

# 3.0 Scope of Supply

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Environmentally  
**Responsible Solutions**  
Engineered

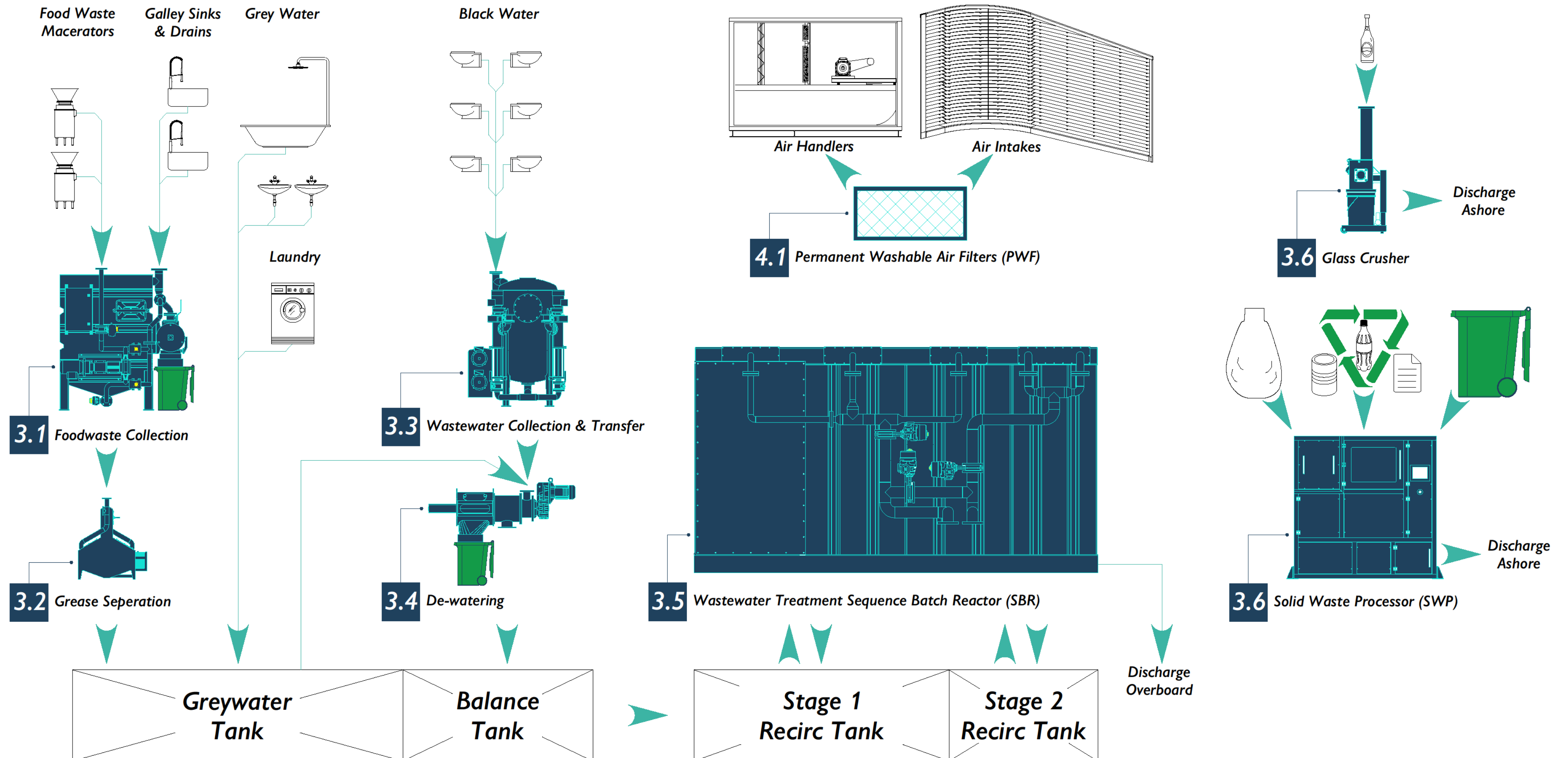
# FMD

*Fundamental Marine Developments*





# ....the path to a better environment





- ✓ Remote Operation
- ✓ Remote System Diagnostic & Monitoring
- ✓ Turnkey Solutions
- ✓ 3D Scanning & System Design
- ✓ System Integration
- ✓ Commissioning & Technical Service

