

## IIH Task Force Conference Call December 22, 2014

### Attendees:

Chrysler: Haiying Tang, Jeff Betz

Intertek: Adison Schweitzer

Lubrizol: George Szappanos

Afton: Ed Altman

SwRI: Karin Haumann, Sid Clark, Pat Lang

Karin started the call indicating this call was initiated in very short notice and just the labs were participating to hear the update from Lubrizol on their alternate thermocouple control test.

George provided presentation materials used for review of the data plots during his update summary (See attachment 1).

- 1) The test used the normal temperature control set point up to the 20 hour level
- 2) After the 20 hour start, temperature control was changed to the new thermocouple location and the temperature set point was changed to 151°C as that was where the gallery temperature was running at the new thermocouple location during the first 20 hours.
- 3) Exhaust backpressure was increased to 4.5kPa.
- 4) Engine coolant pump was running during all shutdowns for oil levels.

PVIS result for this test was 184% viscosity increase.

George reviewed the temperature data for the pump, gallery, and sump data during the first 20 hours compared to the data after changing to the new thermocouple location control.

The group discussed the data and agreed the ambient temperature seemed to have less effect on the sump temperature when the control point was switched to the new gallery location.

George suggested that controlling to the new thermocouple location seemed to remove some of the ambient temperature influence after the change at 20 hours. Karin agreed and the group discussed where the ambient thermocouple was located in the Lubrizol test cell. George recommended locating the thermocouple closer to the bottom area of the oil pan with the groups in full agreement. The group all agreed we have to be cautious to limit the amount of air flow around the oil sump and cautioned against insulating the oil pan.

The group discussed the oil pressure plots provided in the Lubrizol data with Ed Altman questioning the lower pressure data on the SwRI test. Karin assured the group the engine was built correctly and the group agreed if there was a clearance problem; the pressure would have started out lower and stayed low. The group discussed the fact the pump is running in the high pressure mode and George suggested there is high pressure ported above the control spring and therefore could allow higher pressure spikes. George recommended the group continue investigating possible means of fixing the pump pressure.

George commented on the oil pressure delta toward the end of the test where we think we would see a higher pressure delta but we seem to see a lower pressure delta than the IIG. Jeff commented on the pressure relief in the oil filter and the group discussed possible interactions between the oil pump output and the oil filter operations.

The group discussed the pressure decreases just prior to the viscosity increase.

Ed Altman questioned where everyone purchased their oil filters. Jeff indicated there was a difference in filter designs and if the wrong filter is used the engine fails immediately. Jeff also informed the group there is only the one supplier of the oil filters regardless where you purchase or the brand. George provided an image of the filter to the group for discussion and the group discussed the by-pass operations in the oil filter. The pressure relief is set at 2.5 Bar.

Ed Altman and Addison Schweitzer still expressed concern questioning the adaptor plate being unable to be used as is due to the blocking of the coolant into the coolant jackets around the cylinders. Karin suggested she would have to re-visit the thoughts about what affects the change might have on the test and the group expressed the desire to still return the coolant to the coolant jacket with an adaptor. Karin again discussed the thermal shock of the oil being much greater in the engine than what is being seen in the oil gallery below the cooler.

Jeff commented as far as Chrysler is concerned the engine works with the designed 60/40 split and he has not seen any data that tells him he needs to change anything. The delta pressure across the cooler is part of the discrimination of the performance of the test.

The group discussed start of the Afton test with Ed indicating he does not want to start his test until the group makes a decision on what the temperature set point should be. Comments were made that whether we set 150 or 151°C the test would be better than the original control and Karin doesn't see anything objectionable running at 151°C. Ed expressed concern that he might see a more severe result at 151°C.

Karin suggested she would like to keep things as consistent as possible between the tests and would prefer to continue testing at 151°C.

Ed asked if George could provide oil temperature control plots for the controller.

The group discussed where to set the temperature control with Karin commenting "we don't want to drive the test mild". Pass/Fail criterion will be determined during the Precision Matrix.

