HYDRAULICS

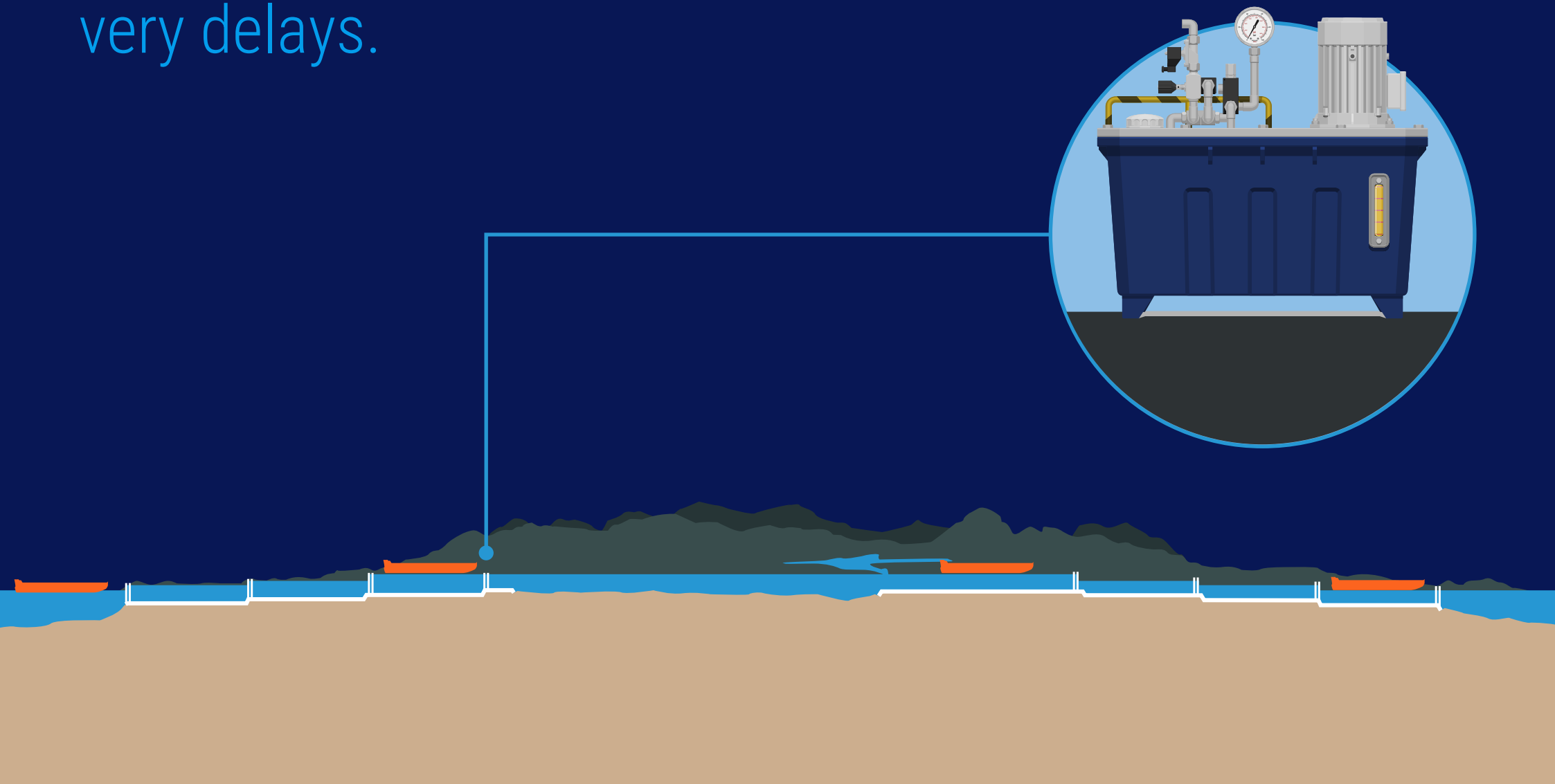
If I tell you ...

... that you can **avoid nerve-wracking, time-consuming, and costly maintenance work** by making a small change to the design of your hydraulics, do I have your attention?

Today, I will show you **how damage occurs in hydraulic systems and what you can do about it**.

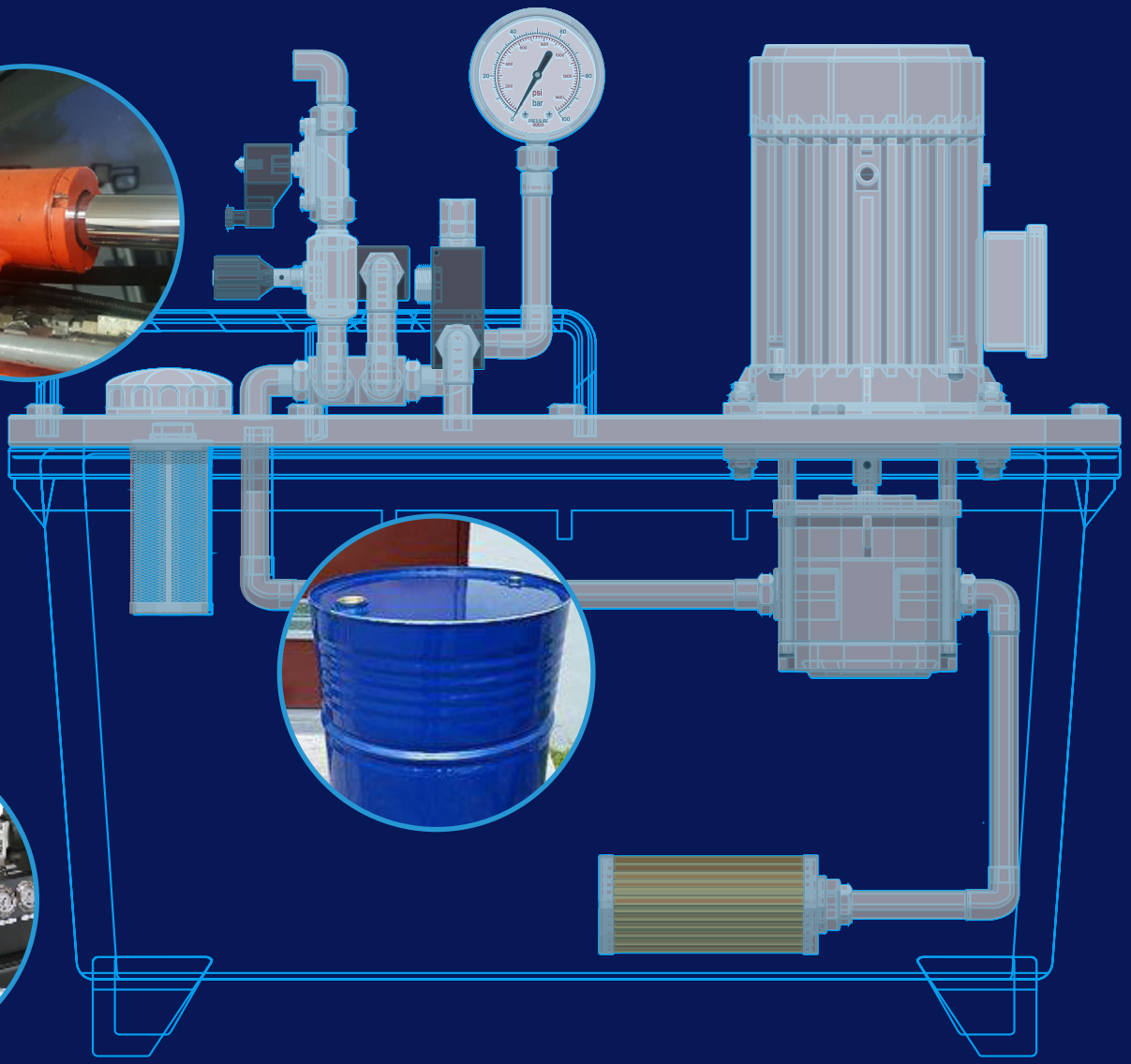
To illustrate this, we accompany the container ship ***MS Adsorbera*** on its journey through the Panama Canal.

There, hydraulic units open and close huge lock gates. Their reliable operation is extremely important, as a failure would result in major financial losses and delivery delays.



How and where can damage occur in hydraulics?

Almost all **damage begins** slowly and unnoticed **with the ingress of moisture and dust**.



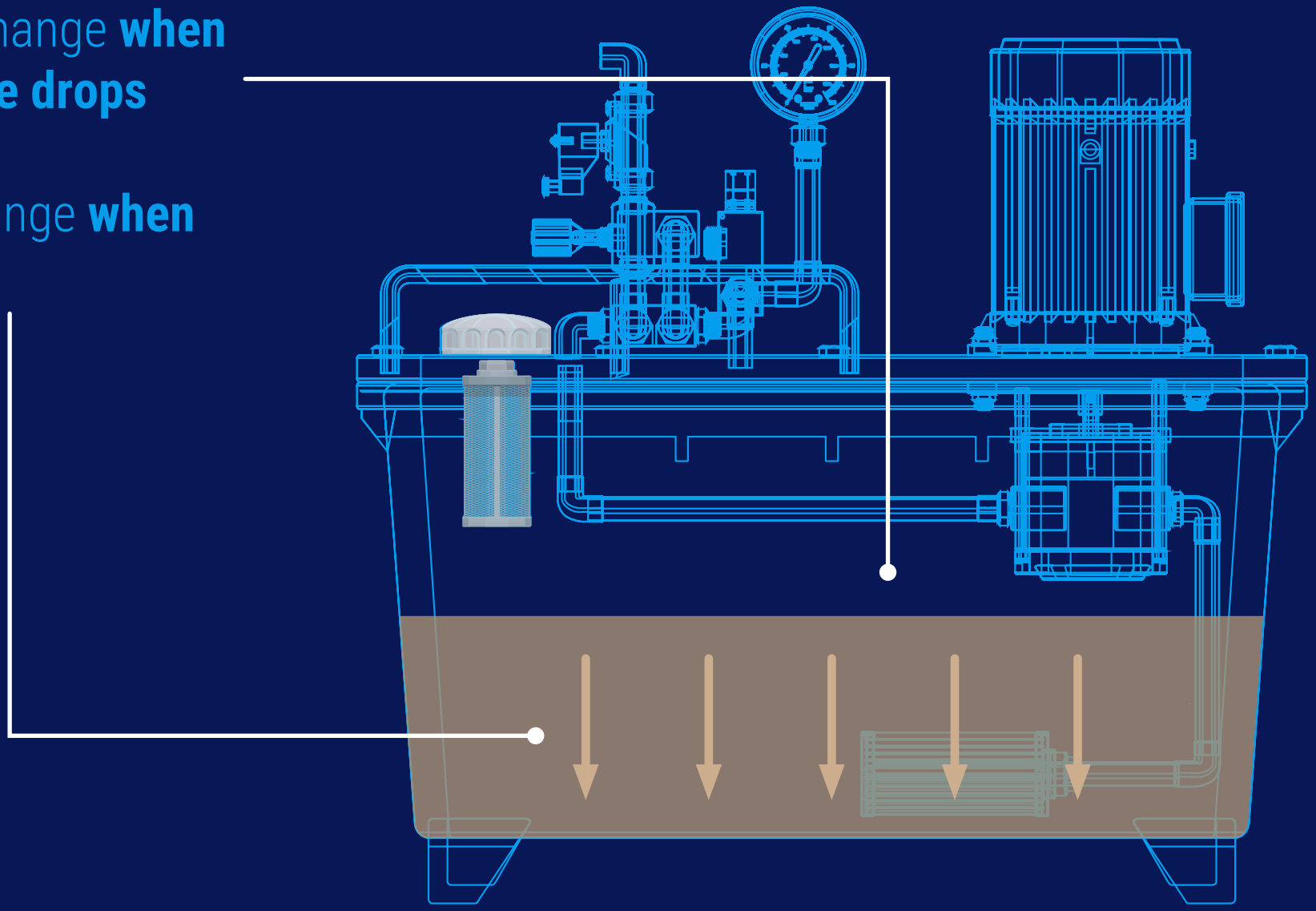
How and where?

- Fracture in the cooling system
- Leaky screw connections
- Water content in fresh oil
- Lubricating film on the piston rod
- **Breather filter**

