GEH® Adsorber Units for Water Treatment

Recommended Operating Conditions

Adsorber bed depth	0.8 - 1.6 m
Freeboard height	50 % of bed depth
Filtration velocity	≤ 20 m/h
Empty bed contact time (EBCT)	≥ 3 minutes
Permissible pressure drop	Max. 0.5 bar (7 psi)
Backwash velocity	26 m/h (with water only)
Duration of backwashing	Until outlet water is clear

Requirements for raw water

- ✓ Free of turbidity
- ✓ Positive redox potential
- ✓ No calcium precipitation

⚠ For every application, a raw water analysis should be provided to assess the adsorption performance.

1. Basic Design of GEH® Adsorber Units

- Conventional pressure filter with filter nozzles (filter floor or star-shaped hub collector), used as stand-alone unit or in combined systems arranged in parallel or series
- Air relieve valve and mechanism to prevent drainage of filter
- Additional connections for filling/removal of GEH® and for disinfection
- Differential pressure gauge and sampling valves at inlet and outlet
- Suitable materials for adsorber vessles: plastic (e.g. GRP), steel with inner surface coat or stainless steel
- Filling of bed:
  - Supporting layer of quartz gravel (particle size 2.00 - 3.15 mm) to cover the filter nozzles
  - GEH® adsorbent (bed depth between 0.8 - 1.6 m)
- Freebord, approx. 50 % of GEH® bed depth, for backwashing

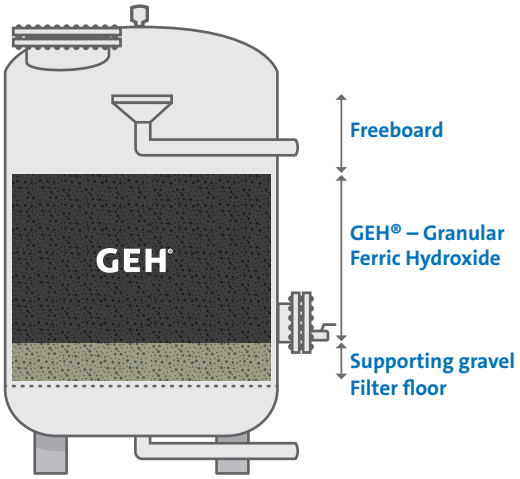


fig.1 Basic Design of GEH® Adsorber Units

2. Filling

- Partial filling with water to protect the filter nozzles while filling of gravel
- Transfer quartz gravel (DIN EN 12904 grade) supporting layer into unit in accordance with suppliers instructions, level and rinse the layer
- Inject GEH® hydraulically using water-driven injector system or place manually through manhole or filling port

⚠ Check to ensure proper functioning of the filter nozzles before placing gravel and GEH®. Take care not to crush or otherwise damage the GEH® when placing. Do not allow GEH® to get into filter nozzles.

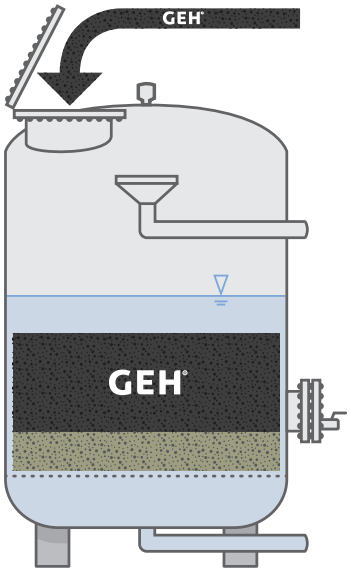


fig. 2 Filling

3. Installation backwash

- Backwash after installation to remove fines from the adsorber bed.
  - Backwash speed: 26 m/h
  - Backwash, until effluent is free of turbidity (approx. 15 minutes)

⚠ Backwash with water only.
⚠ Do not backwash with air or air/water mixture.

