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Odours coming from a septic system

The vast majority of on-site septic systems are based on the same principle: biological water treatment. The microorganisms in domestic wastewater are very valuable as, with or without help, they can themselves treat the biodegradable pollutants that are found there. Although this natural process has many advantages, you could encounter some inconveniences.

The biological treatment of wastewater involves more than simply making pollutants disappear. It is rather the combination of many matter transformation processes that ensures the water becomes much cleaner than when it arrives in the septic system. The pollutants are not simply eliminated, but rather transformed in several ways:

- Some molecules are consumed by microorganisms, providing energy for their growth and reproduction.
- Some molecules are released as solids or simply dissolved in water. These are then reintroduced in the metabolism of the next organism, as is the case in a System O)) treatment system.
- Some molecules become gasses, which disappear completely from the system by evaporation.

Although useful to the complete removal of pollutants, this last possibility can cause some inconveniences, specifically with respect to odours. This gas production is inevitable, but some precautions can be implemented to ensure passers-by don't get a whiff.

THE NORMAL FLOW OF GASSES

The septic tank

The vast majority of on-site septic systems begin with a septic tank. Although its main function is to separate oils, fats and solids, the presence of microorganisms and the absence of oxygen create the perfect conditions for the production of different gasses: methane, hydrogen sulphide, ammonia, etc. In this completely normal situation, these gasses exit the system through the building's plumbing to reach the roof vent where they are dissipated (Figure 1). The pressure differential caused by the height difference between the septic tank and the vent drags the gasses towards the roof vent.

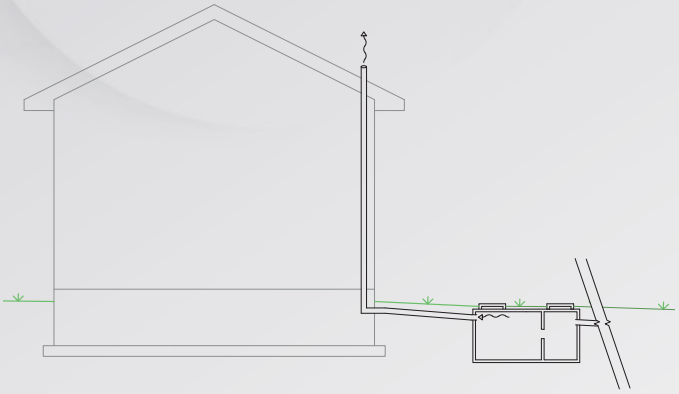

Figure 1. Normal flow to dissipate gasses

THE DOWNSTREAM DISTRIBUTION OR TREATMENT SYSTEM

In many cases, a treatment system after the septic tank is also required (advanced treatment unit, disinfection unit, etc.). This distribution and/or wastewater treatment is also the site of biological reactions where various gasses are produced. Depending on the system and how it is supplied, it may have its own ventilation circuit is in place, or be also connected to the building's plumbing. Figure 2 illustrates this using System O)) as an example. Or, as often encountered with conventional systems, there could be no ventilation. In this case, the gasses are evacuated through the soil covering the system, as illustrated in Figure 3.

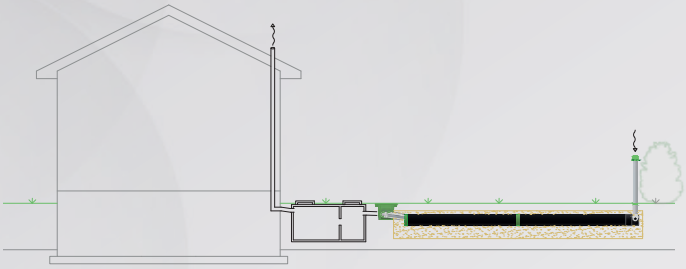

Figure 2. System O)) ventilation circuit

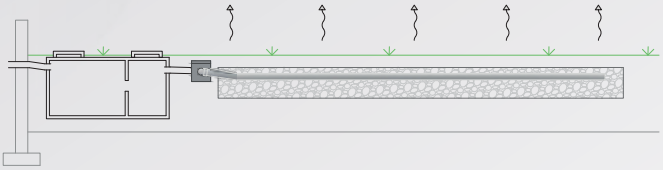

Figure 3. Conventional system without ventilation.

POTENTIAL PROBLEMS

There are cases where gasses do not evacuate properly, creating odours in or near the building.

Inside the building

In some cases, odours are detected inside. The problem is usually directly related to the plumbing. Since gasses will try to evacuate through the fastest route, exits other than the roof vent could be used. For instance, an empty P-trap (no water) is a common source of odours in a building. Simply filling the P-trap with water blocks the exit for odours. You might need to contact a plumber to identify where the gasses are coming from.

Other possibilities:

- Using an S-trap, which is more likely to be empty of water
- A P-trap that is too short
- A floor drain that doesn't have a P-trap or a non-return valve
- For a sink on an island counter – usually not connected to the ventilation – an incoming air valve is required to ensure the P-trap does not empty by suction. This valve can become worn over time.

