

Chrysler IIIH Task Force  
Conference Call Minutes  
September 5, 2014

Attendees

Chrysler: Haiying Tang

SwRI: Sid Clark, Karin Haumann, Pat Lang

Intertek: Charlie Leverett, Addison Schweitzer, Bill Buscher

Lubrizol: George Szappanos, Mike Conrad

Afton: Ed Altman, Dave Glaenzer, Raymond Smart

Ashland: Tim Caudill, Amol Savant

Oronite: Kaustav Sinha, Jerry Wang

Halterman: Tracey King

TMC: Rich Grundza

Karin opened the meeting with a review of action items from the August 21, 2014 meeting;

- 1) Everyone should have contact information for ordering cylinder heads from IMTS. Sid will follow up by sending the one page information sheet from the Assembly Manual to everyone as an attachment to these minutes.
- 2) Labs will work with OHT to decide on a configuration for the Fuel Rail that minimizes the overhung mass at the fuel rail inlet. The group discussed how labs are currently measuring pressure and temperature for the fuel rail. SwRI measures pressure at the Rack and temperature at the fuel rail. Lubrizol uses an in-house fabricated aluminum block at the front of the engine which serves to relieve stresses at the fuel rail. Intertek uses a connector with a seal that clips to the production fuel rail and measures the temperature and pressure at a connection block at the induction air box mount. Afton is ordering an aftermarket aluminum block from Summit Racing that will allow them to attach the front of the engine or front cover. As an action item, the labs will send pictures of their fuel rail connections to the group for further discussion and standardization working with OHT. Afton indicated they would forward the link to Summit Racing for their fuel block to the group.
- 3) Rich Grundza forwarded information on the IVA O2 Sensor cooling fan requirements to the group.
- 4) Karin will contact Tom Smith for direction on process for bringing the test forward to the Passenger Car Classification Panel for recommendation to the Auto Oil Advisory Panel.

Lab Updates:

Intertek: Addison reported they have run their first test stand and are on track for completion of their second stand for the end of October. Haiying asked when Intertek planned to run Reference Oils to prove out their test stands. Addison indicated they would run their tests when the final hardware,

Procedure, and Assembly Manual became available. Haiying questioned whether they had the final hardware. Addison indicated they were waiting on Piston Rings. Karin reminded everyone that Chrysler considers the production rings gapped at the labs to be representative of the final hardware. She reminded everyone that the only difference to be OHT rings will be supplier gapped. Charlie indicated IAR was concerned about running into blowby variations with lab gapped rings and preferred to wait until materials were available through OHT to run any Reference Oils.

Lubrizol: George indicated they were three tests into their stand setup and still making required modifications. George felt once they were completed Lubrizol would be compliant.

Afton: Ed reported they would be ready to start their shakedown engine around the end of the second week of September.

Karin told everyone that OHT was on travel and unavailable for this meeting. Jason provided Karin with an update which she read through for the group;

- working on lower pan modifications
- waiting on fuel rail comments
- working on upper pan modification for crankcase pressure taps
- working on lower oil pan gasket design
- additional fixed phasers should be available in about six weeks
- pistons, there is a prototype quantity on hand
- piston rings should be available the end of September
- All other materials are in stock

Karin indicated the Draft Procedure was about 80% complete and would be forwarded to the group next week. Karin indicated Sid is working on the Engine Assembly Manual and should have the test specific first draft available soon.

Karin asked if the group felt a Honing Workshop was actually necessary and asked Charlie Leverett his opinion. Charlie indicated a workshop may not be necessary as a group as the labs could work individually with SwRI to review the setup and honing operations. Charlie asked George to comment, George indicated they had discussed this and he was concerned about providing a consistent hone going forward. George indicated he was also concerned about running tests on production sized pistons and factory honed cylinders. Charlie reminded everyone that there were pistons available however they were only to be used for prove-out testing. Charlie suggested possibly using a post test engine for practice honing. George said Lubrizol was doing the same.

Karin moved to concerns about maintaining exhaust backpressure. George commented about Lubrizol problems holding the backpressure at 3 kPa indicating Lubrizol was experiencing problems controlling at 4.0 with exhaust valve positioning on the edge and controlled their last test at 4.5 kPa vs. 3 kPa. Ed Altman asked George how their exhaust was configured and realizing they did not go into a common system, indicated he felt Afton would most likely realize problems as they run into their common system. Karin suggested tabling this discussion until Afton was running and could report on their capabilities.

Karin reviewed the coolant flow setup changes and flow capabilities at SwRI after changing the coolant system plumbing to return the integral oil cooler to the reservoir. Karin reviewed reasoning for changes to the flow spec during development, i.e., starting at 160 l/m then to 170 l/m and concerns over cylinder head durability. Karin indicated SwRI initially had problems controlling at 170 l/m flow after changing the oil cooler due to the bleed off through the oil cooler but realized improvement after changing from 1 ¼ to 1 ½ inch coolant supply lines. Ed Altman indicated he has looked closer at the system and believes the front cover may be part of the problem as the inlet for the coolant hose is only 1 ¼ inch and flows through an additional rectangular restriction inside the front cover before entering the coolant pump area. Ed believes the way Lubrizol plumbed their inlet straight to the coolant pump housing may be, thereby bypassing the inlet hose and oil cooler attachment may be helping with their flow capabilities. Karin asked George to run their system wide open to record their flow capability.