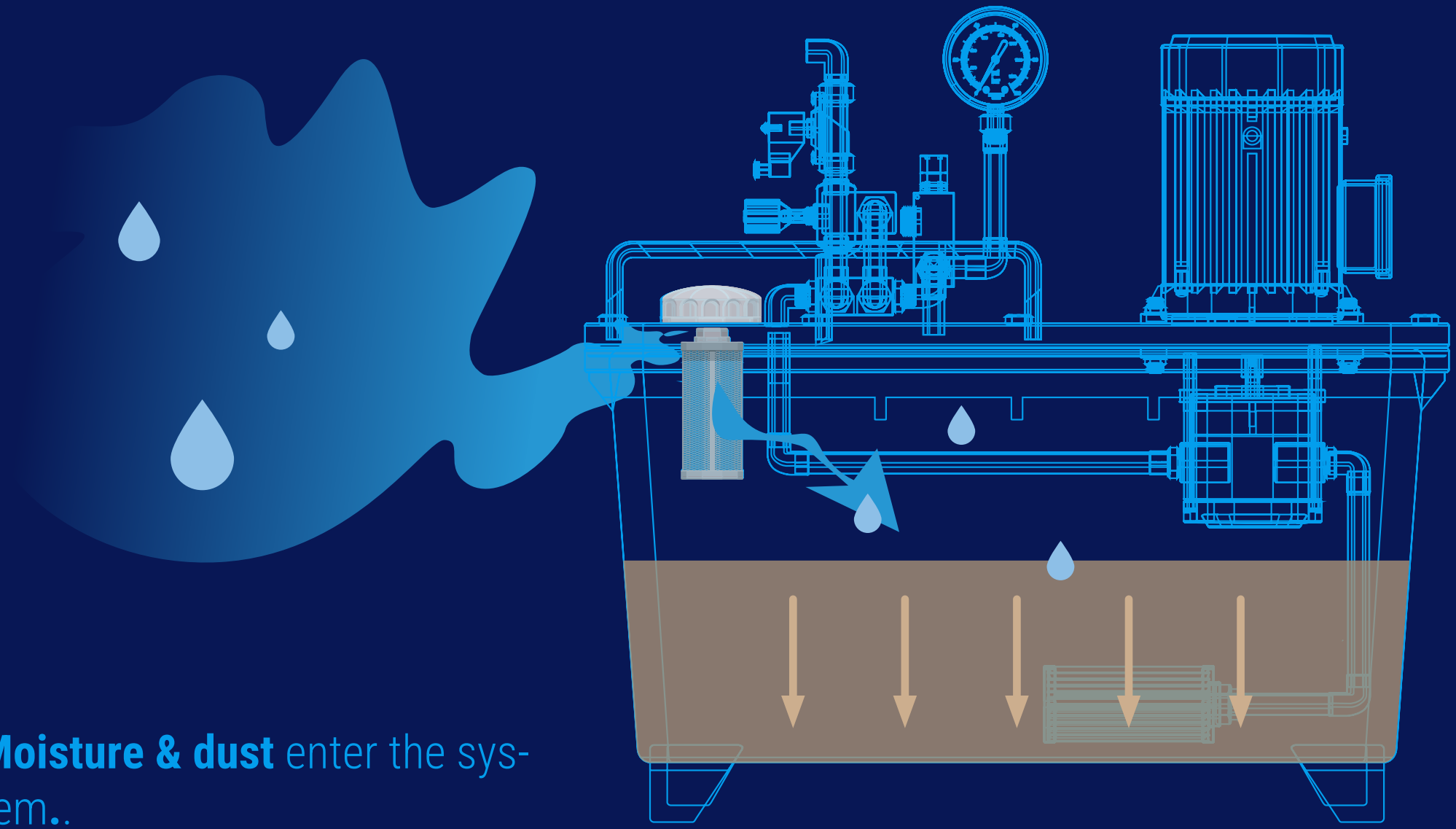
Filter cap: **Air flows in.**

Passive air exchange **when the temperature drops**

Active air exchange **when removing oil**

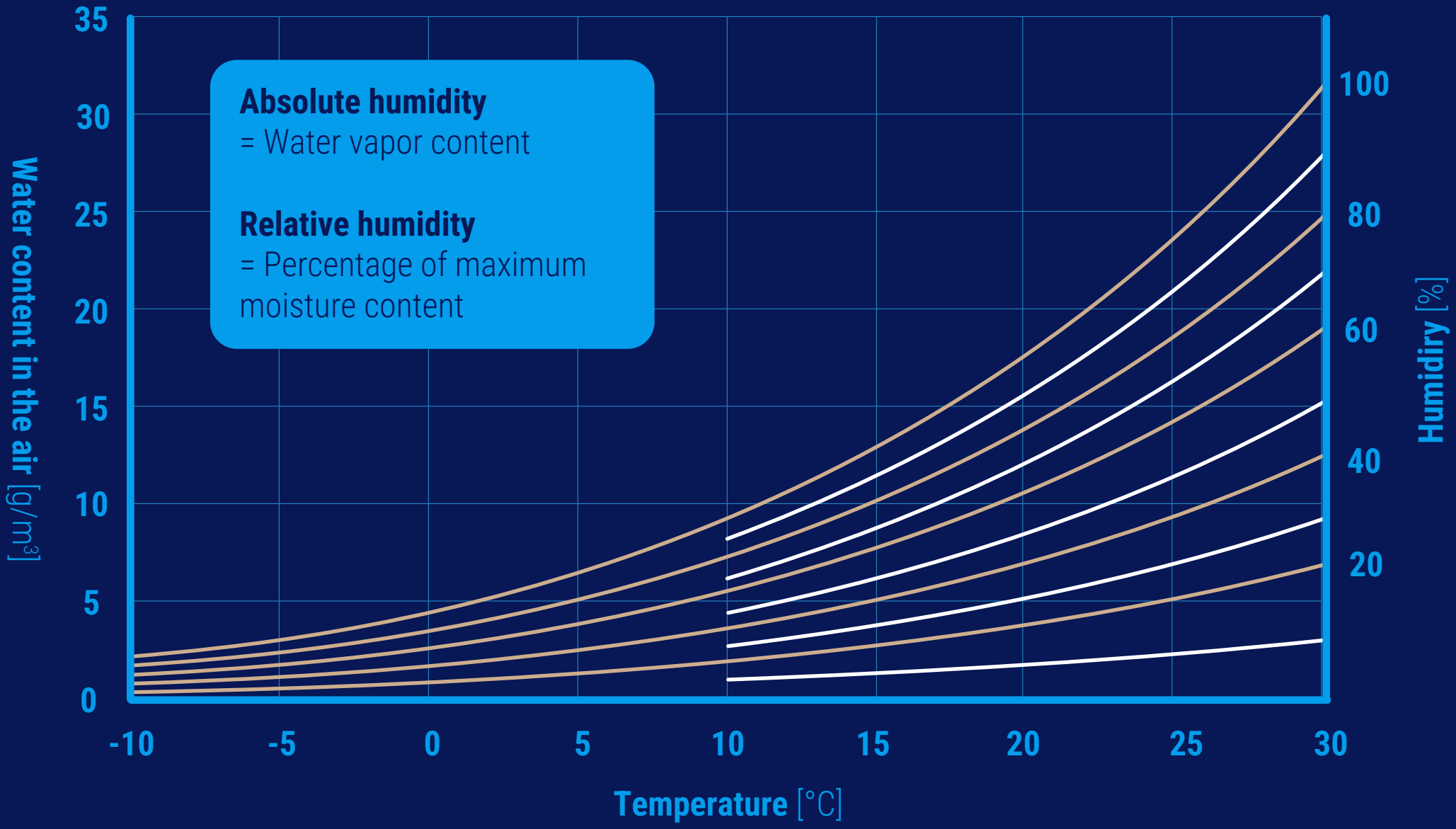


Filter cap: **Air flows in**.

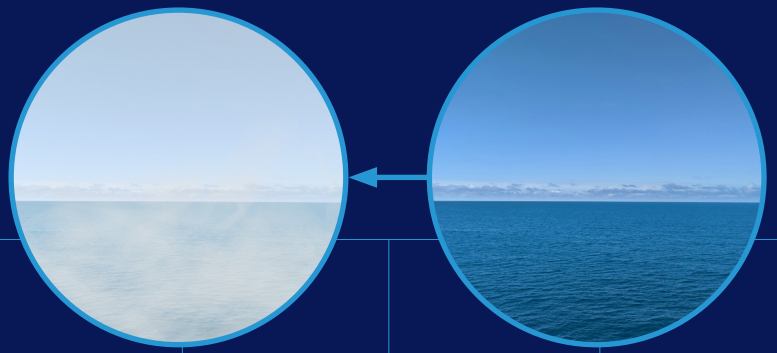


Moisture & dust enter the system..

Humidity.


Absolute humidity
= Water vapor content
Relative humidity
= Percentage of maximum moisture content
Water content in the air [g/m³]
35
30
25
20
15
10
5
0
Humidity [%]
100
80
60
40
20
-10
-5
0
5
10
15
20
25
30
Temperature [°C]

Water content in the air.



At 25°C and 90% rF ⟶ 20,7g/m³

At 20°C and 80% rF ⟶ 13,8g/m³

At 15°C and 60% rF ⟶ 7,7g/m³

Water content in the air [g/m³]

35 30 25 20 15 10 5 0

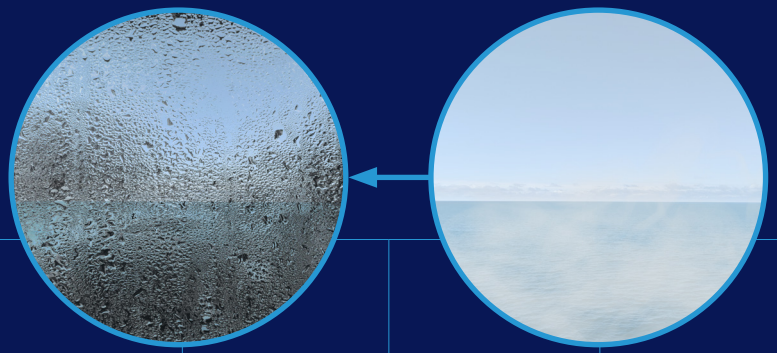
Humidiry [%]

100 80 60 40 20

-10 -5 0 5 10 15 20 25 30

Temperature [°C]

Dew point & condensate.



At 25°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

Water content in the air [g/m³]

0 5 10 15 20 25 30 35

Humidity [%]

20 40 60 80 100

-10 -5 0 5 10 15 20 25 30

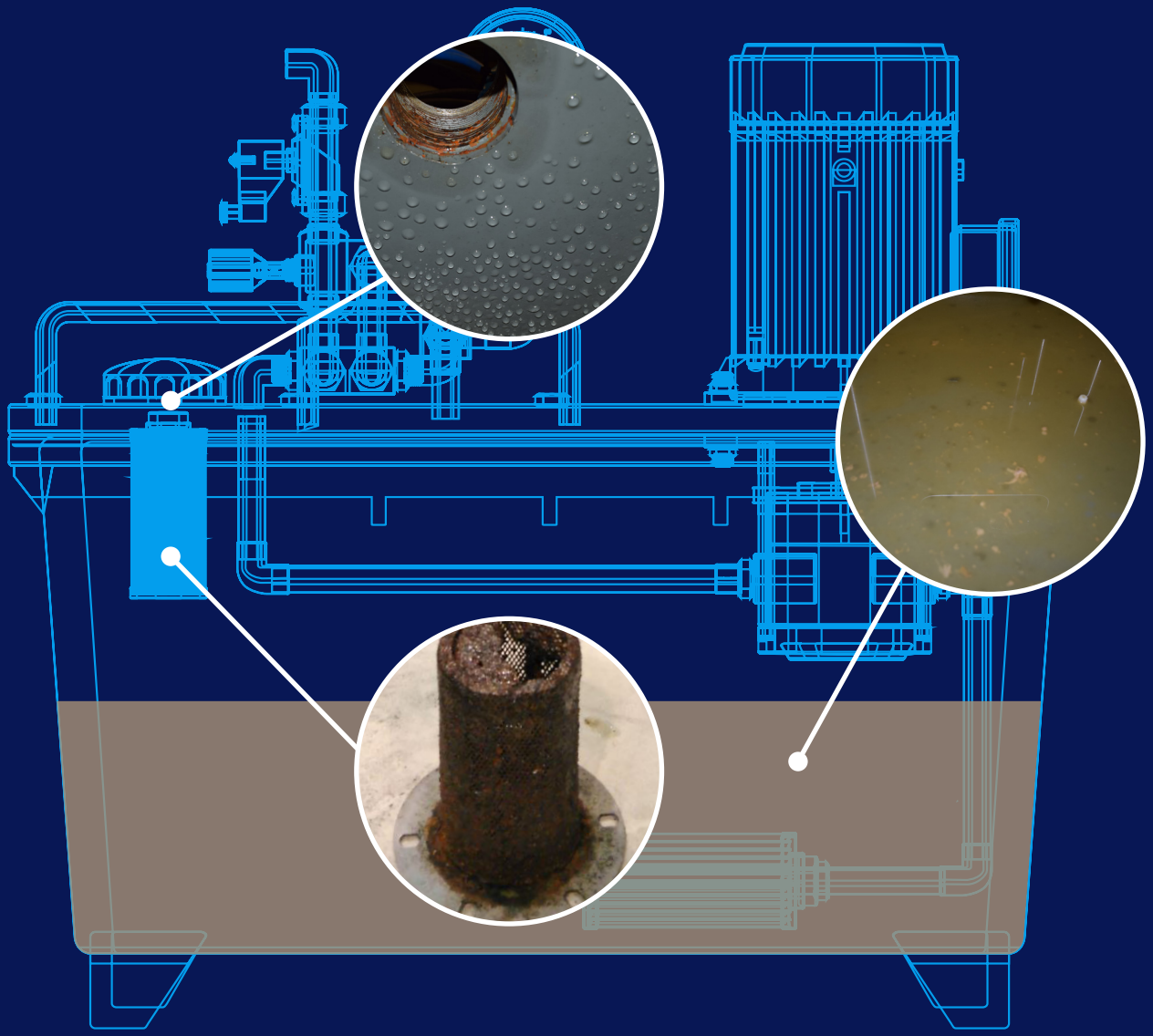
Temperature [°C]

A dangerous combination: Diluted oil, dust & rust

Water changes the viscosity, lubricity, and shear stability of the oil and promotes the breakdown of additives.

Dust particles form sludge deposits.

Rust triggers a chain reaction in diluted oil, forming free radicals that attack the hydrocarbon chains.

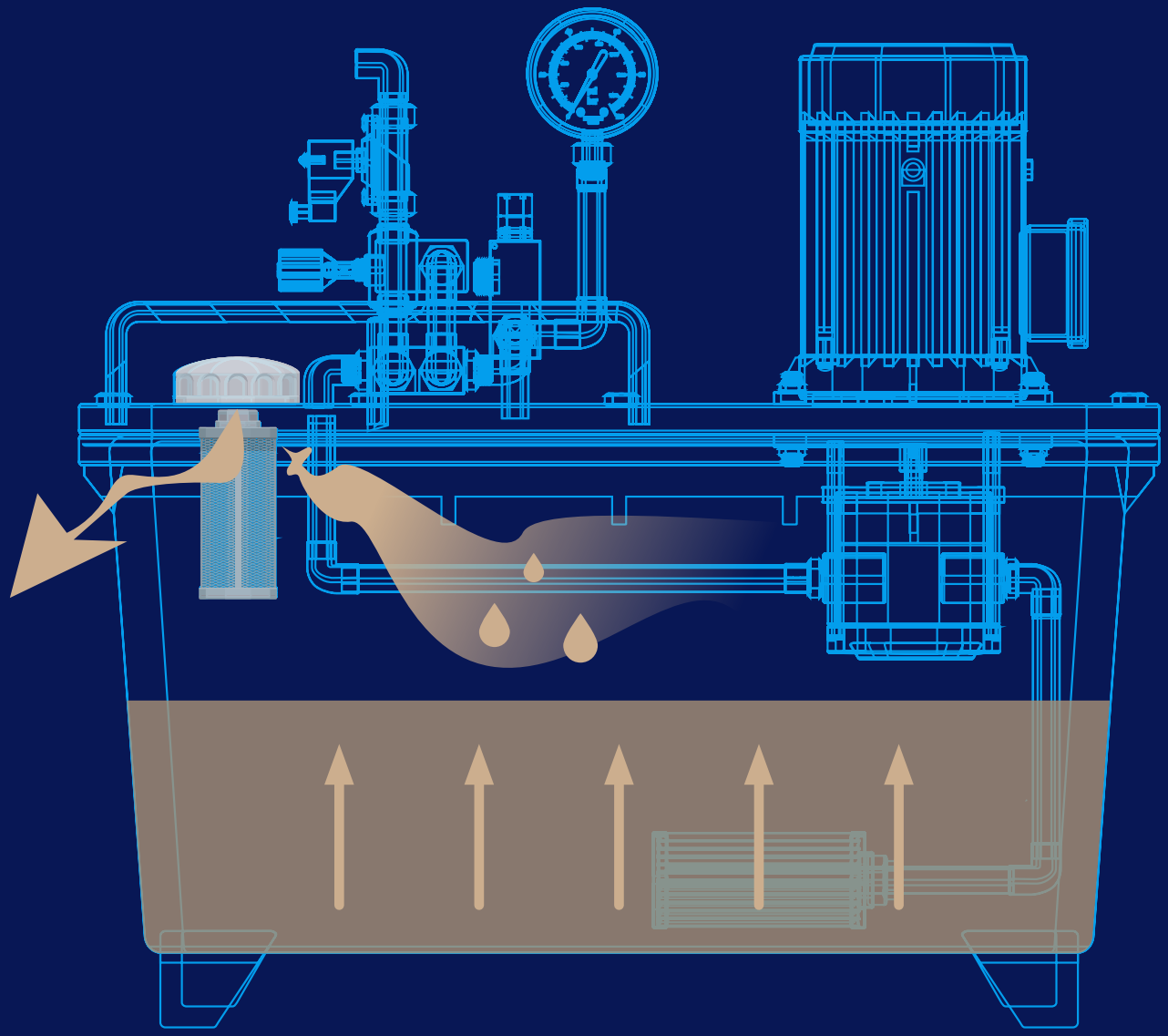


... on the way through your system.

