ROEVAC® Vacuum Sewer Systems

Location

ISO 9001 Production Facility in Tostedt, near Hamburg

Main Office in Hanau, near Frankfurt/Main

Regional Offices
## ROEVAC® Vacuum Sewer Systems

### Engineering & Construction

<table>
<thead>
<tr>
<th>Company</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilfinger Berger Umwelttechnik GmbH</td>
<td>Aarbergen (D)</td>
</tr>
<tr>
<td>Passavant-Roederger Anlagenbau GmbH</td>
<td>Hanau (D)</td>
</tr>
<tr>
<td>Passavant-Roederger Free Zone Establishment, Fujairah (VAE)</td>
<td></td>
</tr>
<tr>
<td>Passavant-Roederger Enviro-tech Co., Ltd., Hangzhou (CN)</td>
<td></td>
</tr>
<tr>
<td>Roediger (Thailand) Co., Ltd., Bangkok (THA)</td>
<td></td>
</tr>
<tr>
<td>Passavant-Roederger Bulgaria PLC, Sofia (BG)</td>
<td></td>
</tr>
<tr>
<td>Passavant-Roederger Romania S.R.L., Bukarest (RO)</td>
<td></td>
</tr>
<tr>
<td>Passavant-Roederger Hungaria Kft., Budapest (H)</td>
<td></td>
</tr>
<tr>
<td>Passavant-Roederger Controls GmbH, Aarbergen (D)</td>
<td></td>
</tr>
</tbody>
</table>

### Products & Services

<table>
<thead>
<tr>
<th>Company</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passavant-Geiger GmbH, Aarbergen (D)</td>
<td></td>
</tr>
<tr>
<td>Umat Deponietechnik GmbH, Hanau (D)</td>
<td></td>
</tr>
<tr>
<td>Passavant-Intech GmbH, Rimpar (D)</td>
<td></td>
</tr>
<tr>
<td>Noggerath France Eurl, Saint Jean le Blanc (F)</td>
<td></td>
</tr>
<tr>
<td>Passavant-Geiger Hong Kong Co., Ltd., North Point (HK)</td>
<td></td>
</tr>
<tr>
<td>Roediger AG, Münchenstein (CH)</td>
<td></td>
</tr>
<tr>
<td>Passavant-Roederger Aquatreat LLC, Amman (JOR)</td>
<td></td>
</tr>
</tbody>
</table>

### Remediation of Contaminated Sites and Landfill Engineering

<table>
<thead>
<tr>
<th>Company</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilfinger Berger Umweltsanierung GmbH, Essen (D)</td>
<td></td>
</tr>
<tr>
<td>Bilfinger Berger Entsorgung GmbH, Mannheim (D)</td>
<td></td>
</tr>
<tr>
<td>Bilfinger Berger Entsorgung Ost GmbH, Deutzen (D)</td>
<td></td>
</tr>
<tr>
<td>Bilfinger Berger Entsorgung Nord GmbH, Hamburg (D)</td>
<td></td>
</tr>
<tr>
<td>Bilfinger Berger Entsorgung Süd GmbH, Dornach (D)</td>
<td></td>
</tr>
<tr>
<td>Bilfinger Berger Environmental Ltd., Surrey (GB)</td>
<td></td>
</tr>
</tbody>
</table>

### Vacuum Technology

<table>
<thead>
<tr>
<th>Company</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum Sewerage Solutions GmbH, Hanau (D)</td>
<td></td>
</tr>
<tr>
<td>Roediger Vakuum- und Haustechnik GmbH, Hanau (D)</td>
<td></td>
</tr>
<tr>
<td>Airvac Inc, Rochester (USA)</td>
<td></td>
</tr>
</tbody>
</table>

---

1) Bilfinger Berger Free Zone Establishment, Fujairah (VAE)
2) Passavant Intech GmbH, Hanau (D)
3) Passavant-Roederger Aquatreat LLC, Amman (JOR)
Project Business Fields

- ROEVAC® Vacuum Sewer Systems OUTDOOR
- ROEVAC® Vacuum Sanitation Systems INDOOR
- Evacuation Systems for TRAINS / AIRPLANES
- Decaying Plants for HOSPITALS
Project Business Fields

