



## *Kittson County Highway Department*

401 2nd Street S.W.  
Hallock, MN 56728  
Phone (218) 843-2686  
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August 1, 2010

**Mindy Carlson**

**CTS 200 Transportation & Safety Bldg.**

**511 Washington Ave. SE**

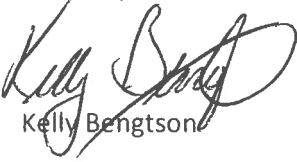
**Minneapolis, MN. 55455-0375**

**Re: Kittson Co. OPERA final report**

Dear Mindy,

Enclosed is the final report for our magnesium chloride project. I hope you will find this report interesting and informative. Thank you for your cooperation in funding this project with the research grants from OPERA.

Sincerely,



Kelly Bengtson

Kittson Co. Engineer

Cc: S. Anderson – Maint. Foreman

B. Younggren – Co. Commissioner

file

**USAGE OF MAGNESIUM CHLORIDE SOLUTION ON LOW TRAFFIC COUNT GRAVEL ROADS IN  
NORTHWESTERN MINNESOTA ON KITTSON COUNTY ROAD 58**

Acknowledgements

This research has been funded in part by a grant from the Minnesota Local Road Research board (OPERA) program, and the Kittson County Highway Department.

Abstract

Kittson County currently maintains over 800 miles of county and township unpaved roads. Gravel roads here are normally maintained by blading with a motor grader and adding additional aggregate when needed. The blading occurs approximately every other week and regravelling every other year. These costs can approach nearly \$5,000 per mile per year.

With the latest budget issues and heavy commercial loads, Kittson County hopes that the application of magnesium chloride can save material and maintenance costs.

Researching information and visiting with other counties that have used the chloride products, Kittson County came to the conclusion to try magnesium chloride rather than calcium chloride. At this time the magnesium chloride was less costly (.85/Gal.) compared to the calcium chloride (1.01/Gal.). Therefore this was an additional factor in this decision. Also to give this our best effort we bladed and reshaped the road first. Then we regravelled the road at the rate of 200 cu. yds. per mile. We tested the gravel to know the specifications of the product and then rebladed the road two more times before the application. We had Dustcoating, Inc. do our application and now are monitoring the project.

Procedure

Trying to achieve the best possible results with the experiment the following steps were taken:

- 1) Blading and reshaping of the road to bring it to an approximate 4% grade. Because of the extreme wet and cold conditions these were delayed by approximately 4 weeks. Blading of the road is shown on the pictures provided.
- 2) Regravelling the road at the rate of 200 yds. per mile. The gravel used was tested and passed all the specifications for Class 5 with a higher specification for the bottom sieve of 5-10. Copies of the test are provided for your information.
- 3) Application of magnesium chloride at the rate of .30 gal./sq. yd. was applied on the 16<sup>th</sup> of June by Dustcoating, Inc. of Savage, Minnesota. The chloride was applied on an 18 ft. width for 15,000 feet. Pictures and slips of the material are provided for your Information.

Because of approaching weather we had to postpone our initial application set for the 12<sup>th</sup> of June to the 19<sup>th</sup> of June. Again, weather conditions changed our plans. Kittson County and Dustcoating, Inc. were able to do a 15,000 ft. strip on June 16<sup>th</sup>. Again, just prior to application the road was rebladed. Pictures showing the application, the equipment and where they finished are provided.

### Conclusion

The application of magnesium chloride definitely provided benefits. These included a very large reduction in dust (at least 75%) which provides for improved visibility for the traveling public and a higher comfort level for adjacent home owners. The product also provided for a "tighter" or improved gravel road surface which increased the ride quality index as the development of "washboards" was virtually eliminated.

And finally, the product did provide a long term cost savings by eliminating the need to apply an annual resurfacing aggregate layer plus a reduction in maintenance blading operations for light traffic (cars and light trucks). This savings would project to be \$420.20 per mile based on the KCHD annual reports for 2009 & 2008 when including special work, repairs and replacements and routine maintenance.

Reported by:

  
\_\_\_\_\_  
Kelly Bengtson  
Kittson County Engineer

Date: 8/1/2010

Road Preparation

①



②



Road Preparation before adding  $MgCl_2$



Application of Mag Chloride

③



④



Application & end of Mag Chloride application



**MINNESOTA DEPARTMENT OF TRANSPORTATION  
WORK SHEET FOR SIEVE ANALYSIS OF GRANULAR MATERIAL**

PIT: **STRATA** (AG PROD) *By Church*

S.P. NO.	DATE: <b>7/18/08</b>	TEST NO. <b>1</b>
CLASS: <b>5</b>	STATION:	LAYER:
TOTAL WEIGHT OF SAMPLE <b>30.0</b>	LBS.	TEST MADE BY <b>JRT</b>