Afton agreed to run the test at 151°C in agreement with all parties involved on the call.

SwRI will run REO2 and agreed if they needed an additional run on 434-1 they could also make that run. Intertek asked for instruction on installing the thermocouple in the block.

Karin indicated she will forward a set of REO3 pistons to Intertek for referee rating and they will send them to the other labs for a round robin exercise.

The call adjourned at 12:40pm

This is a compilation from notes recorded during the call, with comments from member participants during the Draft Review. Certain subjects may not necessarily be in exact order; however, they are believed to represent an accurate account of the call. If anyone feels changes or additional content may be necessary, please contact Sid Clark @ 586-873-1255 or [Sidney.Clark@swri.org](mailto:Sidney.Clark@swri.org)

Thanks, Sid



# IIH oil temperature control revision

**LZ run #2 on RO434**

12/22/2014

# Test summary

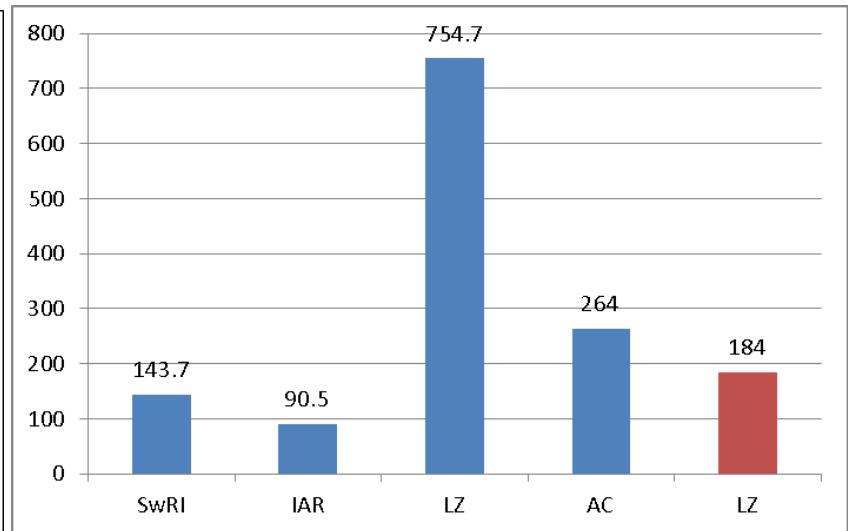
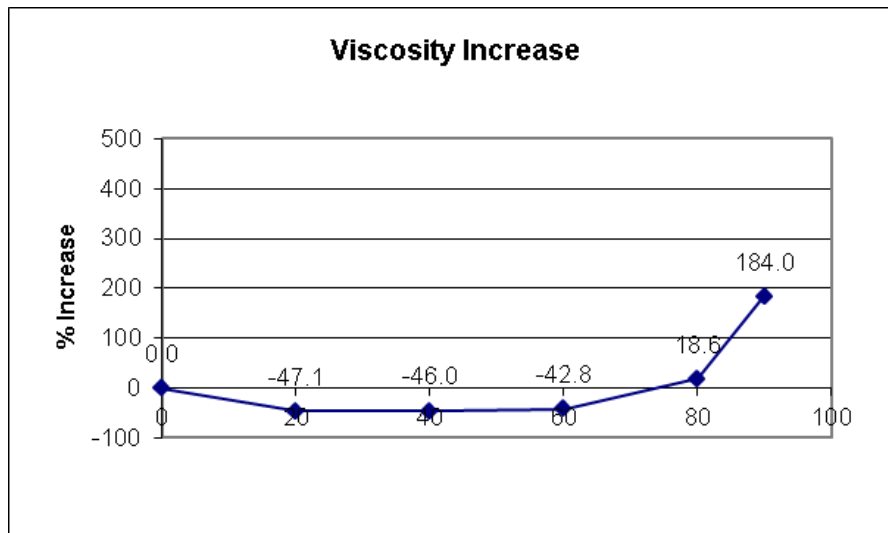