Friction points are no longer supplied with the necessary amount of hydraulic oil - Abrasion & wear - Viscous oil puts strain on drive units - reduces efficiency
Residues clog valves, sludge formation increases filter requirements, increasing acidification increases the risk of corrosion and attacks the seals.

The real annoyance: downtime, lost revenue, and maintenance work

Another problem: **escaping oil mist**.



Oil vapors are released into the ambient air when the system exhales.

Norms such as TA Luft are not being complied with — a danger to humans and the environment.

The solution: **adsorbers** that filter dirt and moisture from the supply air and oil mist from the exhaust air.

Breather dryers

Oil mist separators

When does it make sense to use an adsorber?

	Breather dryer	Oil mist separator
Environment	• High humidity > 70% RH • High temperature > 25°C • Temperature fluctuations of approx. 10°C	• High oil mist emission
System	• Hygroscopic oils • Sensitive systems	• Compliance with TA Luft

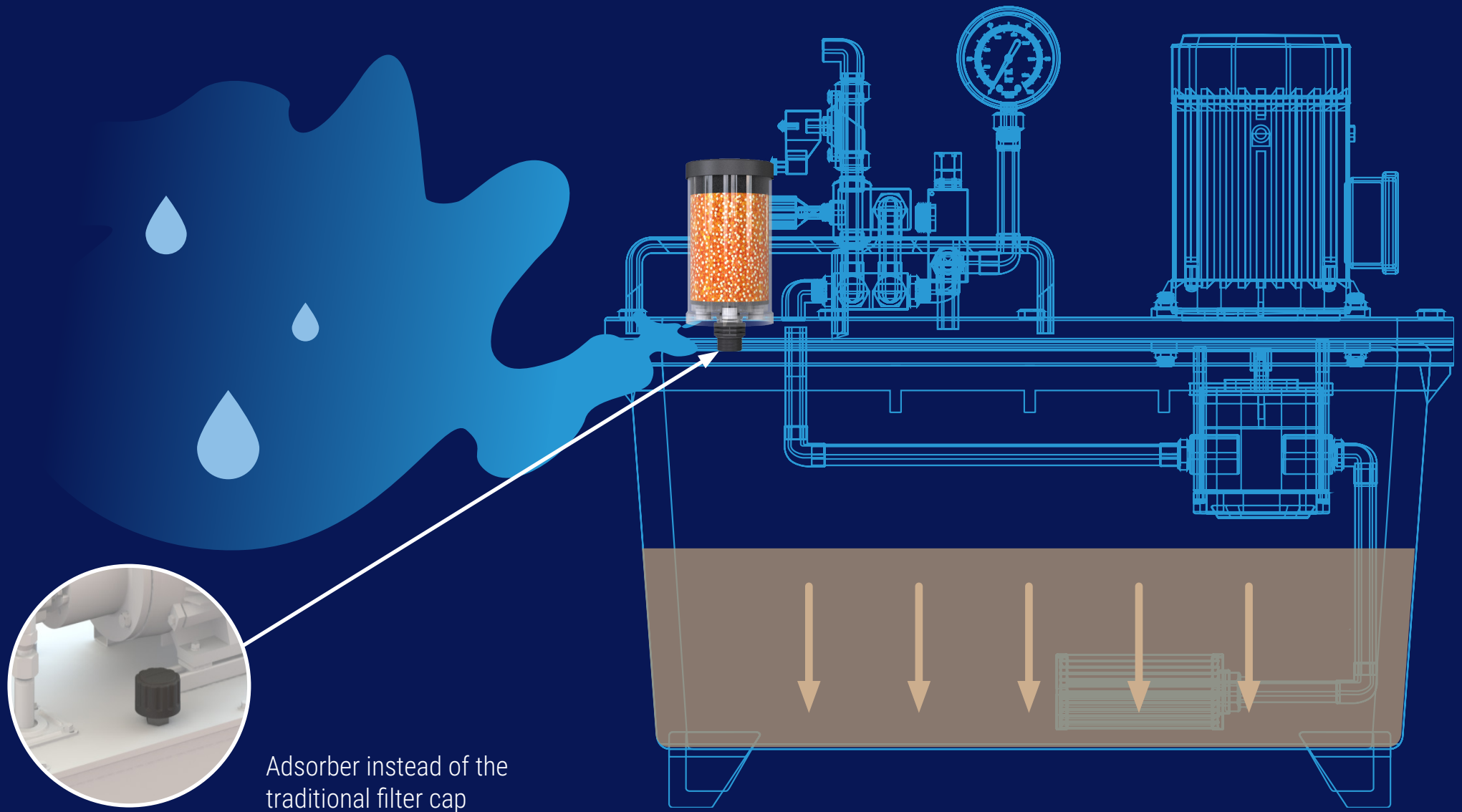
Conditions at the Panama Canal

Temperatures: 24-31°C

Humidity: 78-80% in the dry season, 90% in the rainy season

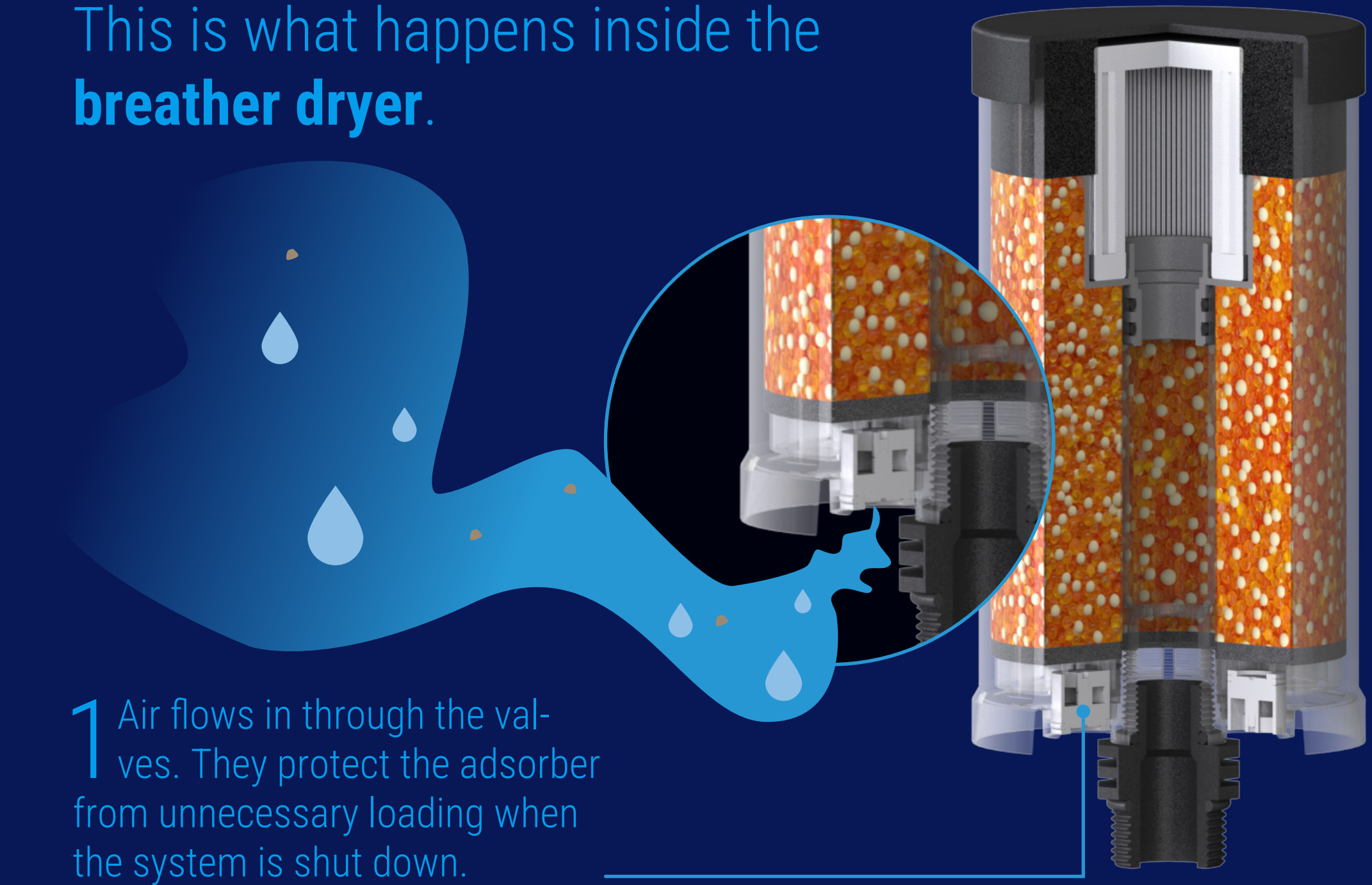
Fluid used: Bio oil

The air flow through the **GIEBEL Adsorber®.**



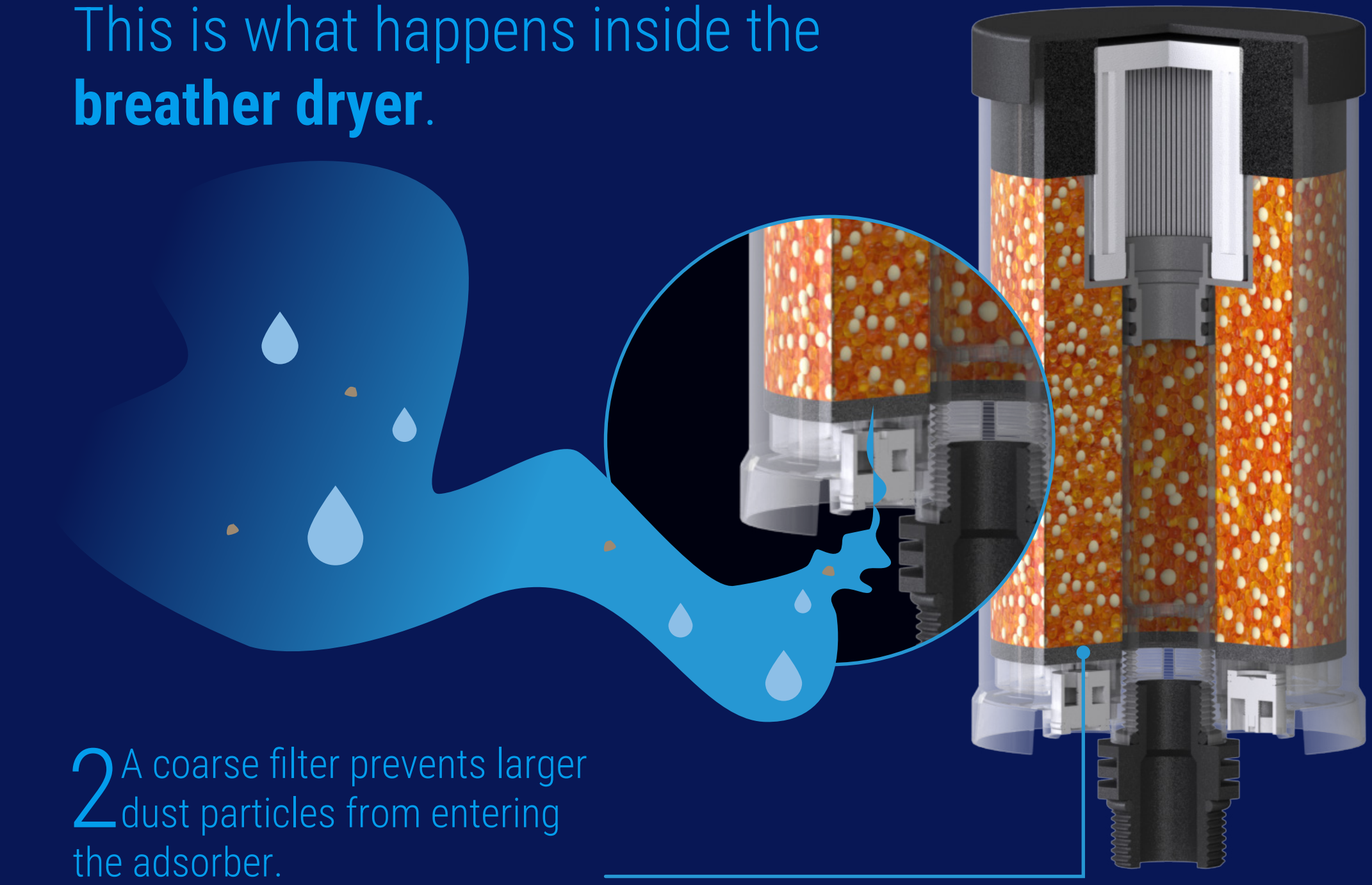
Adsorber instead of the traditional filter cap

This is what happens inside the **breather dryer**.



1 Air flows in through the valves. They protect the adsorber from unnecessary loading when the system is shut down.

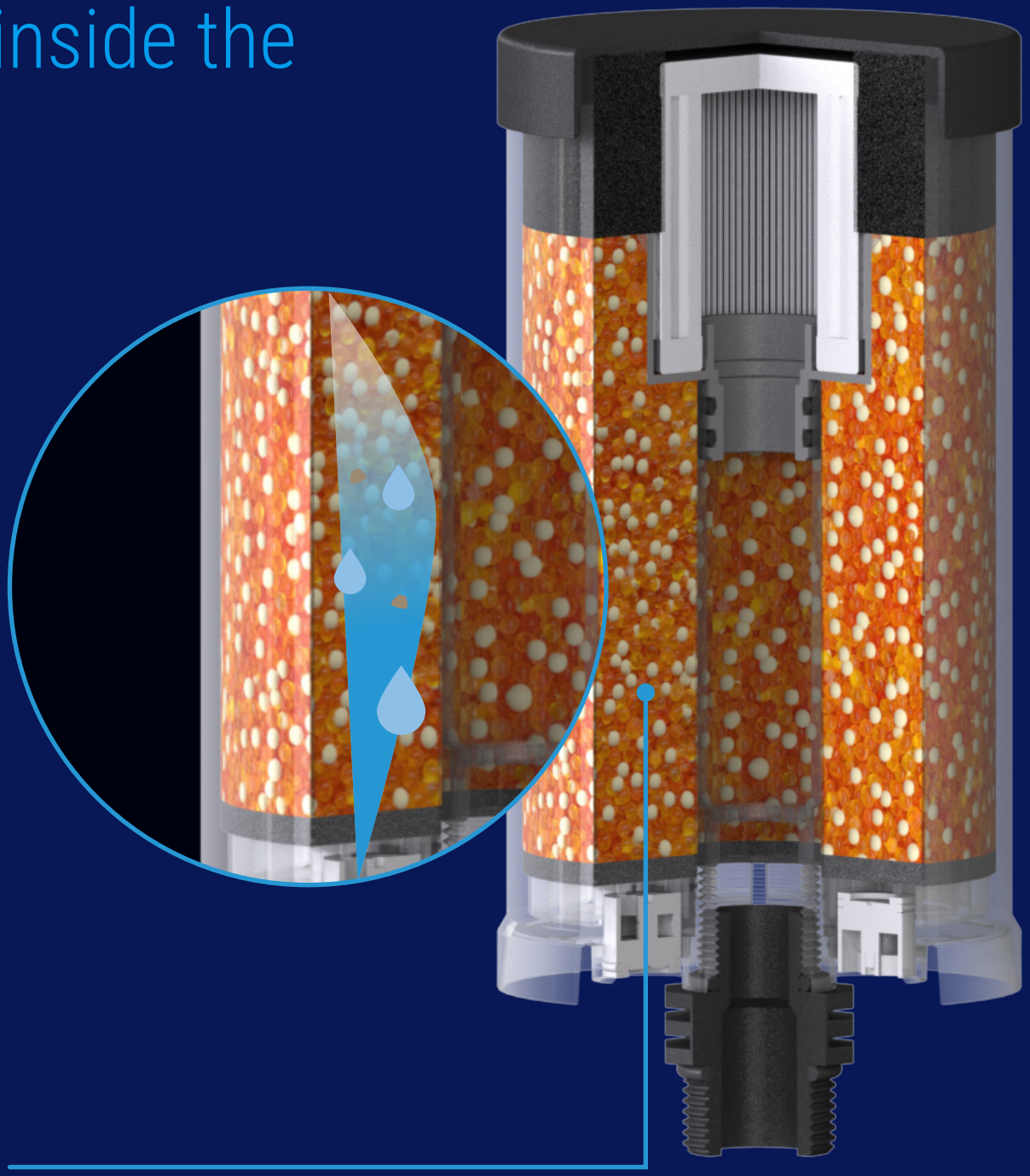
This is what happens inside the **breather dryer**.