ROEVAC® Vacuum Sewer Systems (Outdoor)

- The Alternative to Gravity Sewer Systems
- More Economic and Faster Installation than Conventional Systems
- Ideal for Municipal and Industrial Wastewaters
- Standardized Technology, as per European Standard EN 1091, DWA-ATV 116
- Recommended by many Authorities, Consultants and Operators
Typical Applications

- Flat Terrain
- Expanded Municipalities, Residential, Touristic Industrial, Commercial Areas, Harbours, Marinas
- High Ground Water Tables
- Trenching in Rocky and Sandy Environment
- Ecologically Sensitive Areas – Ground Water
Typical Applications
ROEVAC ® Vacuum Sewer Systems

Typical Applications
Functional Description

Vacuum Sewer Systems

Vacuum Station

Vacuum Sewers

Vacuum Valve Unit (CC)
Functional Description: ROEVAC® Collection Chambers

The chamber is fully emptied when the vacuum (interface) valve opens.

Suction to the Vacuum collection line.
Functional Description

ROEVAC® Vacuum Sewer Systems

- Waste Water
- Air
- ROEVAC® Collection Chamber (CC)
- ROEVAC® Vacuum Valve Unit
- Vacuum Sewers
- ROEVAC® Vacuum Station
- Vacuum Pumps
- Bio Filter
- Vacuum Vessel
- Waste Water to STP
Functional Description and Wastewater Flow Diagram

The Vacuum Station

The Collection Chambers and Vacuum Collection Line
Functional Description

Vacuum Sewer Piping (Saw Tooth Profile)

Gravity Sewer Piping

Manholes

Lifting Stations

Slope min. 0.2%

l = max. 100 m

Roevac® Inspection Pipes
Functional Description – Sawtooth Profiles
Functional Description

Recommended Inspection Pipes for Pressure Testing

Flow Velocities about 3 - 5 m/s

→ NO sedimentation
→ NO Manholes
Advantages

ROEVAC® system:

Any Leakage will be identified a priori through an extended Pump Run Time.

NO Exfiltration in vacuum systems.

Optional Inspection Pipes allow for complete supervision.

The Use of the ROEVAC® Vacuum Sewer System is recommended by many Authorities especially for Water Protection Areas.

GRAVITY:
Fissures & Leakage

VACUUM:
No sewage Leakage,
No Environmental Contamination
Advantages

Gravity Piping

The fresh water pipeline must be installed in a separate trench and on a higher level than the sewer pipe.

Vacuum Piping

It is possible and allowed to locate both the potable water pipe as well as the vacuum sewer pipe within one single trench.

Fresh Water and Sewer Pipes:

The Fresh Water Pipe / Irrigation Pipe can be laid together in ONE trench with the Vacuum Sewer Pipe!
ROEVAC® Vacuum Sewer Systems

Advantages

Water and Sewer Pipes in the same Trench:

ROEVAC® Vacuum Sewer with Inspection Pipe (black, small diameter, HDPE)

Fresh Water Pipe (blue)

Stormwater Sewer (grey, large Diameter, concrete)
Advantages

**High Costs**
- deep Trenches (3 – 8 m)
- complicated Excavation
- large Pipe Diameters
- difficulties in Case of a high Ground Water Table and static Charges
- heavy Machinery required

**Low Costs**
- narrow and shallow Trenches
- Depth of 1 - 1.2 m
- small Diameter (80 - 250 mm)
- Plastic Pipes (PE or PVC), SDR11
- simple or even no Machinery for Excavation
- fast Trenching
Advantages

**Gravity**
- Profound Trenches, intermediate Pumping

**Vacuum**
- Sewers laid close to the Surface

ROEVAC® Vacuum System:
- No Sedimentation
  (even for fluctuating flows in touristic areas)
- No Smell / No Fouling
  (less H₂S)
- No Infiltration of Ground Water
ROEVAC® Vacuum Sewer Systems

Advantages

Gravity

In Case of Obstacles difficult bypass

Vacuum

Obstacles may easily be over- or under-passed

ROEVAC® Vacuum System:

