SPE Technical Services

Customer: Vauxhall
Location: Ellesmere Port
Date: 14/09/11 and 20-09-2011

Concern

Intermittent “Hard Clutch” faults with press 1, which resulted in the Bed Cushion vibrating violently and causing downtime during the recovery process.
The faults can be alleviated by reducing the press speed.

Investigation

The press was monitored for 3 days with no faults occurring.
All relevant switch and pressure settings were checked and found to be OK.
The only noticeable anomaly was the hard clutch pressure on press 1 drifting around 7 Bar upon activation, where all other presses were more stable, being within 1-2 Bar.

The fault was simulated by generating a line fault whilst the slide was operating in contact with the Bed Cushion. This produced the same result without recording a “Hard Clutch” fault, indicating that this alarm was the cause of rather than a result of the stoppage.

The fluctuations in press 1 hard clutch pressure were investigated and found to be generated by press 2 loading the shared power pack during its clutch engagement. To prove this the charging values for press 2 were lowered, the result being a stable pressure at press 1 but generating “Hard Clutch” faults with press 2. All values were restored.

Actions

Press 1 clutch and brake accumulator nitrogen pressure adjusted from 55 Bar to 45 Bar stated in the documentation. This is consistent with assisting the oil volume during the clutch operation. (Soft clutch pressure 58 Bar)
Press 2 clutch and brake accumulator nitrogen pressure adjusted from 43 Bar to 30 Bar, no design value can be found for this setting in the documentation. This is consistent with assisting the oil volume during the clutch operation. (Soft clutch pressure 37 Bar)
The higher pressures would assist in maintaining the system pressure rather than assisting volume during clutch cylinder movement.
A modification has been made to press 1 PLC program (FC 123 network 4) to load the press 1 & 2 power pack whenever the line is ready for automatic. This has resulted in a suitable stable hard clutch pressure. The modification was monitored for 6 hrs with no adverse effects. Details of the modification added to the software change log on line 6.

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Charge control clutch and slide locking press 1 and 2
m 33.1 added to stabilise clutch pressures. SPE 14-09-2011
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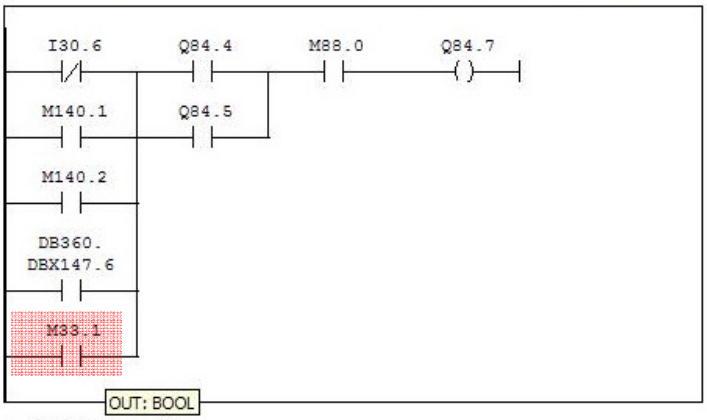