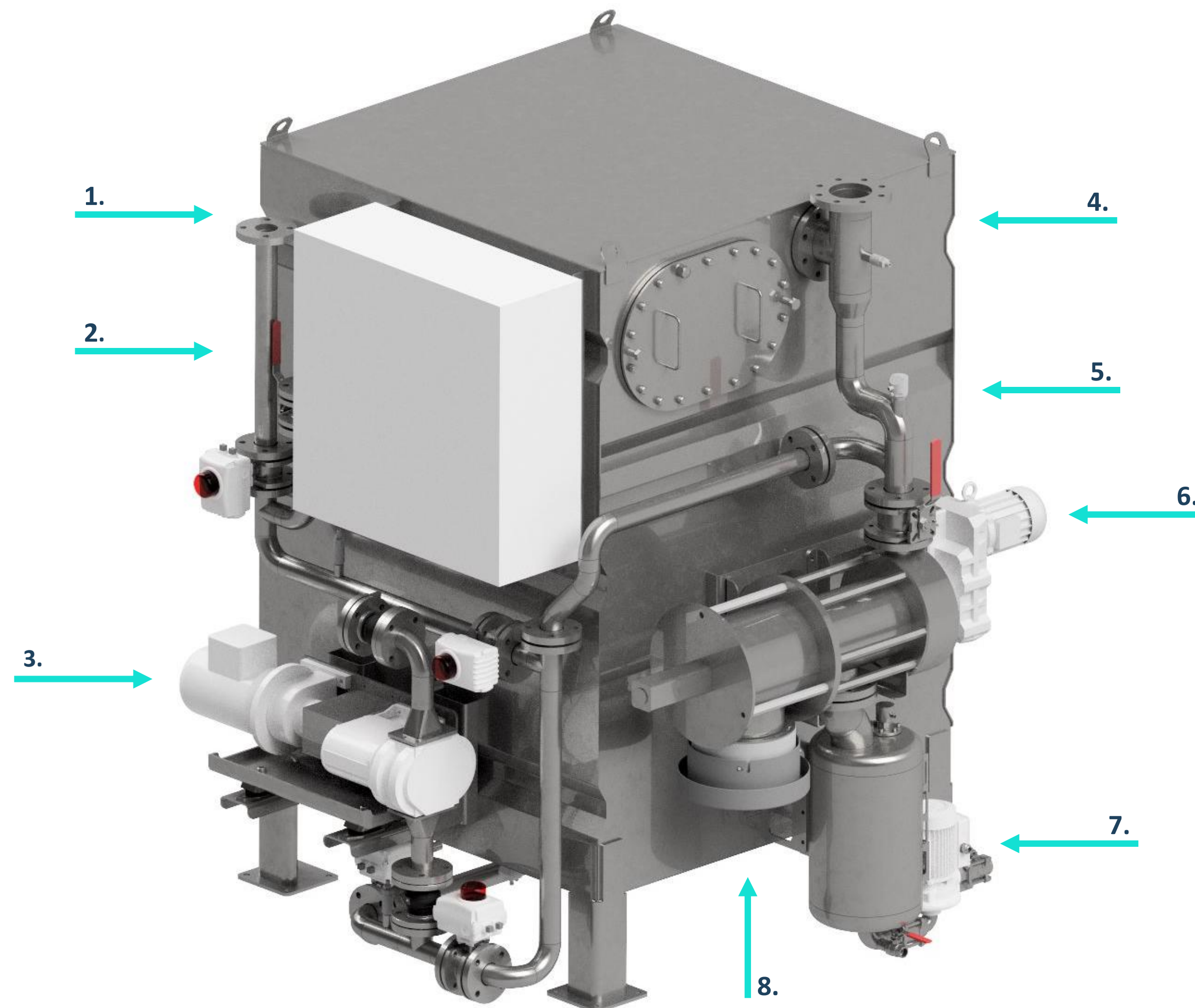


## 3.1 Food Waste System (FWS)

1. Vacuum collection of food waste from macerator stations
2. One pump for vacuum and transfer
3. Compact and simple stainless steel construction
4. Gravity feed of galley greywater to de-watering
5. Low power 0.75kW
6. De-watering of food waste & greywater
7. De-watered food waste liquor to a grease trap by gravity or transfer pump
8. De-watered solids to a sealed endless bag

The food waste is transported by vacuum from the macerator stations to the de-watering unit or the food waste collecting tank. The macerated food waste can be discharged overboard or ashore. The de-watered solids drop into a wheelie bin with an endless bag to control smells. The de-watered solids can be further processed in the SWP.

The FWS is a compact unit combining vacuum system, collection tank and de-watering system.



