



Haulage Efficiency Improvement Project Report Haul Truck Undercarriages & Beds

MPA 1166

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Peabody Energy
North Antelope Rochelle Mine
Wyoming, USA**

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1.0 Project Overview

Global Barrier Coatings, Inc. personnel were on site at **Peabody Energy, Inc.'s North Antelope Rochelle Mine (NARM)** site in Wyoming from February 26 through April 8, 2011 to perform a demonstration of the **MRA™** slip coating product on haul truck undercarriages. The project was designed to demonstrate the effectiveness of the **MRA™** product in preventing materials from building up on haul truck undercarriages and to reduce wash times, thereby increasing equipment availability, reducing stress on equipment due to excessive weight and reducing costs.

The undercarriage application demonstration included 13 x haul trucks and utilized approximately 60 gallons of the **MRA™** product. Data collected from the haul truck undercarriage application conclusively shows that treated haul truck wash times can be significantly reduced (and operational availability increased) by $\geq 40\%$. The project also showed that treated haul trucks accumulate less build-up on the undercarriages between PM intervals. Among other benefits, the treated trucks are less likely to set off overweight sensors and alarms.

While performing the undercarriage demonstration project, **NARM** leadership requested that the project be expanded to include reduction/elimination of carryback in the beds of trucks hauling overburden.

Information collected from **NARM** indicates that the beds of the trucks hauling overburden can accumulate significant (up to $>30\%$) build-up (carryback) over a short period of time (estimate ≤ 40 x load/haul/dump cycles). Carryback is caused primarily by the high moisture content and bentonitic clay content of the material being hauled. The sticking problem occurs to some extent year round and is exacerbated by freezing temperatures and periods of high precipitation.

These conditions create carryback that;

- Reduces the efficiency of the trucks (unusable portion of the bed)
- Causes frequent overloading
- Requires additional truck cycles, resulting in increased wear on equipment, tires, etc.
- Increase the amount of time it takes to clean the mine haul trucks
- Increase the frequency of bed cleaning
- Increase the potential for damage to truck beds from cleaning using an excavator (backscratching)

The data from the Demonstration Project shows that use of the **MRA™** slip coating product:

- Substantially reduced carryback in truck beds, thereby maximizing payload
- Eliminated overloading
- Reduced the number of cycles required per truck through maximizing haulage efficiency
- Maximized throughput by utilizing up to 99% of haulage potential
- Substantially reduced the time and frequency of cleaning the beds, thereby decreasing downtime and increasing availability
- Reduced wear on equipment, tires, etc. through fewer cycles
- Reduced potential for damage to truck beds and risk by cleaning with excavator

2.0 Project Specifics

2.1 UNDERCARRIAGES:

- The average application volume per truck of the **MRA™** slip coating product was 5.5 gallons
- The average application time per truck was 30 minutes
- The Project series included 13 haul trucks, 2 of which were untreated benchmarks
- Most trucks were cleaned prior to beginning the demonstration project.

2.2 TRUCK BEDS:

- The average application volume per truck of the **MRA™** slip coating product was **6 gallons**.
- The Project series included trucks haul trucks, 2 of which were untreated benchmarks
- All trucks beds were substantially clean prior to beginning the demonstration project.

Note – designated application locations were exposed to weather during the demonstration project, which may have had a negative impact on results.

3.0 Project Results

3.1 UNDERCARRIAGES:

MRA™ Treated Trucks:

- | | |
|----------------------------------------------------|-----------|
| * Average wash times of untreated trucks | 3.5 hours |
| * Average wash times of MRA™ treated trucks | ≤ 2 hours |

- * Wash times do not take into account dwell time (actual wash times only)
- Results show a **40% decrease in wash time** through reduction of buildup and ease of cleaning.

