

Resolving Fluid Contamination whilst enabling increased productivity – Optimised Fluid Transfer and Evacuation with Banlaw LubeCentral™

Customer Name

BHP | Western Australia Iron Ore

Customer Business

BHP's Western Australia Iron Ore operations include five mines, four processing hubs, two port facilities, and over 1,000 kilometres of rail.

The business seeks to maximise the value of installed infrastructure by bringing product from multiple orebodies to centralised locations for crushing/beneficiation/blending, and then exporting to customer markets via the Port Hedland facilities.

Western Australia Iron Ore (WAIO) achieved a new production record in FY18, with a Q4 run rate of 290Mtpa. There has also been an 8% reduction in events with the potential to cause serious injury.





The Engagement

Beginning in 2012, Banlaw and BHP engaged in a dialogue regarding opportunities to fix their lubricant transfer processes. WAIO sites were using older-style open-bore fluid couplings, and therefore experiencing the safety, environmental, reliability, and productivity issues which those fittings are prone to.

At the time, Banlaw's flush face range of couplers were considered best-in-class, but we didn't have an efficient solution for removing hot machine fluids during service.

BHP trialled a number of 3rd party fluid transfer products, but these trials were not successful due to ongoing problems with flow rate, reliability, as well as connection issues.

In 2014 BHP and Banlaw began collaborating, with the intent that Banlaw would create a new Common Evacuation Coupling.

The purpose of the new product was to rapidly remove waste fluids from mining equipment using a vacuum, to do so cleanly, and without exposing the operator to hot fluids. The new product also needed to be a unified tool, which could connect-to and drain fluids from 11 different Banlaw receiver sizes. In 2015 the Banlaw Evacuation Coupling was released.

After extensive field trials, BHPs reliability engineers accepted the newly-completed, Fluid Transfer product portfolio from Banlaw. Standardised coupling kits were defined for each

type of machine, and the site-by-site fleet upgrade was coordinated by BHPs Maintenance Centre of Excellence.

The upgraded fluid transfer process and products, are now yielding increased reliability and availability of equipment, and more cost-efficient maintenance actions. This equals competitive advantage, which is after all the ultimate objective of the maintenance function.

The Fleet

Across the WAIO sites, BHP operate over 400 Heavy Mobile Equipment (HME) with an overall mining fleet in excess of 800 machines. The HME fleet consists of some of the following machine types.

Excavators	Loaders
Liebherr R996B	Komatsu WA1200
Liebherr R9400	Caterpillar 994
Haul Trucks	Dozers
Caterpillar 793D/F	Caterpillar D10
Caterpillar 798B/C	Caterpillar 854
Caterpillar 785C	Drills
Graders	Atlas Copco PV271
Caterpillar 16H/M	Atlas Copco D65

Banlaw products and services used

Fluid Transfer Couplings

Common Evacuation Couplings

New product development services

Business Challenges

Safety

Superseding all other priorities was the need to send colleagues home safe at the end of their shift. In context of machine fluid transfer, the solution for BHP needed to support the centralisation of service fluids. Centralised service boxes for haul trucks and excavators mean that staff can top up fluids at ground level, from a single location. This is more efficient than climbing all over large vehicles to add service fluids, and completely negates the risk of falling.

Other safety concerns that needed to be addressed included:

Filling and evacuating fluids with less spills. Oils ending up on the ground were a real concern from an environmental standpoint, but also represented the risk of slips and falls, especially when trodden into other work areas, or onto the steps of a haul truck for example.

Removal of hot oils and lubricants during machine maintenance in a way that minimised the chance of burns to technicians and service personnel was also a focus area.

Contamination

Cross Contamination

Putting the wrong fluid into a \$400,000 engine can be catastrophic to the machine, however lost production represents costs well in-excess of the damaged components. The financial impact of a single 'expensive surprise' such as the one described is significant, but these are not rare events.

Resolving fluid cross-contamination risk was a high priority for BHP, because upgrading the fluid transfer equipment on the entire fleet, would cost less than a single breakdown incident of this type.

Fluid Particulate Contamination

Contamination from dirt/dust/ore is another major killer of equipment that needed to be mitigated. Solid particles collect inside traditional style fluid couplings, and are then pumped into mining equipment when fluids are topped up. The contaminant particles then cause premature wear of internal components, drastically reducing the lifespan of engines and other onboard systems.



If you put hydraulic oil into an engine compartment, then it will cause catastrophic damage to the engine. It's worth considering that on an excavator, the operator is looking at a machine with more than 20 near-identical receivers. That's more than 20 chances to make a mistake.

Productivity

Filling, topping-up, and removing service fluids from machines was inefficient in a number of ways, representing a real opportunity to increase machine availability.

