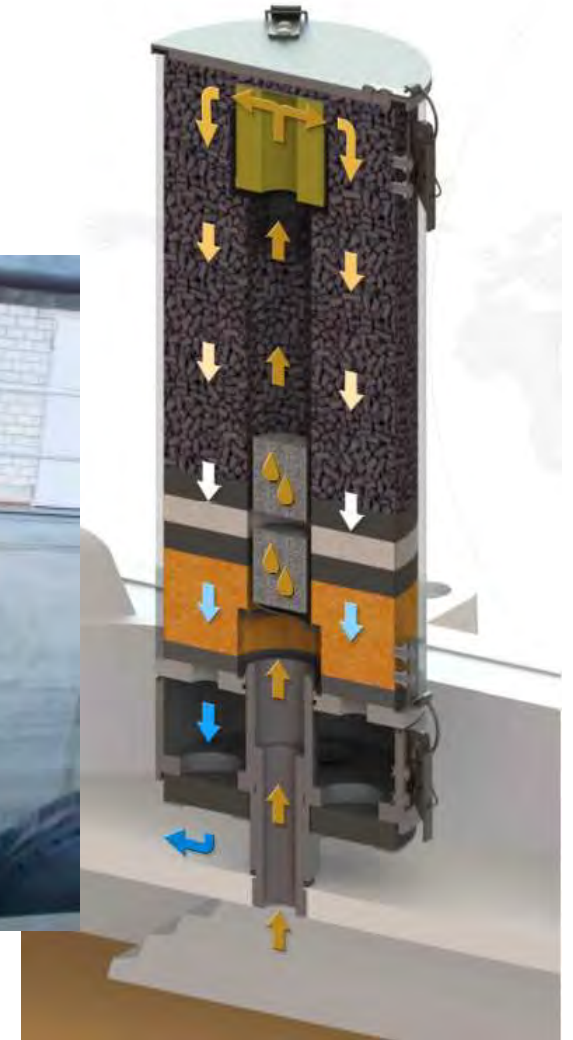


Adsorber	MA-RV	ME-RV	MA-RV
Operation fluids	All common hydraulic oils, mineral oils, biodegradable oils, light and hardly flammable fluids		Skydrol HyJet IV/V Brake fluids
Valves	✓	✓	✓
Rechargeable	✓	✓	✓
Use according ATEX 2014	✓	✓	✓
Offshore suitable	✗	✓	✗

Oil mist separator

The VG series is used in the case of heavily escaping oil mists.

The combination of impeller and oil demister with a high amount of activated carbon, purifies the exhaust air and prevents contamination of the ambient air.



Ölnebelabscheider



Adsorber	VG-D	VG-R
Operation fluids	All common hydraulic oils, mineral oils, biodegradable oils, insulating oils	
Rechargeable	✗	✓

Accessories



Accessories



Adsorbents



Silica gel (SiO_2)

Air drying
Indicator for color change
(orange \rightarrow green / white)
Capacity max. 37
Regeneration at 120°C



Activated Carbon (C)

Separation of oil particles
No indicator (black)
Large surface



Molecular Sieve (Sodium aluminium silicate)

Selective adsorption
Strong binding to water
No indicator (beige)
Capacity max. 25%
Regeneration at 300°C

Services



Customer label

Series call-offs can be supplied with your label



Refresh

Return of the adsorber cartridge

Plastic waste avoidance cycle



Sustainable



1. Reusable

Return of the adsorber cartridge

Plastic waste avoidance cycle



2. Long-term use

Robust metal housing for very long use

No plastic waste



3. Rechargeable

No disposal of plastic housing

Inexpensive and easy to maintain



4. Regenerable

Reusability of the desiccant

Regeneration in domestic oven



Thank you