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NDDOT

NDDOT Chip Seal Oil
Fargo District
Tried Different Oils In Fargo
- CRS-2P – 2013
- HFMS-2 – 2013 & 2014
- CHFRS-2P – 2015+

Different Chips
- Class 41M – w\ CRS-2P & CHFRS-2P
- Class 43 – w\ HFMS-2
History

- **CRS-2P**
  - Concerns from maintenance and oil on plows
  - Losing chips during winter operations
  - Chips not clean enough?

- **HFMS-2**
  - Virtually eliminated concerns from maintenance
  - Slow setting created chip loss at intersections
  - Rural communities
**History**

- **CHFRS-2P**
  - Great chip retention
  - Quick setting
  - No appearance of a wave during placement
**Cost – 2016 Annual Bid Prices**

- CRS-2P $1.93/gal
- HFMS-2 $2.37/gal
- CHFRS-2P $2.34/gal
  - About $2,600/mile additional cost between CRS-2P and CHFRS-2P at 26’ wide
- Class 43 $1.10/SY, small quantity
- Class 41M $0.45/SY
Project Cost

2016 Chip Seal on ND 13
- About 26 miles long
- Epoxy Edge line w/ Tape at an Intersection
- About $32,000/mile

2017 Chip Seal on ND 11
- About 9 miles long
- Epoxy edge line w/tape at an intersection
- About $36,000/mile

2017 Chip Seal on ND 200
- About 9 miles long
- About $25,000/mile but all paint
Chocolate Chip Cookies:

Ingredients:
- 532.35 cm³ gluten
- 4.9 cm³ NaHCO₃
- 4.9 cm³ refined halite
- 236.6 cm³ partially hydrogenated tallow triglyceride
- 177.45 cm³ crystalline C₁₂H₂₂O₁₁
- 177.45 cm³ unrefined C₁₂H₂₂O₁₁
- 4.9 cm³ methyl ether of protocatechuic aldehyde
- Two calcium carbonate-encapsulated avian albumen-coated protein
- 473.2 cm³ theobroma cacao
- 236.6 cm³ de-encapsulated legume meats (sieve size #10)

To a 2-L jacketed round reactor vessel (reactor #1) with an overall heat transfer coefficient of about 100 Btu/F·ft²·hr, add ingredients one, two and three with constant agitation. In a second 2-L reactor vessel with a radial flow impeller operating at 100 rpm, add ingredients four, five, six, and seven until the mixture is homogenous. To reactor #2, add ingredient eight, followed by three equal volumes of the homogenous mixture in reactor #1. Additionally, add ingredient nine and ten slowly, with constant agitation. Care must be taken at this point in the reaction to control any temperature rise that may be the result of an exothermic reaction.

Using a screw extrude attached to a #4 nodulizer, place the mixture piece-meal on a 316SS sheet (300 x 600 mm). Heat in a 460K oven for a period of time that is in agreement with Frank & Johnston's first order rate expression (see JACOS, 21, 55), or until golden brown. Once the reaction is complete, place the sheet on a 25C heat-transfer table, allowing the product to come to equilibrium.