The group discussed flow restrictions through the Elanco Spiral Heat Exchanger as they age and become plugged internally. Charlie indicated they have had success using the Ultra Sonic Cleaner to clean the Spiral Heat Exchangers. Karin then asked everyone if they were using the Micro Motion Flow Control for the Chrysler coolant flow control. Bill Buscher indicated even the Micro Motion would add some flow restrictions. While SwRI can run at 175 to 180 l/m flow with the larger hoses, Karin expressed concern that the higher system pressure at the front of the engine still presented a possible safety concern as the system requires 250 kPa to suppress boiling in the oil cooler with the oil cooler plumber to the reservoir. Karin noted even with the larger hoses, it still requires 140 kPa at the reservoir to suppress boiling at the oil cooler where the original configuration was good as low as 75 kPa on the reservoir. Ed commented that his understanding was that the coolant additives even had a harder time staying in suspension at those pressures and would necessitate more frequent cleaning of the system.

Rich Grundza questioned whether the group felt using 100% DexCool was a viable solution. Pat Lang expressed serious concerns about changing from the development conditions and the effects such changes would inevitably have on PVIS and WPD.

Charlie agreed about the effects any changes would have on rated parameters and asked Pat his view on what effects increasing the Engine Exhaust back pressure might also have. Karin commented that all the development work to date ran the original coolant configuration and SwRI never experienced oil erratic oil temperature control.

Karin will go back and look at  $\Delta T$  and pressures in the coolant system. Addison commented that Refractometers are only accurate to ~ 60/40 coolant concentrations and asked if we had experienced any problems with controlling oil temperatures since making the changes to the coolant system plumbing. Amol asked if it might be possible to run a pressure relief valve in the system.

At this time Haiying Tang asked the question “if we didn’t experience any problems during development, why would we want to change?”

After Haiying’s comment, Kaustav indicated he felt we should not make any changes until seeing additional data from the labs. Jerry Wang supported retaining the original configuration, Haiying then indicated she supported going back to the original configuration, Ed Altman, Pat Lang, and Karin agreed saying she felt the original configuration was the best solution. Bill Buscher commented that there have been over 50 tests run under those conditions with no apparent problems and supports returning to the original configuration. Charlie Leverett agreed and indicated he feels the same about increasing the exhaust back pressure indicating Intertek has modified their exhaust to run the lower pressure.

After a few more comments, Ed Altman made a motion to return the cooling system design back to the original configuration used during development testing. Bill Buscher seconded the motion.

After minimal discussion the question was called, the Secretary used a roll call vote and the results were;

Chrysler – Yes

Oronite – Yes

SwRI – Yes

Intertek – Yes

Afton – Yes

Ashland – Yes

Lubrizol – Waive

Halterman – Waive

TMC – Waive

The motion carried with 6 Yes votes and 3 Waves.

Karin next brought up the subject of using cooling fans on the exhaust system. Lubrizol and Intertek have suggested using cooling fans similar to this application. The group reviewed the wording Rich Grundza sent out on the D6891 Sequence IVA Test which allows the use of cooling fans directed at the Oxygen Sensor. Rich also indicated his understanding that the Sequence VIE Test is also going to use cooling fans to protect the Knock Sensor. Rich also reminded everyone that cooling fans on Oxidation Tests have generally been looked down upon, and admits there are people in the industry that are not comfortable with fans on test engines.

George reviewed the Lubrizol Presentation indicating the specifications were specifically designed to minimize any air flow across the engine block or oil pan areas. The air was directed at the sensor locations on the take down pipes with a squirrel cage design specified at 300 cfm and un-louvered . Intertek and Afton agreed to support the use of fans, Bill Buscher agreed that if approved fans would be required, Pat Lang agreed that if approved they would be required. Karin and the group agreed to table discussion on fans until further information and specifications could be discussed once everyone was running.

The next topic pertained to Blowby Measurement. Karin indicated that the only method of measuring the blowby in the Chrysler Test was by use of the Sequence III Blowby Cart. Charlie Leverett commented that he didn't want to rule out the use of J-Tek Meters suggesting considerable data has been collected in support of their use. Karin referenced concern that there seemed to be a considerable difference in Intertek's initial test readings between the Sharp Edge Orifice Meter and the J-Tek readings.

The group continued discussion reviewing the Lubrizol crankcase ventilation system with the incorporation of a surge tank and the J-Tek meter. Lubrizol's system incorporates a surge tank on the crankcase vent between the engine and the Air Ecology with a bypass system that directs the blowby gasses through the J-Tek Meter only during the blowby measurements. Pat Lang and George discussed the configuration with Pat Lang providing an overview of the SwRI crankcase ventilation system from the cam covers to the Air Ecology indication there is no surge tank in the system. Pat explained the condensate collection container only collects the condensate that collects at the PVC piping which does not pull a draw on the engine. Pat also commented that he wanted it clear that no condensate

collection is to be returned to the engine. Karin mentioned oil consumption differences between the initial and later design of the crankcase system operations at Lubrizol. Sid and George commented that the production PCV valve internal workings had not been removed from the housing interface on the right side cam cover.