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Symbol information:
 I30.6              12-K2-S306                                    -- Clutch & brake pressure control group 1
 M140.1             10M1401                                       -- Slide locking EV activation (Pilz input)
 M140.2             10M1402                                       -- Slide unlocking EV activation (Pilz input)
 DB360.DBX147.6     "CommunicationFromDestack".ClutchBrakeGroup.C_B1Pre  -- Clutch & Brake group 1 active pressure valve for an
                    ssureValve
 M33.1              12M331                                        -- General Conditions for Machine Start-up
 Q84.4              12-L4-K844                                    -- Clutch hyd pressure motor 1 group 1
 Q84.5              12-L4-K845                                    -- Clutch hyd pressure motor 2 group 1
 M88.0              12M880                                        -- Clutch hyd thermostat T4 oil 60C group 1 OK
 Q84.7              12-L4-Y847                                    -- Clutch hyd pressure circuit group 1
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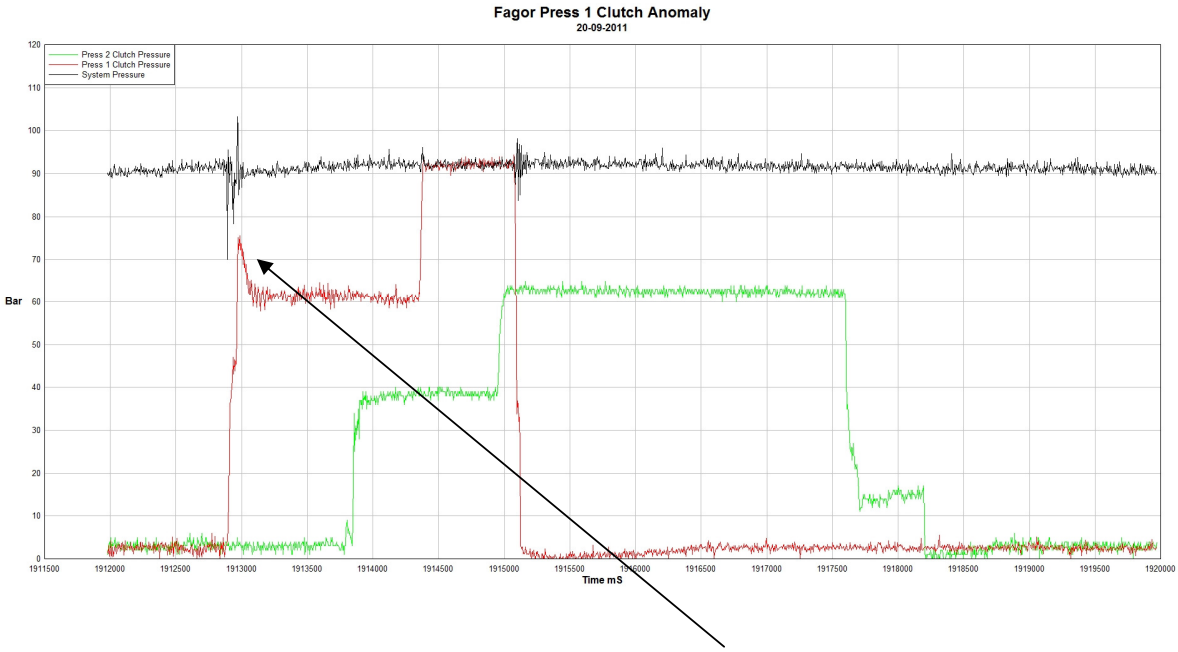
20-09-2011

Further investigation requested after stoppages during weekend production.

Investigation

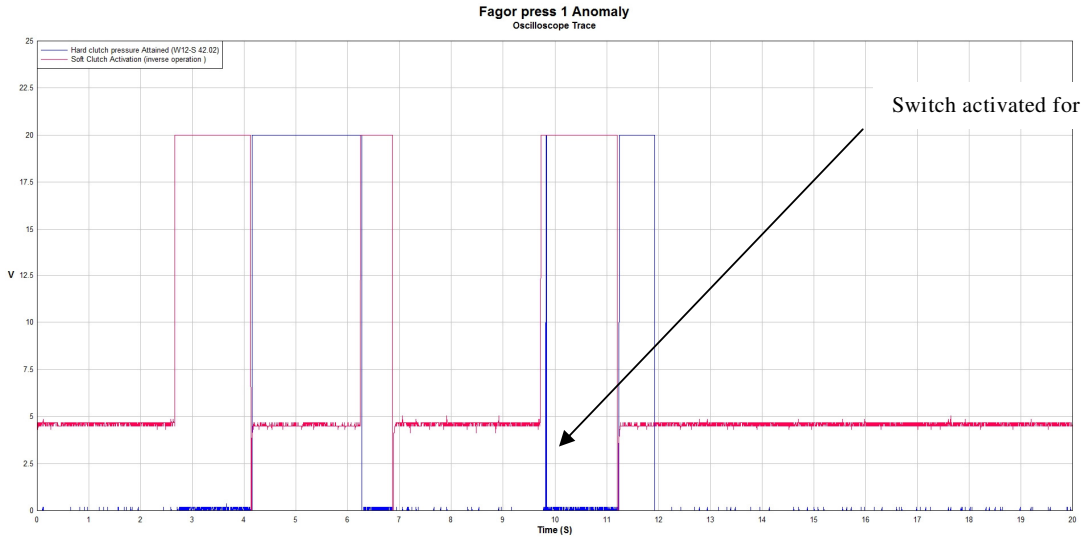
Data logging equipment connected to press's 1 and 2 to monitor clutch pressures with an additional time storage oscilloscope attached to press 1 in order to monitor clutch feedback signals.
During these check we found an intermittent pressure pulse of up to 75 Bar during the soft clutch initiation phase of press 1. Oscilloscope traces proved that this pulse was being detected by the clutch monitoring pressure switch (W12-S 42.02), this results in a false hard clutch engaged signal being sent to the press safety PLC with subsequent immediate removal of the clutch valve signals.

Fig 1.2



Pressure Peak of 75 Bar with duration of 45 milliseconds within switch operating range. Causing unintended operation of pressure switch W12-S 42.02.

