Chrysler IIIH Task Force
Conference Call Minutes
August 21, 2014

Attendees

Chrysler: Jeff Betz, Haiying Tang

SwRI: Sid Clark, Karin Haumann, Pat Lang

Intertek: Charlie Leverett, Addison Schweitzer, Bill Buscher

Lubrizol: George Szappanos, Mike Conrad

Afton: Ed Altman

Ashland: Amol Savant

Oronite: Kaustav Sinha, Jerry Wang

Shell: Scott Lindholm

Halterman: Tracey King

OHT: Jason Bowden, Matt Bowden

TMC: Rich Grundza

Karin opened the meeting with a review of action items from an earlier meeting;

1) Karin indicated she still needs to get everyone contact information for IMTS to order special cylinder heads with the hardened seat inserts for the Chrysler Test. Karin indicated IMTS is machining cylinder heads working off the Chrysler seed material inventory. Karin / Sid indicated IMTS is working on allocating cylinder heads to the laboratories while building the seed inventory to meet industry requirements. George Szappanos asked what labs should be looking for when running production cylinder heads vs the test specific hardened seat cylinder heads. Karin reviewed some of the issues experienced during development that lead to the decision to have the heads modified using an alternate seat material. Those issues related to intermittent compression losses during testing with the production materials when run under IIIH Test Specific conditions. Chrysler Engineering and the development group worked together to identify a material more suited to the conditions under which the Chrysler IIIH Test runs, i.e., high speed / high load, non-cyclic, no PCV, increased coolant temperatures etc.

   Charlie Leverett asked if there were any efforts focused on the possibility of using the cylinder heads for more than one test. Karin indicated SwRI has run the modified test cylinder heads for a second run, based out of necessity due to lack of availability and they may possibly be used for more than one test, however at this time the focus is on running them only one test. The intent during the second tests was to see if they were able to be used more than once to quantify

whether they might be capable of a second use to increase the life of the test if necessary. Sid cautioned the intent is to only be used for one test and if the heads were to be qualified for additional use, an acceptance criterion would have to be developed for such use.

2) Karin reviewed the current plans for Reference Oils indicating Reference Oil 3 (REO3) will not be used. Reference Oil 2 (REO2) will be used and Karin indicated labs first tests will be running REO2. The Test Monitoring Center is currently working on Reference Oil Re-Blend 434-2 for use in the Chrysler IIIH Test, however, Rich Grundza indicated that oil has yet to be introduced in the Sequence IIIG and Rich would suggest we look at its performance in the IIIG first.
3) Karin commented on the different front engine mount configuration as modified and proposed by Lubrizol indicating that she had discussed this with the development group and everyone agreed to its use being OK. Jeff Betz commented, expressing concerns about changes to the front engine mounting possibly affecting the production induction system Air Management Ducting. Jeff indicated he wants everyone to agree to run the Full Production Air Management Ducting, Sensors, and Filtration Element as configured during development. Jeff referenced communications with Chrysler Engineering and Bosch both reinforcing the importance of proper orientation and component usage for Engine Calibration. The group agreed everyone is running the full system and will reference the build packet information supplied by Chrysler.

Karin moved to discussions about materials included in the Chrysler Build List Jeff sent to the labs. Lubrizol indicated they received a few additional parts and questioned that their dealer could not order the Spark Plug Sealant after which Jeff clarified this was the Spark Plug Tube Sealant, required for use at IMTS and the Spark Plug Tubes are not to be removed so this part number is unnecessary at the Labs.

Karin asked the labs to provide an update on their test stand installation as part of her review of the Test Development Readiness Check List. Addison Schweitzer indicated Intertek has completed installation of their first stand and successfully completed their first run on that stand. IAR is working on installation of their second stand anticipating it will be ready for its first run early October. IAR plans both stands to be part of the Precision Matrix. Ed Altman indicated Afton is two to three weeks out from completion of their test stand and questioned whether he should send cylinder heads from his engines to IMTS. Sid commented he would take on an action item to send contact information for IMTS to the labs and work with Dave Passmore at IMTS to put something together for the Engine Build Workshop to be held at Chrysler August 27 and 28. George Szappanos indicated Lubrizol has been running their test stand for a couple weeks with a couple runs being performed. They are satisfied with the results to date and plan to be part if the Precision Matrix. Karin followed with confirmation SwRI has two development test stands that they plan to be part of the Precision Matrix.

Karin next discussed the next steps required to bring the test to Matrix Readiness; what needs to be done and what is the process for moving the recommendation forward from the Task Force to the Surveillance Panel to the Passenger Car Classification Panel for recommendation to the Auto Oil Advisory Panel etc. Karin reviewed current status;

- The honing procedure is complete and being reviewed at IAR with copy sent to the other labs
- SwRI has completed a test on REO2 using the proposed honing procedure with oversize pistons and production rings cut at the lab to the test gap. While the piston rings were

standard production, Chrysler does consider these rings to be the same design as the rings that will be received from the Central Parts Distributor.