2 A coarse filter prevents larger dust particles from entering the adsorber.

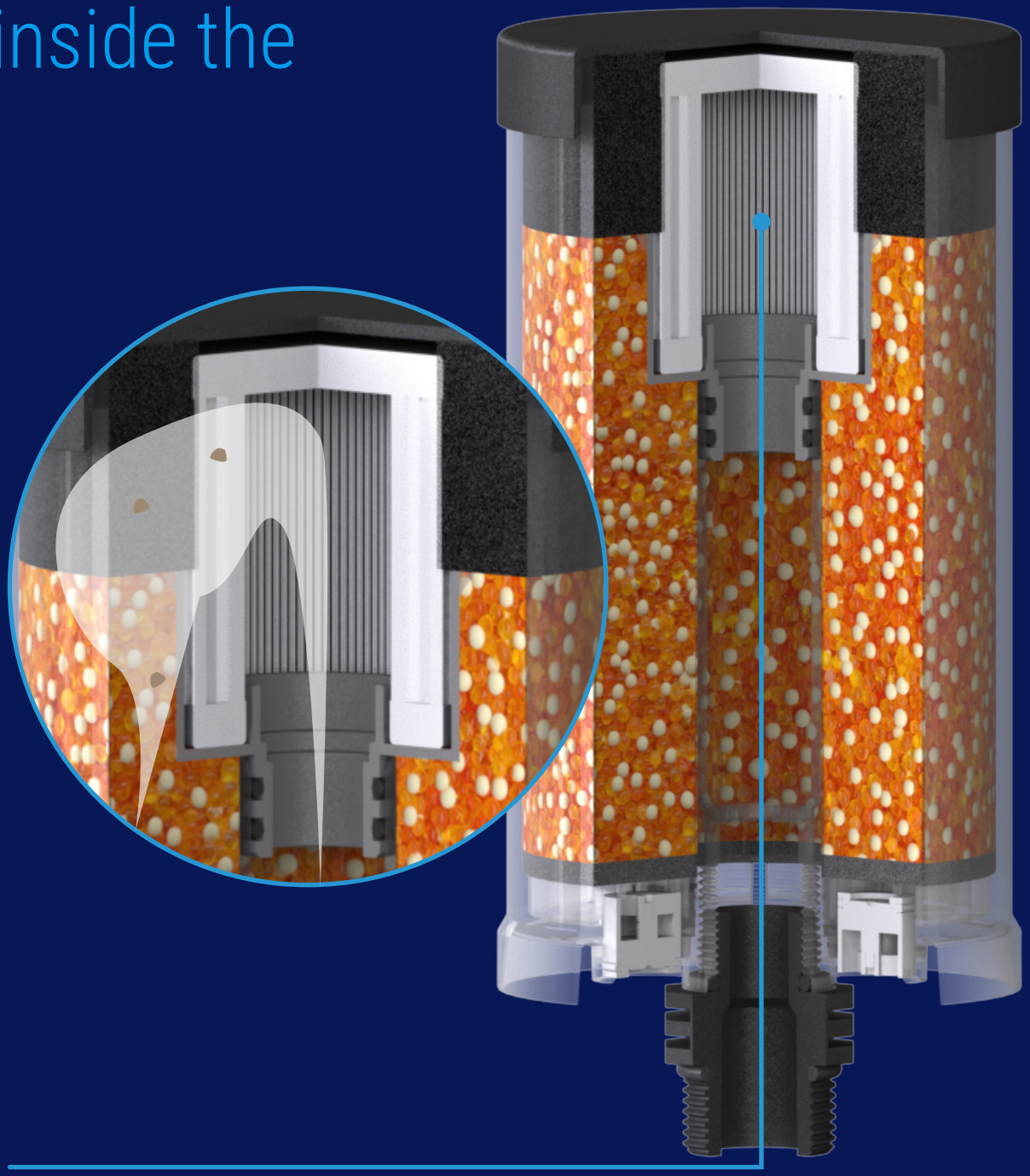
This is what happens inside the **breather dryer**.

- High water absorption
- High-contrast indicator
- Can be used at high temperatures
- Can be used at low humidity levels



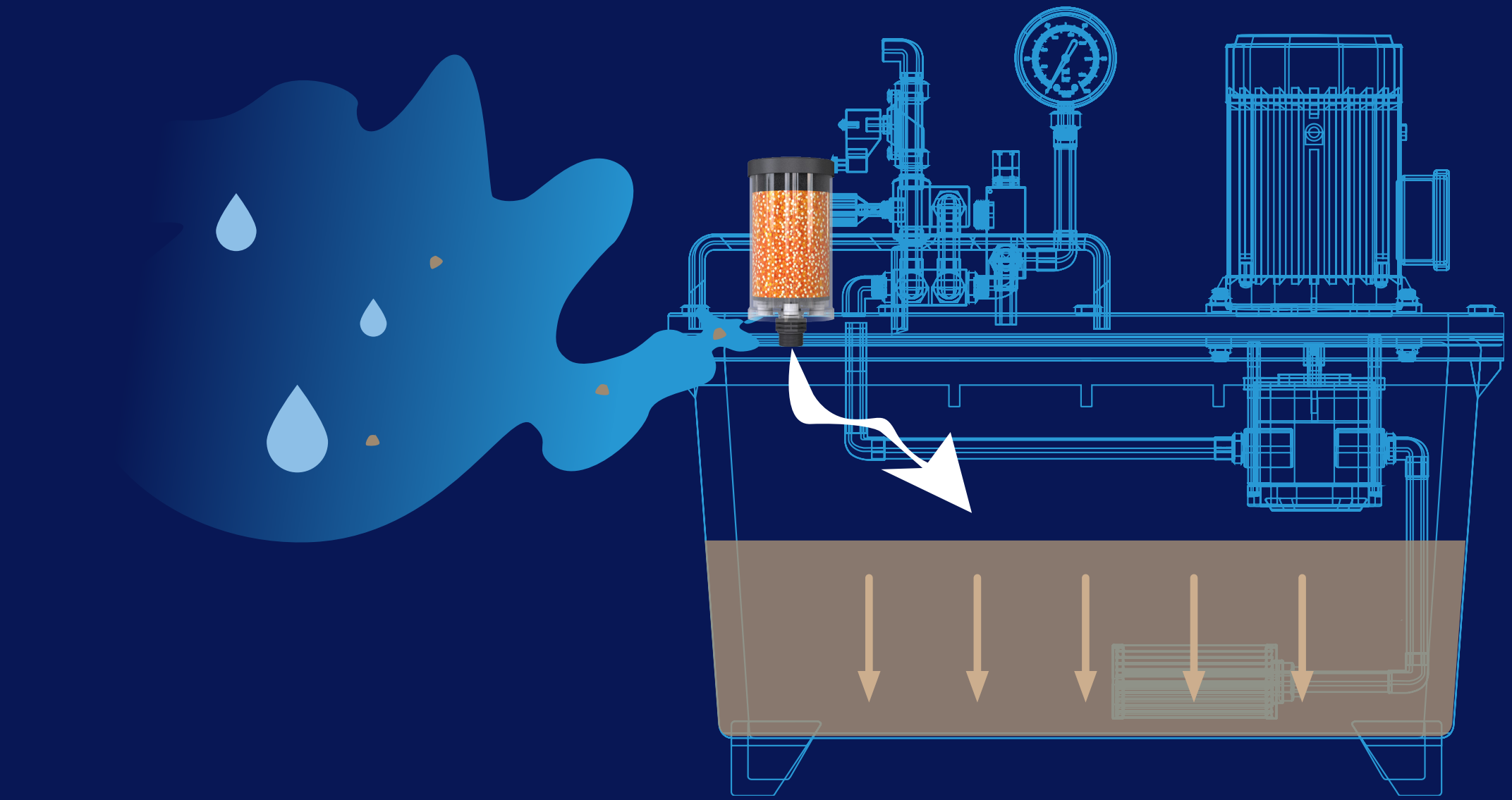
3 The GIEBEL Xdry® desiccant, consisting of orange-green silica gel and 13X molecular sieve, removes moisture from the air.

This is what happens inside the **breather dryer**.



4 A 3µm filter filters out the finest dust particles from the supply air.

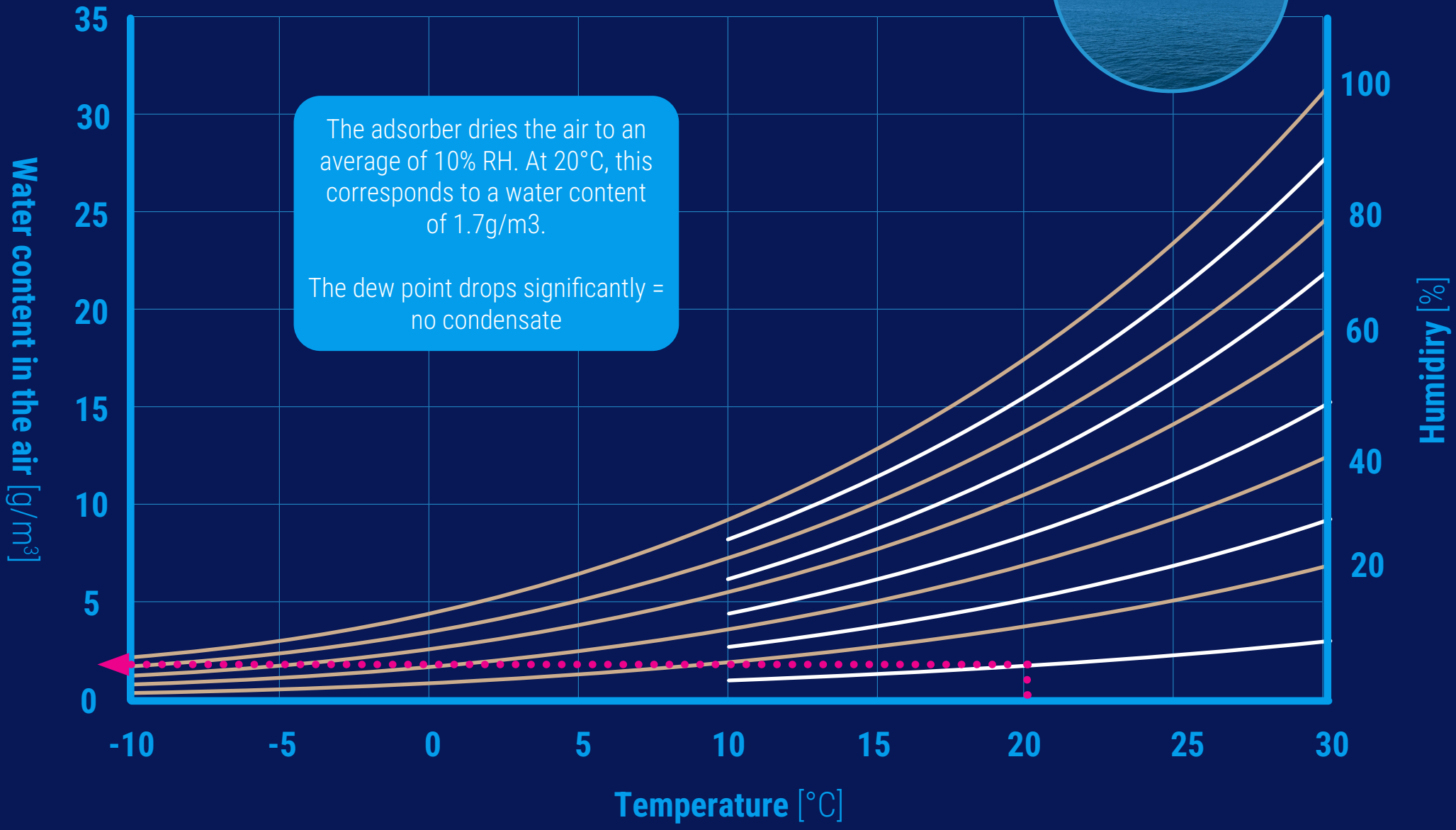
Result: Clean & dry supply air.



