

Calibration & Maintenance of Liquid Applicators and Sanders

Calibration and Maintenance of Liquid Applicators

Calibration of your equipment is one of the most important aspects of having a successful and effective snow and ice program. Proper calibration assures that the operator can get consistent results and that product is not being wasted unnecessarily on the roadway due to over application or under applied which can lead to poor road conditions.

If you don't know how much product you are putting out, you will not have consistency or be able to track your accomplishments accurately. All dispensing equipment needs to be calibrated and regularly cross checked to insure that it remains in calibration. All equipment should be calibrated for each product used, for instance salt/sand mixture has a different density and weight than some of the other solid de-icer and therefore you should calibrate separately for salt/sand and calibrate separately for any other solid materials you may use.

Calibration by definition is: **Adjusting the computer settings to match the rate of application.** Do not confuse this with adjusting the shot (or application) rate that the operator routinely does during the course of a storm. It is important that each individual involved in an anti-icing or de-icing program understands the importance of proper application rates. Do not assume that if a little works, more will work better. Most products are most efficient when used according to manufactures recommendations and industry standards. Using more product than needed can be costly to the budget and to the environment.

Each Maintenance Section should insure that they have a sufficient number of individuals trained and capable of calibrating both sanders and liquid units.

Guidelines for Computer Calibration of Liquid Units and Sanders

Calibrations of on board computer controller systems shall be conducted only by trained and Supervisor approved personnel

- It is recommended that the Area Field Mechanic be the person trained to conduct these calibrations
- As a minimum requirement computer calibration shall be performed annually.
- Each time that a unit is calibrated an equipment work order will be filled out with a note indicating the result of the calibration.
- New date of calibration will be communicated with operator for use on TAPER log.
- Training can be obtained by contacting the vendor who supplies the applicator unit, or appropriate in house training.
- Staff Maintenance Equipment Unit will provide field manuals detailing the procedures to follow to calibrate a computer controller.
- Each unit must be calibrated for each product. So that the operator knows what the setting is prior to application. A record should be made of these settings for future reference.

- When multiple lanes are being treated at once the unit must be calibrated to shoot multiple lanes.
- Each unit must be calibrated when nozzles are changed---in particular when nozzles are changed from a fan pattern nozzle to a drill type nozzle.
- When a mechanic has repaired a problem to an applicator, they shall calibrate the computer.
- Any time mechanical repairs are made to the electrical or hydraulic system the calibration should be checked for accuracy.

Operator Guidelines to insure liquid applicator units are properly calibrated

Liquid Applicators

- The operator should conduct applicator field checks no less than once during each shift, and every time that the type of product being applied changes.
 - Liquid applicators are checked by using this formula
 - ✓ Gallons applied to the roadway divided by lane miles treated equals the application rate.
 - ✓ Do not assume that the computer is correct
 - When an operator believes that the applicator is not functioning properly
 - ✓ Fill out a Work Order
 - ✓ Contact the Supervisor or Field Mechanic immediately for instruction. The problem must be corrected as soon as practical.
- The Taper Log must be filled out at patrol turn around prior to return trip by each operator each round during the storm event.
- Lead Workers and Supervisors shall reference the Taper Logs and calculate the application rate to see if calibration is verified.
- A visual inspection of the unit shall be performed as part of the pre-trip/post trip inspection. This shall include the spray bar, nozzles, hoses/piping, tank, electrical connections, tank fill gauge and computer controller.
- Each unit must be calibrated for the specific product being used. So that the operator knows what the setting is prior to application.
- Operators must be aware of the computer settings when applying product to multiple lanes, and insure that the calibration and application rate are correct.
- Nozzles should be checked for wear and or damage, during and after each shift, and according to manufacturer's recommendations. Nozzles that are worn will have a different application rate as well as spray pattern.

Calibration of Sanders

- Sanders should be calibrated by trained personnel that have been approved by the supervisor.
- Variables such as transmission ratios, rear axle ratios, tire size and type of controller affect the final calibration. Do not assume the same parameters will be accurate for each unit, even though the trucks are the same year, make and model.

