Roediger Vacuum GmbH
Kinzigheimer Weg 104-106
63450 Hanau, Germany
Phone: +49 6181 309 - 274
Telefax: +49 6181 309 - 277
www.roevac.com
export@roevac.com

RV · EN · Sewerage 10/2007 - 1001

ROEDIGER VACUUM

RoeVac®
Vacuum Sewer Systems

Vacuum Technology

INNOVATIVE TECHNOLOGY FOR COLLECTING WASTEWATER

BILFINGER BERGER Umwelttechnik

Above: RoeVac® Vacuum sewer system in the rural community of Nordstrand, Germany (approx. 1000 PE).

Below: RoeVac® Vacuum sewer system for cottages in a hotel resort, Malaysia (approx. 1,500 PE)

Cover: Palm Island Jumeirah, Dubai. Approx. 23.000 PE are connected to the RoeVac® system.

Vacuum Sewer Systems

Conventional gravity sewer systems might cause problems to mayors, project developers and property owners: high costs, slow progress of construction work, restricted traffic flow. Once the sewer is built, there can occur odour, rodent, expensive maintenance and groundwater infiltration. Designers and construction company often have to deal with difficult subsoil conditions, dewatering of trenches, crossing lines, obstacles and static problems.

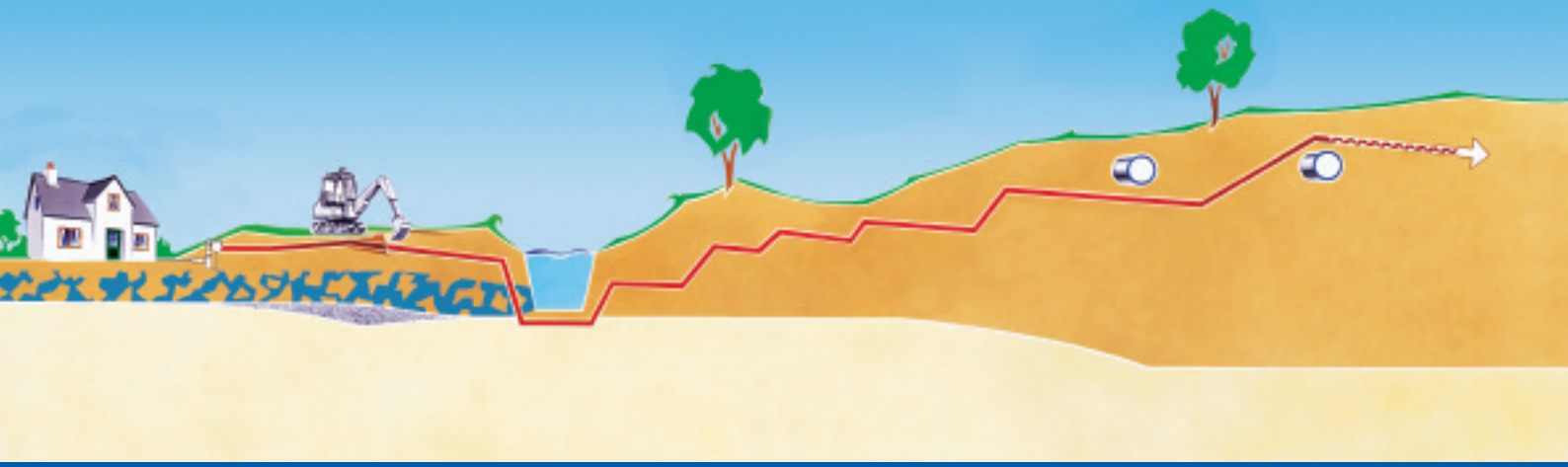
For this type of issues or other difficult projects vacuum sewerage is a future oriented and economic solution that offers numerous technical advantages. Roediger Vacuum technology has emerged decades ago as state-of-the-art and adequate alternative to the gravity system. As European, Asian and African market leader, Roediger Vacuum have installed more than 500 reference systems during the last 40 years.

The modern vacuum sewer system requires substantially smaller pipes than traditional sewers. Just small slopes simplify the laying of sewers and allow shallow installation even in areas with a high groundwater table. Since vacuum sewers are self-cleaning and need no water to flush the pipes, they are not only more economic, but also superior to conventional systems from an ecological perspective. Many developers worldwide entrust the task to the system supplier Roediger Vacuum.

