



GOC Technologies

[3910 W Roll Avenue, Bloomington, IN 47403 812 334 2413](http://www.goc-tech.com)

QuikSoil® 2900

Technical sheet 2016

QuikSoil® 2900 is a bio-augmentation and odor control product useful in all municipal and private wastewater processing operations producing pressed or centrifuged bio-solids. QuikSoil® 2900 is helpful wherever bio-solids are decomposing intentionally or unintentionally. While QuikSoil® 2900 does not eliminate bio-solids odors, it is reasonable to expect a 65% to 75% reduction in odor if the product is properly applied. It is also reasonable to expect decomposition of long chain odors capable of traveling great distances. This results in a localization of odor concerns in much smaller physical areas.

Many of the odorous compounds associated with bio-solids are the products of incomplete oxidation¹. Others are the products of non-biological volatilization from pressure and movement during pressing and centrifuge operations.² Still other odors are the result of insufficient biological activity to utilize chemically available nutrients before they combine and volatilize³. Insufficient microbial activity is common even in the presence of abundant food (organics and nutrients) due to residual chlorine presence, temperature stress, and physical stress from mechanical operations.

QuikSoil® 2900 utilizes a series of amino groups containing significantly increased quantities of hydroxyls and forming a variety of highly reactive amino hydroxyl groups. These groups are housed in a nitrate solution in conjunction with a series of intermediate organic acids, minerals and biological precursors. Nucleic acid and nucleotides are also included. In short, QuikSoil® 2900 is composed of amino hydroxyl groups, mineral coenzymes, soluble carbon surfactants, and reserves of molecular and cellular essentials.

The function of the amino hydroxyl groups is to facilitate and speed certain reactions in known compounds of decomposition that are odorous or are precursors to odorous compounds. These groups are catalytic in function. This means that they enable a reaction without being

consumed, decomposed, or bonded to the products of the reaction. Each group is capable of facilitating the same reaction ten or more times before structural stress disables it, thus providing the most treatment for the least amount of concentrate.

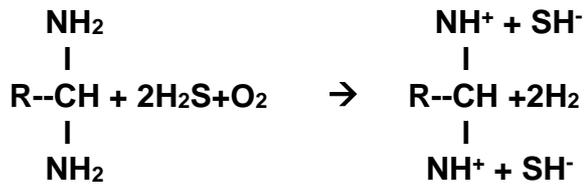
In addition to the amino hydroxyl groups and nitrates, glycosides with readily available carbohydrates (soluble carbon) are added. As these compounds separate, the glycosides become immediately available as energy food to any extant microbial population. This availability can help generate new bio-activity and increase stress resistance to less than perfect temperature or moisture conditions. Saponin glycosides have also proven valuable in providing the same type of stress relief against unfavourable pH changes or high salt environments.

The nitrates also serve an important function. They provide an immediate alternative to sulfates as food for reducing bacteria. The reduction of sulfate causes the formation of reduced sulfur compounds such as hydrogen sulfide (H_2S). Nitrate provides an equally desirable reducing agent with non-odorous nitrogen gas rather than sulfides as the by-product. Some percentage of RSC (Reduced Sulfur Compound) formation is thus replaced by nitrogen formation. Typically, the hydroxyl group reacts with a sulfide to form an amino hydroxyl sulfate (through oxidation).

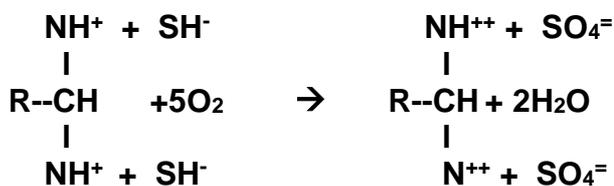
Initially, this increase in sulfate and nitrogen levels, and a corresponding decrease in sulfide levels, results in a change of pH caused largely by the decrease in hydronium ions. Each sulfate has fewer hydronium ions than a sulfide. The nitrogen produced in the reduction of the nitrate has no hydronium ions and the products of the corresponding oxidation and subsequent reactions – including ammonia - are rich in hydroxide ions. The potential shift in pH is balanced by the inclusion of intermediate organic acids. These not only participate in reactions in the bio-solids, they also decrease the rate of production of amines, indole, and skatole.

The aforementioned hydroxyl group becomes “re-available” as part of the same sequence by which the sulfides are originally reacted (ionically) into amino hydroxyl sulfides and then (by oxidation) into amino hydroxyl sulfates. The pH change in the environment facilitates the ionic separation of the amino hydroxyl sulfates back into a sulfate group and an amino group. The amino group is then free to react with another sulfide. Thus the amino hydroxyl function catalytically, allowing large-scale treatment with the minimum of concentrated 2900. This set of reactions is illustrated below.

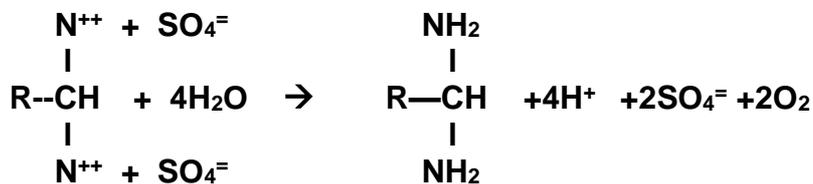
Phase 1 Illustration: Ionic Conversion of Sulfide to Amino hydroxyl sulfide.



Phase 2 Illustration: Oxidation of the amino hydroxyl sulfide to Amino hydroxyl sulfate.



Phase 3 Illustration: Ionic separation of the sulfate and amino hydroxyl group.



In summary, QuikSoil® 2900 works against bio-solids odor in 4 ways. Initially, amino hydroxyl groups promote oxidation of many odorous gases. Secondly, immediately available glycosides provide potential bio-energy and stress relief to increase bio-degradation of troublesome compounds. Thirdly, available nitrate provides an alternative reducing agent to sulfate, decreasing occurrence of RSC's. Fourth, biological precursors and intermediate organic acids chemically restrict and decrease the formation of many common bio-solids odors – including indole, skatole, diamines and triamines.

QuikSoil® 2900 is applied as a liquid diluted with fresh water. It should be thoroughly mixed into the bio-solids at the rate of 3 ounces of 2900 CONCENTRATE per cubic yard of bio-solids. Dilution rate is determined by the amount of liquid needed to create sufficient volume for mixing.

QuikSoil® 2900 is completely biodegradable within 36 hours. QuikSoil® 2900 is also non-toxic. At Concentrate, QuikSoil® 2900 has an LD 50 of

greater than 1.5 grams per kilogram. Its dermal irritation rating is between Category 3, dermal irritant and Category 4 ‡, or non-dermal irritant. However, in concentrate form, we recommend skin protection and eye protection, including gloves and safety glasses or goggles

QuikSoil® 2900 may also be used as a topical spray. However, this only deodorizes the surface area of the bio-solids. For topical applications, dilutions of 50 to 1 are typical. It should be noted that additional materials or exposure of new materials will create the need for new treatment.

1: Decomposition begins aerobically but insufficient oxygen is available to complete the total reaction pathway prior to volatilization. Examples are alcohols oxidized to aldehydes or ketones, further oxidized to carboxylic acids yielding esters including acetates. If the oxidation sequence ceases at any point – including oxidation of the acetates – the resulting compounds are odorous.

2: Examples are reduced sulphur compounds such as hydrogen sulphide, intermediate organic acids such as butyric and propionic acid, indoles, skatole, and reduced nitrogen compounds such as ethylamine and triethylamine.

3: The most common example is simple ammonia. However, ammonium radicals also are precursors to ptomaine diamines such as cadaverine and putrescine.