

ORC TECHNICAL BULLETIN # 1.3.3

Oxygen Release Compound, ORC®

Disposal Issues

Upon the completion of a ORC Filter Sock application, usually about six months, the disposal of the product needs to be addressed. Under most conditions we believe it will be possible to simply dispose of the ORC Filter Socks in conventional dumpsters designated for a Class III landfill.

The product will form a weakly cemented magnesium hydroxide and sand matrix by the time it is removed from the wells in which it is placed. This is essentially a solid block of Milk of Magnesia and sand in a 50:50 ratio. The MSDS on magnesium hydroxide, as prepared by Morton Thiokol a major chemical company, is clear that magnesium hydroxide is non-toxic and in fact is classified GRAS (Generally Recognized as Safe) for consumption purposes. This is of course witnessed by its use as an anti-acid.

MSDS disposal requirements simply require that it be disposed of in a container and does not interpret those requirements; presumably this could be a plastic trash bag. As is indicative of any MSDS you are always instructed to contact local, state or federal EPA offices for a final determination. Recent discussions with state and local agencies in several States have resulted in concurrence that non-hazardous disposal is acceptable.

Alternatively, one may consider a hardened ORC and sand matrix to be a form of concrete - which it is, just as calcium hydroxide and sand has been from the time of the Romans. The dumping of concrete generally does not have to meet MSDS requirements for the individual components, such as calcium oxide and calcium silicate.

With regard to landfill requirements, TCLP measurements on the product show extractable pHs ranging from 8.2 to 10.8, averaging 9.5. The latter extreme value is therefore *significantly below* a value of 12.5 which would classify it as a corrosive material in accordance with the Code of Federal Regulations. By the same token, ORC meets the criteria, beyond the corrosivity standard, for being a non-hazardous waste in that it is non-ignitable, non-reactive and non-toxic.

TCLP also measured a magnesium level between 180 and 1,500 ppm in an *active* extraction test. In a non-advective situation the magnesium levels are essentially not changed as the ORC is virtually insoluble and elevated concentrations can only exist in the vicinity of the well. Actual field data from the University of Waterloo indicates the magnesium levels in the vicinity of the well only elevate to a few ppm above background.

The only remaining issue, relative to a Class III disposal, is whether or not the ORC Filter Socks have absorbed minor amounts of the target hydrocarbons during exposure to contaminated groundwater. This is highly unlikely as the surface of the sock would be in a very highly oxygenated zone where remediation is maximal. Even if a sock was dissipated of oxygen, unless the socks are placed in wells with free product, it is highly unlikely they would have hydrocarbon concentrations in excess of the groundwater in the well from which they are removed. These levels would generally be insignificant once the sock is being considered for solid waste disposal where the actionable standards are much higher. Furthermore, it is clear that if the spent material was exposed to the air it would soon dissipate or be further remediated since it would retain moisture for a period. Spent product set on a tarp and exposed to air would probably allow ND to be reached in a short period on the assumption compounds were present.

Should for any reason the disposal requirements become more rigorous than Class III, then it is probably easiest to simply dispose of the spent filter socks in drums, in a similar manner as PPE used at the site, at a cost of approximately \$100 per 55 gallon drum. For each of the Regensis ORC Filter Sock products there are the following approximate unit disposal charges.

Filter Sock Size	Number/55 Gallon Drum	Unit Disposal Cost

6-inch Diameter	15 to 20	\$3.75 to \$5.00
4-inch Diameter	45 to 60	\$1.25 to \$1.66
2-inch Diameter	110 to 150	\$0.50 to \$0.66

In a typical scenario, 150 socks would be used in a barrier, and would be changed out twice a year. A total of 300 socks would therefore cost between \$150 and \$1500 per year for disposal depending on size, not including drum cost and labor for retrieval and handling.

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