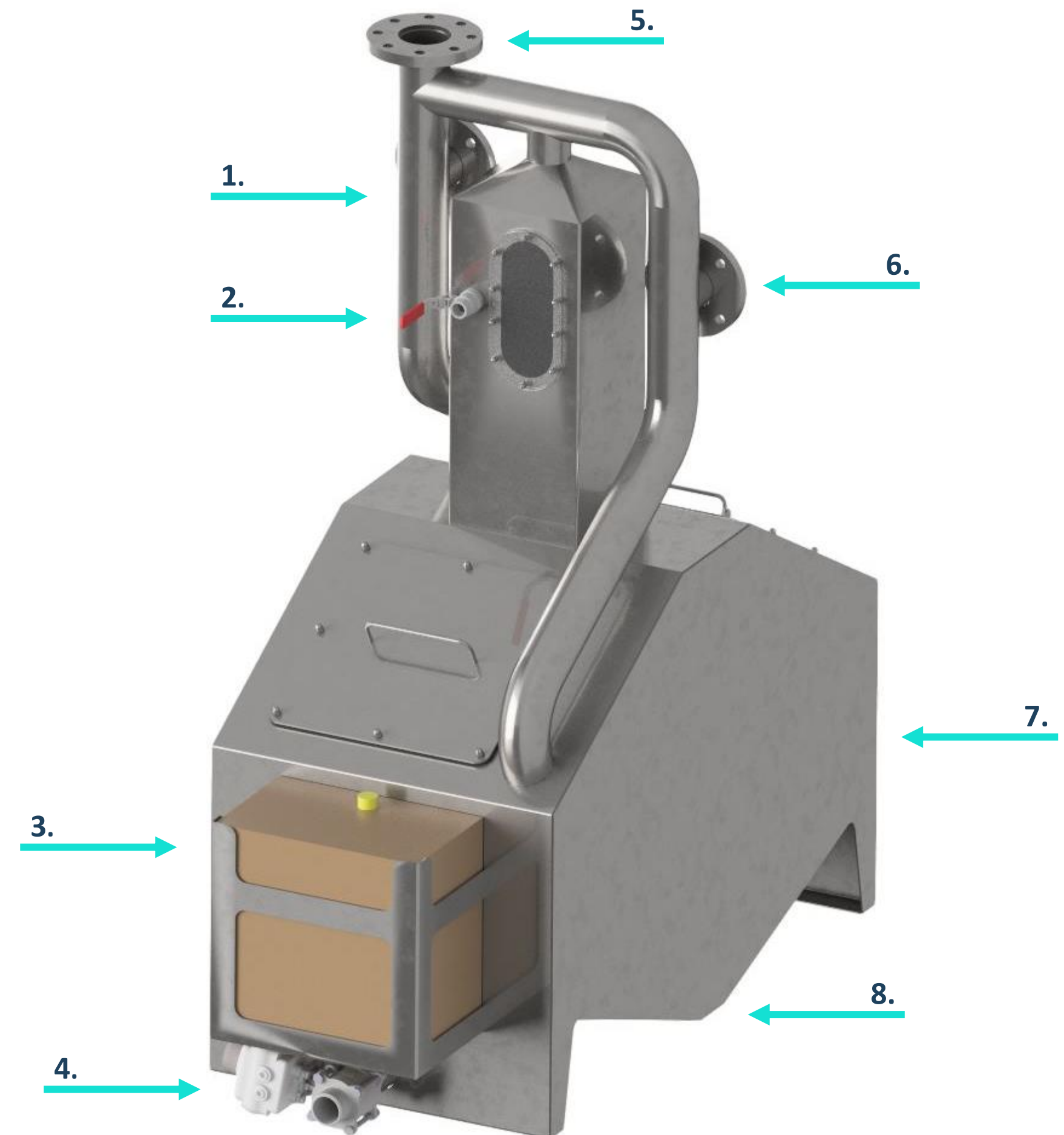


## 3.2 Grease Separator (GS)

1. Greywater inlet
2. Grease discharge
3. Grease disposal with bag in box
4. Sludge removal
5. Vent line connection
6. Greywater discharge to greywater tank
7. Compact and simple stainless-steel construction
8. Sizes NS 0.5, 1, 2 & 4

The Grease Separator uses a gravity grease separation principle with the separated greywater discharged to the greywater tank and the remaining sludge disposed of with an easy-to-store bag in box system.

Compact and simple with all-stainless-steel construction the Grease Separator is designed for reliable and efficient separation of grease from wastewater.



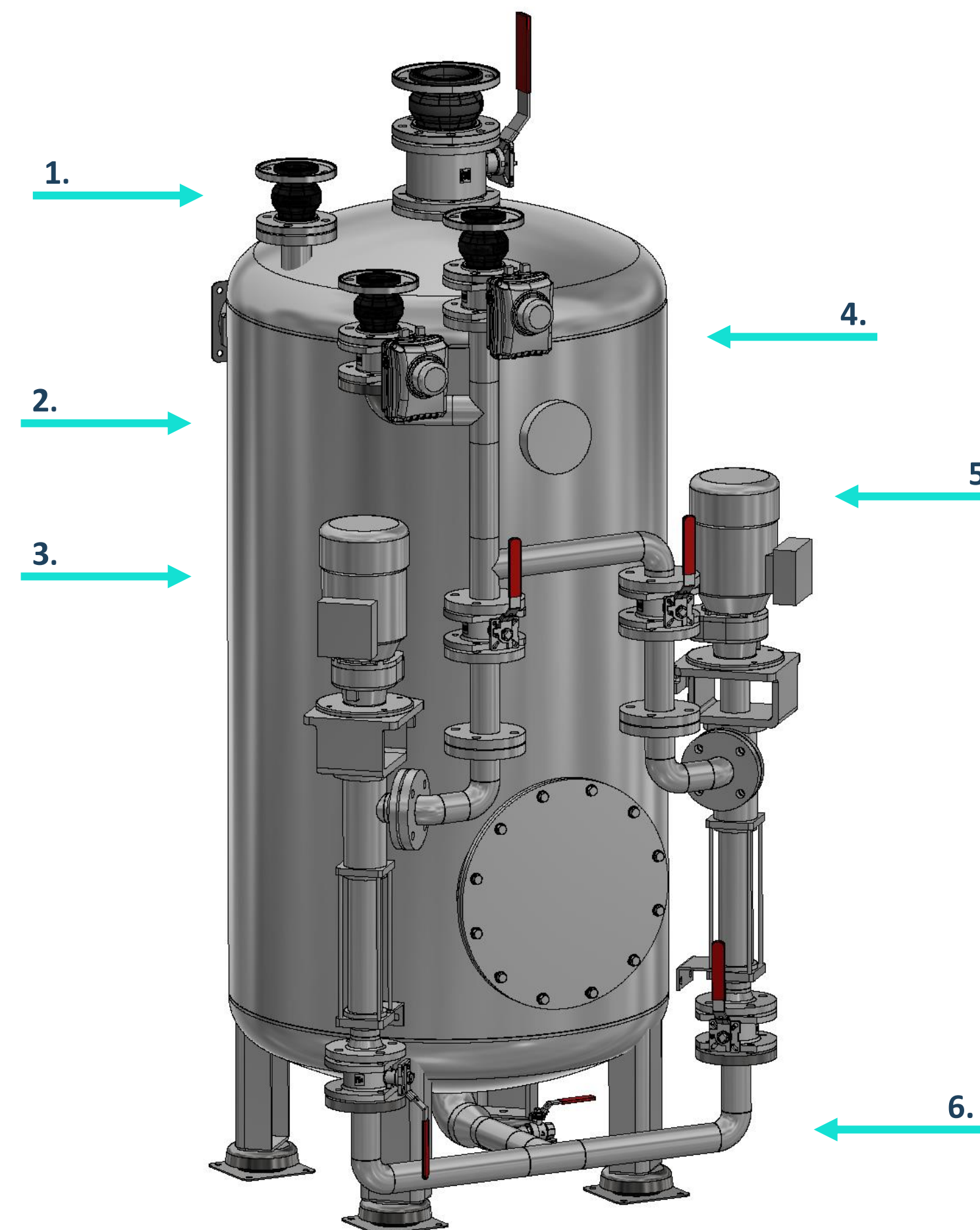


## 3.3 Wastewater Management (WWM)

1. Vent line
2. Compact and simple stainless-steel construction
3. Vacuum pump capacity 16 - 360 m<sup>3</sup>/hr
4. Vacuum tanks from 0.5 - 1.5 m<sup>3</sup>
5. Transfer pump capacity 8 - 40 m<sup>3</sup>/hr for Grey & Blackwater
6. No maceration reduces BOD, TSS, TN & TP

The wastewater is collected by vacuum and accumulated in the tank to a minimum working level. The transfer pumps deliver the wastewater to the de-watering station at a controlled rate. The compressor provides the most robust and energy-efficient method of vacuum generation and maintains a vacuum within the collection tank, a buffer that minimises the start and stop frequency.

The key advantage is that by not macerating the blackwater during the vacuum generating and transport process, the BOD level is reduced for the wastewater treatment plant.



