



**Project:** Sewage System. | **Location:** St. Petersburg, Russia.

**Background:** Access, connection and reservoir shafts for the existing sewage system.

**Contractor:** STIS 000. | **Client:** GUP Vodokanal.

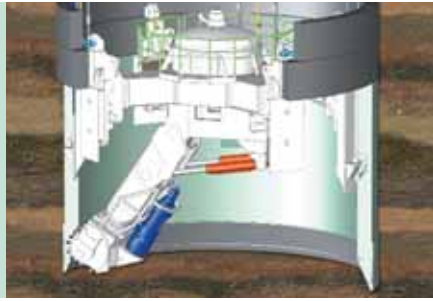
**Construction method:** Shaft building. | **Max. shaft depth:** 58 – 85m.

**Challenges:** Heterogeneous geological formations. Remote-controlled shaft boring. Groundwater.

Accuracy of shaft depth 1%.

## VSM7700 | Sewage System | St. Petersburg.

- Lifting of the vertical shaft sinking machine with an integrated crane system.
- Excavation unit.
- Sinking of the cutting drum in the flooded shaft.



## Shaft building in St. Petersburg.

The vertical shaft sinking machine (VSM) started excavation at the beginning of 2006. Despite  $-30^{\circ}\text{C}$  and frozen ground the VSM excavated through heterogeneous geological formations.

The first formation contained groundwater and reached depths of about 30m. The formation below consisted of compact dry and hard loam. In the transition zone between soft soil and hard loam, large boulders of up to 2.5m were present. As part of the large-scale development of the existing sewage system several new shafts were planned. They will be used as access shafts, connections and reservoirs for the existing sewage system in St. Petersburg. The shafts are up to 85m deep.

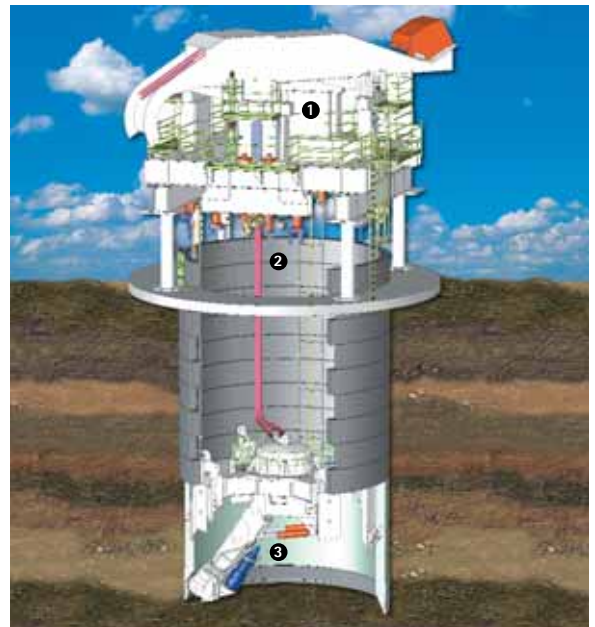


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| FUNCTION                               |
| SEWAGE COLLECTOR                       |
| SOIL                                   |
| SOFT AND HYDROUS CLAY WITH GROUNDWATER |
| RUNNING SAND                           |
| HARD CLAY, LARGE BOULDERS              |
| HARD CLAY, SMALL STONES                |
| SHAFT DEPTH                            |
| 58-85m                                 |
| DIAMETERS (ID)                         |
| 5.5m-7.7m                              |
| EXECUTION DATE                         |
| 2006                                   |

## Turnkey shafts with one machine.

The vertical shaft sinking machine includes a lifting/lowering unit, a shaft lining unit and an excavation unit. The lifting/lowering unit stabilizes the shaft and the excavation unit below and includes a crane system for easy maintenance. The shaft lining unit includes a segment handling crane. The excavation unit with a flexible cutting boom can be adapted to different shaft diameters ranging between 5.3 and 8.8m. The flooded shaft balances the groundwater in the surrounding soil. The submersible slurry pump transports the soil to the separation plant above ground.

The prefabricated concrete segments ensure watertightness and make additional end-lining superfluous. Remote-controlled machine technology and a special shaft steering system allow for safe and controlled shaft sinking. The vertical deviation accuracy is 1%. During the project an average performance rate of 3m in 12 hours was achieved.



1 Lifting/lowering unit    2 Shaft lining unit    3 Excavation unit

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| MACHINE                                  |
| VSM7700                                  |
| OD: 5.3m-8.8m                            |
| POWER: 400kW                             |
| RPM: 0-80rpm                             |
| MAX. TORQUE: 78kNm                       |
| WEIGHT: 65t                              |
| SOIL TRANSPORT                           |
| SUBMERSIBLE SLURRY PUMP                  |
| FEATURES                                 |
| INTEGRATED CRANE SYSTEM FOR MAINTENANCE  |
| GUIDANCE SYSTEM                          |
| SHAFT CONSTRUCTION                       |
| SIMULTANEOUS SHAFT LINING AND EXCAVATION |

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