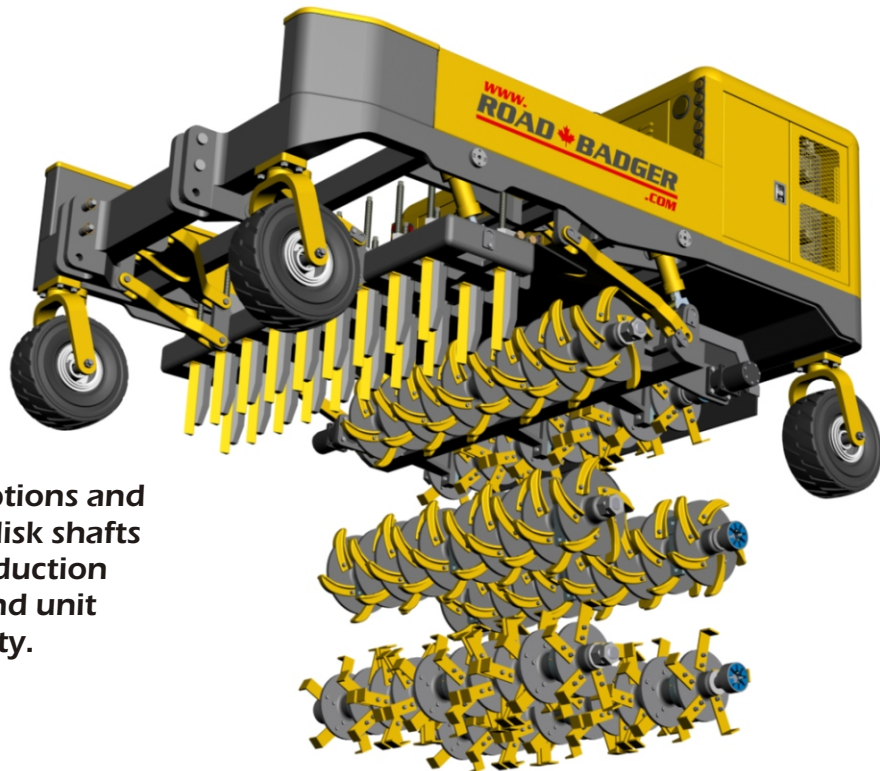


ROAD BADGER TM

**Sustaining Non-Renewable Natural Resources
Reducing CO₂ Emissions
Reducing Infrastructure/Transportation Deficits**

While

**Rehabilitating- Remixing- Resurfacing
Lower volume un-paved or lightly surfaced
Roads, Lanes, and Airport Runways**



New tooling options and quick change disk shafts increase production efficiency and unit versatility.

With the Advanced Generation of Road Restoration and Cost Reduction Equipment

ROAD  BADGER TM

Corporate Mailing Address:
PO Box 4244
Edmonton, Alberta, Canada T6E 4T3

Canadian Patent #2,184,950
US Patent #5,795,096



Designed and Manufactured
in North America

arhca
alberta roadbuilders &
heavy construction
association

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ROAD BADGERTM

APPLICATIONS

COLD MIX / LIGHTLY SURFACED

An effective method of reducing costs associated with resurfacing, Road Badger recovers the existing material up to 75+mm (3+inches) deep without base contamination or material damage at working speeds of 3 -5 km/hr. This reduces the amount of new material (both binder and aggregate) that is required to provide the new surface. Substantial material, equipment and time savings can be generated - while providing increased production.



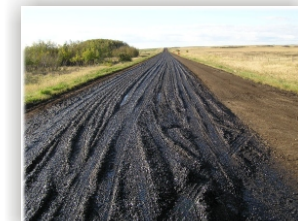
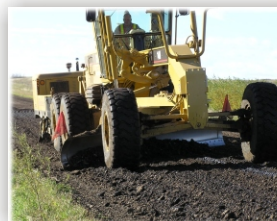
GRAVEL ROADS

The Road Badger can retrieve and re-mix the existing aggregate compacted within the road surface, at depths of up to 150 mm (6 inches) replenishing the amount of surface aggregate present. This process will remove defects of pot holes, washboard and ruts, instead of filling them in with loose material. This process has proven to reduce re-graveling frequency without reducing surface quality. The Road Badger can also be used in conjunction with or prior to graveling, reducing the amount of material required to be applied.



PRODUCT MIXING

For new road surfaces, the Road Badger offers economical production in new product mixing at depths of up to 150 mm (6 inches). Used in combination with a grader or smaller tractor, thorough product mixing is efficiently achieved. Road Badger can be used either to mix windrowed product, or provide effective in-situ mixing as commonly done with thin surfaced abatement sections. With its quick change disk shafts, the Road Badger provides flexibility and efficiency without reduced effectiveness.



ROAD BADGER™

Proven & Documented Results Attesting to

Reducing costs associated with maintenance, rehabilitation and renewal/upgrades of low volume unpaved or lightly surfaced roads (that have had an oil based binder, nominally 5% by volume for a 50 mm (2") compacted lift, introduced into them), urban lanes and airport runways.

Reducing amounts of road re-surfacing materials needed and extending the product life of already in-place Non-Renewable Natural Resources such as gravel and oil that directly relate to provincial/state and federal environmental **Sustainable Resource Programs**.

Reducing the Government Infrastructure / Transportation Deficit thru cost savings and efficiencies created by using patented Road Badger Methodology in common road maintenance, road rehabilitation and road renewal/upgrade applications.

