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Pumping Costs & Percent Solids in a Manure Slurry

The two major factors affecting the price of pumping is: 1) how thick the effluent is (% solids) and, 2) how far we have to pump the manure slurry (Hose miles).

Hose Miles:

This is determined by the layout of the hose from the lagoon to the tractor. It is figured in 1/8 mile segments as that is the length of each hose. We adjust the prices as soon as the hose miles reaches each ½ mile milestone as this closely equates how many booster pumps and the layout time required to reach a given field.

Hose miles is how many hoses it takes to go through the culverts, around fields, and eventually to the far end of the field being applied. As soon as we have to use another 660' hose (*even if it needed to reach another 100 feet*) this will add another 1/8th mile to the hoses miles). Hose miles is fairly easy to measure and verify on Google Earth's mapping application.

Percent of Solids:

In areas where lagoon top water is utilized for irrigation or where there is lots of evaporation the remaining manure slurry solids vary widely. The percent of solids is an elusive figure and not easily known until the official lab reports are returned for the slurry delivered to the field. Our pumpers try to estimate the percent of solids when pumping; but these estimates are just an educated guess and often incorrect.

Our pumping costs are based upon the solid content because as thicker solids are being pumped there is more friction loss in our hoses and pumps and the harder it is to pump. In short, the higher the solids the less gallons per minute (GPM) we can pump. This equates in higher fuel costs, higher labor costs and higher maintenance costs to pump the same number of gallons.

To overcome the friction loss in the hose our crews do one of three things: 1) move the pumps closer together, 2) add more pumps in-line with the fire hose, or 3) sacrifice the flow rate which will lower the GPM. All of these scenarios take more time or fuel or both. Time is money; and extra fuel creates more expense. To recover these increases in expenses a higher cost per gallon is charged as the percent of solids increase.

The goal is to remove solids from a lagoon. While the cost per gallon of pumped manure slurry goes up as the solid level rises, the actual price per dry ton of material being removed goes down. The formula for determining the dry tons removed is as follows:

$$\text{Dry tons} = \text{Gallons pumped} \times \text{percent of solids} \times \text{weight of gallon effluent (est. at 8.5 pounds)} / 2000$$

ie.) 510 tons dry solids = 1,000,000 gallons x .12 (12% solids) x 8.5 / 2000
 (A dry ton of solids is roughly equivalent to a cubic yard of material)