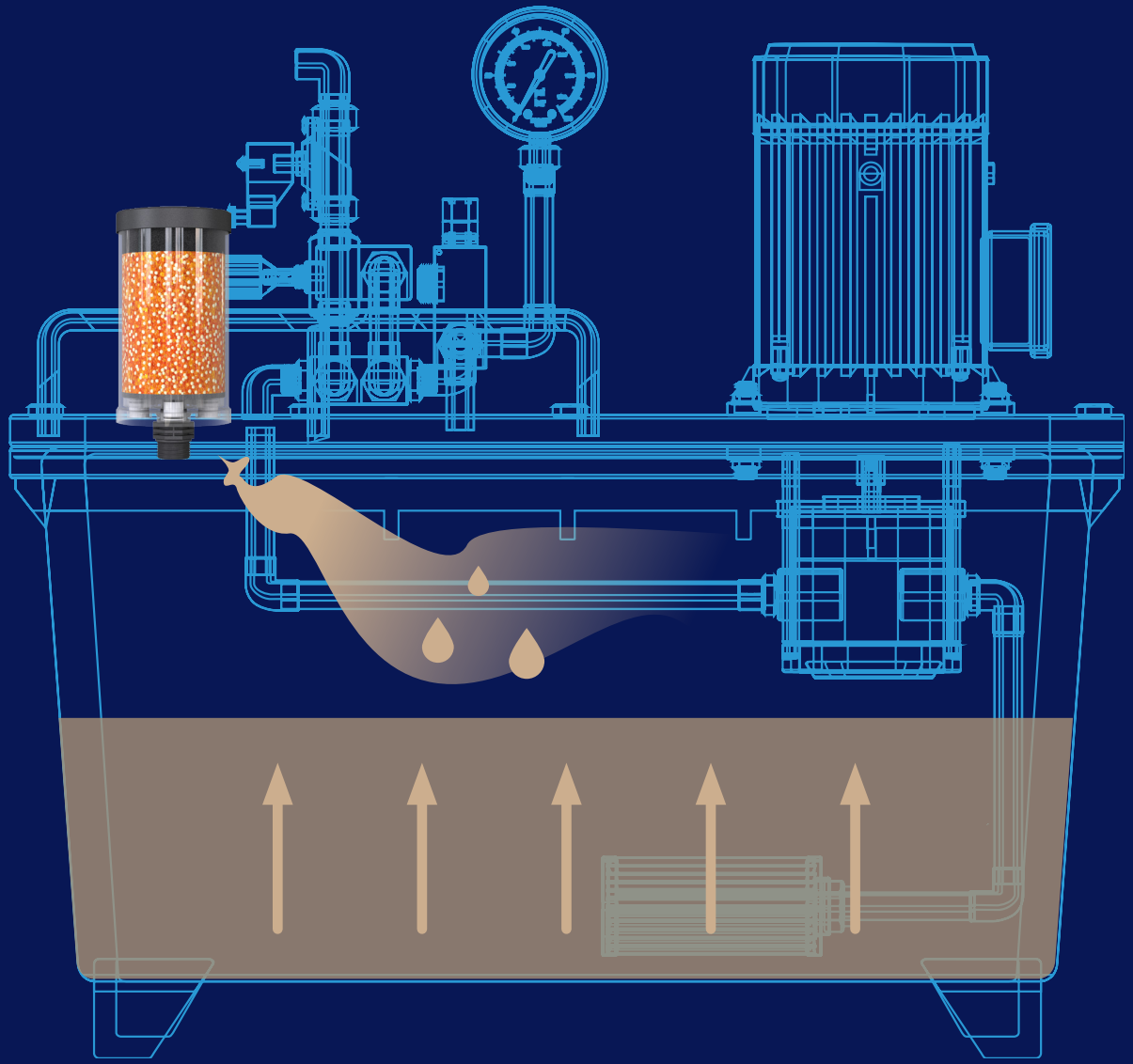
Dew point with adsorber

The adsorber dries the air to an average of 10% RH. At 20°C, this corresponds to a water content of 1.7g/m3.

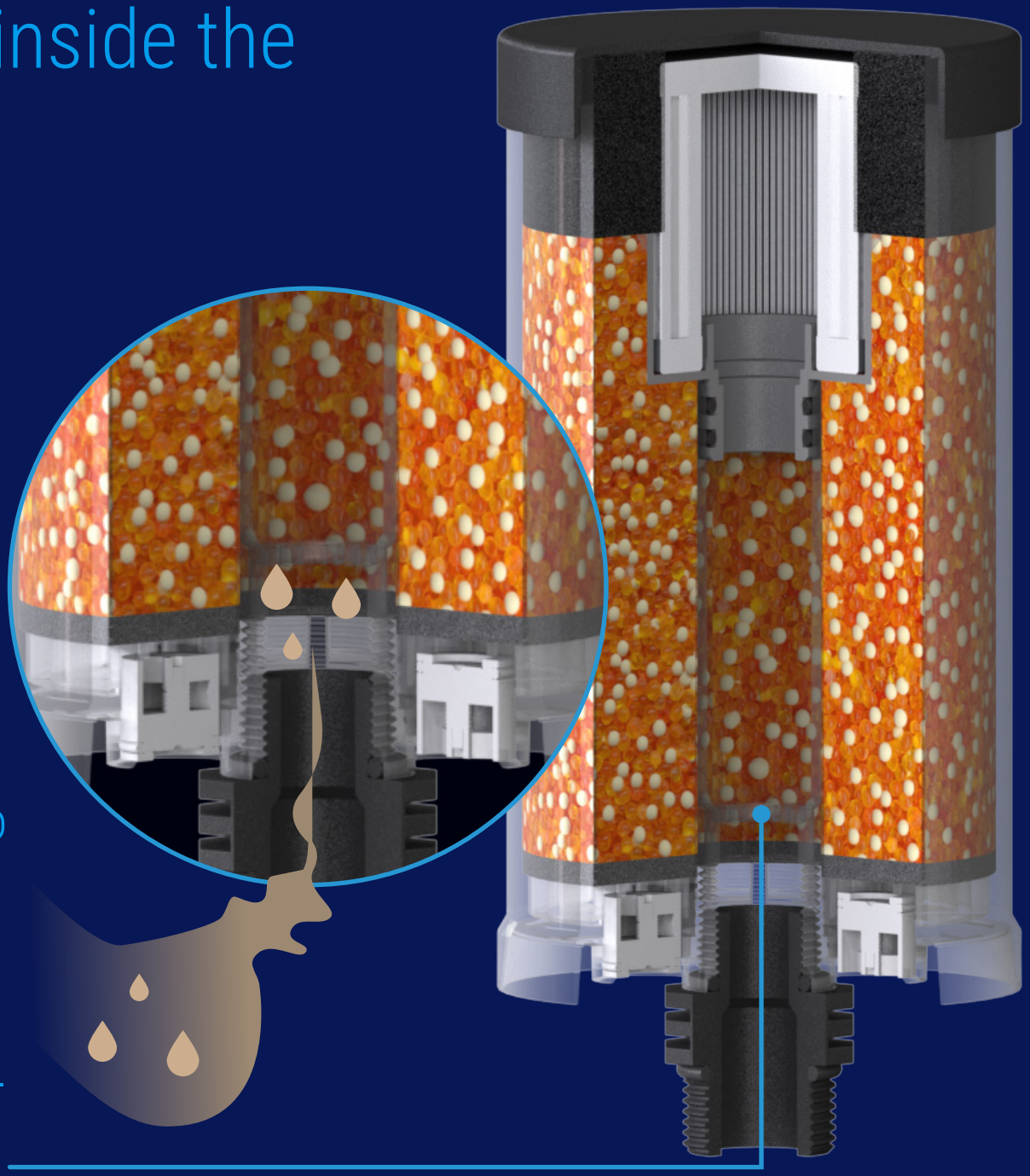
The dew point drops significantly = no condensate



The air flow out of the system through a **GIEBEL Adsorber®**.

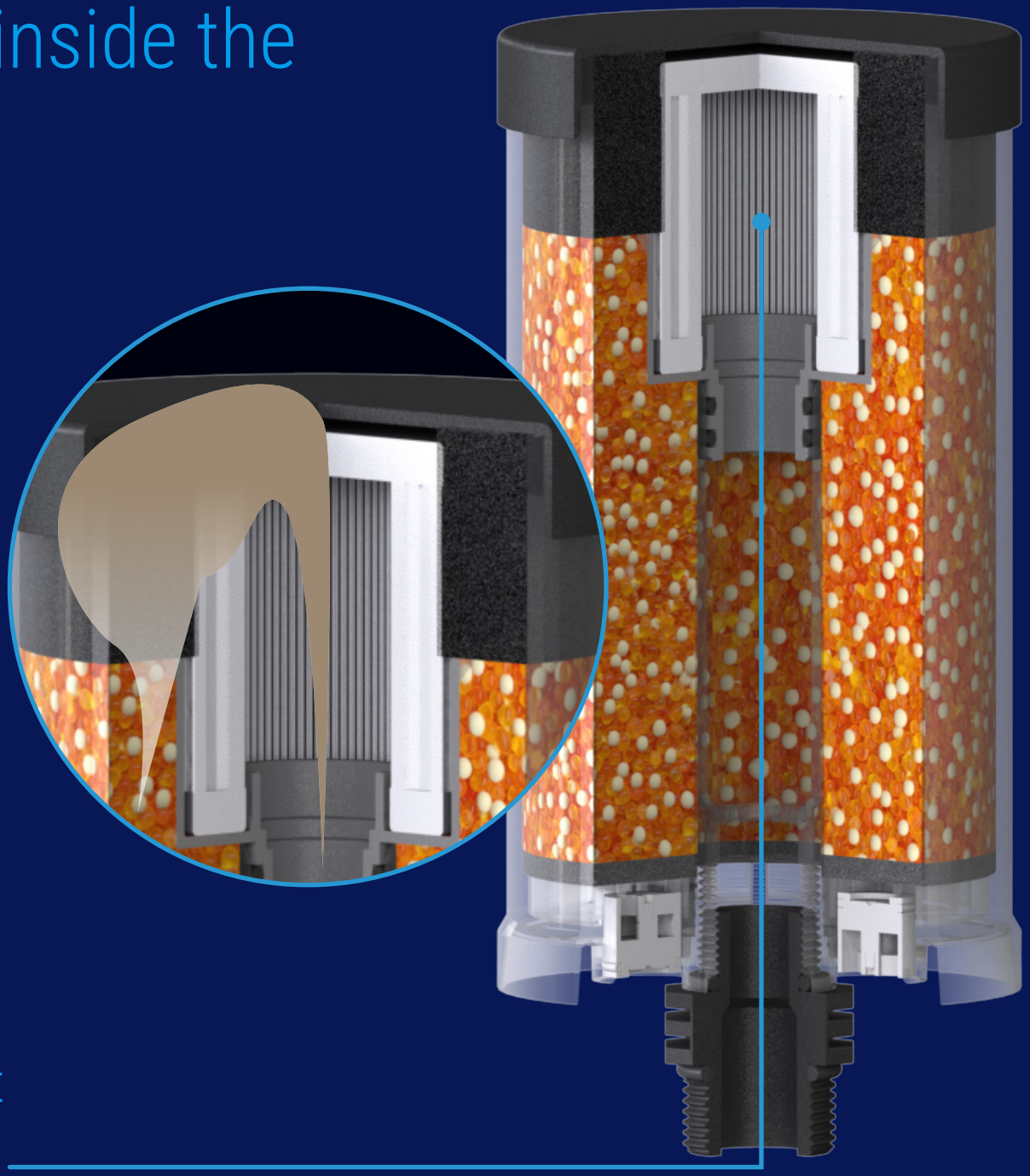


This is what happens inside the **Breather dryer**.



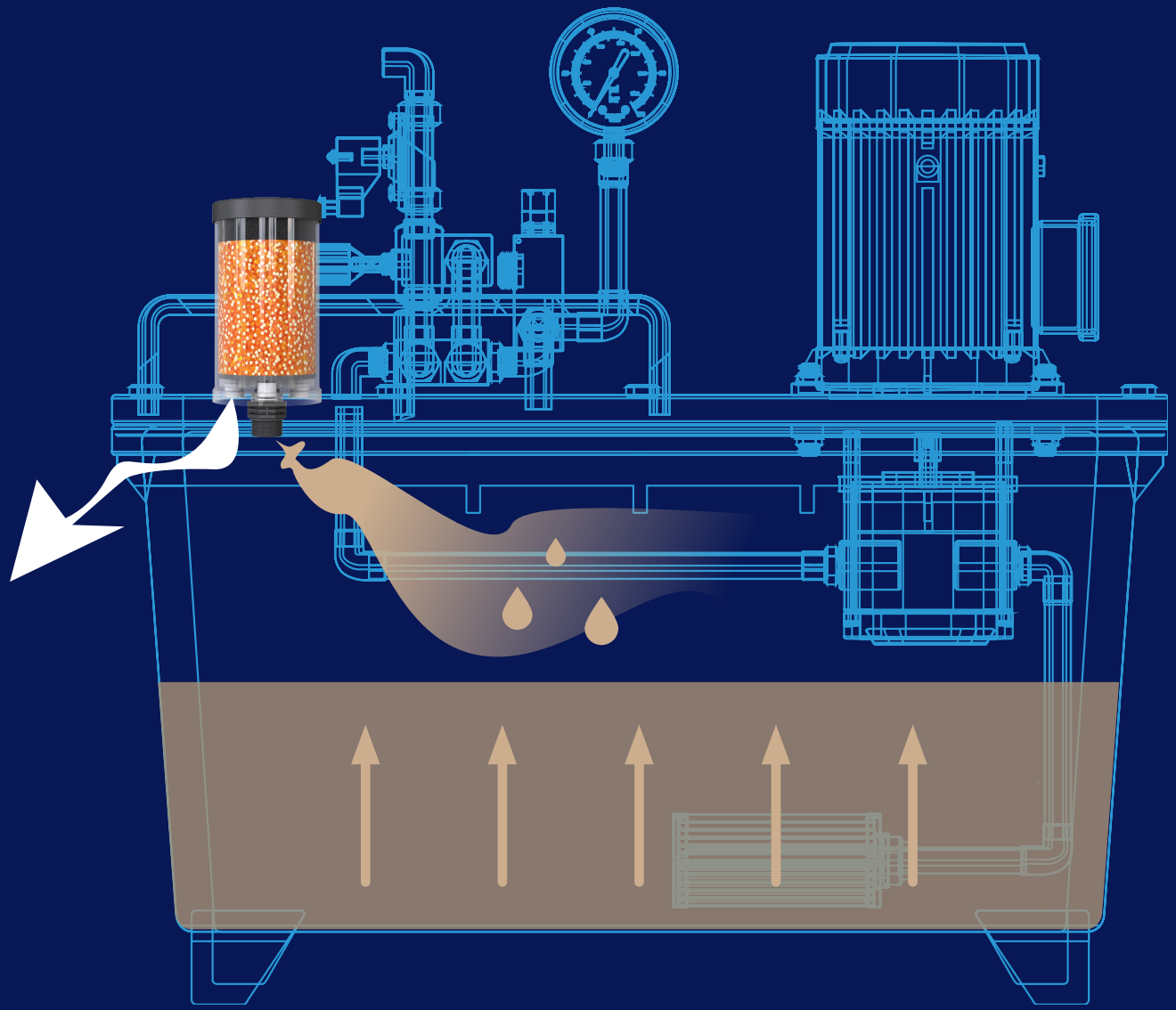
1 Oil-laden exhaust air flows into the adsorber. A grid prevents the oil from spilling into the adsorber. It also ensures that no desiccant can trickle into the system during refilling.

This is what happens inside the **Breather dryer**.



2 A layer of activated carbon absorbs the finest oil droplets and oil aerosols and prevents them from entering the desiccant bed.

Result: Clean exhaust air.