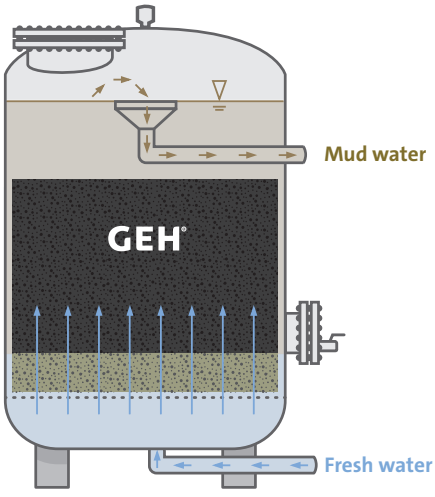
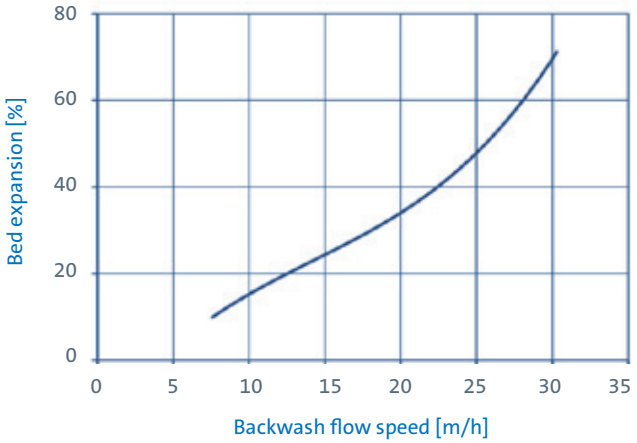


fig. 3 Installation backwash

Adsorber Bed Expansion vs. Backwash Speed



Source of solutions.

4. Disinfection

- Use chlorine bleach or hydrogen peroxide as disinfectant.
- After disinfection, backwash adsorber bed (in the same manner as installation backwash)
- Confirm successful disinfection by checking microbial parameters, i.e. conformance of treated water to applicable drinking water specification.

⚠ When carrying out disinfection, observe data and instructions given in the technical datasheet “Disinfection” from GEH Wasserchemie.

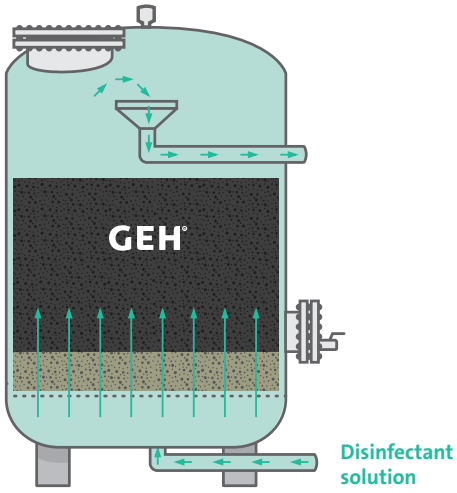


fig. 4 Disinfection

5. Adsorber operation

- Uniform flow through the adsorber bed must be ensured
- Flow speed through adsorber bed: ≤ 20 m/h
- Empty bed contact time (EBCT): ≥ 3 min
- Maximum permissible pressure drop: 0.5 bar (7 psi)
- Prevent draining of adsorber unit during operation (e.g. pressure retention valve)
- Monitor treated water for compliance with applicable water specification.

⚠ Discontinuous or intermittent operation does not impair functioning.

