

# Otta Seal in South Dakota

Between gravel and asphalt.

By Larry Weiss

**F**irst, what is it? Otta Sealing is a process comparable to blotter construction (asphalt surface treatment). As with a blotter surface, the key to success is thickness and strength of the base. The Otta Seal itself has virtually no strength.

The name Otta comes from the Otta Valley in Norway where the process was developed in the 1960s. Based on information from Cass County, MN, the intent was to serve as a “hybrid” road covering between gravel and asphalt pavement (mat). It can be placed in one or two layers. If two layers are applied in the same season, it is recommended to construct the second layer two to three months after the first.

The process was first used in Day County, SD, in 2008. Chuck Fromelt, Day County Highway Superintendent, says the reason they tried the process was to provide an asphalt surface at a lesser cost than asphalt mat. The 2008 project was on a new grade with nine in. of SD DOT standard specification base course. The Otta Seal was then placed.

A second project in Day County was done in 2009. Seven miles of old blotter surface (with multiple chip seals) needed rehabilitation. The blotter surface had about five in. of base material under it which did not meet current specifications. It was milled after placement of three in. of SD DOT standard specification base course. The milling incorporated the new base material with the old blotter surface and some of the existing base. After shaping and compaction, this provided about nine in. of base on which to construct the Otta Seal surfacing.

The first urban project was in 2009 on North Airport Road at the northwest edge of Pierre. It is 1.25 miles long with an ADT in 2009 of 526 vehicles. It was a gravel-surfaced road that brought frequent complaints. The issues were primarily dust and severe corrugation (washboard) in the surface. This road required significant maintenance to keep the complaints to a minimum. The posted speed was 45 mph. Reducing the speed limit to 35 was discussed by the

Pierre Safety Committee, but abandoned because the area is somewhat rural and 45 mph is more reasonable.

Other background information on the road is as follows: It is managed under joint jurisdiction with Hughes County. It serves multi-land uses including commercial business, a rural fire station, a landscaping company, warehousing and storage units, some residences, a salvage yard, and agricultural access.

A commitment to provide an asphalt surface had been made in previous budgets. The initial objective was to place an asphalt mat in 2008, but the dollars budgeted were insufficient. Yet, something had to be done since 526 ADT was too high to effectively maintain a gravel surface. Previous DOT research indicated about 200 ADT is maximum to effectively maintain a gravel surface.

Subsurface investigation revealed about eight in. of base course meeting state specification (with low plasticity) material. Drainage was good. Initial improvement in 2008 was done by adding four in. of asphalt millings to reduce dust.

The millings were blended with existing base and the surface shaped, watered, and rolled. In addition to reducing the dust “somewhat” the millings also added strength, now resulting in about 12 in. of base. Thereafter, a method of affordable surfacing was sought and Otta Seal was selected.

## Why Otta Seal?

Why and how did we choose Otta Seal? Two presentations (Becker County, MN, and Day County, SD) in 2009 introduced us to Otta Seal. It was acceptable for several reasons. The city

### Material and Cost of Otta Seal

- Oil: HFMS2S (high float, medium set, soft emulsified binder)
- Application rate of oil: 0.50 gal/sq yd
- Cost of oil: \$451 per ton or \$0.92 per sq yd
- Cover aggregate: natural, clean crushed gravel (.75 in. top size)
- Application rate of cover aggregate: 50 lb/sq yd
- Cost of aggregate: \$0.65/sq yd

Total cost of Otta Seal material is \$1.57/sq yd plus city equipment and labor.

Cost of asphalt pavement in City of Pierre in 2009: \$68 per ton in place or about \$10.35/sq yd for construction of a four-in. mat.



*Close-up view of large aggregate used in Otta Seal surfacing.*

could perform the work with in-house forces and equipment. The estimated cost was significantly less than an asphalt mat and sufficient budget dollars would be available. Finally, a field trip to Day County by Mark Metzinger, Pierre Street Superintendent, and Lynn Patton, Construction and Operation Manager, was convincing.

Here is a brief description of the construction process. An additional two inches of SD DOT specification base course was placed on the south portion of the project, which received the first application in early October 2009. Earlier would have been better, however, the weather was warm enough for a quality construction.

City-owned equipment including an oil distributor, chip spreader, rollers—rubber tired and steel drum; and trucks to haul aggregate were used for construction.

The cost of Otta Seal at \$1.57 per sq yd plus cost of city equipment and personnel compared to \$10.35 per sq yd for four in. of pavement is considerably more cost effective in the short term. It should also be noted prime oil is not required based on the literature and based on the experience on the Day County and Pierre projects. The intent in 2010 is to apply Otta Seal to the remaining length of the project and apply a second application to the entire

1.25-mile length.

What life can be expected? Due to insufficient length of experience with the Day County and Pierre projects, a 2008 report was reviewed that analyzed Otta Seals from one to seven years old in Minnesota. The report reviewed seven projects and indicated most were in good condition with the exception of one which had potholes at the centerline indicating an issue with the centerline lap joint. Four had received a chip seal over the Otta Seal.

Day County had some frost heave failures in the 2009 project indicating the need for a stable subgrade. The subgrade is 50+ years old and was not

recompacted.

In summary, strong emphasis must be placed on foundation requirements. Otta seals are constructed over an aggregate base course. Since Otta seals do not add structural capacity to the roadway, the base, subbase, and subgrade must be designed to support the anticipated traffic loading. Subgrade and base materials should be compacted and graded to provide a stable working surface before Otta seal placement.

At current unit costs, it is considerably cheaper to construct thicker base with asphalt blotter or thin asphalt concrete mat than trying to provide strength with thick pavement. Base course (with variability in haul and material cost) can be placed six- to eight-in. thick compared to one in. of hot-mixed asphalt.

**GE**

*Mr. Weiss is Central SD LTAP Provider. Input was also provided from Lynn Patton, Pierre Construction and Operation Manager; Mark Metzinger, Pierre Street Superintendent; and Chuck Fromelt, Day County Highway Superintendent. The preceding originally appeared in The Connection (Summer 2010), published by the South Dakota Local Transportation Assistance Program, Brookings, SD.*



*Otta Seal surface near a business that generates heavy truck traffic.*