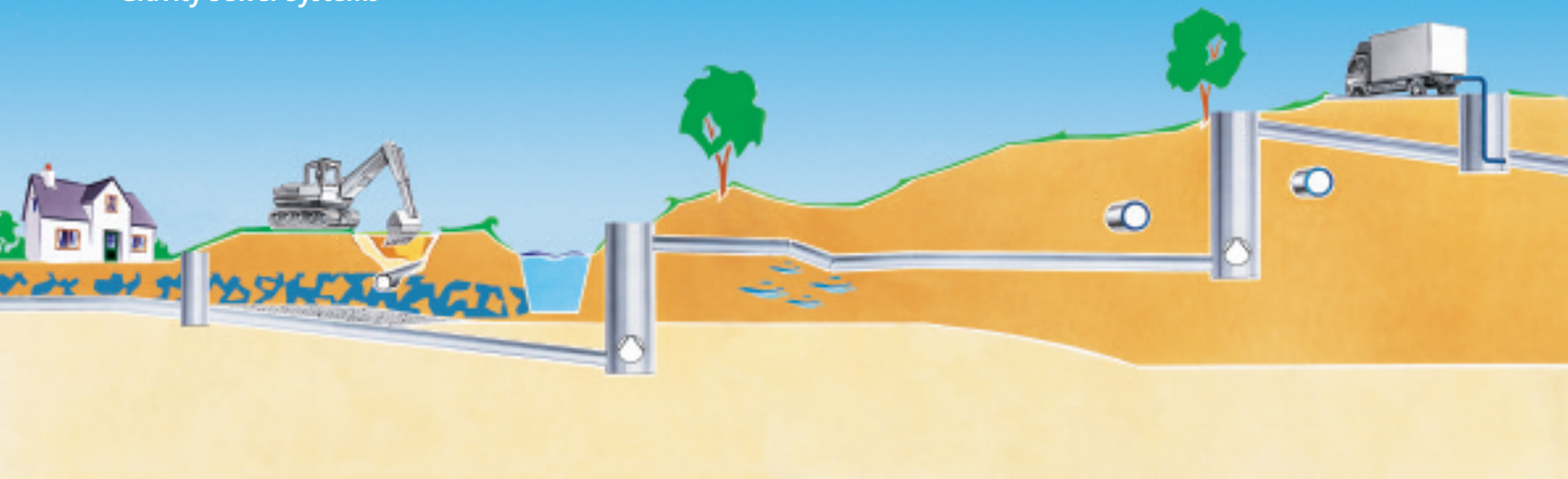
International experience include prestige projects like the Formula-1 racetrack in Shanghai, the waste water disposal system for the historic Old Town of Flavigny sur Ozerain in France, Durrat Al Bahrain, Palm Island Jumeirah in Dubai, the Olympic Sailing Centre in Athens, Greece or the community of Gerasdorf in Austria with itself already 3000 collection chambers.

The following pages describe advantages, applications, the functional principle and technical components as well as tradition and innovation for what Roediger Vacuum stands for as a world's leading system supplier.

Vacuum Sewer Systems



Gravity Sewer Systems



Above: Scheme comparison gravity and vacuum sewer system.

Below left: Complicated installation – Gravity sewer trench with manhole. Flooded trench and sheet piling.

Below right: Fast and easy installation of a vacuum sewer in narrow trench with simple machinery.

The Innovative Technology

Advantages and Applications

When considering the technical, ecological and financial aspects of wastewater collection, vacuum sewerage provides an effective alternative to other options. The RoeVac® vacuum sewer system has proved to be a reliable method for collecting wastewater in separate systems since decades. In comparison to conventional gravity or pumping systems the RoeVac® vacuum system offers the following important advantages to residents and operators:

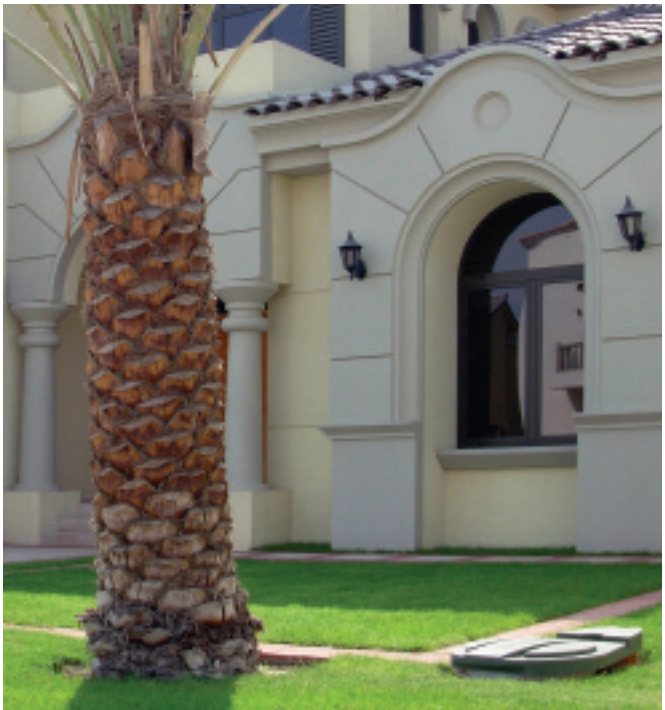
- Considerable savings in construction costs
- Much shorter construction period
- Pipelines laid in shallow and narrow trenches
- Small diameter pipelines (DN 80 – DN 200)
- Flexible pipeline construction
- Easy to lay pipelines around obstacles
- Sewers and water mains can be laid in a common trench
- Closed systems with no leakage or smell
- No manholes along the vacuum sewers
- One central vacuum station can replace many several pumping stations