Fig 1.3



Switch activated for 0.018 milliseconds

Actions

Pressure Switch Settings	Old	Current
SP1	73 Bar	69 Bar
RP1	80 Bar	69 Bar
Dap	3 milli-Seconds	30 milli-Seconds

Changed pressure switch settings, to prevent unintended switch operation. The system was then monitored for several more hours at 17.2 SPM. Two more occurrences of the pressure peak where detected without stoppage of the press.

Recommendations:

Modifications required to stabilize supply pressure in order to improve pressure cycle repeatability.
Ensure a spare soft clutch valve is available as intermittent slow operation of this valve is the most probable cause for the pressure peak.

Notes

During our investigations the following items were noticed.

- The performance of hydraulic pump 1 is better than that of hydraulic pump 2 on press 1 & 2 clutch and brake power pack. During idle the recharge time of pump 1 is 2 seconds, the corresponding time for pump 2 is 6 seconds.
- Bed cushion pumps. Pump 1 appears to be less efficient than the others when selected, it runs at a higher temperature and does not deliver much flow to the control block when at operating pressure. Pump 2 creates more vibration than the other pumps and this should be investigated.
- The Bed cushion oil is running at a high temperature during prolonged use. This is not helped by the fact that oil tank is close to the minimum level.
- The set up of some tooling is not correct. (Cushion TDC & BDC) this results in a calculation error of the slide/cushion contact point and could affect pre-acceleration settings. This can be seen on the cushion curve graphs (on press HMI screen)