Even unexpected Obstacles discovered during Construction Works can easily be bypassed by a modified and more flexible Vacuum Sewer Pipe Laying
ROEVAC® Vacuum Sewer Systems

Advantages

ROEVAC® Vacuum Sewer System: easy Excavation with shallow trenches
Advantages

NO deep and wide trenching with heavy machinery

Photos below: difficult excavation with GRAVITY System
Advantages

NO deep excavation under rocky ground conditions
ROEVAC® Vacuum Sewer Systems

Advantages

No deep excavation in sandy or swampy grounds
Photos below: Risky Gravity Pipe Installation
ROEVAC® Vacuum Sewer Systems

Advantages

Easy and Fast Trenching for ROEVAC® Vacuum Sewers in Africa and Asia

The installation can easily be done by local contractors and pipe suppliers.
ROEVAC® Vacuum Sewer Systems

Advantages

Gravity

Traffic is interrupted during Construction Works

Vacuum

Vacuum Sewers are laid on either Sides under Footpath of the Street

ROEVAC® Vacuum System:

Little Impact on local Traffic

Small Pipes and Trenches
Advantages

- Deeper Trenches
- Larger Pipe Diameters
- Complicated Excavation
- Heavy Machinery required
- Unstable or rocky Underground
- High Ground Water Table
- Lower Population Density
- Additional Pumping Stations required
- Additional Flushing Water required

The diagram compares ROEVAC® Vacuum Sewer Systems and Gravity Systems based on various conditions, showing the cost implications (€/Y/£/AED) for each scenario.
References

Formula 1 Speedway in Shanghai, CHINA
References

Touristic Areas along the Rhine lakes, GERMANY

2 vacuum stations
For approx. 5000 PE in summer
References

University Sabak Bernam, MALAYSIA
References

Residential Area in MALAYSIA

(8,000 PE)
References

Hotel Ressorts and Cottages in Langkawi, MALAYSIA
References

Storical City of Potidea, GREECE

2 ROEVAC® vacuum stations, 3500 PE
References

Olympic Sailing Centre, Athens, GREECE

ROEVAC® Boat Evacuation Units for Wastewater resp. Bilgian Water from Ships and from Marina buildings
References

Palm Island Jumeirah, Dubai
References

Palm Island Jumeirah: 2300 villas (23,000 PE), app. 40 km vacuum sewer lines, 1050 collection chambers, 1 Central ROEVAC® Vacuum Station
References
References

Palm Island Jumeirah, Dubai
References

Durrat Al Bahrain, 400 x G75 Chambers, 3 Vacuum Stations
References

Occidental Mukhaizna, OMAN
Oilfield Labour Camp

130 x G75 Chambers, 1 Vacuum Station
References

MOROCCO: sites under construction
Port De Saidia Marina with Restaurants and Bungalows
Vacuum Stations

Different Buildings for the Vacuum Station
Vacuum Stations  

Tailored (left) and Compact (right) Vacuum Stations
Vacuum Stations

Small Vacuum Station Building with vertically installed buried Vacuum Tanks, Bio-Filter and Collection Chamber
Vacuum Stations

Vacuum Vessels with Reserve Volumes
Vacuum Stations

Wastewater Discharge Pumps
Vacuum Stations

Air Suction with Duty and Standby Vacuum Pumps (here 15 KW)
Vacuum Stations

Optional Biofilter for the Suction Air with Bark Refill
The chamber is fully emptied when the vacuum (interface) valve opens
ROEVAC® Collection Chamber, Type „G“ 65 (passable)

Chamber Ventilation through the (passable) covering lid → no extra vent pipe required!
Collection chamber body:

- Body of collection chamber is made of PE
  Durable, water-tight, light weight, easy-to install

- Vacuum valve unit is completely separated from the wastewater collection sump
  No flooding of controller and valve monitoring unit, the vacuum valve unit remains always clean and hygienic

- Flexible installation depths
  Easy adjusting depending on gravity inlet and for installation on site

- Self-cleaning sensor pipe, due to installation perpendicular to suction pipe!
  → no fat-clogging

- Patented
ROEVAC® Collection Chambers, type „G“ : Advantages 2/4

Collection chamber body:

- Aimed “Bottle-neck” construction
  Limitation of the size of sucked solid pieces;
  simply cleaning of the sump and collection chamber with cleaning lance (bypass) and without getting “dirty hands”

- Each chamber/valve can be isolated from the main line, by inserting a handy interruption plug
Vacuum valve and Controller unit:

- Membrane Valve with no sensitive piston (could clog with sand, due to direct contact with wastewater)

- Valve opening not until -0.22 bar
  (European Norm: “opening limit -0.15 bar or higher)
  Prevention of flooding of the lines

- Complete opening of the vacuum valve as well as in the vacuum low range
  (Situation: valve always fully open or fully closed – never half open !)