The RoeVac® vacuum technology has been established over 40 years and is recommended by numerous independent institutions and organisations acknowledged throughout the industry. Today, hundreds of RoeVac® vacuum sewer systems have been installed successfully throughout the world.

Compared to conventional methods of sewerage, vacuum technology provides major advantages in the following circumstances:

- The topography is flat and groundwater table is high
- Sewer system is located near e.g. a lake or a coastline
- Ground has an adverse gradient
- Wastewater flows are highly variable e.g. holiday establishments or local recreational facilities
- Difficult ground conditions e.g. rock, peat, swamps etc.
- Refurbishment of sewer systems
- Rural area where buildings are not close to each other
- Crossing rivers, streams, railway lines, major road etc.

Below: RoeVac® G-type collection chamber installed in front lawn of a villa



Above: Typical installation of vacuum sewer in minimal depth. Pictorial schematic of the system, consisting of vacuum pipes (1), collection chambers (2) and central vacuum station (3).

Below left: RoeVac® project in Southern Africa, approx. 6000 PE, vacuum pipes (1).

Below centre: Cutaway of the RoeVac® collection chamber. The valve chamber is separate from the wastewater collection sump (2).

Below centre: Pre-assembled, compact vacuum station installed in a completed building (3).

6 RoeVac®

1

2

3

The RoeVac® Vacuum Sewer System

Operation and Components

Depending upon the topography, wastewater is collected with a radius of many kilometres around the central vacuum station. Wastewater flows through a conventional gravity drain from each house to a RoeVac® collection chamber installed outside the building. When a pre-determined volume of wastewater is collected in the collection chamber sump the hydrostatic pressure activates a pneumatic controller. This controller opens a pneumatic vacuum valve and the wastewater in the chamber is completely evacuated into the vacuum sewer pipe. No electricity is required at the collection chamber with all operations entirely pneumatic.

As air is admitted through upstream vacuum valves the wastewater flows at high velocity through the sewer system to the central vacuum station. The RoeVac® system guarantees maximum operational safety with minimum energy costs. In some circumstances the vacuum sewers can be laid using trenchless technology or be placed above ground.

The Vacuum Station

All the vacuum sewers are connected to the vacuum collection vessel installed at the central vacuum station, where vacuum pumps create the required negative pressure (approx. – 0.6 bar). The vacuum vessel can be placed inside or buried outside the vacuum station. Transfer pumps convey the wastewater from the vessel to the wastewater treatment plant or to an existing sewer.

The capacity and dimensions of the vacuum station are dictated by the particular requirements of the sewer system. Operation of the vacuum and transfer pumps is controlled through a PLC with the RoeVac® software designed to ensure optimum demand-driven operation. A standard “compact vacuum station” can be delivered prefabricated and tested for small sewer systems to service a small number of houses in villages or buildings on industrial estates. Individual design and construct services can be provided for vacuum stations for hundreds or thousands of houses and buildings.

The Collection Chambers

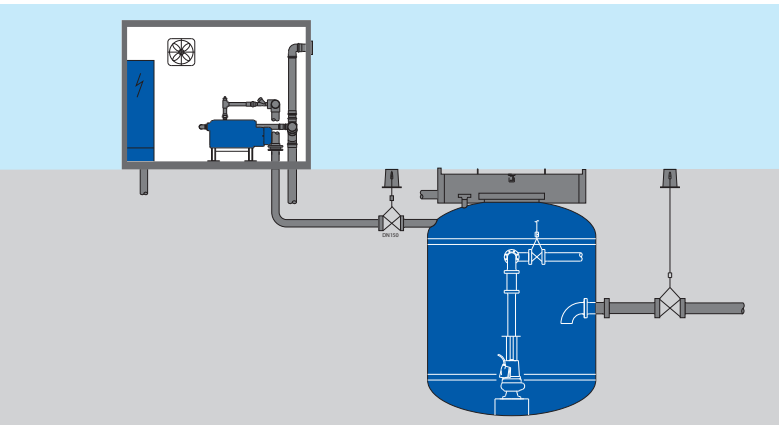
The water tight RoeVac® collection chamber is manufactured in PE-MD with three different designs available for the following loading conditions:

- Pedestrian loading
- Flood-proof and pedestrian loading
- Flood-proof and traffic loading up to 40 t

In all designs the vacuum valve unit is kept separate from the wastewater sump ensuring the RoeVac® vacuum valve unit remains clean, dry and accessible.

