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Environmentally friendly storage and use of dirt, wastewater biosolids and other solid wastes at Minn-Dak Farmers Cooperative.

ABSTRACT

Sugarbeet processing facilities generate a significant volume of solid wastes from a variety of sources. Dirt, rock and weeds separated from the beets comprise between three and eight percent of the beets. The amount of precipitated calcium carbonate generated in juice purification is between five and eight percent of the beets sliced. Other solid wastes include discarded sugarbeets and sugarbeet pulp, coal ash, limekiln waste and wastewater sludge.

The major environmental concerns with solid wastes include ground water contamination, storm water runoff contamination, soil contamination, odors and dust. To avoid these problems, facilities must store and dispose of these wastes in an environmentally friendly manner.

Chemical analysis of solid wastes for potential environmental contaminants includes both elemental analysis of the wastes itself, and analysis of materials leached from the wastes using standard methods. Of particular interest are nutrients, heavy metals and pesticides and herbicides. Other tests may be necessary if the waste materials need to have properties for specific beneficial uses. For example, the calcium oxide and unburned carbon contents are important in using fly ash in concrete manufacture.

Temporary and permanent solid waste storage areas must be constructed to protect the environment. A variety of storage areas are used by sugarbeet processing facilities including mud and ash ponds, landfills and staging areas. Permitting for solid waste storage usually falls under State and local authority, though storm water runoff is part of the National Pollution Discharge Elimination System. The permits will contain requirements for site construction, operation and maintenance, the types of wastes allowed, operator training and emergency procedures.

Storing wastes creates an ongoing liability that can be avoided if the waste material is used beneficially. The key is to establish that the material performs some function that is required. Beneficial uses of soils include fill materials and a source of nutrients. Beneficial uses of ash include soil stabilization, a micronutrient source, and construction aggregate. A beneficial use of discarded beets or pulp is as a supply of nutrients for crops. Beneficial uses of limekiln wastes and precipitated calcium carbonate are soil stabilization, a source of nutrients and materials for construction.

To protect the environment, environmental regulatory authorities have rules regarding beneficial uses. Two examples of these rules are Minn-Dak Farmer Cooperative's requirements for land application of waste materials. For land applications in North Dakota, the North Dakota Department of Health required Minn-Dak to create a Nutrient Management Plan. For land applications in Minnesota, the Minnesota Pollution Control Agency required Minn-Dak to submit an application for a Solid Waste Management Facility Permit.

The basic requirements for these include site suitability criteria, soil testing requirements, notification requirements, site management limitations and restrictions, end user information, operation certification and record keeping and reporting requirements. Though obtaining these documents was costly, having them ensures Minn-Dak is able to spread dirt, discarded beets and

pulp on fields in a way that will not hurt the environment, and will legally protect the cooperative.

During sugarbeet washing, nutrients leach from the sugarbeets ultimately getting deposited in the dirt. The high nutrient content of the dirt must be accounted for when storing the dirt or land applying it. Minn-Dak uses double-belt presses to dewater most of the dirt to about 50% solids. This dirt is either land applied directly or deposited in a permitted mud-solids storage area. Some of the dirt ends up in wastewater ponds or is pumped directly out to a mud pond. Minn-Dak has used two methods for cleaning these ponds and land applying the dirt. The dirt in Minn-Dak's mud ponds is fairly fluid, being between 15 and 25 percent solids

In both cases the nutrient analysis was done of the mud and the application site. The total nutrient requirement for the upcoming crop was calculated. The total nutrients for the upcoming crop would be supplied from existing nutrients on site plus the nutrients supplied in the applied dirt.

Winter application was done using heavy equipments and trucks. The frozen dirt was loaded into trucks with a loader and backhoe. The dirt was trucked to the application site and deposited. After the frozen dirt thawed in the spring, it was leveled using a dozer. Winter application had no odors. In addition, the frozen dirt did not leak from the trucks. The major disadvantages were the high cost along with the high visibility.

Summer application was done by pumping a mud slurry to the selected field and injecting directly to the ground. The advantages of this method were a lower cost and an operation practically invisible to the public. The major disadvantages were a short window after harvest and before fall factory startup for applications, and mud ponds sitting all summer with some odor generation.