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Septic Tank Maintenance: A Research Paper

This paper is delivered to you courtesy of **Rockyview Aqua Ltd** and **Cochrane Septic**, your Rockyview resident specialists.

HOW SOIL TREATS SEPTIC TANK EFFLUENT

Suitable soil is an effective medium for septic tank effluent. Soil contains a complex biological community: one tablespoon of soil contains over one million microscopic organisms, including bacteria, protozoa, molds and other critters. It is the bacteria and other organisms in the soil that treat the waste water and purify it before it reaches the groundwater table. Waste water must pass through the soil slowly enough to provide contact time with soil particles and micro-organisms.

WHAT IS WASTE WATER (EFFLUENT)?

Waste water, which enters the soil in a septic treatment system, becomes food and water for the biological community. Normally the waste water leaving the septic tank is 99.9% water and only .1% pollutants (solids) that need to be removed. The percentage of solids in the waste water will be dramatically higher than .1% if the septic tank is not being cleaned at the proper frequency and thus overloading the field. The normal .1% solids in waste water that must be removed or modified consists mostly of organic material, bacteria and nutrients. The organic material comes from food preparation, dish and clothes washing, and wastes from the relatively inefficient human digestive system. Pathogens are micro-organisms that cause disease and are usually present in residential sewage. Fecal coliforms are indicators of the presence of pathogens. Along with these coliforms are two septic system nutrients, nitrogen and phosphorus which are of major concern in septic tank effluent.

NITRATE REMOVAL

Nitrogen from the septic tank is usually in the ammonia form. While some is used by the soil bacteria, most is converted to nitrate in the aerated soil. Nitrates are soluble and will move with soil water. Nitrate movement is one of the reasons for separation distances between septic treatment systems and water supply wells. Although a properly located and installed septic field does an excellent job of reducing Nitrate load by denitrification, there remains the possibility of nitrate problems with water supply wells.

PHOSPHATE REMOVAL

Phosphates are removed from waste water by being absorbed into soil particles, particularly particles with high concentrations of iron manganese and aluminum. Soils with a great percentage of clay particles have more of these minerals than sand. Phosphates move through the soil at a rate of 10 to 20 inches per year. If a septic system is functioning properly, problems of phosphate movement from the septic field to groundwaters should be minimal.

SOIL AS A SELF-RENEWING TREATMENT SYSTEM

Soil of suitable texture is an excellent treatment medium for septic tank effluent. The soil is a self-renewing treatment system and will maintain this treatment effectiveness and capacity only if the septic tank effluent remains of reasonable quality and as long as aerobic conditions exist in the soil treatment system. A properly installed and maintained septic field receiving good quality effluent (grey water) can be reasonably expected to have a life expectancy of 30 to 50 years while a field receiving a high percentage of sludge may not last ten years.

SEPTIC TANKS

The septic tank provides the primary treatment system. As sewage enters the septic tank, those solids heavier than water settle to the bottom, and those lighter float to the top, forming a scum layer. Normally a starter is not needed for bacterial action to begin in a septic tank. Many bacteria are present in the material deposited into the tank and will thrive under the growth conditions present. The solids, which settle to the bottom of the tank, are partially decomposed by the aerobic bacteria present in the tank and form a bottom sludge layer. About 95% of the solids entering the septic tank from the home are retained in the tank with the balance carrying over as turbidity and decomposed organics. Between the sludge layer on the bottom and the scum layer on the top, is a relatively clear zone which the baffle crossover pipe allows it to flow out into the grey or clear-water chamber. From this chamber the effluent water leaves by either pump or siphon action. The cleaner the water leaving the septic tank is, the lesser the chance of septic system failure. On certain older vintage septic tanks (over 15 years), the grey water chamber was built half the depth of the solids chamber. The siphon draws effluent some 2 cm off the bottom. It is expected the rationale during their design was that no sludge will cross the partition wall and contaminate the grey water chamber. This has proven to be incorrect as some 6 cm to 10 cm of sludge will transfer and settle to the bottom of the grey water chamber annually. The siphon in these shallow grey water chambers picks up all this sludge and sends it off to the septic field resulting in premature field failure. In the newer generation tanks, the siphon is mounted some 80 cm. off the bottom and therefore will not readily pick up sludge. Septic tanks with shallow grey water chambers should be cleaned annually to minimize the sludge transfer to the septic field.

