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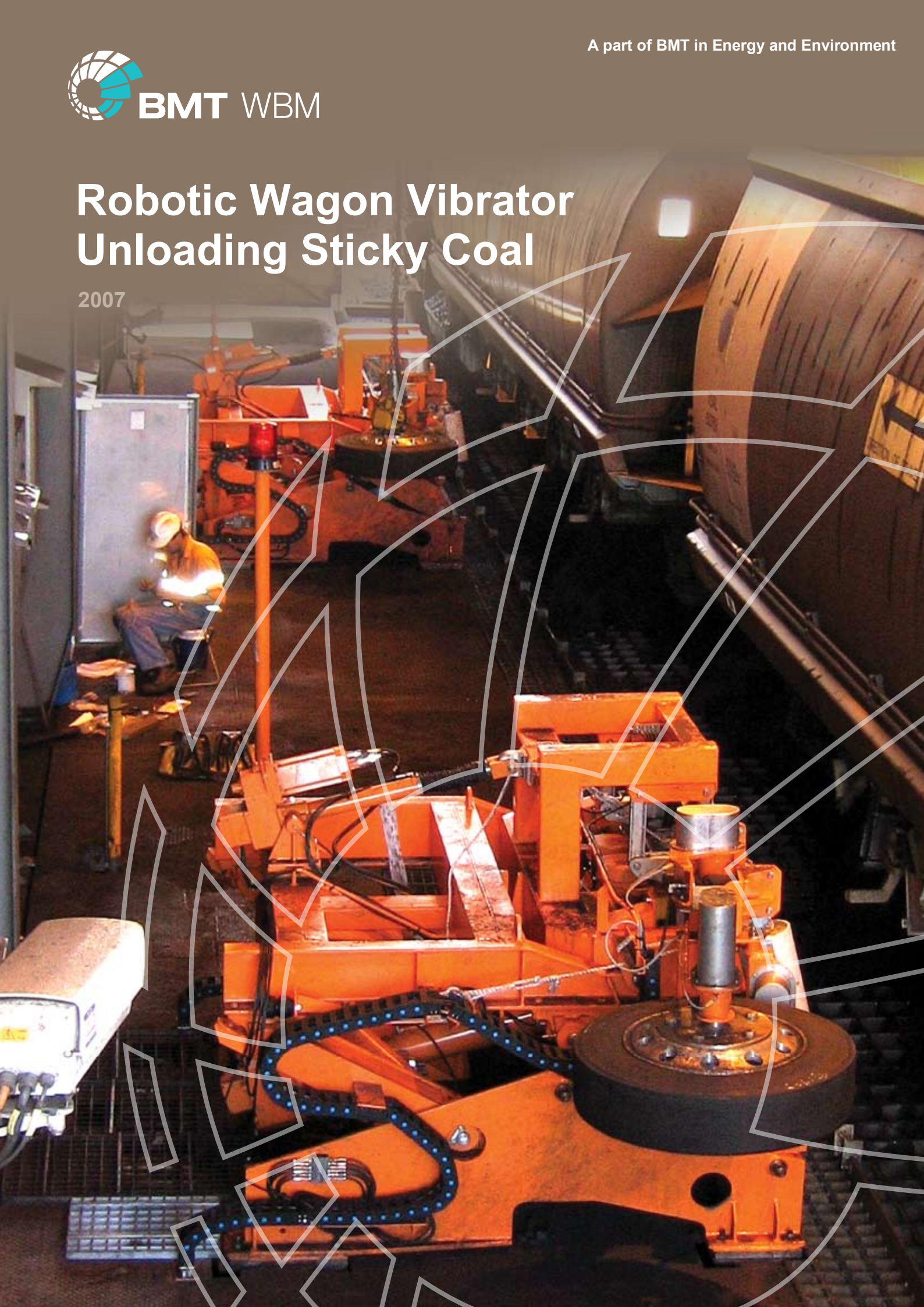
BMT WBM

Robotic Wagon Vibrator Unloading Sticky Coal

2007



The Problem

Many high-capacity coal export terminals, which receive coal by rail in bottom-dump wagons, experience major delays due to discharge failure when handling sticky coal. These delays can have a serious impact on the capacity of the rail system feeding the port and on the terminal inloading capacity.

For trains carrying about 10,000 tonnes of coal, sticky coal discharge problems often increase unload times from a nominal 2 hours to more than 4 hours, and sometimes to as much as 10 to 15 hours. The associated costs to the terminal through lost production can be substantial.

At Australian ports, the technique used to address sticky coal discharge problems has historically been to use manually-operated jackhammers, applied to the sides of the wagon.

While moderately effective, delays with sticky coal can still be very long. Furthermore, the use of jackhammers is physically demanding for operators, and represents a significant OH&S risk, because of the need to work for long periods in a very noisy, often harsh environment, performing an ergonomically difficult task.

The Solution:
BMT WBM Robotic Wagon Vibrator

To address these problems of discharging sticky coal, BMT WBM has developed a fully automatic robotic wagon vibrator. A number of these are now operating in Queensland coal terminals.

One or more vibrators are installed in a dump station, at fixed locations adjacent to the track. As the wagons roll past, at relatively constant speed, the vibrator lands on and tracks the lower sill of each wagon, retracting automatically at the wagon end. Failure of the coal to discharge when the bottom dump doors are opened is detected automatically, activating the vibrator, which dislodges the coal.

The vibrator operates at high frequency, delivering an oscillating force of about +/- 1.5 tonnes to the side of the wagon. This is more than an order of magnitude greater than for manually-operated jackhammers. Because of the method by which the force is applied, however, wagon stress levels are relatively low, with no adverse impact on wagon fatigue life.

The vibrator system is equipped with sensors, controls, and logic to enable it to recognise and adapt to the geometry of different wagon types, and to recognise and avoid locomotives.

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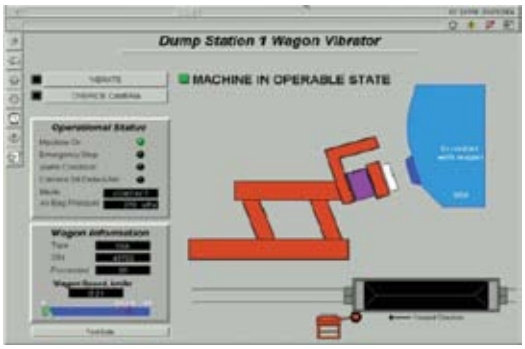

Operators Control Room and SCADA Mimic Panel

Electrical Control Cubicle

All equipment on the vibrator is designed to IP67 or better, to accommodate the aggressive environment of the dump station, including hose-down requirements.

Operation of the vibrators is monitored remotely by a single operator, located in an acoustically-treated, air-conditioned control room.

The vibrator's control system incorporates a comprehensive system of self-diagnostics to facilitate the rapid resolution of equipment problems. The system is also connected to and integrated with site SCADA networks, to permit remote interrogation and the logging of vibrator performance.

Benefits of the Wagon Vibrator

Use of the robotic vibrator offers significant benefits to coal terminal inload operations including:

- Significant reduction in unloading delays when handling sticky coal, with a corresponding increase in throughput rates.
- Removal of operators from OH&S risks associated with manually operated jackhammers. Previous risks of hearing damage from high noise levels, and of shoulder and back injuries are eliminated.
- Opportunity to substantially reduce manning levels. Dump station operations can now be controlled by a single operator, and the potential exists for total automatic control.
- Elimination of possible structural damage to the wagons.

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