- At 20 test hours the oil temperature control was switched from using the TC at the rear of the oil cooler, to a new TC installed in the oil gallery at the top of the engine block (“TBLOCK”)
- The new oil setpoint was set to 151 deg C, which was set to the approximate temperature of TBLOCK during the first 20 hours (while the setpoint was 150 deg C at the rear of the cooler)
- Other change: 4.5kPa exhaust back pressure
- Other change: coolant pump operating during engine off periods (about 10 deg C cooler oil during restarts)

# PVIS results



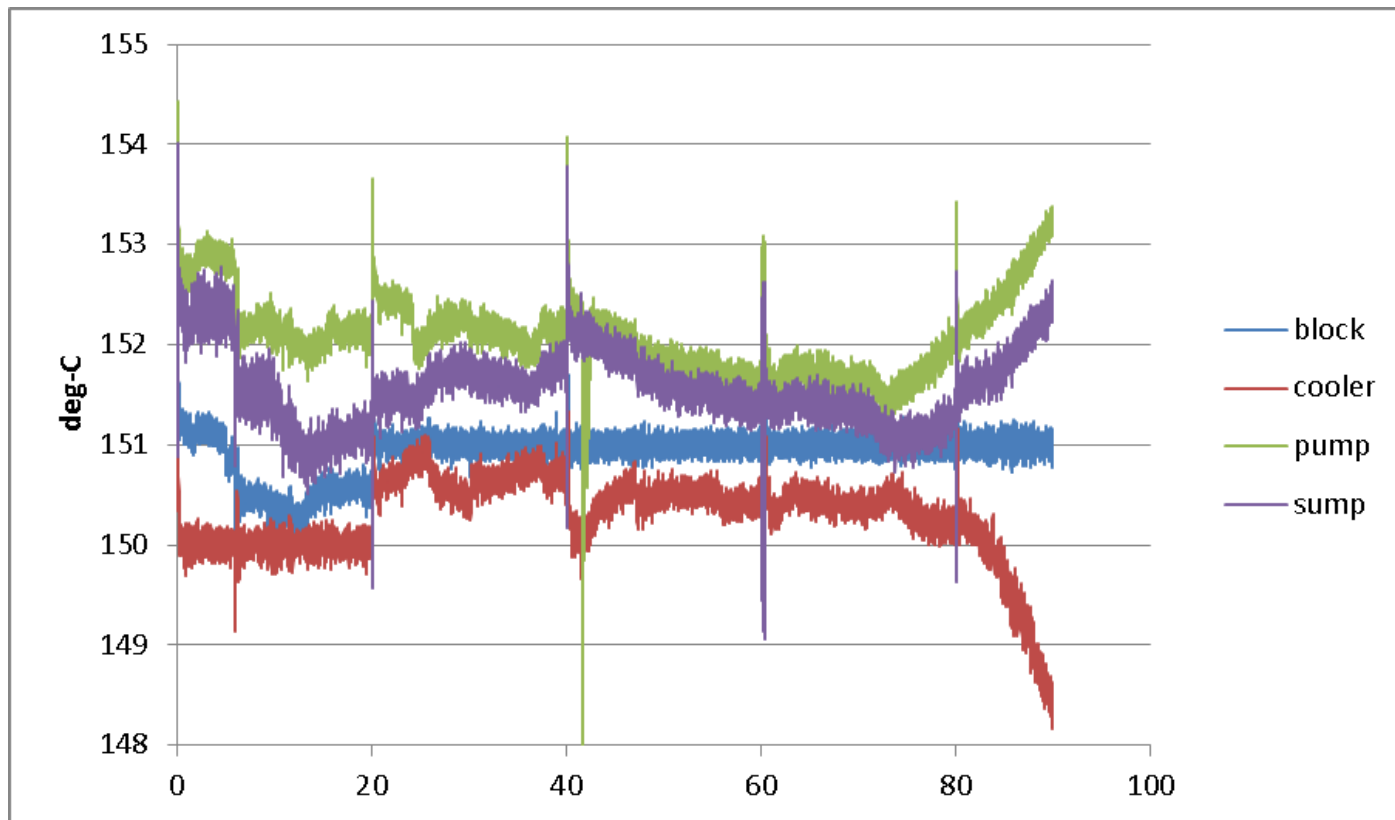
- Test was milder than previous run



# Oil temperatures

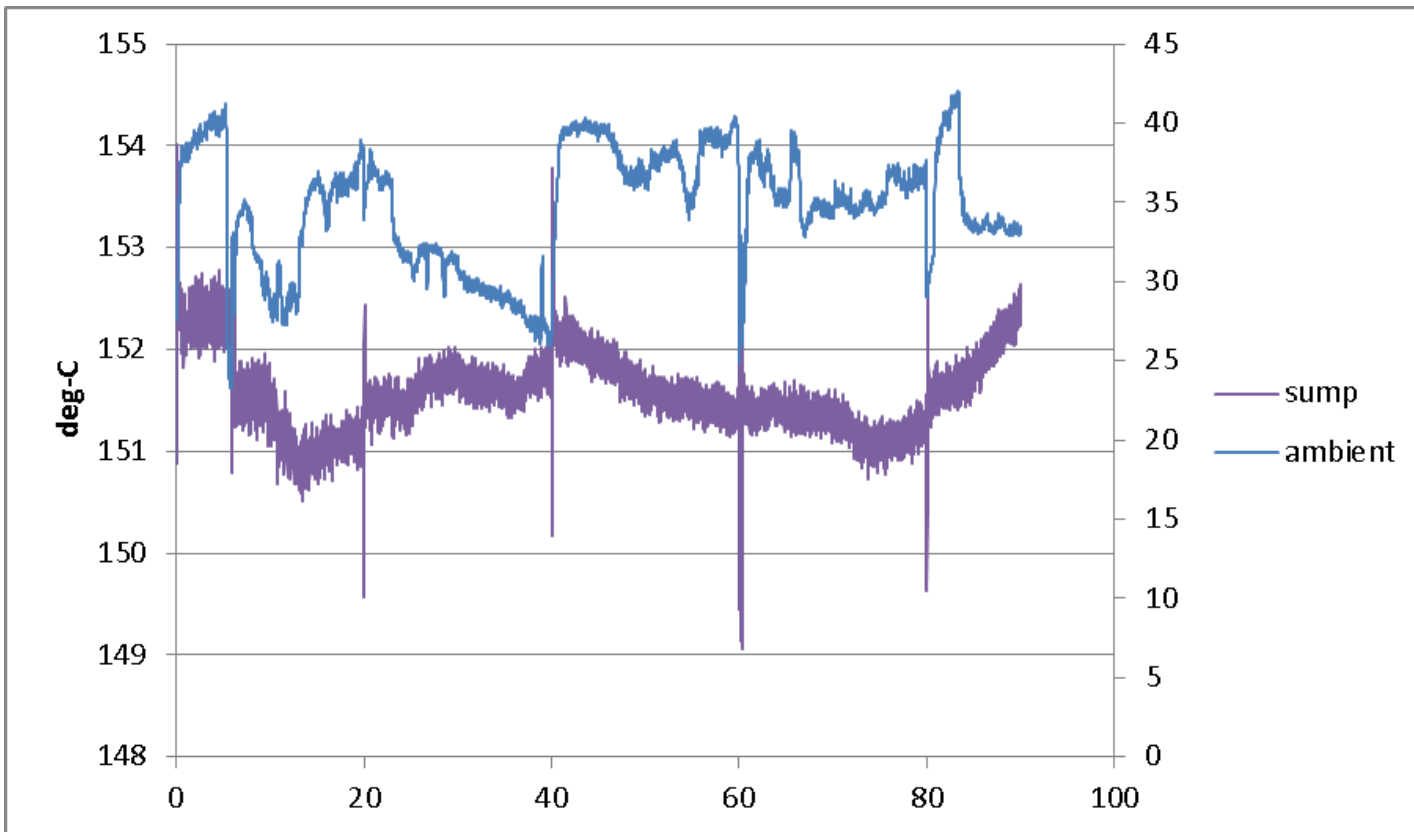


- Setpoint to 20 hours: cooler = 150
- Setpoint after: block = 151
- Note how temps diverge after oil breaks at about 70 hours