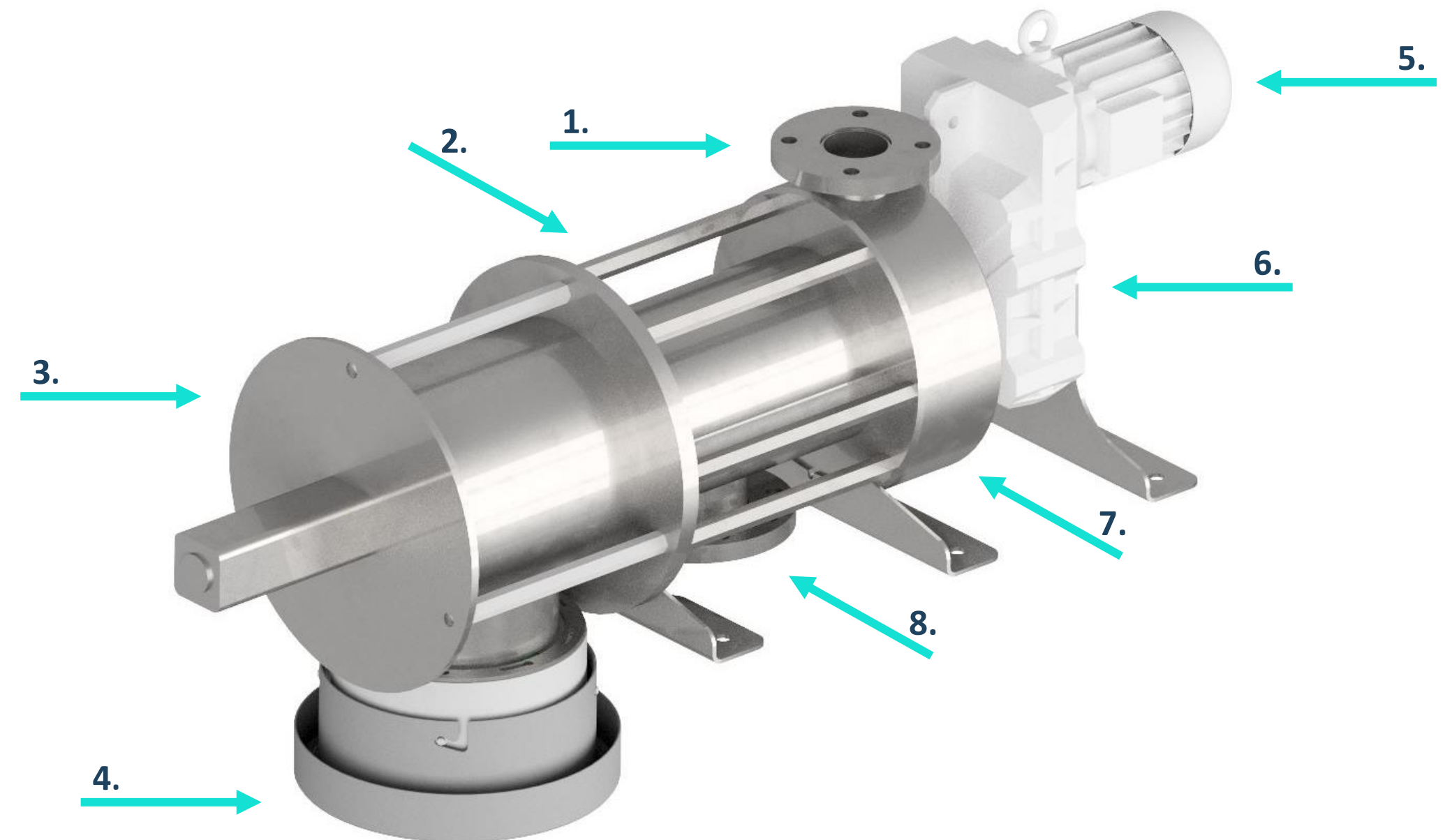


## 3.4 De-watering System (DWS)

1. Wastewater inlet
2. Solids are separated from the wastewater using a precision stainless-steel screen
3. Compact and simple stainless-steel construction
4. De-watered solids drop into a sealed endless bag to eliminate smells
5. Low power 0.75 kW 0 - 20m<sup>3</sup>/hr, 2.2 kW 0 - 40 m<sup>3</sup>/hr
6. Excellent de-watering performance with sewage, macerated food waste and sewage sludge – from 75 to 1000 microns
7. Stainless steel screw with a carbide finish
8. De-watered liquor discharge

Internally a tapered screw conveys the wastewater across a precision stainless steel screen, where the liquid is separated from the solids. The separated solids are discharged through a sealed discharge chute into an endless bag or a transport screw for larger scale systems, with the de-watered liquor flowing from the bottom of the DWS into a tank.

Highly wear-resistant screw constructed from stainless steel with a carbide finish to ensure an extremely long service life even when in contact with highly abrasive media.