Additional advantages of RoeVac® chamber system are:

- Easily adapted on site to suit the level of house service drains and vacuum sewer pipes
- No smell or deposits
- No electrical power at the chamber
- Removable plug for connecting a suction lance enabling local emptying and easy cleaning
- A stopper can be quickly installed to isolate the vacuum sewer for valve maintenance
- Optimum wastewater sump capacity to ensure a constant air-liquid flow rate



Left page: Vacuum station building with buried vacuum vessel, biofiltres and RoeVac® collection chamber for condense water (front).

Left: Schematic view of vacuum station with buried vacuum vessel and submersible discharge pumps

Above: 65mm dia RoeVac® vacuum valve (diaphragm type) including pneumatically activated controller (in front) and sensor cap (white) installed in a collection chamber.

Below: 75mm dia RoeVac® pinch valve including pneumatically activated controller (behind) installed in a collection chamber.

The RoeVac® Vacuum Valve Units

Quality and Reliability

The valve unit, which works pneumatically, consists of the vacuum valve (diaphragm type) and the associated controller. RoeVac® vacuum valves are all-purpose, easy to maintain valves with a long design life. There are two types of units: the 50 mm and 65 mm dia units are normally installed, but where flow rates are high, e.g. restaurants, hotels and public buildings, the 75 mm dia pinch valve is recommended.

The RoeVac® pinch valve was developed for special applications. Its robust construction and 75mm dia clear flow path makes it particularly suitable for high flow rates and wastewater with high solids content.

RoeVac® vacuum valves do not require electrical connections. The valves are activated pneumatically by rising water level in the collection sump.

The function of the RoeVac® controller is to open the vacuum valve when the level of wastewater in the sump of the collection chamber is rising, and to close the valve after the batch volume and a preset amount of air has been evacuated from the sump. Valve opening times and air-liquid flow rates can be adjusted optionally by the controller. Roediger Vacuum can also offer a sump and valve monitoring system that includes the street name and house number.

Quality Assurance

The various components of the RoeVac® vacuum sewer system are manufactured to the highest quality standards by Roediger Vacuum GmbH in Germany. For example, the reliability of the Vacuum Valve Units has been proven in an accredited endurance test with more than 300,000 exhausting-cycles. The company operates a quality assurance system complying with the requirements of DIN EN ISO 9001 and EN 1091. This ensures all components are manufactured in accordance with prescribed quality control procedures.

All components used in the RoeVac® system are designed in accordance with “DWA-ATV Design Manual A116”.

Left and centre: G- and Z-type collection chamber – The vacuum valves are installed in the valve chamber of the Roevac® collection chamber, hygienically separated from the wastewater in the sump.

Above both: Covers are available for pedestrian (centre: G-type collection chamber) or heavy duty loading (right: Z-type collection chamber).

Background and Diversity

Innovation and Expertise

Roediger Vacuum GmbH has a history of more than 160 years and is part of the Bilfinger Berger Umwelttechnik GmbH. With its international experience, the company has the expertise to identify and solve environmental problems.

In the field of vacuum technology Roediger Vacuum has operated successfully for over 40 years. Roediger Vacuum is one of the world's leading contractors in the design and construction of vacuum sewer systems. In many countries Roediger Vacuum has a local partner or is represented by a local agent. Contact us for details of our local representative.

We offer a substantial range of products and evacuation solutions in the following fields:

- Vacuum Sewer Systems
- Vacuum Sanitation Systems for buildings and ships
- Vacuum Sewer Systems for industrial complexes
- Evacuation of wastewater from trains and aircraft
- Management of wastewater from hospitals
- Evacuation of wastewater from Marinas

Above: Supply and evacuation at apron

Below: Evacuation of toilet wastewater storage tanks on an ICE train

Below right: Evacuation of toilet wastewater tanks on boats at the Olympic Sailing Centre in Athens, Greece

Above: Collection and discharge of wastewater from public areas, F1 Circuit, Shanghai, China, (Wastewater discharge 44 l/s).

Below: Municipality of Gräfenhain, Germany. The wastewater from 160 house collection chambers is collected at a central vacuum station.