

## An Introduction to Landfarming of Drilling Fluids

### **The Author:**

Peter Ashe began his research into the landfarming of hydrocarbons in the 1980s. Initial work was carried out for the then Urban Water Research Association of Australia. The work was undertaken at the Willawong Liquid Waste Treatment Plant and involved applying waste oils to prepared areas which were designed to prevent runoff during rain events.

Over the subsequent years the author has continued to be involved in the research and practical application of landfarming of waste drilling fluids and other hydrocarbon waste streams in both Australia and New Zealand.

This paper gives a very simple introduction to landfarming of used drilling fluids.

### **Definitions:**

Bioremediation is the use of microorganisms to breakdown contaminants such as hydrocarbons.

Landfarming is a bioremediation technology where wastes are mixed with soil to allow microbiological processes and oxidation to degrade contaminants.

There are a wide range of drilling fluids used in the oil and gas industry but generally they can be broken down into three main types:

- Water Based Muds (WBM) - These generally contain water, clay and other chemicals. Used muds may also contain hydrocarbon contamination.
- Synthetic Based Muds (SBM) - The base fluid in a SBM is synthetic oil.
- Oil Based Muds (OBM) - The base fluid in OBM is a petroleum product such as diesel.

### **Approval:**

In most jurisdictions, particularly those within Australia and New Zealand, one or more approvals will be required to undertake landfarming. These approvals will list various conditions which must be monitored and complied with. As the process and details of approvals vary greatly no further detail is given here.

### **The Landfarming Process:**

The landfarming process varies depending on waste type, soil type, climate and land use. However, In simple terms the landfarming process usually consists of the following steps:

- Selection and preparation of a suitable area. This will be determined by a number of factors including proximity to where fluids are being used, proximity to waterways etc, current and proposed future use.
- Transporting drilling fluids to the site for either storage or direct application. If fluids cannot be applied directly, suitable storage will be necessary. Analysis of waste fluids will be required to allow the calculation of suitable loading rates. In general terms, water based muds will be the easiest to treat, followed by synthetic based muds and oil based muds.

- Fluids are allowed to dry and then tilled into the soil to the required depth. Different waste streams should be applied to separate areas to allow greater control over the process. Tilling is normally undertaken at regular intervals to provide aeration. Various soil conditions may be controlled to improve the natural process. These include moisture content and pH. Additional bacteria may also be added. Nutrients are also monitored and additions made where necessary. Temperature has an effect on the speed of degradation but usually cannot be controlled.
- Careful monitoring is undertaken to ensure the process is working effectively, natural biota are not overloaded and approval conditions are being complied with. As a minimum, monitoring should include contaminant levels, pH, moisture level, nutrient levels. Additional monitoring may also be required by the approval. Regular inspections should also be undertaken. Sodium and metals levels should also be regularly monitored.
- At the end of the practical use of the area, the area may be leveled or harrowed.
- Topsoil may be applied.
- The area may be sown in crop or pasture and fertilizer applied.

**Discussion:**

As with any process, landfarming of drilling fluids can have advantages and disadvantages. If poorly carried out the process can lead to environmental contamination of land and water. However, if properly undertaken, the process can have many advantages over other methods of disposal. Landfarming actually breaks down many contaminants or uses them beneficially whereas this may not be the case in other disposal methods. The process can also improve rather than degrade land. In South Taranaki, New Zealand, for example large tracts of low productivity sandy soil have been converted into highly productive pasture with the assistance of landfarming.

In most cases, landfarming can also be carried out close to where the used fluids are generated. This can prevent the occurrence of environmental incidents during the transport of waste fluids. Disposal costs can also be significantly reduced. The process can also improve relations with landowners by returning an improved site after drilling operations are completed.

**Want more details:**

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