- The test procedure is ~ 80% completed and SwRI is planning on completing the First Working Draft and hopefully distributing it the first week of September.

Charlie and Rich suggested Karin send the first draft of the procedure to the labs and the ASTM Sequence III Test Facilitator as soon as possible so he can start working on transforming it into an ASTM Format. I believe Rich said the Test Facilitator assigned to the IIIH is Terry Bates.

Since Charlie Leverett is the most recent Surveillance Panel Chairman to have brought a new test through the system, Sid asked if he could outline the steps required through the process. This prompted a discussion by the Task Force on what was actually needed involving the Matrix Design Group, the AOAP Chairman, ILSAC's Reference Oil Selections, and who actually says it's suitable for the GF-6 category and fit for purpose. Scott Lindholm outlined a process which people seemed to agree upon; Task Force – Surveillance Panel – Classification Panel – AOAP – inside the AOAP would be ILSAC – Matrix Design – Matrix – and a final comment that no stands are actually considered calibrated until after Matrix completion. Charlie also suggested Karin contact Tom Smith at the Classification Panel to ask what the Surveillance Panel needs to do to insure the test is ready and recommended for Matrix Testing.

Jerry Wang suggested reviewing the Heavy Duty Class Panel timeline for direction. Sid will work with Scott Lindholm to follow up on the process and timeline updates for the Chrysler Test.

Rich Grundza gave an update on the status of the Data Dictionary:

- Currently in Bata Testing
- TMC will review with Karin when ready
- Beta close is September 19th.
- Forms should be available shortly after that date

Lab Visit Group:

Karin discussed possible requirements for lab visitations prior to the running of the Matrix. The group agreed it would be nice to have participation from each laboratory. Rich indicated this needs to be done before each lab runs their Matrix Readiness Test. The group agreed the visitations should be kept to a small group consisting of Development Group Engineers and laboratory Engineers.

- Jeff Betz
- Haiying Tang
- Karin Haumann
- Addison Schweitzer
- Ed Altman
- George Szappanos
- Rich Grundza

Karin commented that each lab does need to run a prove-out test on REO2 prior to the actual lab visit to show they can run the test. The group also discussed the importance of having the Procedure and Assembly Manuals before any planned lab visits. The group discussed plans for the Engine Build Workshop and what materials would be included in any manuals handed out

during that program. Sid reviewed plans for the manual understanding it would not be complete for the workshop scheduled at Chrysler the week of August 25th.

The group discussed parts availability updates:

- Jeff Betz and IMTS are working on increasing the number of seed materials for cylinder heads.
- Fixed Phasers have been proved out and a larger order is pending from OHT.
    - Fixed Phasers will require an updated ECM calibration.
    - Phaser replacement interval will need to be decided.
- Karin is working on Summary Data for the Task Force
- Jason reviewed a drawing of a proposed injector fuel rail.
    - Need to insure the fuel inlet clears the induction system
    - Need to confirm inlet fuel connection angle
    - Need to decide upon connections and fittings for pressure and temperature
    - Need to confirm minimal overhung mass at front of fuel rail for safety concerns
      George Szappanos commented on the Lubrizol block adaptor used for these connections which is mounted close to the front of the engine to accommodate pressure and temperature taps. It was decided the labs would work with OHT to standardize these connections.
- Pistons and Rings
    - Limited number of oversize test pistons are available
    - Rings should be available ~ September.

Both Karin and Jason commented that these parts are to be used for prove-out and development testing only. Jeff Betz agreed and indicated direction for their use will come from Chrysler. Karin asked about the lead times necessary for Matrix Materials and the quantity's required being a minimum of one reference period. Again Karin indicated she would send Summary Data to the labs to review and reply their needs to the Development Group. Jason commented that a large quantity of materials typically require a minimum of 12 weeks delivery.

Outlining what's required for in the upcoming months:

September – Procedure, Assembly Manual, Standardized Test Stand Setup Documents
October – Lab Visits
October / November – Prove-out runs – Lab Hone – 434-2. Rich indicates he needs two runs on each stand. Parts Orders placed.
January / February – Run Precision Matrix

Ed Altman asked if the group could switch discussion to technical issues and the group started with exhaust back pressure. Karin indicated George Szappanos is having troubles holding the exhaust back pressure at 3 kpa and would like to recommend possibly changing the set point to 6 kpa . George commented that while the Chrysler test runs higher speed than the Sequence IIIG it controls the engine back pressure much lower. Lubrizol is using the same exhaust configurations and with their control valve at 100% open, they are running just over 3 kpa pressure. Rich Grundza indicated he was not in favor of changing parameters and recommended staying close to where the test development work was conducted. The group had considerable discussion on this subject and finally decided as an action item, George will look into his control capabilities at 4 kpa and report to the group.