SEPTIC TANK ADDITIVES

Additives need not be added to a septic tank, since they have no benefit and some may do great harm. Additives that cause the accumulated sludge in the tank bottom to increase in volume will result in the sludge being flushed out into the treatment field, plugging the soil pores and perforated laterals. The use of yeast or similar products is strongly discouraged. Other additives, particularly degreasers and digesters may be carcinogens (Cancer-causing) or suspected carcinogens that will flow directly into the groundwater with the treated sewage. Some additives claim to have bacteria and enzymes that promote the increase of bacterial action. However, their claims are not supported by laboratory tests, rather testimonial of users. Use of additives can cause damage to the field with carry-over or harsh chemicals that create pollution hazards for the environment. Ideally, the numerous strains of bacteria that provide the eutrophic condition in the septic tank will continue to multiply, digest and decompose organics as long as they are not killed with the introduction of microbiocide such as chlorine, commonly called bleach (scientific name: sodium hypochlorite).

CONTROLLING SEPTIC WASTE

Discharge all of the sewage waste from the home into the septic tank. Do not run laundry directly into the septic field since soap or detergent suds will quickly clog the soil pores, causing failure. The purpose of the septic tank is to separate out that scum and retain it in the septic tank where it will be removed by the proper cleaning procedure. While excessive amounts of household chemicals should not be used, nominal amounts of detergents, drain cleaners, toilet bowl deodorizers and other household chemicals can be used and will not harm the bacterial action in the septic tank. Do not deposit coffee grounds, cooking fats, wet-strength towels, disposable diapers, condoms, facial tissues, feminine hygiene products and other similar non-decomposable materials into the sewage system. None of these materials will decompose and will cause a rapid accumulation of solids in the septic tank. About 1/3 of pump failures can be attributed to these products. Cooking fats and grease may plug sewer pipes or build up in the septic tank and plug the tank inlet. Keep a separate container for these products and throw them out with the trash.

If you must use a garbage disposal, know that you will have to remove septic tank solids every year or more often. Also ground garbage will frequently find its way out of the septic tank and clog the septic field distribution system. It is better to compost, incinerate, or throw out materials like lettuces, carrot tops, potato peels as these organics do not break down completely in the tank thus adding volume to the accumulated solids in the tank.

Use a good quality toilet tissue that breaks down easily when wet. To determine suitability, place a portion of the tissue in a jar half full of water and shake the jar. If the product breaks up easily, the product is suitable. The color of the toilet tissue should have no effect on the septic system as long as the tissue breaks up easily when wet. High wet-strength toilet tissue often causes plugging problems with a septic system. Many of the scented toilet tissues are high wet-strength.

Detergents can cause problems with septic systems. Be wary of inexpensive washing products which may contain excessive quantities of filler or carrier, some of which can be extremely detrimental to the sewage system. It has been reported that some granular detergents use bentonite clay as a filler. Bentonite clay is a product typically used to reduce soil permeability and certainly should not be used with a septic system. An alternative is to use liquid laundry detergents since they are less likely to have carriers or fillers.