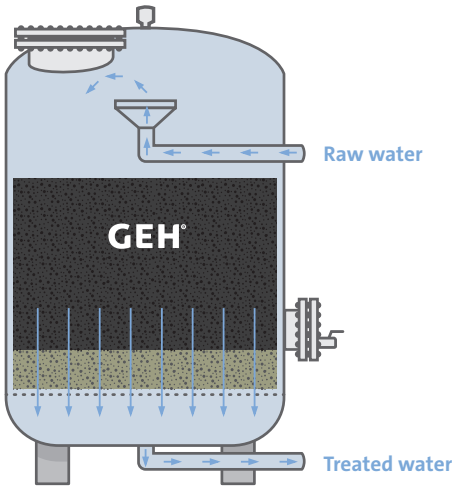
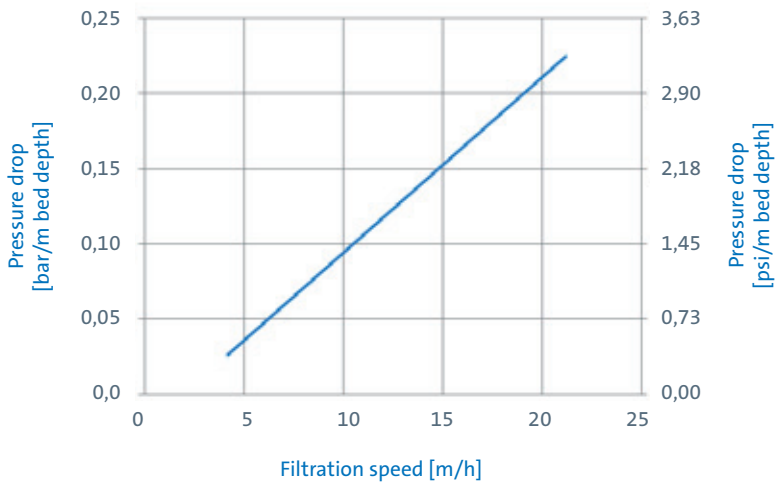


fig.5 Adsorber operation

Pressure Drop vs. Flow Speed through Bed



6. Operational Backwash

- Operational backwash to remove particulate matter retained in bed is necessary when pressure drop exceeds the maximum permissible value of 0.5 bar (7 psi).
- Backwash process (upflow configuration):
  - Backwash speed: 26 m/h
  - Duration: until effluent is free of turbidity (approx. 10 minutes).
- Treatment of backwash water to meet local discharge requirements, if necessary

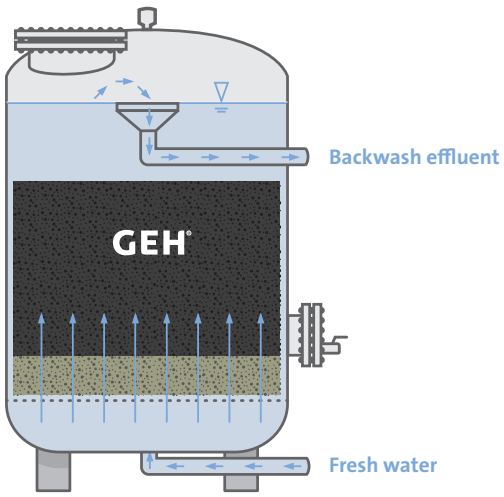


fig. 6 Operational Backwash

7. Replacement of GEH®

- When treated water quality drops below specification, the GEH® bed must be replaced. Removal is normally carried out by vacuum transfer or flushing out through the lower removal channel.
- Disposal or use of exhausted GEH® must be in compliance with applicable waste regulations.

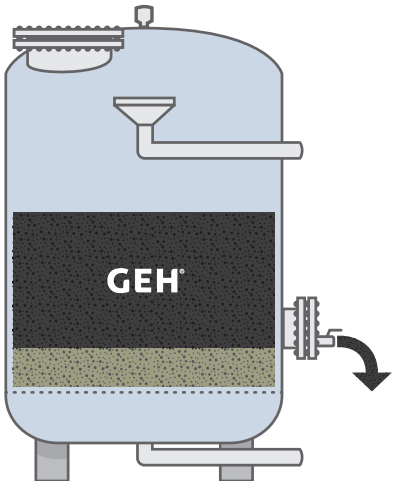


fig. 7 Replacement of GEH®

Important Information

- All work described above is to be done by qualified technical personnel only and in accordance with all applicable safety regulations.
- Every application in water treatment is unique. The application must be studied in detail including all peripheral factors before the operating conditions of the GEH® system can be determined. Accordingly, the recommendations given above are general in nature and not legally binding.
- We will gladly provide application advice regarding dimensioning and operation of your GEH® adsorption unit.
- Please observe all instructions and information given in our product data sheets and safety data sheets.

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