Meridian's TLI advances in

Train passing through loading station at Christmas Creek.


Train loaded with iron ore.


Inbound Train Identification point for TLI system at Christmas Creek.

Meridian Engineers' Train Loading Improvement (TLI) system has been finding favour with miners like Fortescue, Vale and Whitehaven Coal. Meridian's managing director Anthony Pruiti spoke to ABHR about TLI and the challenges of accurate mass loading.

In the middle of a mining boom, with iron ore and coal miners desperate to ship maximum tonnes, the importance of accurate mass loading of ore wagons has never been greater.

If a system under-loads wagons, miners lose valuable tonnes of ore from each rail shipment. It is not uncommon in many existing train loading stations that miners – for fear of overloading wagons – average two tonnes less per wagon loaded than the allowable target. Considering typical ore trains can be anywhere from 90 to 300 wagons long, it's easy to see how under-loading can result in significant lost tonnes in a very short timeframe.

Overloading of ore wagons is also an important issue. With loading targets set so high there is little margin left to accommodate overloaded wagons. At best, an overloaded wagon might mean more maintenance for wagons and track. At worst, it represents a serious safety risk and a possible derailment.

Given that today's train loading stations can operate at 5,000 to 10,000tphr, with wagon overload limits at as little as 2t above the required target load, it can take only a fraction of a second to over-load a wagon.

For example, loading at 10,000tphr or 2.8 tonnes per second, a delay of just 2 seconds in closing a loading chute can result in a wagon being 5.6t above the actual target load. This overload may then need to be removed by the facility prior to the train being cleared for travel causing further delays and loss of productivity.

In the last two years, Meridian has deepened its footprint in the coal and iron ore sectors. It has installed its TLI system at Whitehaven Coal and Vale's Integra Coal in NSW, and at three mines in WA, including Fortescue's Christmas Creek train loading facility.

"Fortescue in particular has demonstrated its support for the Meridian TLI system with all their train loading stations fitted with our systems," said Pruiti.

"The TLI system can be applied to existing train loading systems or, as in Fortescue's case, supplied as part of a new train loading system. The objective of the system is to load each rail wagon with the maximum amount of material while not over or under loading the wagon."

Before Meridian's TLI system came to market, there were two main ways to load ore trains: volumetric loading with weighbridge feedback; and batch loading.

The first involves a conventional train loading station that will flood load wagons between two points as the wagon traverses under the loading chute. A weighbridge, typically installed a few wagons after the loading point, then provides feedback to the loading control process. This enables loading times to be increased or decreased marginally as the process attempts to lock onto the desired target weight for each wagon.

The drawback of this method is that it is not very accurate particularly when loading material where the properties change. For example, density or flow rate changes to the material being loaded can dramatically impact wagon load variations.

"It is not uncommon to see excursions of as much as 10 tonnes from wagon target when using this loading method," said Pruiti.

The second method involves two train loading bins. A main surge bin fills a small batching hopper before each wagon arrives under the hopper. As the batching hopper sits on load cells it is possible to get a very accurate batch that can then be discharged into each wagon.

"The drawback of this method is that it is a very expensive option both in initial capital outlay and also in ongoing running and maintenance costs," explained Pruiti.

Two bins, and complicated supporting structures and control processes are required, along with various hydraulics and moving parts.

"Running costs are higher as the need to fit two bins necessitates that material being fed to these bins is conveyed to higher points compared to a single bin solution," said Pruiti. "Another

coal and iron ore sector

Meridian track scale for tare weighing at Christmas Creek.

drawback to this option is that it cannot be applied to an existing installation and is generally not considered in iron ore applications in Australia due to ongoing maintenance concerns."

According to Meridian, the TLI has the benefits of both options: it is able to mass load accurately but keeps costs down as the hardware is based on a single load bin design similar to a volumetric system. The performance level of TLI over weighbridge feedback is shown, by way of example from two recent Meridian installations, in Figure 1. It can be seen clearly from Figure 1 that train loading is far more controlled using real time TLI technology as opposed to a weighbridge feedback approach.