TREATED DOMESTIC WATER

Many homes and subdivisions within Rockyview are connected to a treated water source, i.e. Bearspaw Water Co-Op and Westridge Water Co-Op. These sources of water contain a microbiocide called sodium hypochlorite (chlorine) which is controlled at a residual that does not allow bacteria, fungus or algae to survive in the water supply lines. While a safe and reliable water source is desirable, it is not conducive with the principal of operation of a septic system. The residual chlorine, although minute (usually less than .5 mg/L) inhibits the natural reproduction of bacteria which is needed in the decomposition of organics. The result is improper sludge layering with the organics building up loosely towards the bottom of the tank. Without the vigorous bacteria/enzyme action, the non-decomposed solids build up rapidly to the point where raw sludge transfers via the crossover pipe into the clean chamber and ultimately to the septic field by way of the siphon or pump. The result of this is an accelerated rate of clogging up the septic field and ultimate field failure. The addition of bacteria/enzyme products are not of good value as the eutrophic condition of the tank is not favorable to their reproduction. The solution is the annual mechanical extraction of the sludge build-up before excessive amounts transfer to the septic field.

CLEANING FREQUENCY

Cleaning frequency of a septic tank depends upon tank capacity, the number of people using the system and appliances such as a garbage disposal: The solids from one person on average, occupies about fifty gallons of septic tank capacity per year. The use of a garbage disposal will approximately double the rate of accumulation. The tank must be cleaned before half of the solids chamber's liquid capacity is occupied by solids. As an example, some 50% of rural septic tanks are 700 imp. Gallon capacity, of which the solids side of the tank will hold about 500 imp. gallons. No more than 250 gallons of solids (sludge and scum) must be allowed to accumulate in the solids side. At 50 gallons per person, per year, a family of four would have to get their tank cleaned out every year. It should be kept in mind that the more solids that accumulate in a septic tank, the greater the risk of carry over into the grey water tank and ultimately into the septic field. Once sludge leaves the tank, it can quickly plug a septic distribution system to the point where a new one is required. Rural waste water treatment consultants and the Alberta Private Sewage Treatment and Disposal Regulations strongly recommend a cleaning frequency

of once a year. This is particularly true with septic tanks smaller than 1000 gallons. A septic tank of 1000 gallons servicing three or less persons could be cleaned at a frequency of two years. Homeowners connected to a water source incorporating chlorine treatment are advised to have their septic tank cleaned annually.

TANK CLEANING

The tank cleaning job should be performed by a contractor having adequate equipment. To accomplish this, the manhole cover(s) must be removed to facilitate access to both the solids and grey water compartments. Septic tank cleaning should be done using a solid pipe that allows the equipment operator to draw up all sludge corner to corner. It is not necessary to leave solids in the septic tank to “start” it again. A septic tank pumping technician who indicates this is either misinformed, does not have adequate equipment to draw up all the solids or does not have a large enough pumping tank to remove all the contents of the tank in one load. It is not necessary to hose or wash down the walls in the solids compartment, however a thorough cleaning/hosing of the clear (grey) water compartment is desirable to remove all scum built up on the walls, bottom and pump or siphon arrangement. Typically, a septic tank will be located within 20 meters of a location accessible by a septic truck in both summer and winter.

TANK AND COMPONENT MAINTENANCE

A septic tank is a simple design where the influent/solids entering the solids side of the tank are allowed to precipitate out (float or sink) prior to carrying over into the grey water tank and eventually into the septic field distribution system. One of the most important components or features of the septic tank is the baffle or divider wall between the two compartments. This wall is positioned to hold back the solids and allow the grey water to rise up and out the cross over tube. Should this wall be allowed to deteriorate to a point where solids/sludge can cross over into the grey water chamber, the solids/sludge will either be pumped or siphoned off into the field ultimately resulting in premature field failure. A deteriorated baffle wall is repairable to a point and will extend the useful life of the septic tank. Signs of field failure appear as effluent flowing back around the pump out line or high water level on a siphon system. While a field may be able to be partially cleared by the pumping technician vacuuming the field, the field will ultimately have to be replaced with a new one. The scale of economics of annual cleaning versus premature field failure is greatly favored to annual preventive maintenance. Some 90% of field failures are attributed to poor maintenance and procrastination of cleaning. It is advisable to choose a contractor who offers schedule cleaning whereby you will be contacted and reminded of required maintenance.