- Based on the demonstration project results, using a sample of 40 dirt trucks being washed once every 15 days, total monthly increase in availability (reduction in wash time) is estimated at:

Untreated:

$$40 \text{ (trucks)} \times 3.5 \text{ hours} \times 2 \text{ washes per month} = \underline{280 \text{ hours}}$$

Treated:

$$40 \text{ (trucks)} \times 2 \text{ hours} \times 2 \text{ washes per month} = \underline{160 \text{ hours}}$$

Savings/Increased Availability:

$$120 \text{ hours/month} \times 12 = \underline{1,440 \text{ hours per year}}$$

It is important to note that the longer MRA™ product is in use, the better it performs. Extended usage allows the product to effectively penetrate the undercarriages surfaces, creating a longer lasting, non-stick surface. Product performance will increase over what was achieved in the demonstration project when in full scale, regular use.

3.2 TRUCK BEDS:

MRA™ Treated Trucks:

- Average number of cycles before build-up could be observed: **150**
- Maximum number of cycles reported without build-up: **359**
- Average number of cycles before cleanout was required: **175**

Untreated Trucks:

- Average number of cycles before buildup could be observed: **82**
- Average number of cycles before cleanout was required: **114.5**

Notes

- Results show a **35% increase in haulage efficiency** through carryback reduction (based on average cycles before cleaning is required)
- Based on the demonstration project results, using a sample of 40 dirt trucks running 80 cycles per shift with the **MRA™** product applied during shift changes, cleanout and equipment overloading can be virtually eliminated.
- At the conclusion of the demonstration project, of the **MRA™** treated trucks, only #214 had enough build-up to warrant clean out.
- Haulers that were sprayed with the **MRA™** slip coating product averaged 150 cycles before any measureable buildup was reported.
- Haulers that are not sprayed with the **MRA™** slip coating product average 109 cycles before accumulating approximately 30% carryback.
- Haulers assigned to the Demonstration Project were monitored and reported on during the course of the investigation by **Global Barrier Coatings, Inc.** personnel, shovel operators and other **NARM** personnel.

It is important to note that the longer MRA™ product is in use, the better it performs. Extended usage allows the product to effectively penetrate the metal of the truck bed, creating a longer lasting, highly slick surface. Product performance will increase over what was achieved in the demonstration project when in full scale, regular use.

4.0 Data Schedules & Detail

5.0 Photographs



Demonstration project hauler showing build-up on the untreated side of underbody. In this example, one side of the underbody was treated with the **MRA™** product and the other side was left untreated. The average wash time for untreated haulers is 3.5 hours.



Demonstration project hauler showing build-up on the **MRA™** treated side of underbody. In this example, one side of the underbody was treated with the **MRA™** product and the other side was left untreated. The average wash time for **MRA™** treated haulers is 2 hours.



Haul truck bed showing damage caused by 'back scratching' with shovels to remove carryback. Use of the **MRA™** product proved to significantly reduce carryback. In doing so, **MRA™** reduces the need for cleaning, reduces the time and expense associated with repairs and extends the useful lifespan of equipment.



6.0 Recommendations

Based upon the results of the demonstration project, we are confident in the capability of the **MRA™** product to consistently allow for a **minimum 40% decrease in haul truck wash times** and a **minimum 35% increase in haulage efficiency (beds)** for the trucks hauling overburden at the **NARM** site. As noted above, prolonged use of the **MRA™** product allows for better penetration, therefore further improving performance and allowing for longer periods between applications.

Undercarriages:

The implementation of spray equipment at the truck maintenance shop (or immediately outside in an area well protected from wind and weather) to treat the undercarriages of the heavy haulers at **NARM** is recommended in order to most efficiently apply the **MRA™** product.

Truck Beds:

The utilization of an automated, drive through system located near the Ready Line to treat the heavy haulers at **NARM** is recommended in order to most efficiently apply the **MRA™** product.

With your permission, we would like to provide you with proposals that we have prepared for the implementation of the **MRA™** product for both the undercarriage application and the truck beds.

Thank you for affording us the opportunity to work with you on these important projects. Based upon the results of the two demonstrations, we are confident that use of our product will result in significant savings to **NARM** and we look forward to working with you on a path forward.

Sincerely,
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