# Ambient temperature influence

- The correlation between oil and ambient temps seemed to be stronger before the 20 hour control scheme change

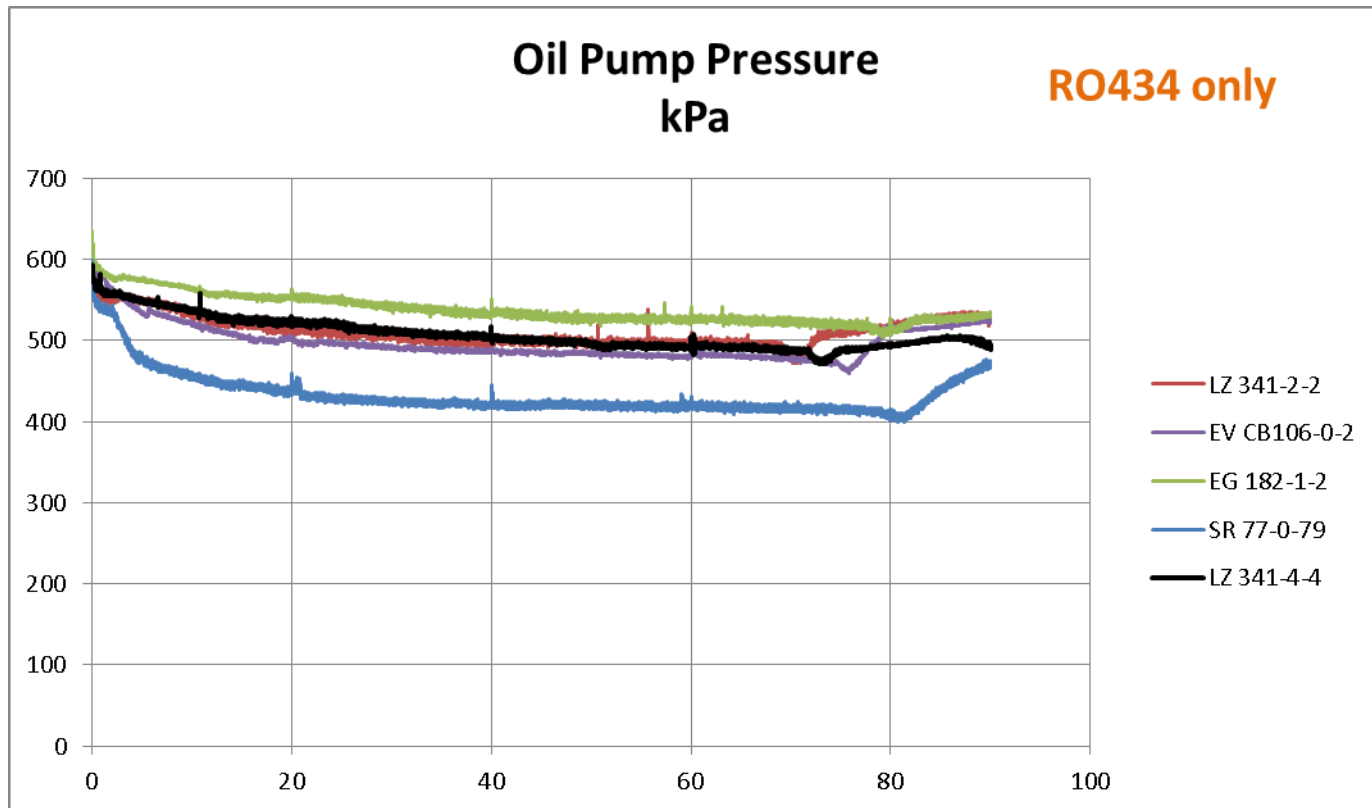




# Oil pressure (pump)

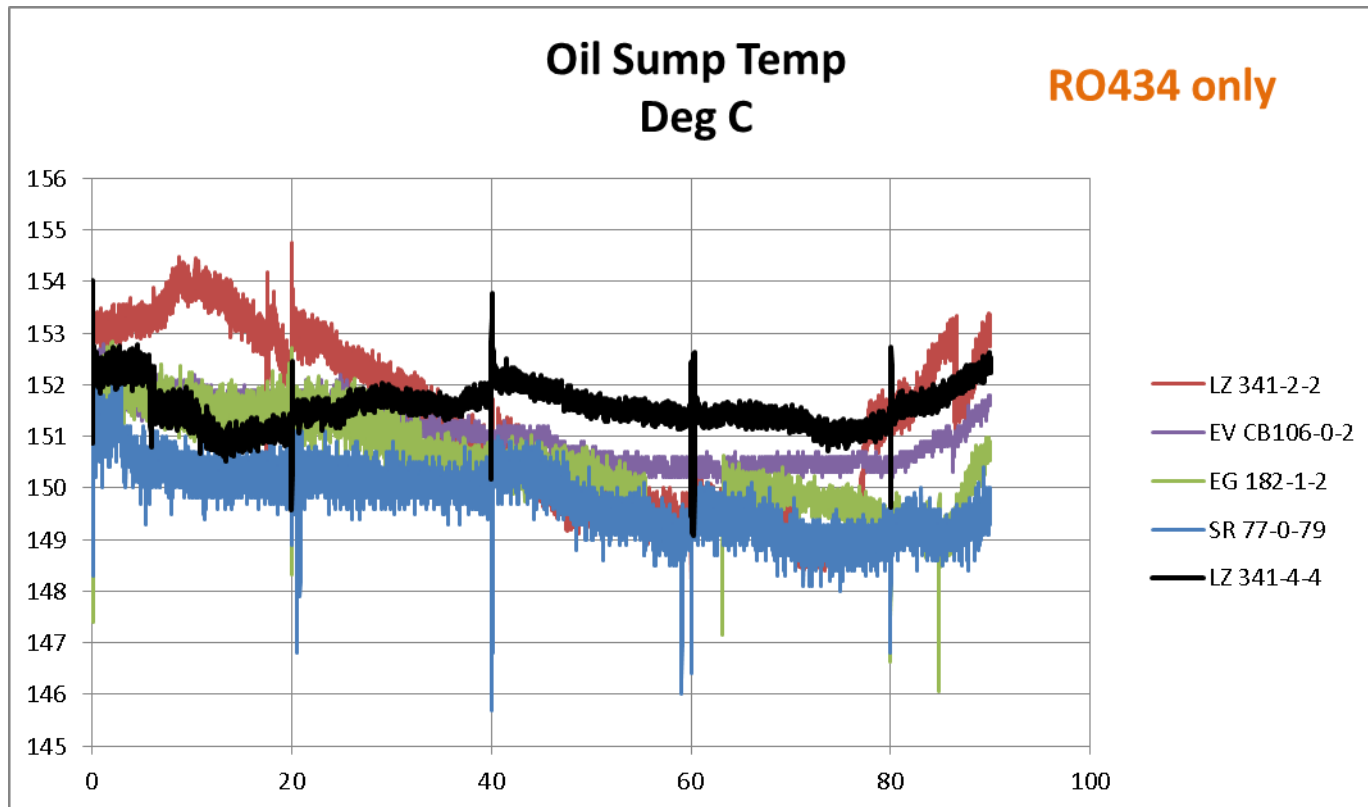


- This run duplicates almost perfectly duplicates LZ's first run
- The “break” point is about 3 hours milder (SWRI seems outlier)



# Oil sump temperature

- Sump temp and PVIS seem roughly correlated
- 3 highest sump temp were 3 highest PVIS



# Oil pressure DELTA (pump – gallery)



- Change in oil pressure from pump to gallery
- Interesting how pressure delta DROPS when oil viscosity increases
- SWRI run does not