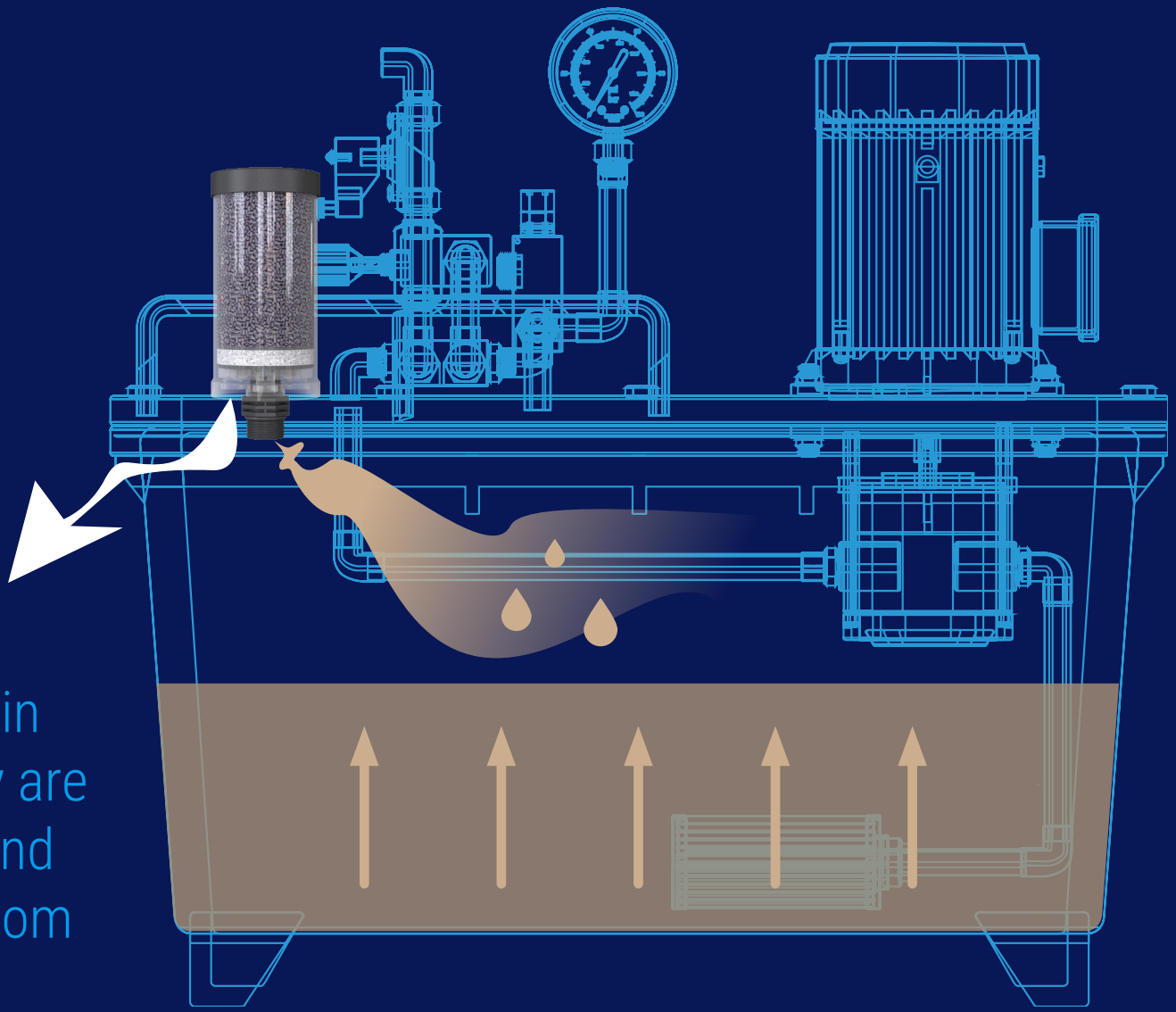


Transits: 32-38 ships per day
Price per container ship: depending on size, US$80,000-450,000, with ULCVs sometimes even more expensive
Fee revenue in 2024: $3.38 billion

For shipping companies, however, the journey through the Panama Canal is still 5-10% cheaper than the alternative route, which is 15,000 km longer.

Smooth-running hydraulics & clear sailing!

For heavy oil mist: **VG-D**



Oil mist separators are used in cases of heavy oil mist. They are filled with activated carbon and filter the finest oil particles from the exhaust air.

Loading breather dryer.

Unloaded

The adsorber is completely orange in color.

This means that it has adsorbed little or no moisture so far.

Loaded from above

The adsorber is green at the top and orange at the bottom.

This means that the adsorber has mainly dried the outgoing air. There was a high level of moisture in the system.

Loaded from below

The adsorber is orange at the top and green at the bottom.

This means that the adsorber has mainly dried the incoming air. The system is reliably protected.

Fully loaded

The adsorber is completely green.

This means it is time to replace the adsorber or desiccant. The adsorber has reached its maximum absorption capacity!

Loading Oil mist separator.

Unloaded

The silica gel layer is white in color.

This means that it has adsorbed little or no oil mist so far.

Fully loaded

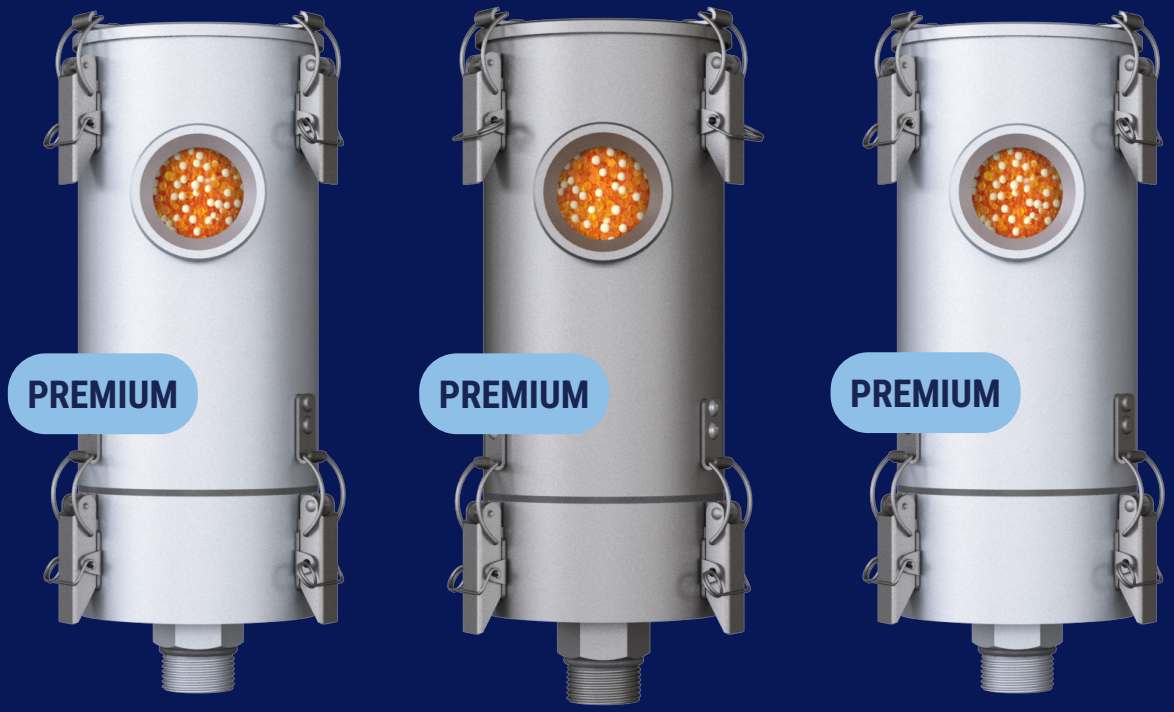
The silica gel layer is brown in color.

This means it is time to replace the adsorber or activated carbon. The oil mist separator has reached its maximum absorption capacity!

Breather dryers - Basic & Eco.

ADSORBER	VV-D	VV-DV	VV-R	VV-RV
Operating fluids	Hydraulic oils, mineral oils, biodegradable oils, highly flammable and low flammability liquids			
Refillable	✗	✗	✓	✓
Vents	✗	✓	✗	✓
ATEX	✗	✗	✗	✗
Offshore	✓	✓	✓	✓

Breather dryers - Premium.

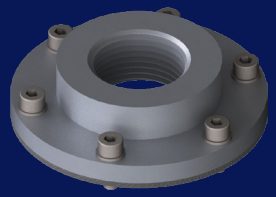


ADSORBER	MA-RV (FKM)	ME-RV (FKM)	MA-RV (EPDM)
Operating fluids	Hydraulic oils, mineral oils, biodegradable oils, highly flammable and low flammability liquids		Skydrol, HyJet IV/V, brake fluids
Refillable	✓	✓	✓
Vents	✓	✓	✓
ATEX	✓	✓	✓
Offshore	✓	✓	✓

Ölnebelabscheider - Basic & Eco.

ADSORBER	VG-D	VG-R
Operating fluids	Hydraulic oils, mineral oils, biodegradable oils, highly flammable and low flammability liquids	
Refillable	✗	✓
Vents	✗	✗
ATEX	✗	✗
Offshore	✓	✓

Accessories for **installation**.



Flange adapters

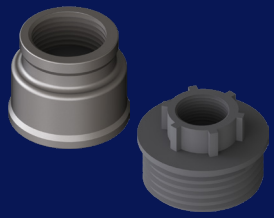
for easy adsorber installation on existing bolt circles

Wall mounts

for flexible adsorber installation in confined spaces

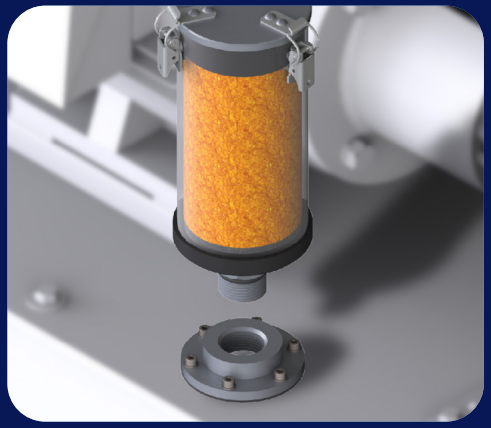
Mounting adapters

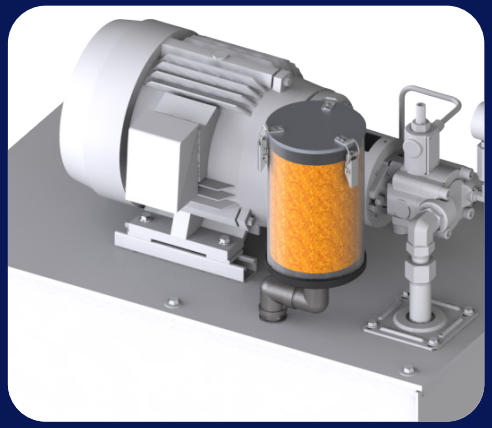
for offset or horizontal adsorber installation in confined spaces

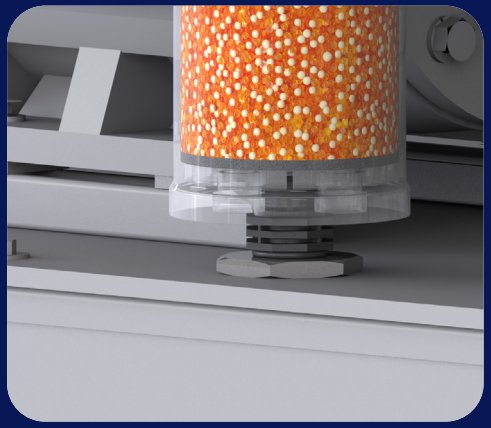


Adapters, sleeves, and reducers

for easy adsorber installation on existing threads



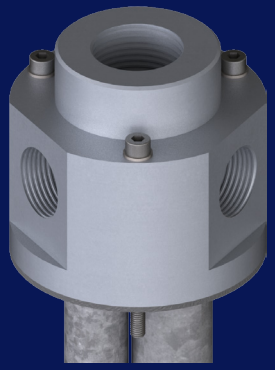




Accessories for **maintenance**.

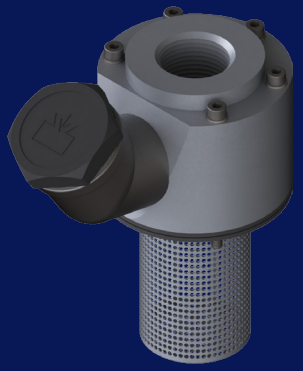
Sensors

for monitoring the adsorber loading status



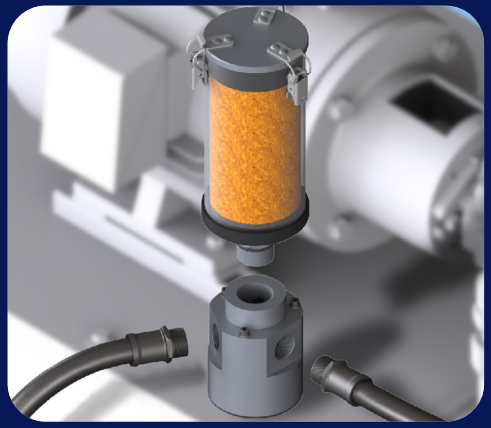
Suction lances

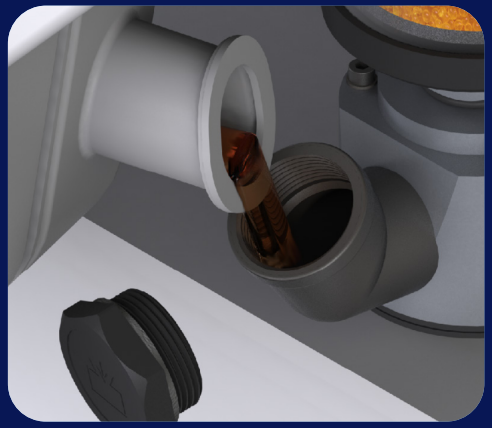
for connecting barrel pumps and bypass filter systems



Filling adapters

for refilling oil during absorber operation





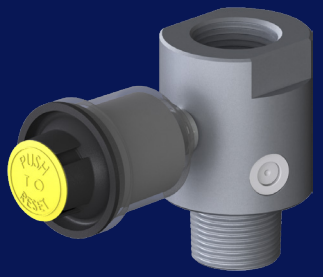
Accessories for **protection**.

Oil demisters

for protection against high oil emissions

Pressure adapters

for maintaining the tank preload during adsorber operation

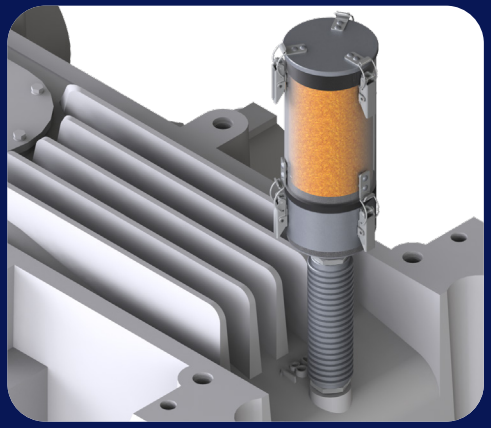


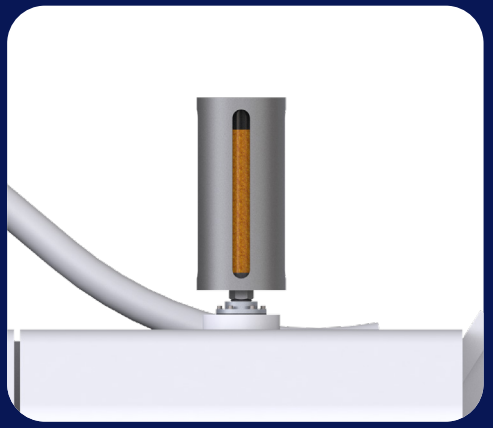
Protection adapters

for monitoring and limiting pressure build-up

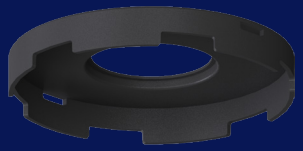
Protection hoods

for protection against strong vibrations and stone chips





Accessories for **protection**.