Reducing GHG Emissions with the ability to document & audit the GHG Emission Credits created. Approved under Alberta Environment. View offset protocols for Road Rehabilitation at www.carbonoffsetsolutions.ca

Creating safer road travelling surfaces and lowering most facets of commercial & private user "time to market" costs as well as vehicle maintenance costs.

- Fact:**
- Alberta has in excess of 130,000 km. of gravel road
 - Canada has in excess of 660,000 km. of gravel road
 - North America (Canada & USA) has in excess of 3,300,000 km. of gravel road.
 - Over 10,000 airports in North America with unpaved runways.
 - Gravel, oil based road binders and road surfacing product delivery costs have tripled since 2004.



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Explanations, Guidelines, Standard Practices, Factors and Calculations

- 01/. Normal road maintenance to refresh a travelling surface is to add more road surface materials (gravel for gravel roads or another full, 50 mm compacted layer of gravel & oil based binder for cold mix roads).
- 02/. The Road Badger allows you to reclaim and reuse existing product in place in order to help Sustain Non Renewable Natural Resources and reduce costs.
- 03/. 1 tonne = 1000 kilograms = 2205 lbs. 1 cu. metre = 1.307 cu. yards,
1 cu. yard = 0.765 cu. metres. 1 litre = 35.20 Imp. fl. oz. or 33.88 U.S. fl. oz.
- 04/. Tonnes per cubic metre or per cubic yard vary based on gravel density, packing geometry, moisture content, state of compaction, and percentage of fines to aggregate. Hard rock varies between 2.2 & 3 tonnes per c/metre.
- 05/. Gravel with little or no fines has a **dry** weight of 2490 lb per c/yard or 3255 lb per c/metre. This is equal to 1.476398695 tonnes per c/metre.
- 06/. Alberta Transportation des.4-cl.20 standard (20 mm road crush) has a weight factor of 1.63 tonnes per c/metre.
- 07/. Gravel suppliers use 1.75 to 1.78 tonnes per c/metre as their loose fill conversion rate and normally have a minimum delivery of between 20 & 30 tonnes.
- 08/. 62.5 mm (2.5") of loose fill gravel and binders compact down to 50 mm (2") of cold mix surface road.
- 09/. Oil based binders added to gravel to create cold mix are added in by a volume factor of up to 7% dependent on product design characteristics. The most commonly used, MC-250, is 5% by volume.
- 10/. Gravel value should be based on regional or national benchmark cost replacement just as oil is, not local or jurisdictional.
- 11/. Alta Trans suggested good practice for re-gravel is 200 tonnes per km.
- 12/. Formula for tonnes of gravel per km. is: length x width x depth x weight factor (i.e.) 1 km. (1000 metres) long x 8 metres wide x 50 mm. Deep x Alta Trans standard (as per point 06) of 1.63 tonnes per c/metre = 652 tonnes.
- 13/. Rough formula to factor in litres of MC-250 oil based binder for above point 11 is total tonnes x volume as per point 09 (652 tonnes x 5% = 32,600 litres).
- 14/. Compaction of travelling surface is desirable after rehabilitation or adding more gravel and/or binders. The use of water to aid in compaction can be desirable.

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Example

Alberta contains over 130,000 km. of unpaved and lightly surfaced roads (roads that have had an oil based binder, nominally 5% by volume of loose fill introduced into them to create a 50 mm (2") compacted layer of cold mix.

- A/. Alberta Transportation suggests good practice should be to replenish the travelling surface gravel of low volume unpaved roads every three years with approximately 200 tonnes per km. This cycle and the product amounts can vary more or less based on traffic volumes, road conditions and jurisdictional budgets.
- B/. Lightly surfaced roads have a slightly longer cycle but the maintenance & product replenishment costs are usually higher because current procedure is to lay down another full layer, minimum 50 mm (2") of compacted gravel & oil based binder.
- C/. Using the Road Badger methodology to rehabilitate road defects and re-use existing in-situ gravel and oil based road binders helps to Sustain Non-Renewable Natural Resources (gravel & oil) thereby reducing product replenishment costs, product transportation costs and other road maintenance associated costs. This can also help reduce GHG emissions associated with road rehabilitation by over 5 tonnes of CO₂ per km of unpaved road and more than 25 tonnes of CO₂ per km of lightly surfaced road.
- D/. Long term (2.5 yr.) test results, by Alberta Transportation, of the Road Badger on unpaved roads have indicated a reduced need for gravel of up to 120 tonnes (-60%) per km. Other results, by other than Alta Trans., regarding oil based road binders have shown a reduction of binder product required for road rehabilitation of more than 50%.
- E/. To put this in perspective, over the current good practice three year maintenance cycle the province of Alberta could expend :

130,000 km X 200 tonnes of gravel per km = 26,000,000 tonnes of gravel over the 3 years or 9,333,333 every year over the 3 year maintenance cycle.

Think of saving not the 60% attested to by Alberta Transportation but just 10% which is 933,333 tonnes of gravel per year @ current Alta Trans. July/08 weighted average cost of \$24.49 per tonne

Didn't even talk about oil based binders, currently (August 2008) at \$0.80 per litre, transportation fuel usage, associated GHG emissions or costs of same.

- F/. Soaring oil, gravel, transport and other maintenance associated costs coupled with longer haul distances and environmental concerns serve to enhance the economics, efficiencies and effective results of using this machine providing a return on investment within days rather than months or years.

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