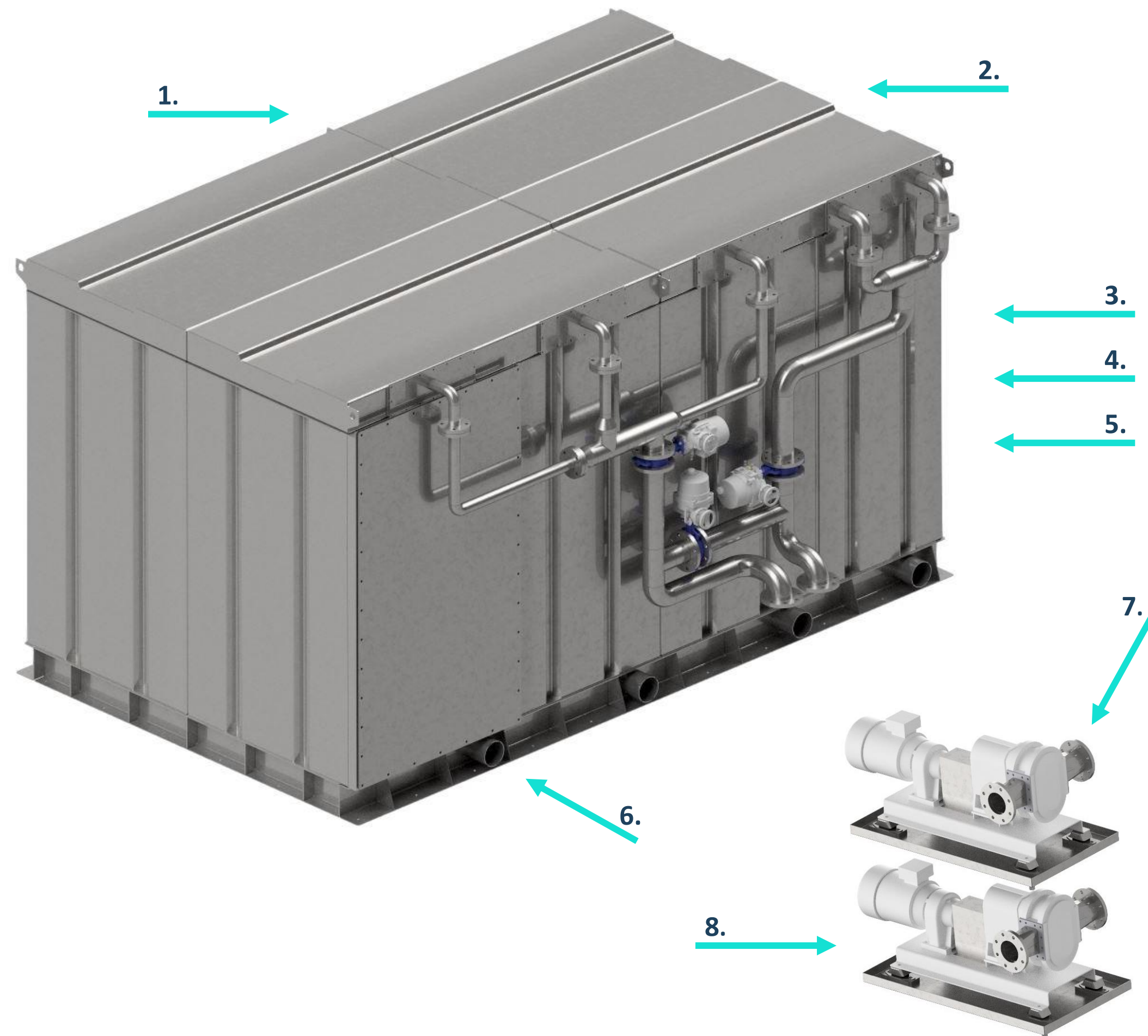
## 3.5

# Wastewater Treatment (WWT)

1. Sequencing Batch Reactor (SBR)
2. **No chemicals – No foaming – No membranes**
3. 5 Year Warranty on bio media
4. Low maintenance requirements
5. Simple all stainless-steel construction
6. Stage drains
7. Recirculation pumps stage 1 & 2
8. Low maintenance requirements

Blackwater, accommodation greywater, laundry and galley greywater are first pre-screened by the DWS to remove solids. The wastewater then flows to the balance tank, from which the SBR stage 1 takes suction. Stage 1 and 2 are running parallel for a certain time period. Each pump of each stage is pumping in a circle, spraying wastewater over the special gills to treat the wastewater.

When the set time is finished, the treatment is complete; the stage 2 pump then discharges the contents of stage 2 overboard through the UV sterilizer.





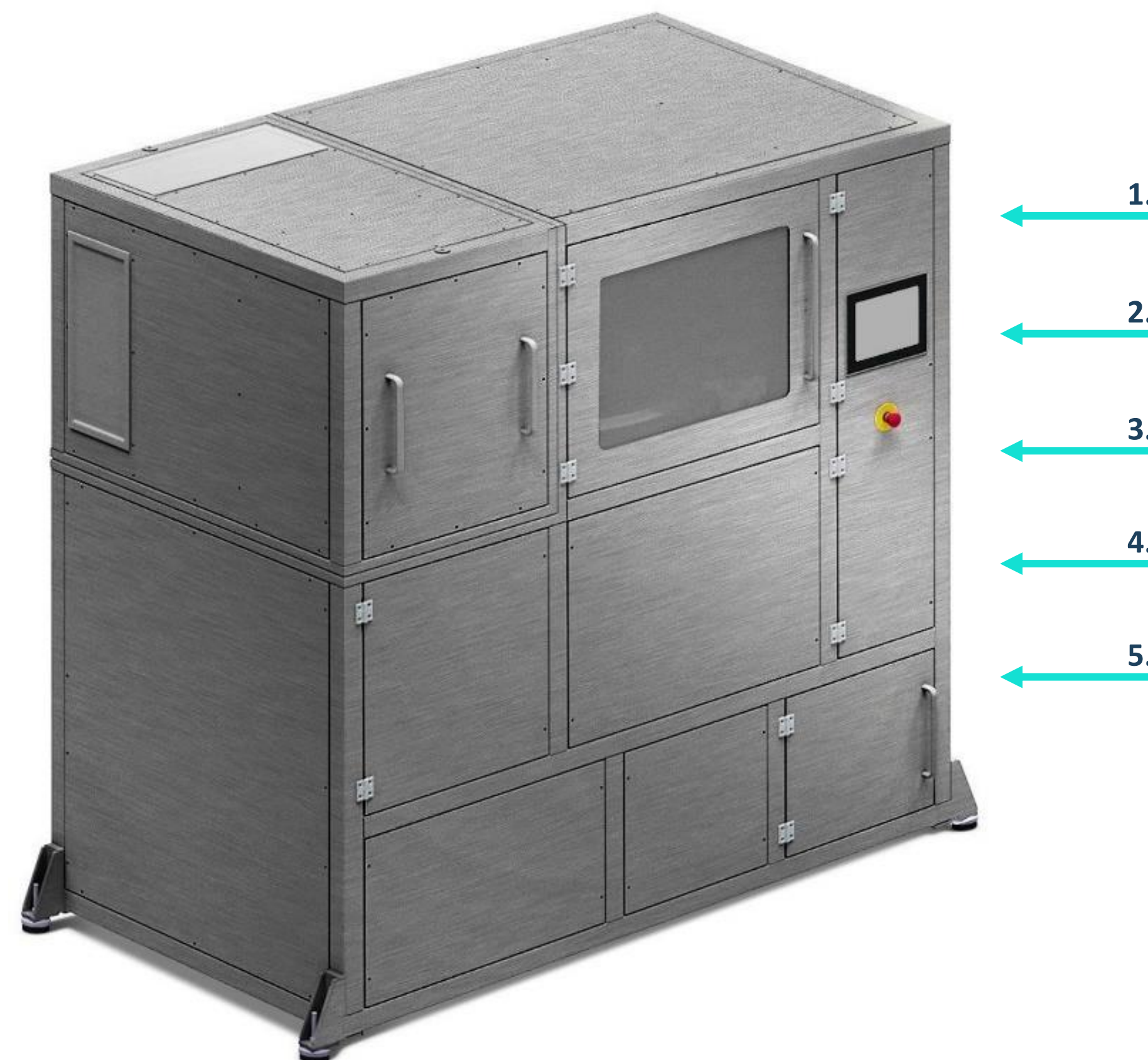
## 3.6 Solid Waste – Solid Waste Processor (SWP)