Karin indicated coolant pressure concerns were also discussed with Lubrizol. Karin indicated SwRI started out controlling the coolant pressure by applying 125 kpa at the coolant reservoir. Realizing that control at that point would be dependent upon stand designs and different configurations she recorded the pressures at the engine out connection with 125 kpa on the reservoir. Under those conditions the pressure at the engine out connection was 200 kpa. George commented that he experienced aeration in the coolant system at 125 kpa at the reservoir compounded by problems controlling oil temperature. George indicated bumping the pressure at the reservoir to 130 kpa seems to reduce aeration in the system. George and Karin discussed concerns about boiling in the engine and Karin suggests controlling the engine coolant system pressure at the engine out connection may solve the problem. George feels his problems could be attributed to differences in stand designs and coolant heat exchanger placement and sizing. As an action item, Karin and George will work together to investigate coolant system pressures and possible boiling.

Additional discussions about the Air Box indicated the components and mounting will stay the same.

The group discussed allowing additional cooling fans directed over the exhaust takedown tubes. Concerns were expressed about ensuring the fans did not blow on the oil pan or engine block. If allowed they would have to be specified and possible hardware changes might have to be made to test stand fixtures to ensure they do not blow on the oil pan or engine block during operations. Rich reviewed positioning of cooling fans in the IVA. The group agreed we have to be very cautious in positioning any cooling fans. Rich read the section from the IVA and will forward copy to the Task Force Group. Pat Lang commented he preferred not to use any fans in an oxidation test. He commented SwRI used heat insulated wrap on the exhaust. Ed commented he felt heat insulated wraps also could introduce additional heat at the cylinder head. Sid suggested possibly making water cooled take down tubes. After discussions about what affects that might possibly have on exhaust temperatures at the cylinder head and any changes to exhaust gas temperatures on any built in EGR, the group decided not to pursue that suggestion. Karin indicated we might consider including some sort of exhaust shielding around the take down pipes but that would require designing them the same at all labs.

Karin discussed possible coolant flow rate changes required as a result of changes to the oil cooler flow direction. Karin reviewed possibly reducing the coolant flow rate to 165 l/m measured at the coolant outlet. Discussion focused on the fact that with the oil cooler flow direction change, we are actually pushing 170 l/m plus the flow through the oil cooler and this may put the flow at the upper limit of the system capability. Karin reviewed the history of the coolant flow changes starting at 160 l/m changing to 170 l/m to keep higher flows through the cylinder heads. Karin asked if the labs could look at their coolant flows and see if they are close to their limits on flow. Ed Altman asked if SwRI saw variations from stand to stand and Karin responded that all the SwRI Stands were at the high side of their flow limit. George commented Lubrizol had plenty of flow control, however, when the oil cooler was set to manual full flow it did create problems. George indicated he felt the oil cooler had plenty of capacity and under test conditions he generally runs at about 70% closed on the oil cooler circuit. Karin will look at control valve positioning with the flow set at 165 l/m on her stands and reply back to the group.

Addison asked if the group felt confident we are going to stay with the flow control specified on the outlet side of the engine. Karin indicated she felt we are close enough in the details and the design should stay the same.

The group discussed the next meeting. Rich Grundza indicated the Task Force needed to get their information to Dave Glaenzer prior to his scheduled Surveillance Panel Conference Call for September

4th. Additional discussion prior to adjournment focused on having a conference call focused on putting together a test stand installation document. The group discussed possibly having this call before the September 4th. Scheduled S. P. Call. The group ended with conversation with Amol about possible conversion of Sequence IIIG stands and whether they felt it might be possible to configure an IIIG Stand to run both the IIIG and IIIH. Rich Grundza indicated that changing from an IIIG to an IIIH would nullify an IIIG calibration.

Action Items:

1) Sid Clark will work with IMTS to put together contact information and cylinder head preparation instructions for shipping heads to IMTS for processing.
2) Labs will work with OHT to standardize the fuel rail connection requirements to minimize overhung mass at the fuel rail.
3) George Szappanos will investigate exhaust back pressure control capabilities at Lubrizol setting the back pressure at 4 kpa.
4) Karin will go back and look into coolant work to see where the coolant pressure and temperature boiling points fall. George will measure the pressures in his coolant system at both the reservoir and the coolant outlet to see where aeration sets in.
5) Rich will forward Sequence IVA wording on the use of cooling fans in lubricant testing to be used for continued discussions about allowing external cooling fans on the Chrysler Test. The group will discuss this in more detail.
6) Karin will look at the control valve positioning with the set point at 165 l/m for the coolant flow and report that to the labs for further discussion.
7) Karin will send a list of stand installation requirements to Amol at Ashland.
8) Dave Glaenzer will contact Tom Smith for requirements from the Surveillance Panel to the Pass Car Panel.

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

Thanks, Sid