- In low range vacuum (-0.3 bar) the controller unit opens earlier (lower sensor pressure needed)
  Fewer amount of sucked waste water
  → optimized recovery of the vacuum collection lines, e.g. highest system performance due to optimized Air-Liquid-Ratio

- In high range vacuum (-0.6 bar) the controller unit opens later
  → minimized air suction, e.g. minimized energy costs !
ROEVAC® Collection Chambers, 65 (2.5“) Vacuum Valve : Advantages 4/4

2.5” (65) ROEDIGER Standard Vacuum Valve unit,
Membrane Type :

- Smart dimensions and clear design with few pieces
- No clogging
- Simple and tough construction
- Easy maintenance
  Exchange only of the membrane, very simple (time for exchange: app. 3-5 min)
ROEVAC® Collection Chambers, 75 (3“) Vacuum Valve

The 3“ (75) Roediger Vacuum Valve unit,
Pinch type:

For special applications on demand
ROEVAC® Collection Chambers

Passable, Heavy-duty and Floodable Version
ROEVAC® Collection Chambers

Installations in France and Spain
ROEVAC® Project Support with International Partners

Examples:

Southern Africa

South East Asia
Summary of Advantages

- Closed System – no Leakage, no Odour
- Only one central Vacuum Station – no further Lifting Stations required
- No Blockage – No Flushing (Water Saving effect)
- No Clogging due to high Velocity in the Sewer Pipes
- Flexible System
- No electrical Connection except at the Vacuum Station
- Small Diameter Pipes (DN 80 to DN 250); HDPE or PVC SDR11 (PN10)
- Shallow, fast and easy Trenching
Summary of Advantages

- No Manholes required – no possibility of throwing rubbish into the sewer
- **No Flushing Tanks required – Significant Water Saving**
- Reduction in Maintenance & Operating Equipment Infrastructure
- No Ground Water Pollution – No Exfiltratrion
- No Storm / less Ground Water Infiltration
- Smaller Sewage Treatment Plants possible
- Low Maintenance Works to be done
Project – specific Design Support

- Feasibility Studies
- Cost Estimations
- Hydraulic and Hydro–Pneumatic Calculations
- Technical Support, Analysis of critical Situations
- Arrangement of Longitudinal Piping–Profiles
- Design of Vacuum Station
- Delivery of Drawings and Documentation, Installation and Commissioning of Vacuum Systems
- Construction Field Training and Service
- Maintenance Support / Training / Optimization and After Sales
- Marketing Support with over 400 Reference Sites worldwide
Further ROEVAC® Systems: Airplane Evacuation Devices

Evacuation Pits for flexible and optimized Airport Management
Further ROEVAC® Systems: Evacuation Devices for Trains

Drop-Free and Fast Evacuation
Further ROEVAC® Systems: Decaying Plants for Hospitals

Minimization of Decaying Vessels when using Vacuum Toilets for Radioactive Urine
Further ROEVAC® Systems: Vacuum Sanitation Systems (INDOOR)

The ROEVAC® Vacuum Toilets flush efficiently with just 1 (!) litre of water.
Further ROEVAC® Systems: Vacuum Sanitation Systems (INDOOR)

Flexible Indoor Pipings with small diameters for Complex Buildings
Further ROEVAC® Systems: ECOSAN (decentralized Solutions)

Vacuum Toilets are the key technology for great Water Savings. Thus decentralized collection of Concentrated Brownwater becomes possible and provides the possibility to install Anaerobic Treatment with Biogas reactors (Ecological Sanitation = ECOSAN).
Thank you for the attention !