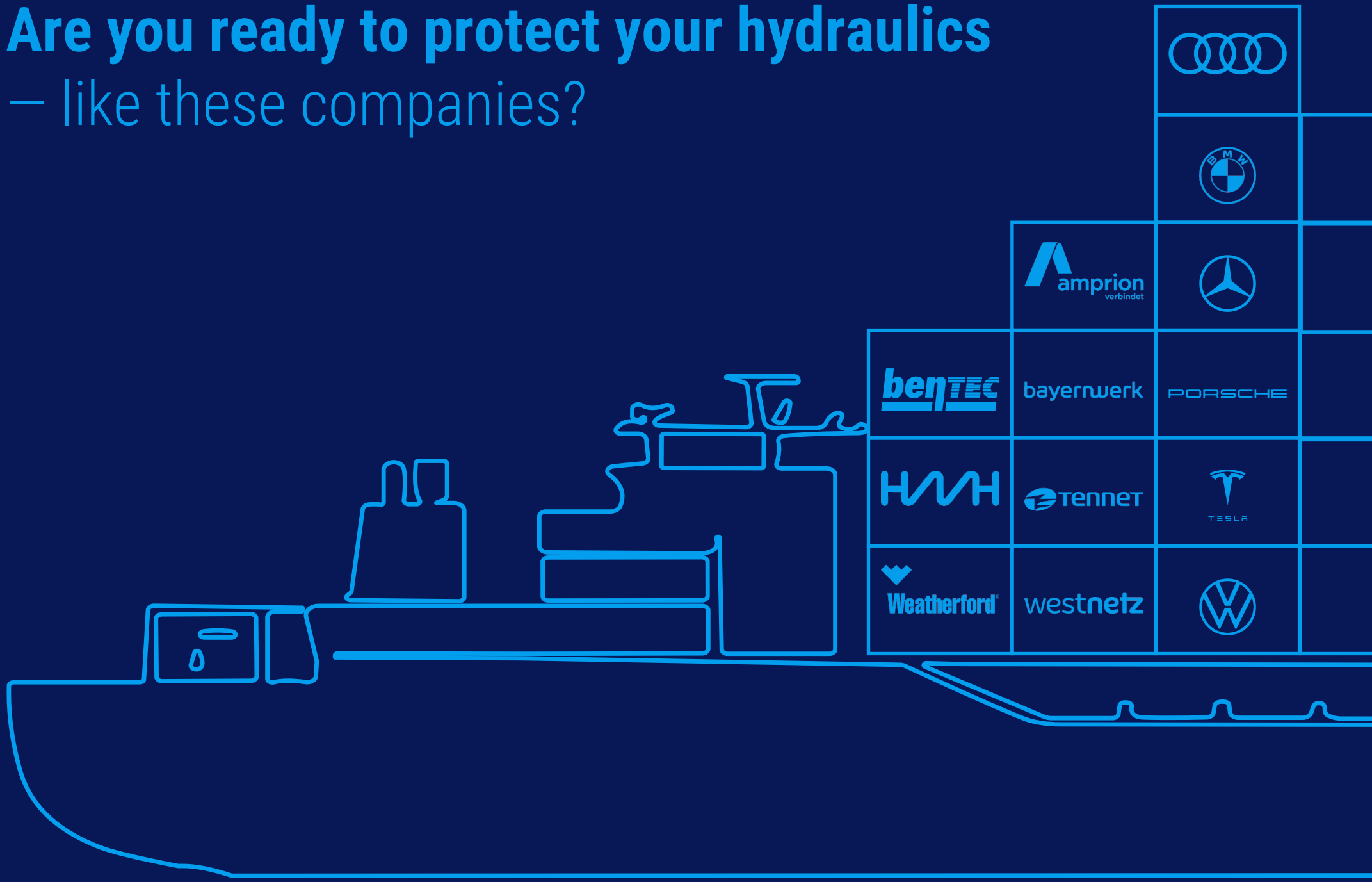
Valve Protection

for protecting the valve part
from water

16,000 companies keep their equipment dry and clean with GIEBEL Adsorbers®.

This prevents **13,200 liters** of water from causing damage to machines and storage tanks each year and prevents **900 liters** of oil in the form of aerosols from endangering people and the environment.

Are you ready to protect your hydraulics
– like these companies?




Bauhaus-Universität Weimar
CERN
AIRBUS
BLUE ORIGIN
BAYER
ANDRITZ
HANSA FLEX
clemco
DESY.
Bundeswehr
Fraport
BASF
HAWE HYDRAULIK
CADELER
HSR
forbo
Fraunhofer
HENSOLDT
Lufthansa Technik
BOREALIS
HUNGER Hydraulik
LÜRSSEN
PIRTEK 24/7 HydraulikService
Henkel
FAU FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG
RHEINMETALL
Bähr GmbH Bremen
LH Virtual
LANXESS Energizing Chemistry
Rexroth Bosch Group
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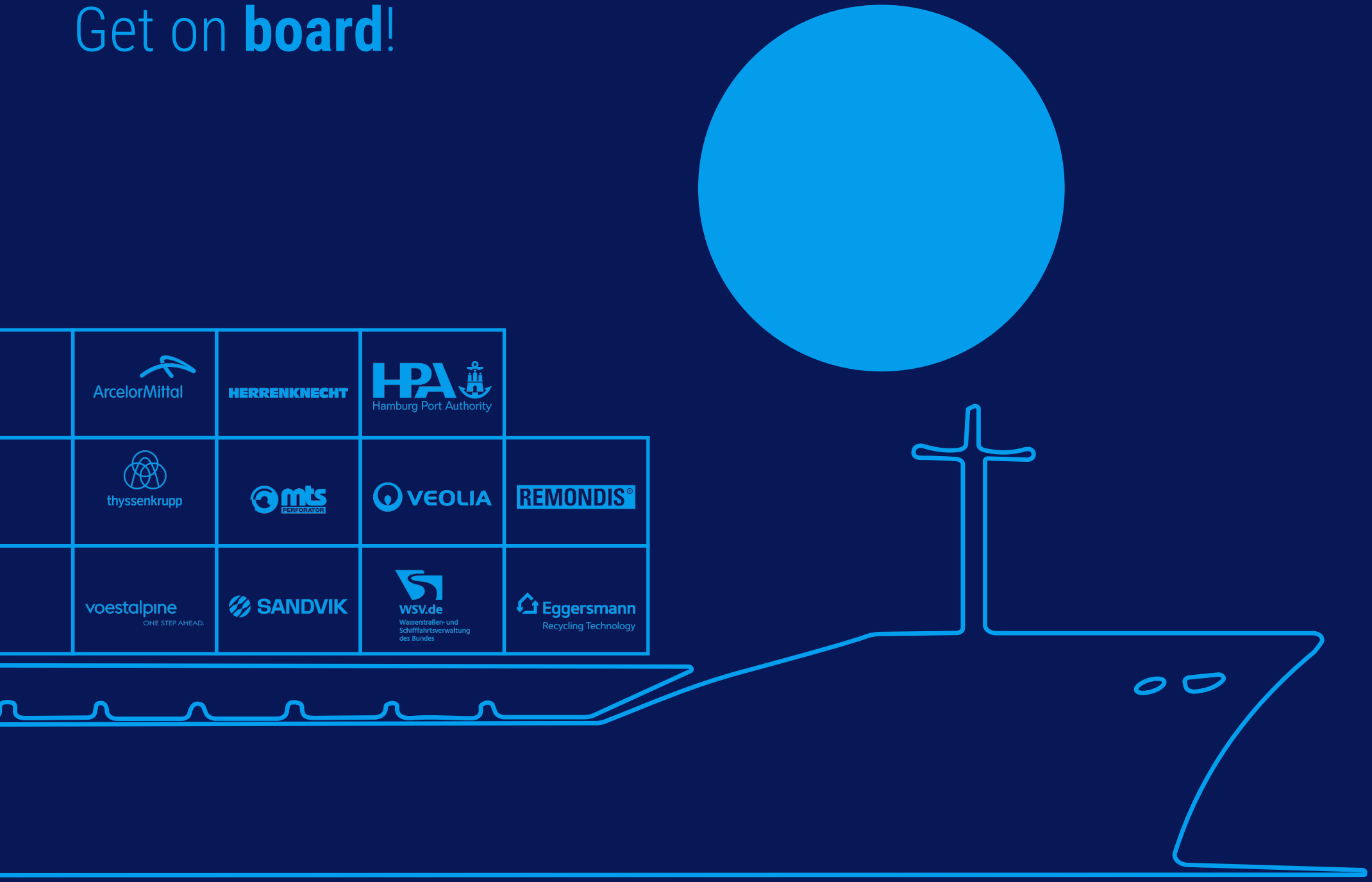
polyplan PEPPERL+FUCHS
Technische Universität Berlin

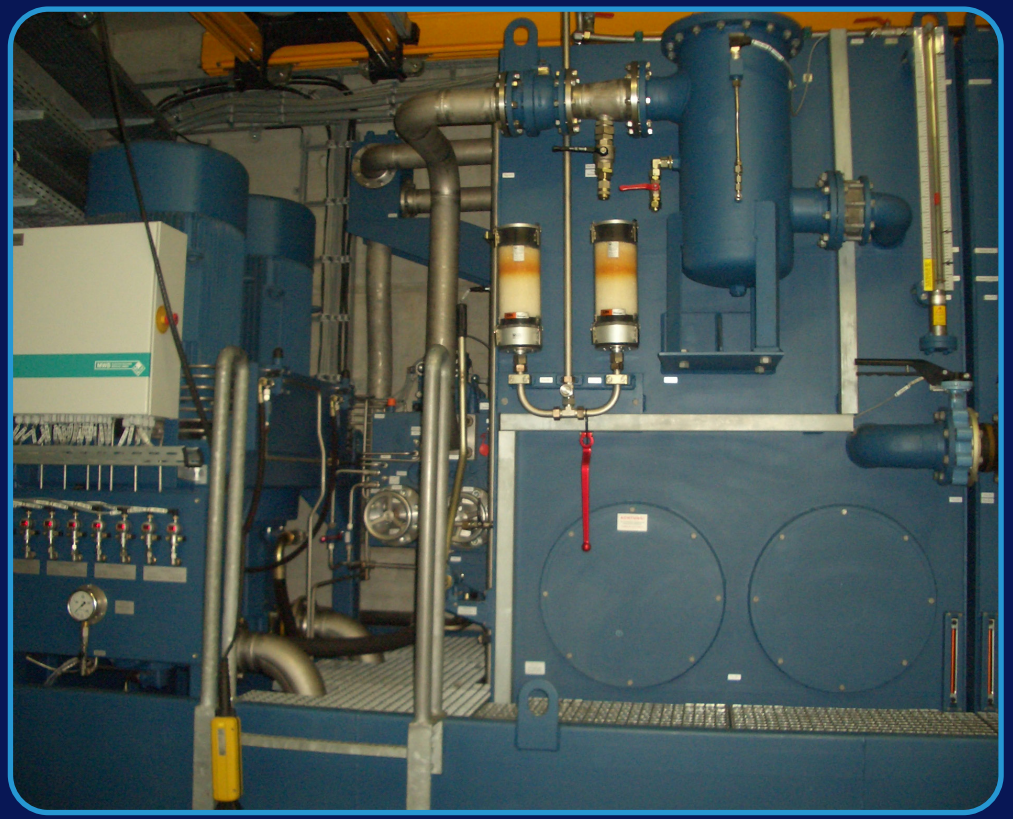
Get on **board**!

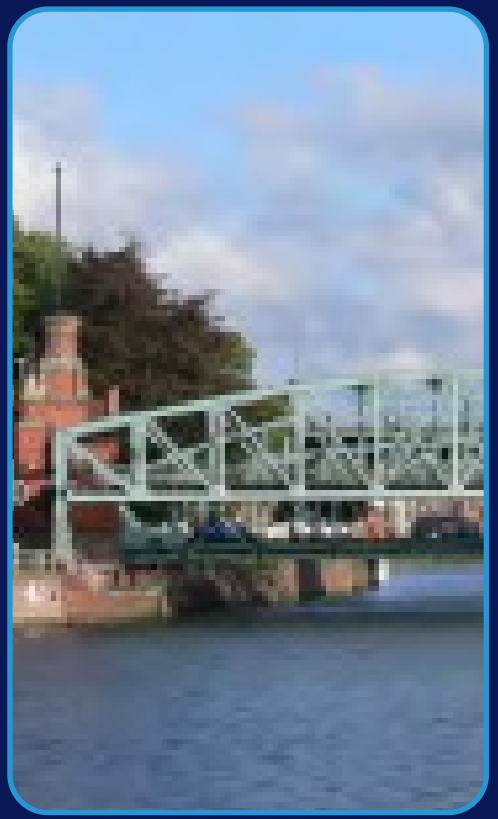

ArcelorMittal
HERRENKNECHT
HPA
Hamburg Port Authority
thyssenkrupp
mts
PERFORATOR
VEOLIA
REMONDIS
voestalpine
ONE STEP AHEAD.
SANDVIK
WSV.de
Wasserstraßen- und Schifffahrtsverwaltung des Bundes
Eggersmann
Recycling Technology

Lift bridge.

Lifting the bridge / filling cylinders

Tank size: 5000l
Oil: synthetic esters
Operation: 10x per day



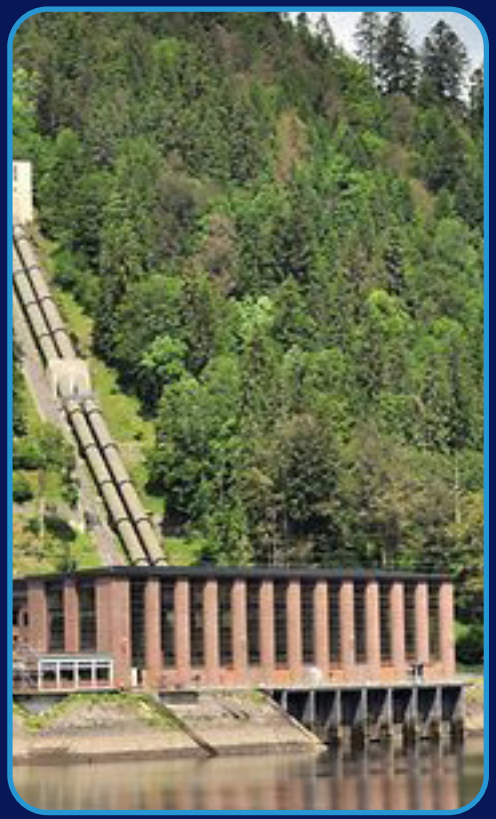


VV-RV 5L

Hydroelectric power station.

Turbine lubrication

Tank size: 1000l
Oil: synthetic esters
Operation: Continuous operation, oil circulation lubrication



VV-RV 5M

Paper machine.

