Miller Paving Limited's Double Surface Treatment with Stress Absorbing Membrane Interlayer (SAMI) on Old Homestead Road in York Region, was completed over a 3-week period in July-August 2015. This project provided a cost effective and environmentally friendly alternative to a major road reconstruction and is a great example of using the correct treatment on the correct road at the correct time.

85% less expensive than full reconstruction ($12.5M vs $2M)

37% less energy per tonne of material, 78% less energy per square meter

3900 tonnes of aggregate and 600 tonnes of emulsified binder vs 21,000 tonnes of HMA and over 400,000 tonnes of aggregate

Same day return to traffic during operations and 3 week overall project duration vs months for reconstruction

10 - 15 year service life with an additional seal at the 5-7 year mark.

BACKSTORY:

This 19-km stretch of road passes through rural and residential areas, with a saturated road base in many locations throughout the contract length. The Region of York is located in Southern Ontario where cold, snowy winters and hot summers create a freeze-thaw cycle annually.

PROBLEM:

Old Homestead Road had been pulverized and treated in years past with less than favourable results. The road would frost heave and break apart yearly due to water ingress from the surface into the base material. To the point where the Region of York believed only reconstructing the whole road with new base materials and 65mm of HMA would be their only option.

SOLUTION:

Based on the past success of the Stress Absorbing Mebrane Interlayer (SAMI) in similar conditions, Miller Paving worked very closely with the Region of York and the design consultant and suggested a double surface treatment with SAMI. This method prevents water ingress from the top and prevents water pumping up to the surface, thus eliminating distortions and extending pavement life. Because of this suggestion, the Region and design consultant agreed that the SAMI was the preferred road maintenance option. The tender was issued and won for a fraction of the cost of the original proposal and lessened the environmental impact compared to a full road reconstruction. As of the winter of 2018/19, the road is still well performing. This initiative won the ORBA Green Award displaying efforts to continuously improve environmental sustainability.

The method used was a typical of a surface treatment operation. After the road surface is swept and cleaned of dust, a light tack coat is sprayed on the road, immediately followed by application of the geotextile. The bottom layer of emulsion is sprayed on top of the fabric, then the bottom coat of aggregate is dropped onto the surface and compacted with a rubber-tired roller. Traffic is allowed to drive on this surface while the adjacent lane receives the same treatment. Allowing traffic on immediately reduces the inconvenience to the travelling public. Emulsion is then sprayed again and the top coat of aggregate is then applied. The Clean Bond Coat fog seal follows thereafter, and traffic is allowed on the fresh surface within 30-60 minutes. At no time does excavation or pulverization of the road surface take place. The project was completed in 3 weeks during July – August of 2015. Selected areas were padded with hot mix or milled to adjust the profile prior to surface treating.

The tender price for this project was under $2 Million. Comparable options that the Owner was considering are shown in Table 1.

Table 1.0: Rehabilitation Options for Old Homestead Road

Option 1	Length	Width	Depth	Density	Unit Cost	Total Cost
Full Removal	19 km	7 m	1.4 m (Frost depth)	2.2 t / m2	$10 / tonne (trucking)	$ 4,096,400
Granular B	19 km	7 m	1.0 m	2.2 t / m2	$15 / t	$ 4,389,000
Granular A	19 km	7 m	350 mm	2.2 t / m2	$25 / t	$ 2,560,250
Hot Mix	19 km	7 m	50 mm	2.5 t / m2	$90 / t	$ 1,496,250
Total						$ 12,541,900
Option 2						
Pulverize	19 km	7 m	150 mm		$2 / m2	$ 266,000
Hot mix	19 km	7 m	65 mm	2.5 t / m2	$90 / t	$ 1,945,125
Poor Performing Areas			Excavation and replace with new granular as needed			$ 200,000 (est)
Total						$ 2,411,125

This situation is typical of rural areas with poor road bases and limited budgets. Option 1 is technically the best option (longest usable life of the road) but is far more expensive than the traffic volumes justify. Option 2 is more conventional, but the pulverization would bring deleterious material closer to the road surface and require

more repairs in the near future. Miller's suggested alternative to these resulted in a further cost savings at construction and in the future, as another seal coat can be applied in 5-7 years to preserve the road in good condition.

Aside from the tendered price of the project, additional savings came from reducing energy consumption. The method used requires 37% less energy per tonne and 78% less energy per square meter than hot mix asphalt (see table 2.0). This treatment used on this project reduces the energy required to heat the hot mix asphalt and the trucking associated with removing and replacing the existing material. Where a long stretch of rural road has a saturated base, full removal and replacement can be cost-prohibitive, while pulverizing would result in deleterious material being even closer to the surface. Future resurfacing with another chip seal or Slurry Seal would still consume a fraction of the energy per m2 that selective resurfacing with hot mix asphalt would. Material use was approximately 3900 tonnes of aggregate and 600 tonnes of emulsion, compared to 21,000 tonnes of a 65 mm hot mix overlay following pulverization, and over 400,000 tonnes of aggregate in a full remove-and-replace.

Table 2.0: Energy Savings of Paving Processes

Treatment	Energy Consumption (MJ/t)	Energy Consumption (MJ/m^2)
Hot Mix Asphalt	680	82.0
Cold Recycled Mix	457	75.5
Graded Seal	424	17.5
RAP Graded Seal	397	16.0
Slurry Seal	695	8.5
RAP Slurry Seal	608	7.5
Unbound Granular	113	37.0 (at 150 mm thick)

In summary, using a Double Surface Treatment with Geotextile on this project provided a net benefit in terms of overall sustainability. The Region of York used this method on two similar roads in their network, both in 2016 and both are performing well today. This is a great example of using the correct treatment on the correct road at the correct time.