COARSE SIEVES:	(1) INDIV. WEIGHTS	(2) SIEVE SIZE	(3) CUMULATIVE WTS. PASSING	(4) TOTAL % PASSING	GRADATION REQUIREMENTS
* Pass. _____ " Sieve, Ret. _____ " Sieve					
* Pass. _____ " Sieve, Ret. <b>1/4</b> " Sieve					
* Pass. <b>1/4</b> " Sieve, Ret. <b>3/4</b> " Sieve	1.2	1	30.0	100	100
* Pass. <b>3/4</b> " Sieve, Ret. <b>1/2</b> " Sieve	2.2	3/4	28.8	96	90-100
* Pass. <b>1/2</b> " Sieve, Ret. <b>3/8</b> " Sieve	1.4	1/2	26.6	87	-
* Pass. <b>3/8</b> " Sieve, Ret. <b>4</b> " Sieve	3.9	3/8	25.2	84	50-90
* Pass. <b>4</b> " Sieve, Ret. Bottom	21.3	4	21.3	71	35-80
Check Total -	<b>30.0</b>	-Shall check Total Wt. Within 0.2 Pounds			

- \* Enter necessary sieve sizes for class of material to be tested.
- Column (1) Enter weights of material between each set of sieves individually.
- Column (2) Enter the passing sieve size.
- Column (3) Add column (1) from bottom up to get cumulative weights passing each sieve.
- Column (4) Divide column (3) by check total of sample to get total % passing.

FINE SIEVES:		(5) INDIV. WEIGHTS	(6) SIEVE SIZE	(7) CUMULATIVE WTS. PASSING	(8) CUM % PASSING	(9) % PASSING OF TOTAL PASS.	GRADATION REQUIREMENTS
* (A) Take two samples identical in condition and damp weight from "passing <b>#4</b> material".							
* (B) Dry one sample and record weight.							
* (C) Wash and dry other sample and record weight.		<u>665.9</u>					
* (D) Loss in washing (B-C) (Enter below).		<u>577.7</u>					
		<u>88.2</u>					
* Pass. # _____ Sieve, Ret. # _____							
* Pass. # _____ Sieve, Ret. # <b>4</b>	-						
* Pass. # <b>4</b> Sieve, Ret. # <b>10</b>	105.3	4	661.0	100	71	35-80	
* Pass. # <b>10</b> Sieve, Ret. # <b>20</b>	111.1	10	555.7	84	60	20-65	
* Pass. # <b>20</b> Sieve, Ret. # <b>40</b>	105.5	20	444.6	67	48	-	
* Pass. # <b>40</b> Sieve, Ret. # <b>100</b>	179.0	40	339.1	51	36	10-35	
* Pass. # <b>100</b> Sieve, Ret. # <b>200</b>	69.6	100	160.1	24	17	-	
* Pass. # <b>200</b> Sieve, Ret. Bottom	2.3	200	90.5	13.7	9.7	5-10(mod)	
Loss by washing-	<b>88.2</b>						
Check Total -	<b>661.0</b>	-Shall check (B) Within 5 grams.					
Percent Passing #200 Sieve Divided By Percent Passing 1" Sieve (if specified)							

- Column (5) Enter weights of material between each set of sieves and loss by washing. (DO NOT OVERLOAD SIEVES)
- Column (6) Enter the passing sieve size.
- Column (7) Add column (5) from bottom up to get cumulative weights passing each sieve. Be sure to add loss by washing to weight of material passing #200 sieve by dry sieving to get first entry at bottom of column (7).
- Column (8) Divide column (7) by check total dry weight of fine sample (Column 5) to get cumulative % passing.
- Column (9) Multiply column (8) by % passing final sieve from column (4) to get "Percent Passing" based on total sample.

**DUSTCOATING INC.**

**Quotation**

7217 W 128 TH STREET  
SAVAGE, MN. 55378

Phone Number  
952-894-0012 OR 800-881-5848  
Fax 952-894-0126

**TO:** Kittson County Hwy Dept      **DATE:** 3/9/2009  
**PAYMENT TERMS:** 30 DAYS  
**ATTN:** Jim      **DELIVERY:** 2009

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>UNIT PRICE</u>
Approx 22,000 Gallons	Magnesium chloride furnished and applied to variuos county roads	\$.845 / GI
	Calcium chloride	\$1.01 / GI

Please respond by signing, dating and returning this sheet  
via fax or mail to the address noted above

Yes, we wish to use your services and agree to the price  
and payment terms above

\_\_\_\_\_

No, we do not want to use your services

\_\_\_\_\_

Questions regarding this quote.  
Please Call: Stan Johnson