



Figure 12-7 Tailgate mounted material spinner

7. Other Chlorides (Calcium or Magnesium)

- a. What are chlorides?
 - i. These materials are naturally occurring, and are liquids in their natural state. They maintain an affinity for returning to a liquid.
 - ii. Both calcium and magnesium are commercially manufactured by either an extraction or a chemical process
 - iii. Both are produced and sold in a liquid solution form, and in a solid flake form
 - a) ODOT typically uses calcium chloride since it is more readily available and slightly less expensive than magnesium
- b. How do calcium and magnesium chlorides work?
 - i. Unlike salt (sodium chloride), these chemicals do not require heat energy to go into a solution
 - ii. Instead, they emit heat when they go from a solid into solution
 - a) Releasing heat when going into a solution is referred to as “exothermic”

- iii. Calcium and magnesium chloride also attract moisture from their surroundings
 - a) This improves their effectiveness in dry, cold conditions
 - iv. These materials have low eutectic temperatures so they provide more melting action at lower temperatures
 - v. Both materials are also very corrosive by nature and are frequently purchased with added corrosion inhibitors
- c. How is calcium chloride used?
- i. The liquid calcium chloride and the corrosion-inhibited versions as purchased by ODOT are within a 30-33% solution
 - a) This is the concentration that relates to the eutectic temperature (-60 degrees F)
 - ii. These products are typically used for pre-wetting salt and can be used to pre-wet abrasives
 - iii. It is also common to purchase calcium chloride in a dry flake form and mix it with salt or abrasives for effective melting at low temperatures
 - iv. The higher cost of calcium products frequently prohibits use for routine purposes
 - a) These products can also be used in anti-icing
 - b) However, at the higher cost they quickly become uneconomical
 - v. As detailed on ODOT's Route Application Guidelines and Goals document, the use of calcium chloride (or a corrosion-inhibited version) is recommended for use at temperature ranges below 25 degrees F

8. Agricultural By-Products

- a. Agricultural by-products work in basically the same way as other snow and ice control chemicals, but they do not form a brine
 - i. They are soluble in water; the resulting solution acts by depressing the freezing point of water

- b. In addition to the melting characteristics, the agricultural by-products are environmentally friendly and less corrosive than many conventional materials
- c. These products are the concentrated liquid residues from the processing of grains and other agricultural products
 - i. They are derived from the processing of agricultural raw materials and are often used in combination with other materials (for example, mixed with magnesium chloride)
 - ii. Like the chloride materials, their higher cost frequently prohibits use for routine purposes

C. Material Handling and Storage

1. Material Handling

- a. Exercising awareness and following requirements for personal protection can help prevent hazards

2. Materials Safety Data Sheet

- a. All chemical manufacturers are required to have a Materials Safety Data Sheet (MSDS) for each of their products
 - i. These sheets are required by law to be available to the user, and the safe user will be familiar with all of the information on these sheets
- b. All necessary information about the chemical is included in the MSDS
 - i. The manufacturer's name, address, and telephone number
 - ii. Identification numbers for the chemical
 - iii. A list of the major components of the chemical
 - iv. The chemical's characteristics and reactivity with other materials
 - v. Requirements for personal protective clothing and equipment needed in handling the chemical
 - vi. Emergency procedures in case of exposure or a spill
- c. All materials are to be handled in accordance with their respective MSDS

3. Material storage

- a. Improper stockpiling of salt and other materials can cause the major portion of environmental problems associated with salt use
 - i. Rain and melting snow can carry salt from uncovered piles into the ground and nearby bodies of water, and possibly cause chloride build-up
 - ii. Clean up of such contamination, should it occur, can cost millions of dollars. Salt piles must be covered.
- b. Storage Requirements
 - i. Section 900, *Snow and Ice Control*, in the Maintenance Administration Manual, details specifics of storing various winter maintenance materials
 - ii. Basic storage requirements
 - a) Salt must be stored on an impermeable pad and must be covered
 - b) Abrasives must be stored in an accessible area and must be protected from freezing
 - c) Liquid chemicals must be stored in a non-corrosive vessel
 - d) Liquid calcium and magnesium chloride require walled containment
 - e) No wall containment is necessary for salt brine, but protection from freezing is needed

D. Overview of Equipment Types

1. The role of equipment

- a. Equipment is the foundation of a maintenance organization
 - i. The available fleet must be suited to the job and must be well maintained
 - ii. The extreme conditions experienced within winter maintenance require the highest level of equipment maintenance and attention to detail