Operator Guidelines to insure solid applicator units are properly calibrated

Sander units

- The following formula can be used to check sander application rates.
 - Tons applied times 2000 equals the total lbs applied divided by the lane miles treated equals the lbs per lane mile applied.
 - ✓ It is the responsibility of each individual operator to insure that they are not over applying material for the particular event or road condition.
 - ✓ Individual loader buckets of product being used must be pre-weighed to determine the amount of product being loaded into a truck. The count of loader buckets times the weight of a loader bucket of material will determine the weight of the load on the truck.
- When an operator believes that the sander is not functioning correctly
 - Fill out an equipment work order
 - Contact the Supervisor or Field Mechanic immediately for instruction.
- The Taper Log must be filled out at patrol turn around prior to return trip by each operator each round during the storm event.
- Lead Workers and Supervisors shall reference the Taper Logs and calculate the application rate to see if calibration is verified.
- Hot shotting a load of sand with liquid products shall be performed at the direction of the Supervisor.

Applicator and Sander Maintenance

Corrosion protection, Cleaning, Maintenance and Wiring

- All electrical repairs shall be performed to CDOT standards for weather tight connectors by CDOT trained and authorized personnel.
- Magnesium Chloride is a salt like any other chloride. As such, it has corrosive properties that have proven to be somewhat complex. Generally, Mag Chloride ($MgCl_2$) is less corrosive than Sodium Chloride ($NaCl$); Sodium Chloride is commonly referred to as salt. Magnesium Chloride will corrode over a much longer period of time, than salt, if it is not removed.
- When both salts were studied in a research project, it was learned that Magnesium Chloride has a much higher viscosity than Salt. It is thicker and stickier than Salt. As such, it sticks to metals, from which Salt will drain more completely than will Magnesium Chloride. When both salts dry, they turn into a crystal. Magnesium Chloride absorbs moisture from any source and in particular from the air (at night when dew point is reached and condensation forms) salt does not. This means that when Magnesium Chloride is exposed to any moisture – even moist air – it reactivates and starts corroding again. Salt will not do this. Once Salt dries out, it is very difficult to get it to a water-soluble state again. Magnesium Chloride is very easily returned to a wet state, which is the corrosive state. This is why we say that even though Magnesium Chloride is less corrosive than Salt, it corrodes longer. How long? That is up to the equipment operator. The longer you do not remove Magnesium Chloride, the longer it will corrode metal.

- **It is imperative** that equipment be washed as quickly as possible after use in a storm. Equipment must be washed at approved sites to prevent contamination of our maintenance yard. Runoff from washing activities must not leave CDOT property.
- Care must be given where the interior of vehicles is concerned. Insulated floor mats frequently stay wet over long periods of time. Magnesium Chloride tracked into the cab by the operator finds its way to the wet underside of these floor mats and the corrosion process continues – forever. Floorboards in relatively new trucks can be severely corroded in short periods of time. Consider replacing insulated floor mats with solid rubber ones. Remove floor mats after a storm and wash them, as well as scrub the floorboard to halt corrosion. However do not use a hose in the cab of the truck, as you stand the chance of damaging the computer and other electrical components. Consider some sort of undercoat style treatment for the floorboards.
- Wiring is especially vulnerable. Again, the same principles apply for wiring. Magnesium Chloride will continue to corrode as long as it is wet and it can regenerate itself from moisture in the air. Wiring harnesses, insulation and connections must be watertight or Magnesium Chloride will corrode the copper wiring quite readily and destructively. Additionally, as needed all electrical connectors shall be cleaned, inspected, treated with dielectric grease or encapsulated and capped.
- Under no circumstances should the protective wire coating be punctured, nicked or removed to expose the wire.
- The entire liquid applicator system shall be flushed with clean water and drained prior to being stored for the summer season or for prolonged periods of time. Particular attention must be paid to the product pump and spray nozzles to prevent solidification of the material in those areas. Many units require the pumps and valves to be stored during the summer months with RV anti-freeze in them. If ethylene glycol is used, it must be captured in a container and not allowed to spill onto the ground or into a floor drain. Water soluble oil is recommended for storing the pump during the summer.
- All screens/filters shall remain in the system at all times, removing and discarding these devices is not acceptable. If attention is needed, the screens/filters shall be cleaned or replaced. Blockages in the system can lead to incorrect application rates.
- Nozzles that are worn must be replaced, as they will have a different application rate as well as spray pattern.
- Prior to performing any repairs that require welding the truck negative battery cable shall be removed at the battery. After the battery is reconnected the system calibration must be rechecked and verified.
- When jump-starting the carrier unit or using the carrier unit to jump-start another vehicle the computer must be disconnected or turned off.