OUTSIDE THE BUILDING

Exit vent

Odours detected near the exit vent (roof vent) have many possible causes. It is important to understand that to completely dissipate, gasses must achieve a certain exhaust velocity. Many factors can hinder the circulation of gasses, leading to a lower exhaust velocity. This could mean that instead of gasses rising and dissipating in the atmosphere, they will drop to the ground. Here are some of these factors:

- A badly maintained effluent filter
- A reduction in the diameter of the ventilation circuit
- Many pipe elbows along the way
- An exit vent that does not lead straight up
- Snow or ice that obstructs the roof vent

Entry vent

An entry vent is also required, according to the system. This provides a source of oxygen to help aerate the treatment system and evacuate the gasses generated by the microorganisms. In many cases, this entry vent is connected to the same circulation system as the septic tank, creating one long ventilation circuit that ends at the roof vent. When there is sufficient height differential between the vents (3 m), the air and its gasses is dragged out the roof vent.

When there is an entry vent, an inadequate differential or any obstruction between the two vents could cause problems with odours. Here are some causes:

- A badly maintained effluent filter – which obstructs the ventilation circuit
- A reduction in the diameter of the ventilation circuit
- Insufficient differential (less than 3 m) between the two vents
- An entry vent that is blocked by snow or ice
- A lifting station that was not adapted to maintaining ventilation – more information below.

Lifting station

When a treatment system is higher than the septic tank, a lifting (or pump) station is installed. If this system requires an entry vent, special disposition must be applied to ensure adequate ventilation.

When there is a lifting station, the ventilation circuit going from the entry vent to the exit vent is broken by the small-diameter pipes used for pumping (Figure 4). Moreover, the fact that the pump itself is under water adds another obstacle to the air passage. In this sense, you must consider a solution to ensure adequate ventilation between the two vents.

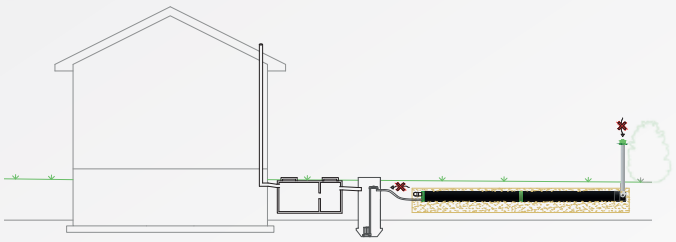

Figure 4. Ventilation circuit with lifting station

The main one consists in bypassing the lifting station with a ventilation pipe. This bypass pipe is directly connected to the lifting station tank and the septic tank. This means the ventilation remains functional despite the use of a lifting station (Figure 5).

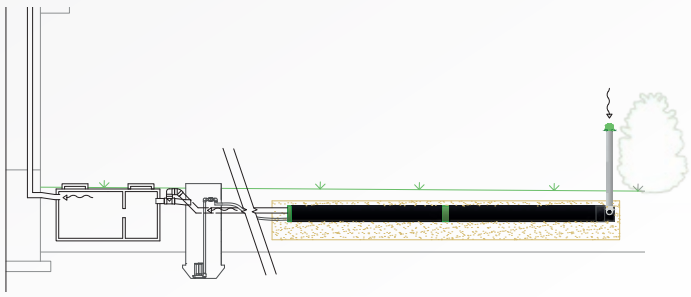

Figure 5. Bypass pipe

In some situations, the lifting station is many meters from the treatment system, which means a simple bypass is not practical. An alternative is to simply create a ventilation circuit specifically for the treatment unit. The system must then have its own entry and exit vent, all while ensuring a 3-m differential between the two. The aeration of the system is thus completely independent of the building and its septic tank (Figure 6).

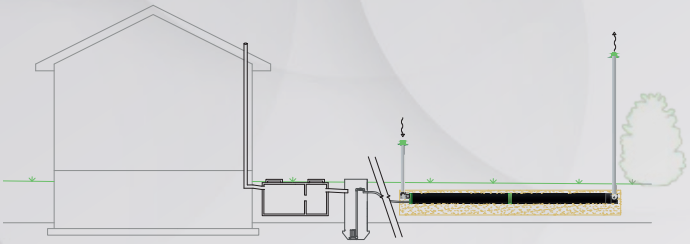

Figure 6. System with separate ventilation

ELSEWHERE ON THE SITE

Other than inadequate ventilation, other situations can explain the presence of odours around a septic system.

Tanks

Tank lids that are improperly closed or not airtight are a frequent cause of odours on the site. The concrete lids are heavy and it can be difficult to close them properly. For the plastic lids, the odours could seep from the sealant or improperly secured screws. In all cases, a simple solution is to add material (earth, snow) to render the lids impermeable.

The ground

Despite adequate ventilation, part of the gasses will always vent through the backfill. In some cases, an insufficient quantity of earth on top of the treatment system could explain odours on-site.

Atmospheric pressure

The dissipation of gasses is strongly influenced by atmospheric pressure. If it's high, it can hinder their dissipation towards the sky. An even greater differential between the vents could help them achieve an even greater exhaust velocity, but it could very well not be enough. As a last resort, a carbon filter can be installed on the exit vent on the roof. Carbon is very efficient in adsorbing different gasses so that it is used as a filter. However, the carbon granules must be replaced at a frequency relative to the system's use – or whenever the odours return.

CONCLUSION

Gas production is inevitable for any wastewater treatment technology based on microorganisms. This gaseous production is in fact an important step towards the complete elimination of some pollutants. A well conceived and unhindered ventilation circuit is crucial to the efficient dissipation of gasses – which means no issues with odours that are linked to the treatment system.

In this document, many problem sources and potential solutions were presented to eliminate odours and benefit from a septic system without side effects.