

LRRB
Local Operational Research Assistance Program (OPERA) for
Local Transportation Groups
Field Report

Date: February 2017 through March 2018

Project Title: Pickle Brine as De-icing and Anti-icing treatment

Project Number: H006160101

Agency: Carver County Public Works

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Problem: The brine from the pickle cannery would have a variable salt salinity and felt that it would be difficult to manually control the manufacture of the brine to a usable liquid for road staff.

Solution: Purchase a Brine Boss

Vari-Tech Industries recommend solution was to purchase a Brine Boss. This would automate the manufacture of brine and guarantee the 23.3% solution we were looking for.

We obtained a small 300 gallon sample of the pickle brine for testing in 2016. We sent samples to several labs to determine the PH and how best to neutralize it to a useable liquid. We found that we could add Potassium Hydroxide 45% (KOH) at a ratio of 1gallon per 1000 would raise the PH to a neutral level of 10. During this lab testing time we also began the restoration of the Vari-Tech 600 brine maker obtained from MN-DOT.

Carver County installed the Brine Boss, an additional 5000 gallon storage tank and retrofitted the Vari-Tech 600 to work in conjunction with the Brine Boss. After the initial set up, staff made some natural brine to calibrate the Brine Boss. After we were comfortable with the Brine Boss functioning correctly, we introduced 1000 gallons of pickle brine. With the Vari-Tech staff on hand, we ran a load of pickle brine though the maker.

Procedure: The procedure involved testing of pickle juice along with equipment upgrades. The steps are listed below.

- 1) Obtain a 300 gallon sample of pickle juice for testing purposes.
- 2) Small samples of pickle juice were tested in the following examples stored in freezer at 0 degrees F:
 - a) Pickle juice blended with 23.3% salt brine mixture of 50/50.
 - b) Plain 23.3% salt brine mixture.
 - c) Pickle juice with Limestone added.
- 3) Sent pickle juice out to independent lab for composition.

- 4) Determined PH level of pickle juice and determined a safe chemical to raise PH level to neutral level.
- 5) Installed Vari-Tech brine Boss automated blending system.
- 6) Final pickle juice blending and Anti-icing pre-treatment to roads.

Results: This project started out as a request to implement the use of bi products from a pickle canning plant in the west metro area of the Twin Cities. After contacting the canning factory and determining we could obtain pickle juice at no charge. This would enhance our production of Sodium chloride for snow and ice control anti-icing and de-icing. In turn this would lower the amount of bi-product disposal of the pickle brine. Carver County began testing samples of the pickle juice. The results of the samples are listed below: All the samples were place in a 0 degree freezer.

- 1) Pickle juice blended with 23.3% salt brine mixture of 50/50. The result of this sample was a thin layer of frozen slush on the top of the sample. The blend was consistent in color and stayed blended throughout.
- 2) Plain 23.3% salt brine mixture. The salt brine mixture also had a top layer of frozen slush, similar to the 50/50 blend.
- 3) Pickle juice with Limestone added. Plain pickle juice with acidic PH level had no adverse effect on the limestone or the juice.
- 4) Pickle juice has a normal PH level of 2-3 which is acidic. After contacting a chemical company (Hawkins) we determined that the use of Potassium Hydroxide 45% (KOH) at a ratio of 1gallon per 1000 would raise the PH to a neutral level of 10.

Ingredients: The pickle juice is made up of Salt, Calcium Chloride, Lactic acid (product of the fermentation, not added to the brine), Cucumber remnants and a small amount of vinegar.

Implementation: Once we had the brine maker system sensors calibrated to the batch of pickle juice on hand the output of calcium chloride was used for anti-icing pre-treatment the product performed as expected.

Status: After installation of the Brine Boss blending system, we were ready to run our first batch of pickle brine through the brine maker to get a usable pre-treatment mixture of 23.3% salinity blend. Two Technicians from Vari-Tech were on hand to calibrate the system from using fresh water to using pickle brine to make brine. This process involved recalibration of the sensors in order to get the correct output of the final product. This process took over 4 hours to complete. We witness multiple sensor issues and a constant adjustment to correctly read the brine. Vari-Tech staff on hand had installed multiple Brine Boss systems and had never encountered these issues. They were concerned over the pickle brine and what else may be in it causing issues with the sensors. They obtained samples and took them back to their engineers to work with for a solution to the sensor recalibration question. Once the pickle brine batch was run through the system, we recalibrated the Brine Boss back to run fresh water to make brine.

Vari-Tech engineers concluded that the pickle brine acquired from the cannery had to be exactly the same each and every batch obtained. The salinity, the vinegar content, the sugar content, everything needed to be exactly the same, or we would have to continually adjust the sensors. Varying salinity by more than 1 point, for example, would cause the sensor output would fail. They recommended checking with the supplier to see if this was even a viable option. The results from the supplier of pickle brine were that there was no way to get the same chemical makeup of each batch. With an inconsistent supply, Vari-Tech will be unable to guarantee a consistent blend of 23.3% brine solution using pickle brine with unknown variables. Unfortunately because of the varying nature of the pickle brine product, Carver County will be unable to continue using pickle brine as an anti-icing product

Benefit to other Agencies: This project will be a benefit to other agency that may be willing to try using food processing bi-products. Carver County's project show there can be an alternative anti-Icing product. As technology continues to advance, we may again look to pickle brine as a viable option.

Total Duration of Project: 13 Months

Project End Date: 03/2018

Approximate Cost of Entire Project: \$45,000.00

Total OPERA Funds used for project: \$20,000.00

Send and Email a completed report with pictures to: Mindy Carlson, CTS - 200 TSB, 511 Washington Ave. SE, Mpls. MN 55455, email carlson@umn.edu. For questions about this report please contact Mindy Carlson at 612-625-1813.