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Fig 1.2

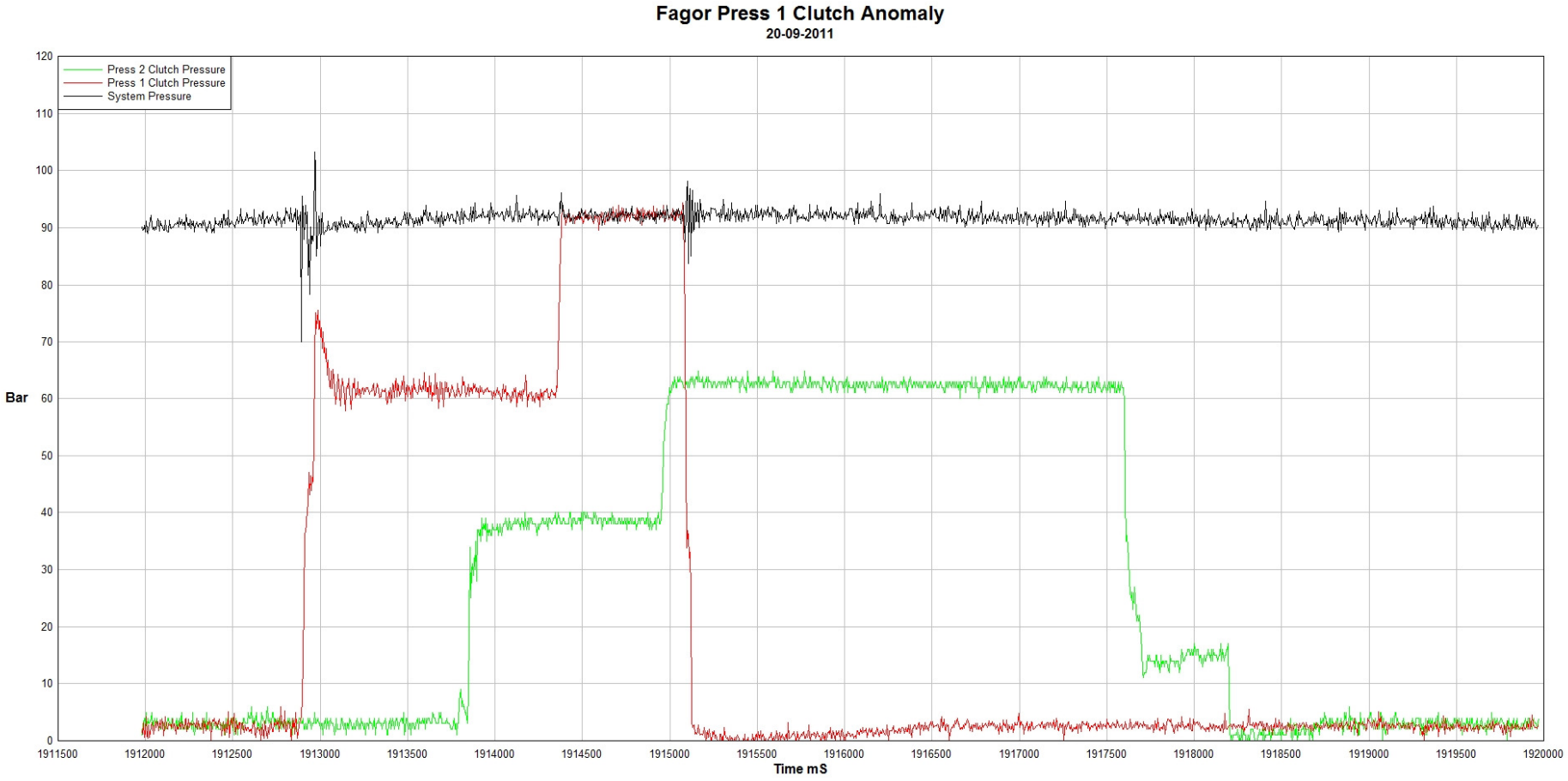
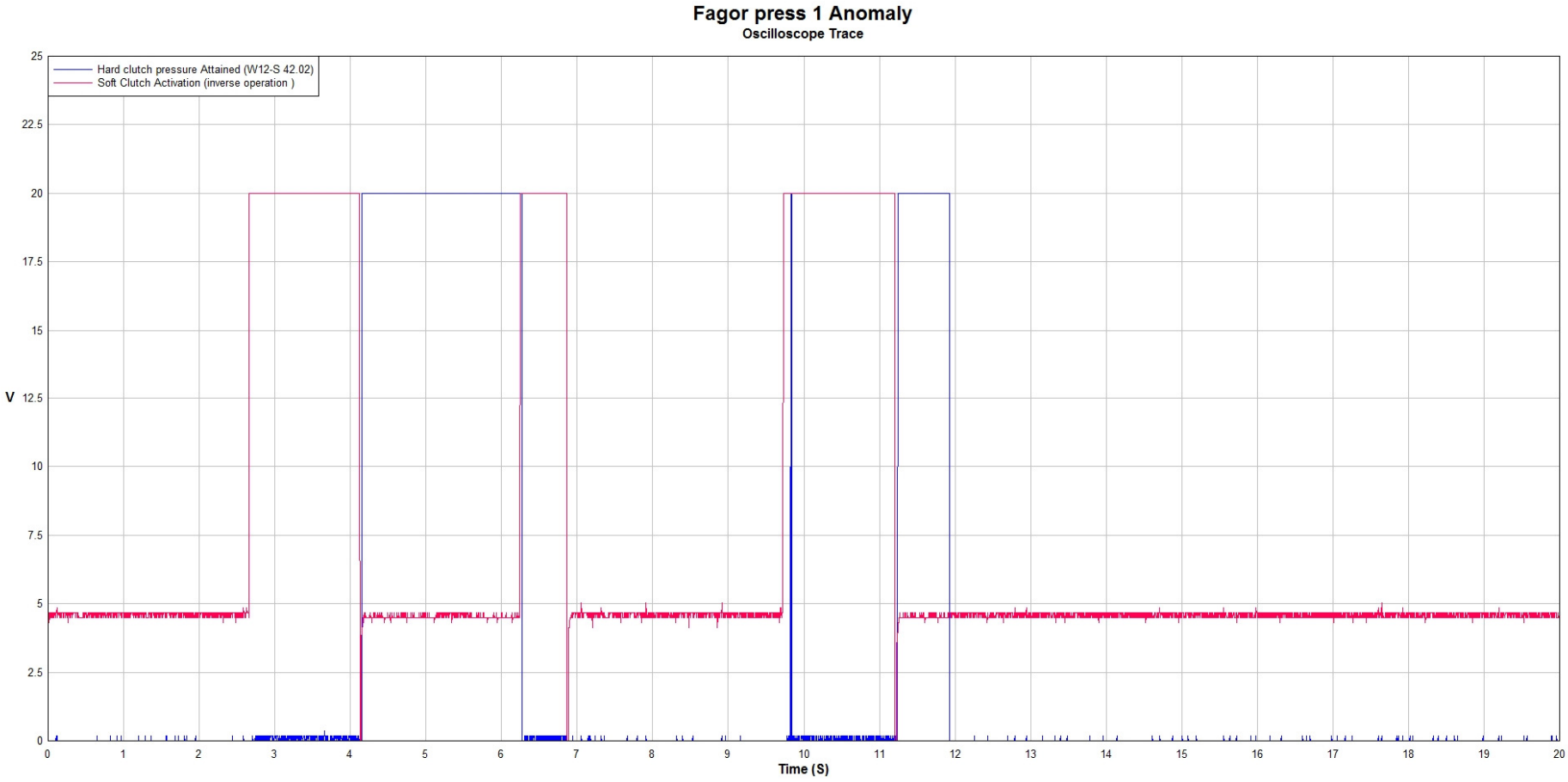


Fig 1.3


Fagor press 1 Anomaly
Oscilloscope Trace
Hard clutch pressure Attained (W12-S 42.02)
Soft Clutch Activation (inverse operation)
V
Time (S)