

Sewerage System: Comparison between Vacuum and Gravity Systems

	Vacuum	Gravity
1	Pipelines with small diameters	With large diameters
2	Light, flexible pipelines made of PE or PVC	Heavy, rigid pipelines made of concrete respectively cast iron
3	Small trenches (layout also beneath pavements, in narrow streets/passages, small shovel dredgers can be used)	Wide, large trenches – big excavating machinery (caterpillar) in use (for ex. power shovels)
4	Shallow trenches (1,0 till 1,2 m depth, frost-free layout or even nearer to the surface in frost-free areas)	Deep trenches
5	Layout (in common trenches) together with other pipelines (for ex. those for drinking water) possible	Layout together with other pipelines not allowed
6	Manholes in pipeline reticulation are not required	In case of changing the direction of the pipeline as well as at least at each 70 m distance a manhole is required
7	In flat terrain, the layout of pipelines for a length of several km possible - without additional pumping stations	In flat terrain at appointed, regular distances pumping stations are required, in order to lift the sewage to a higher level
8	Layout of pipelines in potable water supplying/catchment areas possible, because in case of damages no exfiltration of sewage can occur	Layout in ecologically sensible areas prohibited due to danger of exfiltration
9	Simple layout of pipelines in swampy ground and in areas with a high ground-water level or in areas which are often flooded	Layout of pipelines in swampy ground and areas with high ground-water table is difficult and mostly impossible due to often expensive and work-intensive excavation security measures and water management
10	Easy crossing of obstacles (trenches, rivulets, inverted siphons, cables) over pipe bridges or beneath obstacles	Crossing of obstacles is difficult and cost-/work-intensive, only with lifting machinery
11	Modifications/restructuring during construction phase are easy to plan and to handle	Modifications/restructuring during construction phase are difficult and expensive and require a lot of work

12	Maintenance-free pipeline net	Regular maintenance of pipelines necessary
13	No flushing needed, self-cleansing effect by high flow velocities	Flushing to avoid sedimentation necessary, minimum quantity of water level required
14	Immediate realizing of occurring untightnesses due to increasing depression losses	Inspections of sewerage lines are regularly necessary in order to detect leakages/untightnesses
15	Flexible dimensioning of the entire system, also in case of widely varying wastewater flow for ex. in week-end resorts, camping areas and holiday camps	Flexible dimensioning not easy, because:a) in case of large diameters of the sewer lines too low flow velocity = danger of sedimentation b) in case of too small diameters = danger of clogging or overflowing
16	Cheaper layout of the sewer lines in case of difficult geological/ground conditions (moorland, peat soil, rocky ground, danger of movements of ground or unstable ground)	Cost- and work-intensive layout in case of difficult ground conditions
17	Layout of the sewer line reticulation can also be made above ground	No above ground installation of the sewer lines possible
18	Trenchless layout possible	Trenchless layout not possible
19	Less construction costs	Higher constructions costs
20	Shorter construction periods	Longer construction periods
21	Less traffic impediments due to small space requirements during construction period, fewer bothering of residents and no need of closures of streets etc.	High impediments during construction period due to significant space requirements – partially high traffic interference during construction period
22	Tight, odourless system	Open, no odourfree system
23	Wastewater remains "fresh" by constant aeration, no fouling of the sewage since the oxygen of the incoming air prevents from a chemical reduction, no corrosion of construction components	Up to 50 % more H ₂ S (hydrogen sulphide) in sewer net with corresponding impacts (corrosion, etc.)
24	Wastewater remains "fresh" by constant aeration	By biological activity during the transport of the sewage, without active addition of air, CO ₂ and CO as well as H ₂ S and other "noxious" elements are produced. These elements represent an elevated danger for the maintenance crew/per-sonnel
25	No fouling of the wastewater because the oxygen of the incoming air prevents a chemical reduction, instead reduces biological activities	The biological activity (occurring fouling) of the wastewater during the transport to the sewer line leads to a stronger charging of the subsequent/connected purification plant
26	No rat plague/nuisance, no animals are	Often animals settle down in the sewer

	caught in the sewer reticulation	reticulation
27	System becomes cheaper with lower housing density	System becomes more expensive with lower housing density
28	Earthquake proof, no rat trouble, no animals are caught in the sewer net	Not earthquake proof
29	Higher solid component portion/quota does not render the system more expensive	Higher solid component quota enlarges and increases the costs of the system, especially concerning the operation costs (higher waterflow quantity for "spooling")
30	Simple and easy installation in case of separated sewage lines, no infiltration into the system (surface water/ground water), rain water can easily percolate	Cost- and work-intensive installation in case of separated sewer lines, otherwise common collection of wastewater and rain water
31	No infiltration during the mounting by layout of pre-installed vacuum lines	In case of high groundwater level constant infiltration during the mounting is inevitable
32	Relief for the subsequent pumping stations and the purification plant, fewer dimensioning expenses resp. works	Costly and large-scale dimensioning of the subsequent purification plants due to high water quantities and infiltration
33	During operation nearly no infiltration due to a closed and tight net without manholes	Infiltration into the system can occur (via the manholes and the continuing hair-line cracks in the concrete tubes concrete inspection holes) leads to overcharging of the whole sewerage system
34	Self-controlling system: untightnesses and leakages are immediately localised	Untightnesses are difficult to be detected and recognised
35	Especially in flat terrain: Energy saving: Connection to the electrical net only in the vacuum station	Several decentralized pumping works and lift stations increase the energy consumption of the total system