When adding oil to a specific fluid compartment on a vehicle, the operator would have to find the correct receiver from several, or even tens of near-identical options. He or she would then spend time cleaning dirt out of the couplers, prior to attaching the often difficult-to-connect components. Actual fluid transfer rates

were slow, because the fittings themselves were of small-bore.

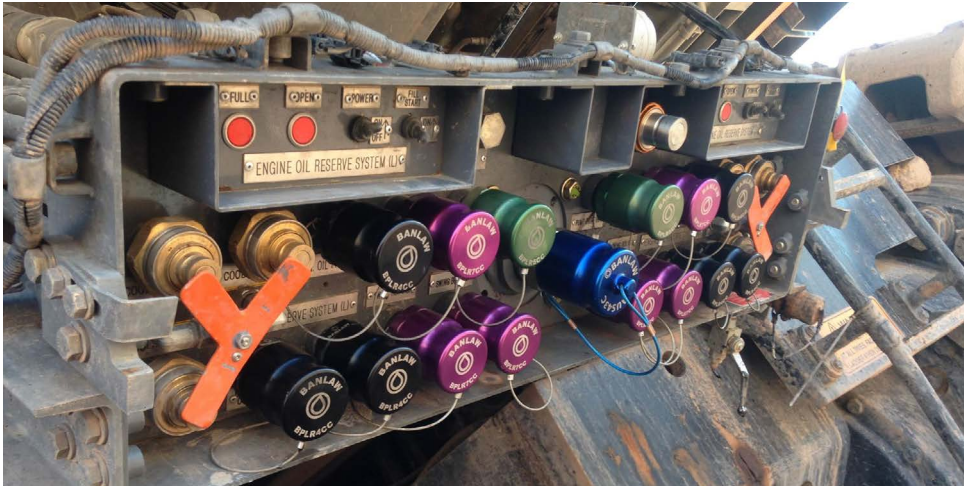
Removing waste fluids was likewise a cumbersome endeavour. Either receivers would have to be manually held-open using a tool, potentially damaging them, or drain hoses would have to be affixed, with a different nozzle screwed-on to suit each different receiver encountered. Thick waste fluids were then slowly drained into a drip tray using gravity, prior to being handled again into a storage area.



A Banlaw service box for a haul truck. The exact size and layout of our service boxes is tweaked to suit the many different machine configurations.

Problems Solved:

Operator slips and falls	Solved ✓
Breakdowns and component failure due to fluid contamination	Solved ✓
Cumbersome, dirty, waste fluid removal processes	Solved ✓
Slow fluid transfer rates due to inefficient hardware	Solved ✓
Operator burns from exposure to hot liquids	Solved ✓
Fluid spills from nozzles and receivers	Solved ✓
Connection difficulty from unreliable hardware	Solved ✓
Wasted time, connecting incorrect nozzles and receivers	Solved ✓



Centralised service boxes allow for fluid maintenance tasks to be performed on the ground, so that operators do not need to climb all over industrial machines. This is safer for staff, and much more time-efficient as well.

Benefits / Business Outcomes

Operators now fill and evacuate fluids, including hot machine fluids, at optimum transfer rates, with standardised colour-coded couplers, from a single point on the machine.

Safety:

- ▶ No climbing around vehicles to maintain service fluids, avoiding falls.
- ▶ No chance of operator exposure to hot machine fluids while removing them, avoiding burns.
- ▶ No fluids spilled onto the ground and walked around the work site, avoiding slips and falls.

Environmental:

- ▶ Fluids are removed under vacuum using a single tool, via a closed system, meaning no chance of oils and lubes ending up on the ground.
- ▶ Waste industrial fluids are automatically collected into a storage tank for appropriate recycling or disposal processes.
- ▶ Flush face nozzles and receivers do not leak when disconnected, unlike open-bore connectors.

Reliability:

- ▶ Greatly reduced chance of particulate contamination, because flush face couplers do not have deep recesses that can fill up with mud and ore. Simply remove the cap, wipe, and connect.
- ▶ No chance of fluid cross contamination causing breakdowns, because only matched couplers are able to connect.

Productivity:

- ▶ Higher-flow couplers reduce the time taken to fill or top-up machine fluids.
- ▶ A common evacuation coupling which can connect to all receiver sizes and uses vacuum to remove fluids, delivers dramatic time savings compared with the gravity-drain process.
- ▶ Push-to-connect fluid transfer couplings are simple to attach, and do so reliably.
- ▶ Colour-coded fittings help operators immediately recognise which fluid goes into each receiver, saving time on every top-up.

Cost:

- ▶ Less injuries, less spills, less wasted time, and less breakdowns, means the business is now producing more ore, at a reduced cost.
- ▶ With tremendous outcomes in terms of safety, environmental, speed, reliability, and cost; WAIO's choice to standardise fluid transfer processes around the Banlaw Flush Face range of couplings, is a win on all fronts.



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