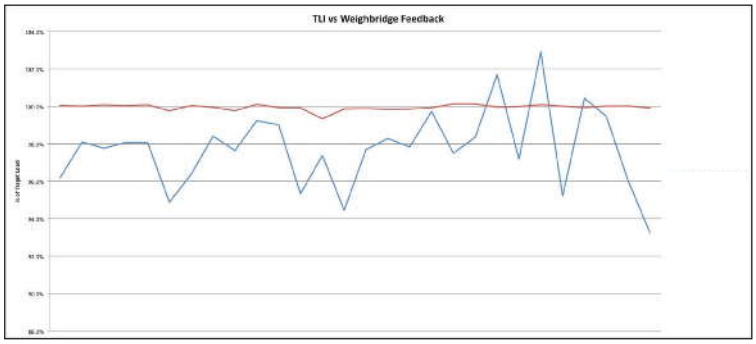
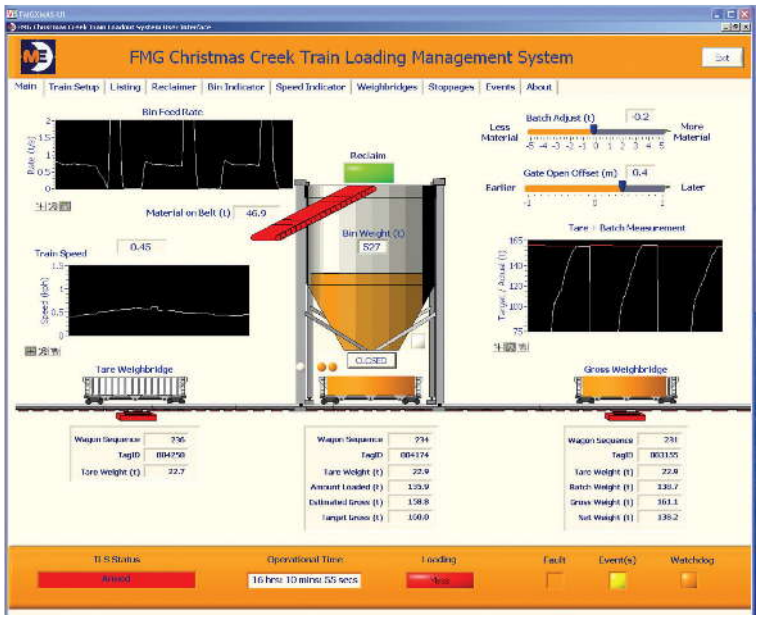


Figure 1: TLI vs weighbridge feedback for train loading.



Plot shows the main Scada interface used by an operator to review and control Meridian's TLI system. Software development was done in-house by Meridian.

How the TLI system works

In terms of the key components of a Meridian TLI system, firstly, there is an inbound weighbridge that records the starting weight of each rail wagon. Wagons are automatically identified by an RFID system that enables the TLI system to determine the required target load for the wagon when it arrives at the loading chute.

The train loading bin is instrumented with Meridian's proprietary bolt on column load cells. These allow the TLI system to accurately measure the mass inside the bin. More importantly, the TLI system is able to resolve accurately (within 100kg) the loss of weight inside the bin as a rail wagon is being filled. This allows the system to control when the loading chute should be closed to achieve the target mass.

For systems where the loading bin is being filled at the same time it is also necessary to use a conveyor weightometer to measure the amount of material being fed to the bin while the wagon is loaded, as this needs to be added to the wagon weight measurement.

An outbound weighbridge is then used to confirm the TLI system has accurately loaded all wagons in the train. Aiding matters, Meridian is a leading manufacturer of in-motion train weighbridges in Australia.

Most of Meridian's hardware manufacturing and all of its software development is done in-house.

Recent case studies

At Fortescue's Christmas Creek operation, Meridian installed its latest TLI system which delivers a gross average wagon load of 160t for each train.

"Over 100 trains have now been loaded since commissioning of our TLI system," said Pruiti. "The target gross load for these trains is over 38,000 tonnes. Our system has been able to deliver this target on every occasion to within better than 0.2% tolerance."

At Whitehaven Coal, installation of the TLI system allowed the operator to move to coal wagons of 120 tonnes capacity.

"The major benefit of our system was that it allowed Whitehaven to bring in larger wagons as authorities had confidence they would be loaded accurately and comply with the stringent local rail infrastructure limits on wagon loads," explained Pruiti.

At the Integra Coal operation at Singleton in NSW, operator Vale used a TLI system to address wagon underloading.

"In the month after commissioning the TLI system, the Singleton site recorded a record low of 0.7 tonnes per wagon underloaded, compared to an average of 2 to 3 tonnes in previous periods," said Pruiti.

Overall, Meridian has 14 systems installed in NSW, 21 in Queensland and 15 in WA. In the latter location, the company also has three high speed train weighing systems installed on BHP Billiton's main rail lines from Newman to Port Hedland.

"We will continue to invest in R&D so our products in both train weighing and train loading control remain at the forefront of their field," concluded Pruiti.

Meridian will exhibit its TLI system at the AusRail Plus exhibition from 22 - 24 November, 2011 at the Brisbane Convention & Exhibition Centre.

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