WATER SOFTENER DISCHARGE

Water softener and iron removal equipment are commonplace amongst rural residences. The position of the “Canadian Water Quality Association” is as follows: “The disposal of waste waters and brine from the backwashing and regeneration of household water conditioning equipment to private sewage disposal systems is an economical practice and in the best interest of the equipment user”. Experience of the industry, available literature and studies have shown that treated water and backwash from filters and water softeners have no significant effects on such septic field. There is however an accelerated deterioration of the high porosity concretes used in older septic tanks when used in conjunction with a water softener. This deterioration is particularly evident with the rotting or emulsifying of the partition wall between the solids and grey water compartments. It must also be noted that the Alberta Private Sewage Treatment and Disposal Regulations clearly indicates the following: “If a water softeners must be used, avoid the installation of water softeners that automatically regenerate at preset intervals of time. This type of unit may discharge excessive concentrations and volumes of salt

into the septic system. If a water softener must be used, a metering or "Demand" type unit would definitely be preferred. These water softeners only regenerate when necessary, after a preset volume of water has been used thereby reducing the total volume of salt discharge". Typically, economical water softeners will use a simple timeclock to control regeneration which results in as much as five times the salt consumption ultimately being deposited in the septic field. Under no circumstances should any water softener be used for iron removal. If iron removal is required, the use of a proper iron filter should be employed. If water treatment is being considered, it is advisable to employ a rural specialist that is knowledgeable of local water sources and septic disposal systems as water treatment equipment backwash requirements can adversely affect water well and septic field operation.

SEPTIC TANK ODORS

By code, all plumbing fixtures that comprise a plumbing system in any residence must have a liquid seal "trap" to prevent sewer gasses from entering a dwelling. Sinks all have a "p" trap located under the sink, while a water closet (toilet) uses the water in the bowl as a liquid seal. On a properly installed and functioning septic system, sewer gasses cannot make their way back into the dwelling unless a liquid seal or trap has dried out. An example of this may be a floor drain in a furnace room that is not receiving water and has dried up to the point where sewer gasses can enter the home. Approximately one out of three septic tanks have a "Tee" at the point where the line from the dwelling enters the septic tank, in which case the tank will be vented through the dwelling and up to the roof via the vent pipe. The other septic tanks rely on the septic tank being vented around the lid or the line to the septic field. It is not uncommon to smell sewer gas in the area of the septic tank lid, particularly if it does not fit well or is deteriorating. A foul smell off the septic tank can be an indication the septic tank is not working properly (lack of or loss of enzyme activity) or the tank is in a flooded condition. A tank that has stopped working due to perhaps being too cold or having been filled with bleach will rapidly accumulate solids as the decomposition process has stopped. A visual indication of this is the solids and the normal relatively clear water in the grey water chamber may have gone black. The tank must be cleaned at this point.

SEPTIC TANK AND FIELD MAINTENANCE

Septic tanks should be located to facilitate cleaning and maintenance. A typical installation will have the manhole lid at ground level which allows access in the event of a problem in winter. Generally most field failures occur with home owners that have their septic tank manhole lid buried or are not aware that their septic tank does in fact require regular cleaning. The saying "Out of sight, out of mind" definitely captures this situation. An accessible, surface manhole lid results in labour savings or smaller contractor excavation charges plus the benefit of eliminating strenuous work on the part of aging homeowners. A septic field, although requiring minimal maintenance, should be located where wind can get at the surface of the field and rain will not collect over the field. It is important to keep the surface of the field area clear of long grass and weeds as a septic field works both on percolation and evaporation of moisture. Grass should be kept short and thatch (trimmings) be removed off the septic field area. It is not uncommon to find a septic field failure due to septic trench saturation caused by years of unmaintained surface conditions. Another problem that can occur with a saturated field due to lack of evaporation, is winter freeze-up. Essentially, what occurs is the moisture laden soil above the distribution pipes freezes and "caps" the field inhibiting further evaporation. As important as clipping grass over the field is ensuring that no rodents burrow in the septic field area. This includes the "Richardson Ground Squirrel" or gopher and the common mole often referred to as a pocket gopher. The use of subsurface or surface lawn sprinkler systems that would discharge over any part of the septic field absorption area should be discouraged. Avoid unnecessary foot or livestock traffic over the septic field and absolutely no vehicle traffic. In the winter time, there should be no traffic of any type that might compact accumulated snow over the field. If a septic field does require replacement, it's advisable

