

Data Log Hydraulic Tuning of Excavators

Glencore, Clermont Open Cut Mine

The Problem

In February 2017 a Coal Mine Worker (CMW) was injured when a hydraulic hose fitting failed under pressure during the use of a hydraulic flow meter. The CMW was positioned inside the pump room and was undertaking the task of a hydraulic tune up. The task requires a calibrated flow meter to be installed in line with the main hydraulic pump system to read the hydraulic flow and pressure the machine is producing. The operator of the flow meter is required to manually adjust the flow meter by hand and watch the pressure and flows on the meter, making it impossible to be out of the line of fire. On the day of the incident a hydraulic fitting failed at the flow meter under 50bar of pressure and shot back contacting the maintainer in the knee luckily only causing minor bruising. During testing procedures the maximum pressure ranges up to 300bar.

The Solution

The implementation of a data logging system that reduces the need to have a person inside the pump room during hydraulic testing.

There are two pumps to each main pump. Each pump can now be “turned on” remotely via an electronic remote control. The first individual pump can be cycled and loaded through all curves required to satisfy testing and the change to test, then the second pump can be tested via the flick of a switch. Load to the pumps is applied proportionally through a remote control lever on the test box remote and the pump performance can be seen by the operator outside of the pump room. If adjustments need to be made to the pump regulators the pump is destroked to minimum flow and to standby pressures using the remote control lever. Once the adjustments have been made the operator can once again remove themselves from the high pressure hose area inside the pump room and return outside and complete the tests again.



Picture 1: Flow Meter Valves



Picture 2: External Pump Control



Picture 3: Main Remote Control Box



Picture 4: Data Logger

Benefits/Effects

This innovation will eliminate the need for a worker to be present while pumps and hoses are under full operating pressures. The hydraulic system pressure can be reduced almost instantly using the remote control compared to having to manually reduce the pressure by hand while in the pump room with live high pressure hoses.

By utilising this innovation we can reduce the number of set ups per test day by half and reduce testing time from 30mins per pump to 40mins for both pumps combined. This system will also allow us to record all tuning information electronically on the data logger compared to being written down manually by the Tradesperson.

This system with some small changes has also been used on our Drill fleet for pump tuning and fault finding of hydraulic circuits. A concept plan has been put together to add contamination measurements, case drain pressures and flow to be able to determine pump internal condition and forecast failures. We are using it to trend data and have now seen the information gathered being used to custom design the setup of regulators for site applications when default factory settings have been found to be incorrect.

Transferability

The transferability of this innovation is possible with any machinery utilising open loop hydraulic systems. The technology is easily accessible and a company could come up with a scope of what is required and simply design a system to achieve the required task.

Innovation

This system is not being used at any other site, this design was engineered by two of the Diesel Fitters at our Clermont mine site. While costings are high to initially set this up (in large part due to the comprehensive data logging capability), the repeatability and time savings in comparison to the previous externally sourced specialised labour costs, this system has paid for itself in the first test and has dramatically reduced our labour costs for subsequent performance tune ups. The added data logging capability has already detected pump failures before time and allowed planned change outs instead of after failure.

This has also removed our Trades persons from the line of fire.

Approximate Cost

Data Logger and testing measuring equipment - \$15000

Flow Meter Load Valve (2 required to enable faster testing) @ \$7000 each - \$14,000

Total project cost – \$29,000

Analogue/Digital flow meter (old process) - \$9,000.00