1. Stainless steel construction
2. Classifiable as ZEE, Zero Emissions Equipment
3. Processed waste can be stored at room temperature, for up to 6 months
4. Energy consumption 0.25 - 0.6 kWh/kg waste
5. Capacities:

Medical waste	20 - 40 kg/hr
Food waste	20 - 40 kg/hr
Sewage solids	20 - 40 kg/hr
Mixed waste	50 - 90 kg/hr
Tin cans	10 cycles/hr
Plastic bottles	10 cycles/hr

The SWP series of variable-speed impact mills are designed to seamlessly process separated or mixed solid waste including plastic, tins and cardboard – as well as organic fractions like de-watered kitchen and food waste. The SWP delivers a homogenous, finely-shredded, dry and stable product while simultaneously using the heat generated by friction to boil off any moisture under vacuum and finally sterilize prior to discharge.

The running process is dust and odour free, reduces the volume up to 90% and reduces the weight corresponding to the moisture removed.



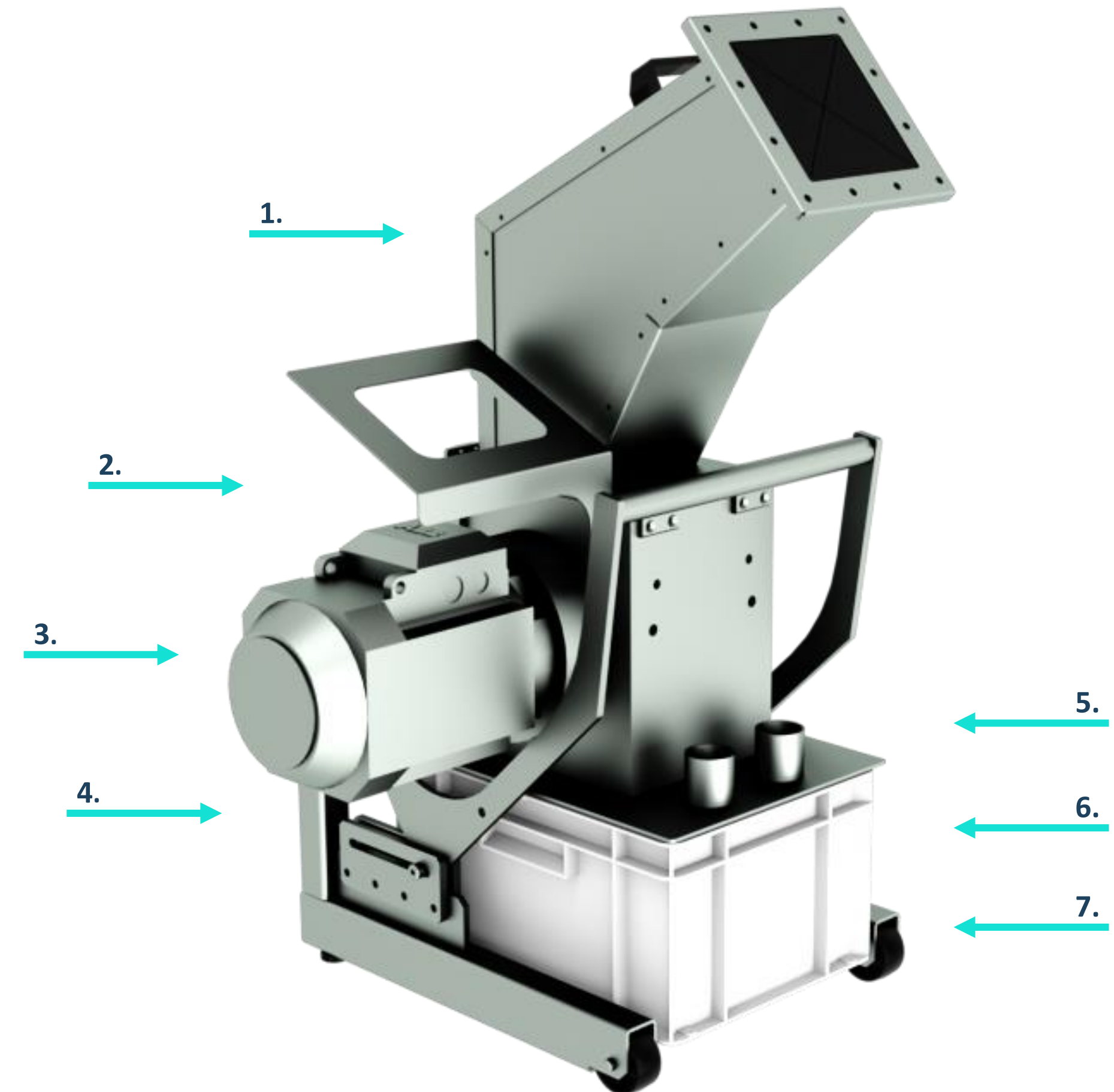


## 3.6 Solid Waste – Glass Crusher (GC)

1. Compact design 0.6 x 0.5 x 1.3 m
2. 1.5kW, 220vac 50/60hz
3. Noise 60-90db
4. Feed capacity 300kg/h
5. 3 - 5 seconds crush time
6. Safe-to-handle sand
7. ~ 90% Volume reduction

The Glass Crusher is a compact unit that crushes bottles in 3 - 5 seconds. Inside the 20L bin fit 60 wine bottles or 160 small beer bottles.