Central lubrication system

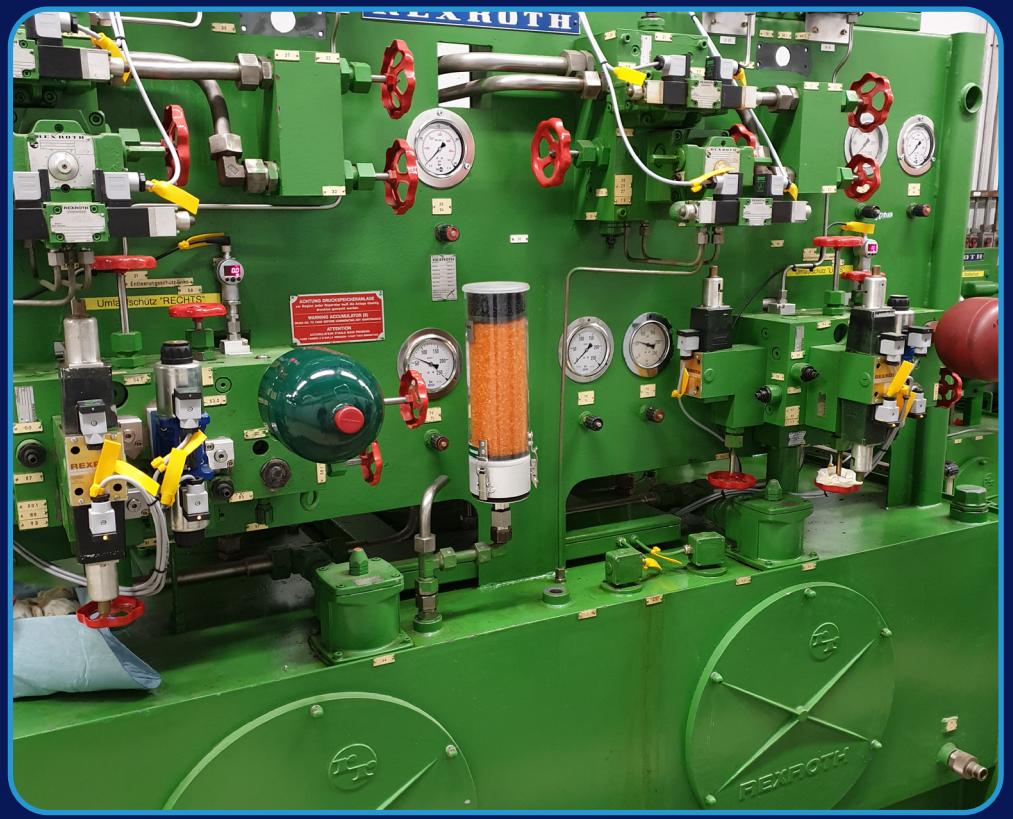
Tank size: 800l
Oil: Mineral oil HLP46
Operation: Continuous operation, oil circulation lubrication

VV-R 5M

Lock.

Moving the gates / filling cylinders

Tank size: 600l
Öl: Mineral oil HLP46
Betrieb: 20-40x per day

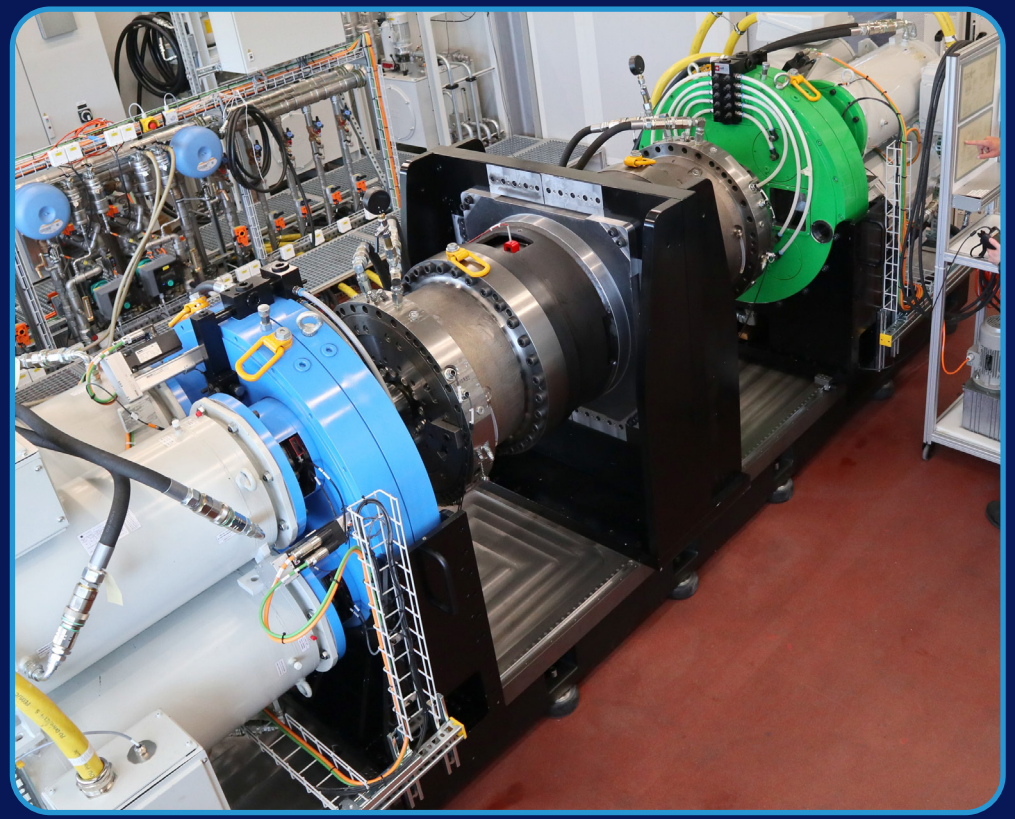


VV-DV 3L

Test bench.

Lubrication test gearbox Automotive

Tank size: 150l
Oil: Mineral oil HLP46
Operation: Continuous use, protection against oil mist



VG-D 3L

Portal lift truck.

Brake cooling & steering

Tank size: 55l
Oil: Mineral oil HLP46
Operation: Shift work, outdoor work, pendulum motion

VV-DV 2L

Tunnel boring machine.

Feed drill head

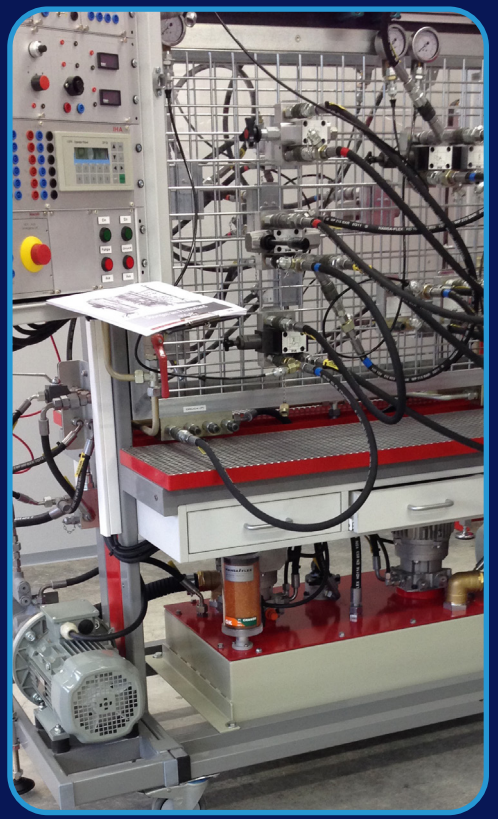
Tank size: 400l
Oil: Mineral oil HLP46
Operation: Continuous throughout operation, low pendulum

MA-RV 3M

Training facility.

Training / Presentation

Tank size: 10l
Oil: Mineral oil HLP46
Operation: Rarely, during training

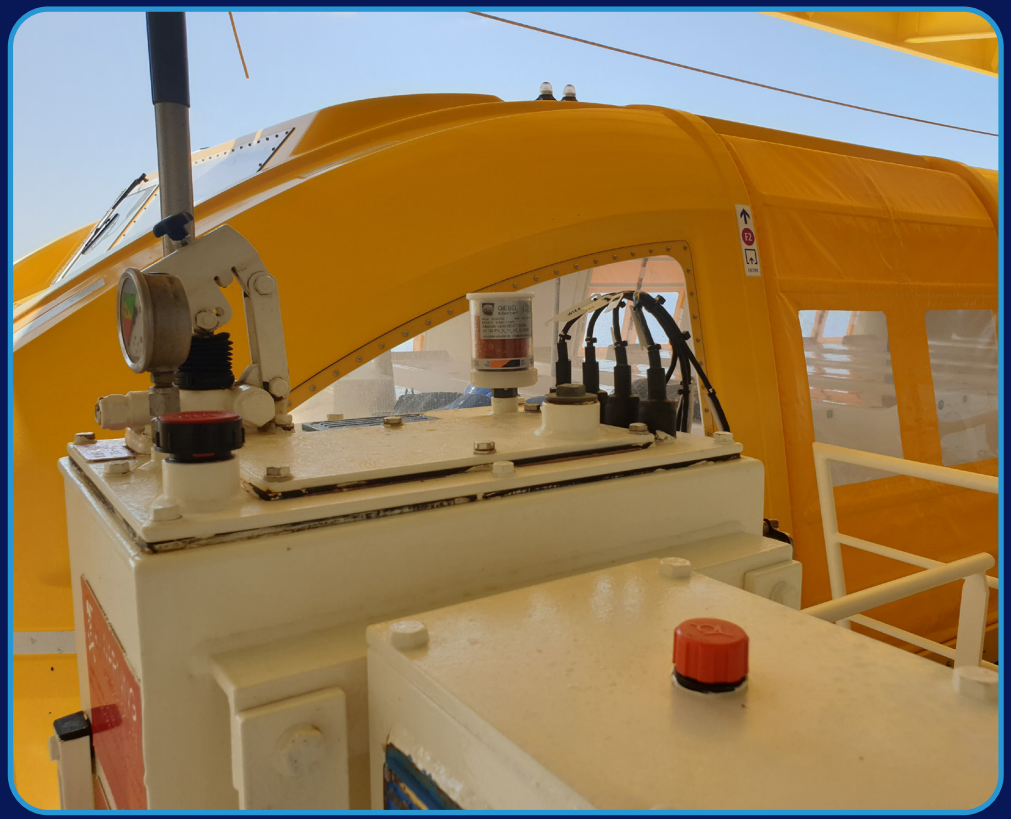


VV-DV 2L

Cruise ship.

Lowering the lifeboats

Tank size: 60l
Oil: Biodegradable oil
Operation: During tests & possibly in an emergency



VV-DV 1L

Injection molding machine.

Closing the casting tools

Tank size: 6000l
Oil: Mineral oil HLP46
Operation: Continuous operation, approx. every 100 seconds

VV-R 5L

Excavator.

Earthmoving / Cylinder strokes

Tank size: 200l
Oil: Biodegradable oil
Operation: Continuous use, outdoor use, harsh conditions

MA-R 3M +
Valve adapter 0,5 bar

Carousel.

Movement of cylinders

Tank size: 1000l
Oil: Mineral oil HLP46
Operation: Continuous use during the season, outdoor use, harsh conditions

VV-DV 3L
Wall mount
Flange adapter

Mobile machine.

Movement of the container

Tank size: 200l
Oil: Mineral oil HLP46
Operation: Little movement, long periods of standing, outdoor use, harsh conditions, mobile

VV-DV 3ML

Garbage compactor.

Cylinder of the trash compactor

Tank size: 2500l
Oil: Mineral oil HLP46
Operation: Continuous operation during shifts, dirty environment, significant temperature fluctuations

VV-RV 5L

GIEBEL Extras.

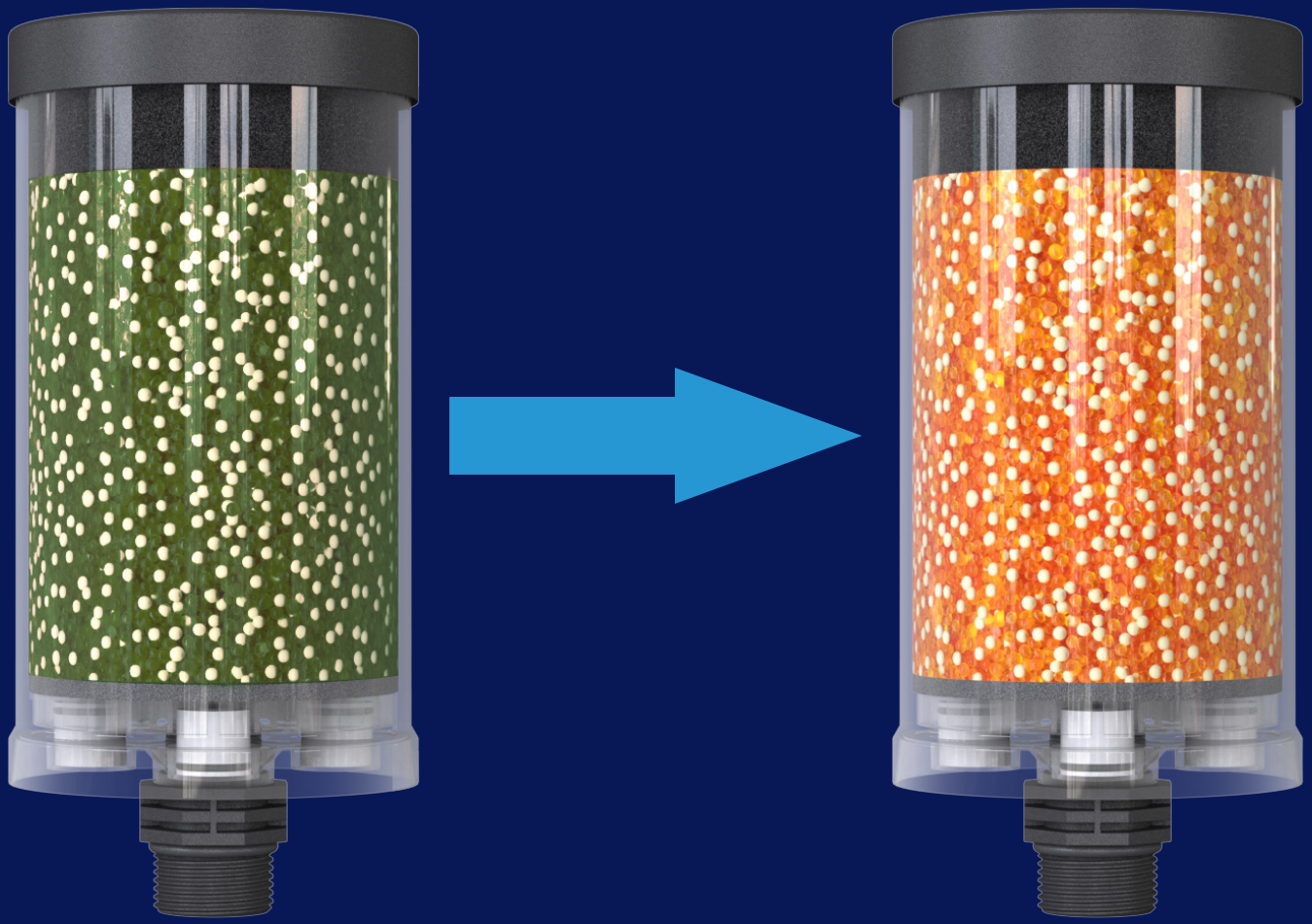
Custom design

Colored adsorber cap

Your own label to match
your corporate design

GIEBEL Extras.

Send & Refresh



For participants in the **GIEBEL Send & Refresh** System, we prepare loaded adsorbers at low cost.

You save money and operate your systems more sustainably!

No machine has to die due to **corrosion**.

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