to employ a contractor that installs septic systems as their primary business. Problems with improperly installed septic systems in newer home are as commonplace as problems with older vintage homes. Do not enter the septic tank without following safety precautions as set out by “Alberta occupational health and safety services”.

SEPTIC FIELD, TREES AND VEGETATION

There is little legislation governing the use of vegetation near or above a septic field. One clause of the “Alberta private sewage treatment and disposal regulations” prohibits discharge of effluent onto a vegetable garden. It is not uncommon to find cupriferous trees dying adjacent to a septic field. Deciduous trees root systems appear to search out high moisture zones within a septic field. This can cause a root ball within the gravel bed of the lateral which in itself is not a problem unless there is standing water or sludge within the lateral pipe, in which case the roots will enter the perforated pipe and plug is off. Sludge or water standing in the lateral pipe is a result of a clogged perforated pipe. The planting of small shrubs, flowers and perennials is actually encouraged as it assists in consuming moisture and available nutrients. No additional soil should be added over a septic field then that was originally provided (12” to 18” maximum above perforated pipe) as moisture will not be able to work its way to the surface for evaporation. Raised planters, rock gardens, parking areas, skating rinks or structures cannot be incorporated over a septic field.

INSTALLATION OF “ADVANCED SYSTEMS

In recent years, much innovation has taken place with new designs of residential and commercial ‘package systems’, or advanced systems. The underlying purpose is efficiency in bio-digestion and improving the quality of the effluent leaving the tank or plant. These systems have been effectively used, particularly in tough applications where a conventional system would not be effective due to soil conditions, limited area, challenging topography, or proximity to surface water. Advanced systems should be installed by competent and certified installers, as designed and attention to detail in the installation are paramount. It is strongly recommended that the system is inspected annually by either the installer or a trained pumping technician. It is further recommended that the owner enter a contract with a service provider to inspect and clean the system as required in the maintenance procedure. With ‘advanced systems’ installation costs being several times higher than that of a conventional system, it is prudent for the homeowner to adhere to the maintenance requirements, and avoid a system failure.

SUMMARY

It is hoped that after reading through the information provided that you have become familiar with your septic system as an important component in the operation of your home. A copy of this bulletin would likely be appreciated by a new neighbour inquiring about septic systems. Having your septic system cleaned and maintained can be compared to taking the household garbage out. Because garbage accumulates regularly in containers throughout the home, it is visible and therefore dealt with. Equally as important, is removing the accumulated garbage or sludge from the septic tank. Homeowners typically have problems when they procrastinate in taking out the septic garbage. Problems often don’t show up immediately, rather years later when the sludge finally plugs up the septic field. Folks in urban homes pay a greater portion of their water bill for a wastewater treatment plant to efficiently remove and treat their garbage or sludge prior to releasing effluent to rivers.

Rockyview Aqua Ltd provides a scheduled service to clean out your septic tank at a frequency determined by septic tank size and usage. In addition to regular septic cleaning service, Rockyview Aqua Ltd has developed an excellent reputation in trouble-shooting and solving problems with septic systems.

Call Rockyview Aqua Ltd and discover that professionalism, knowledge and competency make a real difference in this business.