Introduction

Our on-site industry relies heavily on concrete for septic and pump tanks. Concrete has the benefits of strength, long service life, and cost effectiveness, but in cases where sulphur-rich water or sulphate-rich soil is present, problems arise with corrosive reaction occurring, and premature failure can be expected.

The two most common methods in which concrete septic tanks can be attacked include:

1. Corrosion by Sulphate-Rich Soils

Sulphate-rich soils are primarily across Western Canada, and attack the exterior of the tank. The problem is addressed by using sulphate-resistant concrete such as type-50 cement (Darby, 2004)

Through a series of chemical reactions, sulphate ions (SO_4^{2-}) in the soil react can react with hydration products present in hardened cement {such as tricalcium aluminate ($3CaO \bullet Al_2O_3$), calcium hydroxide ($Ca(OH_2)$) and silicate hydrate ($C_3S_2H_8$)} to form two reaction products (Neuwald, 2004):

a. **Ettringite:** The formation of ettringite causes an increase in volume to the concrete matrix, leading to the physical expansion and cracking of the hardened concrete. (Neuwald, 2004)

b. **Gypsum ($CaSO_4 \bullet 2\ H_2O$):** The formation of gypsum makes the concrete softer and can lead to failure and collapse of the concrete structure. (Neuwald, 2004)

Depending on the amount of sulphur in contact with the concrete, it may be necessary to pr(www.gov.on.ca/omafra/english/nm/regs/conpro/conpro04.