CASE STUDY:

Lead, Zinc Concentrate

TIVAR® 88 High Performance Lining Solution

THE CASE IN BRIEF

Application: Bottom Dump Hopper Railcars
Quantity: 45 Hopper Railcars
Liner: TIVAR® 88-2, 3/8" and 1/2" Thick
Bulk Material: Lead, Zinc Concentrate
Substrate: Mild Steel
Problem: Poor discharge of concentrates
Date Installed: 1996

TIVAR® 88-2 LINING INCORPORATED INTO HOPPER RAILCAR DESIGN IMPROVES DISCHARGE RATE

Background: In the mid-1990s, plant personnel at a Canadian rail company received a mandate to develop and implement a plan to reduce unloading times at the dock and thereby reduce expenses by finding an economical way to modify the 45 existing hopper railcars that transported zinc and lead concentrate. The existing 100-ton railcars were built in 1966 with 45-degree interior sloping walls.

The **TIVAR® 88-2** liner panels and TIVAR® "H" profile as a seam protector provide a "super slick" interior surface on which the coal will flow reliably.

Problem: The zinc concentrate that was transported had a bulk density of 120 lbs. cu. ft. and moisture content of 6%. Due to the 1966 design, only 50% of the material discharged when the doors on the hopper rail car were opened. After bumping the car with a trackmobile three or four times another 35% discharged. Cleaning out the remaining 15% of the ore was a costly and time-consuming process, particularly in light of the time spent using the trackmobile and not receiving complete discharge of material.

Solution: Due to the age and design of the railcars, the company recognized that the cars needed a structural redesign and state-of-the-industry liners in order to achieve acceptable mass flow levels. Working in conjunction with Quadrant Engineering Plastic Products' SystemTIVAR® team, one car was modified and lined as a test to determine if and how the material would flow. The interior of the car was modified by increasing the sloping walls from 45˚ to 70˚. All wall surfaces of the railcars were lined with 3/8"-thick TIVAR® 88-2, but the discharge doors were covered with stainless steel.

Results: The test car, modified and lined with TIVAR® 88-2, completely discharged dry concentrates in 4 seconds and wet concentrates in 14 seconds, surpassing customer expectations. Test results for the stainless steel lining on the discharge doors were not as successful. Excessive sticking on the stainless steel-lined surface caused plant personnel to deem the stainless steel unacceptable for unloading concentrates. The doors were then lined with 1/2"-thick TIVAR® 88-2 (1/2"-thick was used here because more bulk material flows across these areas than elsewhere in the car), eliminating sticking and reliably discharging the concentrates.

Based on the results of the test car, the interior sloping walls of the remaining 44 cars were modified and all were completely lined with TIVAR® 88-2. According to plant personnel, the TIVAR® 88-2 liners continue to perform well over five years later, successfully discharging all material and reducing unloading times and costs.

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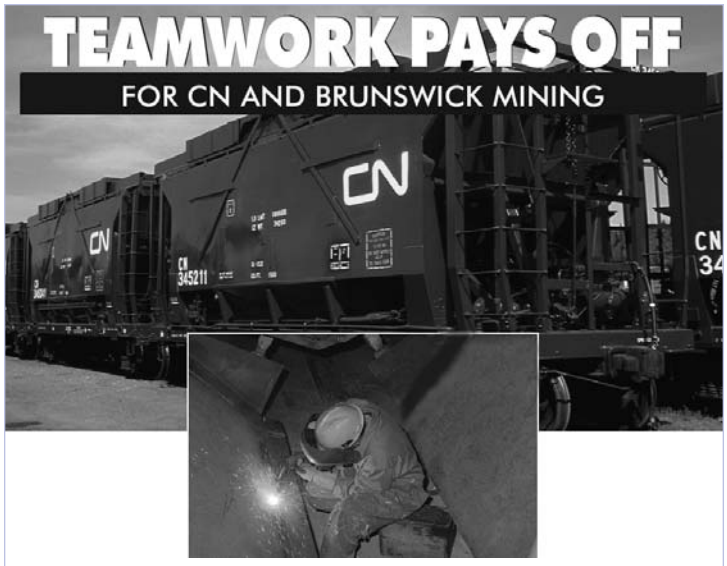
When Brunswick Mining, a division of Noranda Mining and Exploration Inc., decided to relocate its unloading site from Dalhousie to Belledune, New Brunswick, the shift gave CN and its customer an opportunity to develop a faster, more cost-effective way of unloading concentrates. They put their heads together and came up with a radically modified hopper car, just right for the job.



These modified hopper cars, due to enter service in September, will result in a faster, more cost-effective way of unloading concentrates.

Mary Taylor, account manager in CN's Industrial Products business unit, attributes the innovation to teamwork: "Our people worked very closely with Brunswick's people, and the synergy between us unleashed a lot of creative thinking. Thanks to their knowledge of rail-roading, we solved the problem in a way that satisfied both companies."

Team members included from Brunswick Mining - engineer Gerry Bisaillon, superintendent of Information and Purchasing Services Denis Babin, and concentrator superintendent Larry Urbanoski and from CN - technician Manning Jay and engineer Pierre Dubé.

Breakthrough in Equipment Design: Unloading a train made up of 25 gondola cars can take up to eight hours. With CN personnel on site, the process can tie up two locomotives and a full crew for an entire day - a costly proposition. The Brunswick/CN team went looking for a solution that would cut unloading time in half. That way, a train could make the return journey between mine and unloading site in a single day.

They challenged the conventional view that concentrates do not flow. They discovered that given the power of gravity, concentrates will indeed flow, if loaded into a rail car with a large bottom dump shape and lined to minimize friction. The team then developed a prototype car with angles suited to the particular product and a large, streamlined "hole" and all surfaces coated with the non-stick product TIVAR® 88-2.

The prototype performed beautifully. Dry concentrates discharged in four seconds, wet concentrates in fourteen. CN's Moncton shops then set to work on modifying 44 hoppers, due to enter service in September.

"The project was extremely gratifying," says Brunswick's Gerry Bisaillon. "It showed that anything is possible when you combine expertise and determination." **CN**

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