Leaving only a safe-to-handle sand.





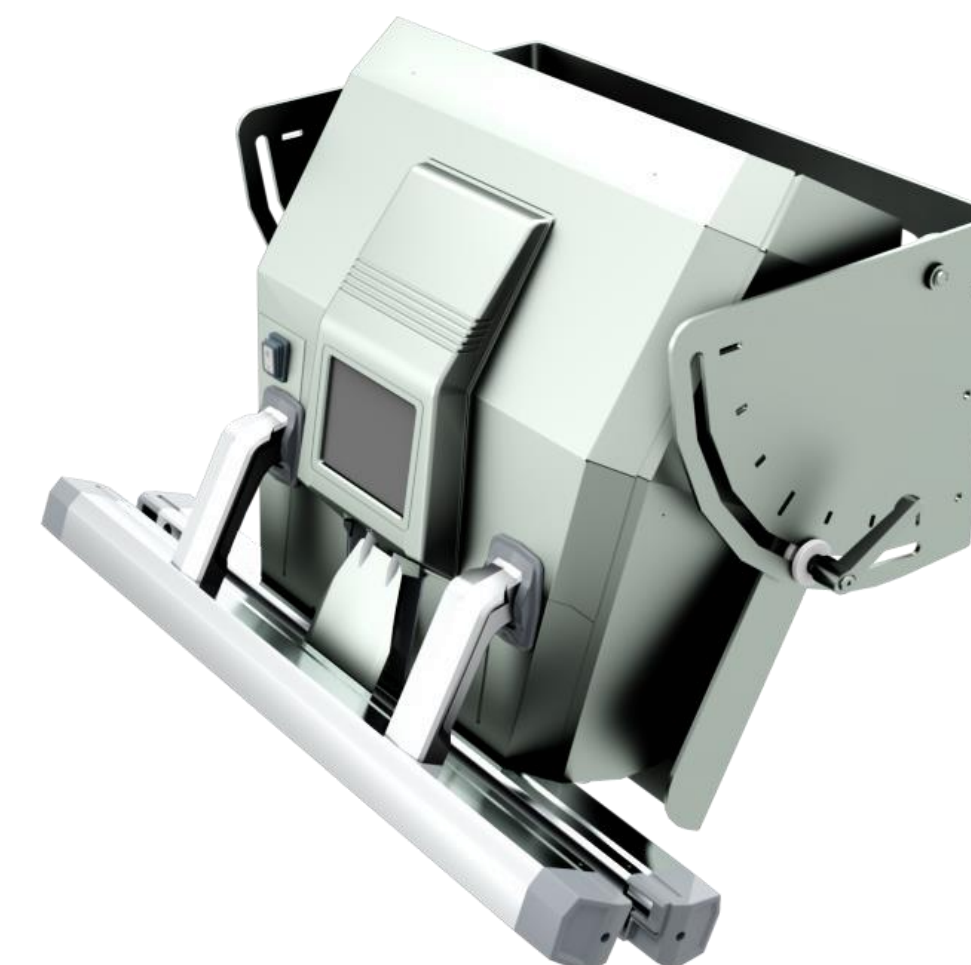
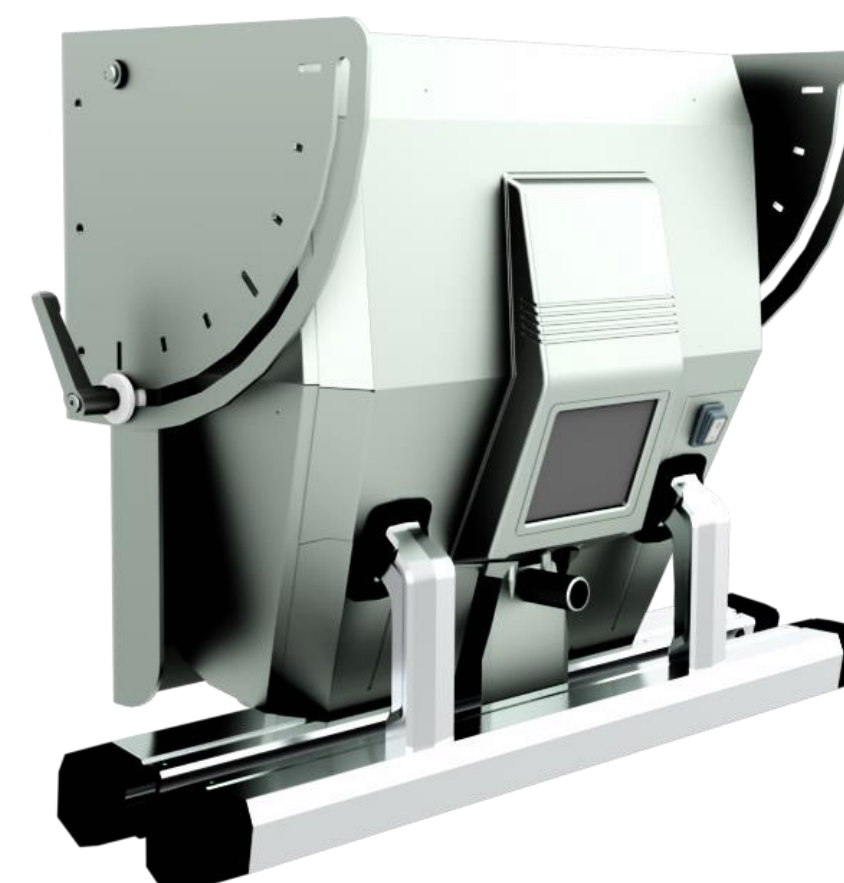
## 3.6

# Solid Waste – Vacuum Heat Sealer (VS)

1. Space efficient storage of garbage
2. Improved hygiene
3. Minimize smells & odour
4. Eliminated “bin juice”, no wasted hours cleaning garbage storage
5. Compresses rags, oily or clean
6. Safe storage and minimised volume of electronic spares, food, uniforms, linen, towels etc..

The function is simplistic, it reduces the volume of the waste in the bags by up to 50% with vacuum, then heat seals them closed. The sealed PA/PE type bags maintain the vacuum compression, whilst containing smells, liquids and other undesirables. The vacuum heat sealer can help crew manage waste onboard and eliminate annoying odours in the ship and risks of infection from contact with degrading waste.

The vacuum heat sealer can bring benefits to all departments on the vessel.





## 4.1

# Permanent Washable Air Filters (PWF)

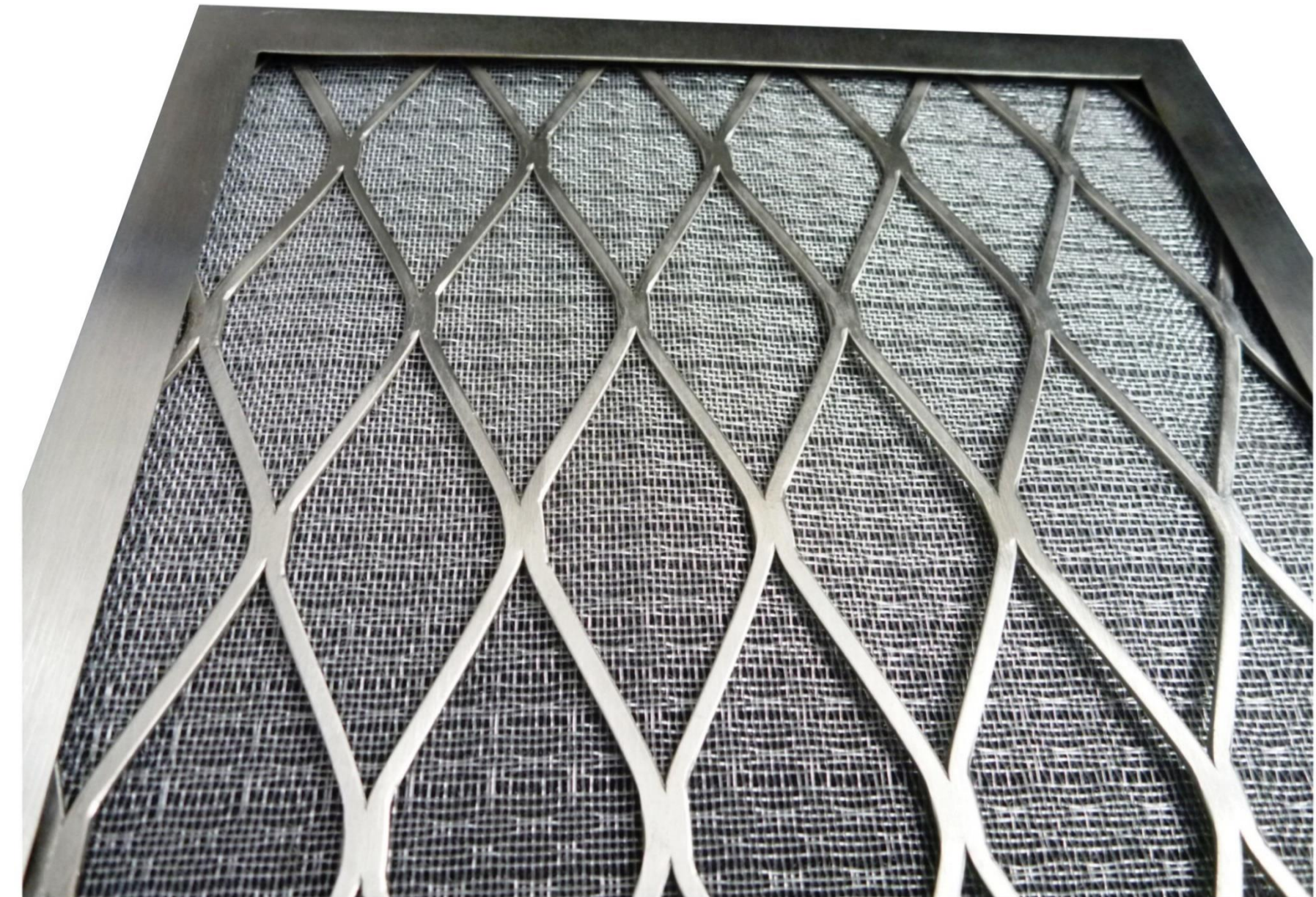


1. 316 Stainless Steel
2. Standard & custom sizes
3. 12 Year Warranty
4. Wash & re-use
5. M5 / MERV9 filter rating
6. Reduce ...
  - or eliminate disposal to landfill sites of traditional air filter media
  - storage space demands on board
  - carbon footprint

The PWF are of higher quality filtration than many traditional filter elements and can easily be washed with water. Reduced storage demands on board leading to increased volume available for alternatives.

For example, a cruise ship may have as many as 3000 disposable air filters, replaced 2 - 3 x a year, over 12 years, that's up to 108,000 disposable air filters creating a carbon footprint.

Over the same period, our permanent air filters will never need replacement.







Fundamental Marine Developments long-term focus centers on systems and technology merging within our products to bring about beneficial changes to the marine environment and our customers operation within it.



Knowledge and technology is drawn from industries and research centers all over the world to bring to the marine industry high quality leading technology that has been proven stable.



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