Ed Altman recommended the test development group provide a detailed diagram of how the crankcase ventilation system should be configured. Karin indicated the ventilation system would be detailed and specified in the procedure.

The group moved for adjournment and a few questions were asked and answered before finally ending the call.

- 1) Kaustav wanted everyone to discuss Prove-out testing requirements. Karin indicated she was in discussion with appropriate parties on what oils and how many tests would be required at the labs.
- 2) Charlie requested there needed to be a clear understanding of proposed Prove-out Test requirements for the next meeting.
- 3) Karin plans to have weekly meetings but does not want to schedule a recurring time at this moment.
- 4) George asked and was confirmed that the group felt there was no need for a Pre-Test Coolant Flush as every test will be a new block.

#### Action Items:

- 1) As an action item, the labs will send pictures of their fuel rail connections to the group for further discussion and standardization working with OHT.
- 2) Lubrizol will run their coolant system full open to map the system capabilities using the Kundinger Fluid Processor setup with the Spiral Heat Exchanger.

The next meeting will be Friday September 12, 2014 at 10:00 Eastern.

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



Section	2	Precautionary Statements	Revision DRAFT 1
Sheet	1		Aug-14

**Caution:**

The 3.6L Pentastar Engine is NOT A FREE SPIN ENGINE. Care must be exercised during disassembly not to rotate the crankshaft or camshafts once the valvetrain chain assemblies have been altered in any manner.

**Caution:**

Do not lay cylinder heads on gasket sealing surfaces. The design of the Multi-Layer Steel (MLS) cylinder head gasket will not seal properly if there are any imperfections on the cylinder head or engine block. Use only approved plastic type gasket removing tools when cleaning these surfaces.

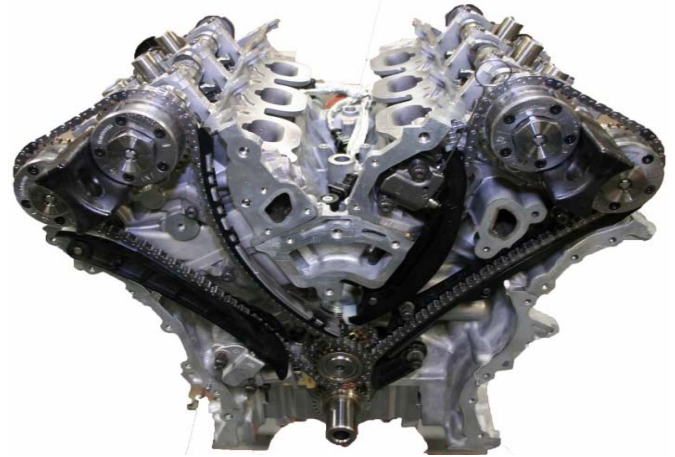
**Warning:**

Multi-Layer Steel (MLS) head gaskets have very sharp edges that could cause personal injury if not handled carefully.

**Note:**

Multi-Layer Steel gaskets require a scratch free sealing surface.

1. Remove all gasket materials from cylinder head and block using care not to gouge or scratch the aluminum sealing surfaces.
2. Non compressible debris such as oil, coolant, or RTV sealants not removed from bolt holes can cause the aluminum cylinder block to fracture when tightening fasteners. Do not add lubricating oils to these fasteners during assembly.
3. Clean all cylinder head bolt holes in the engine block. Do not use any sealants or adhesives on fasteners, Multi Layer Gaskets, or any sealing surfaces. Surfaces must be debris free and scratch free for proper sealing.



**NOT A FREE SPIN ENGINE**

Valve to Piston interference will occur if not properly disassembled / assembled



Notes:

Section	2	<b>Cylinder Head Core Preparation</b>	Revision DRAFT 1
Sheet	2		Aug-14

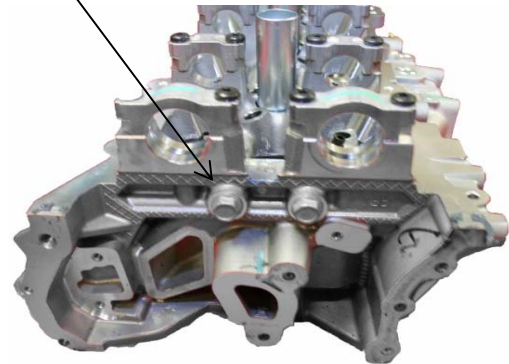
New engines are ordered through Chrysler MOPAR under special order part number. Engines are preserved under long term packaging. Once received at the test laboratory, they should be disassembled and put into storage for future build. Cylinder heads should be completely disassembled and the valvetrain gear stored for future use.

Bare cylinder heads (Cores) should be sent to IMTS for re-work. Labs must use the IMTS Special Packaging to protect the cores from damage. Packaging contains special cushioning sleeves for both Right and Left cylinder heads.

1. Camshaft caps are identified on the sides, "1E-> , 2E->" etc. for exhaust camshafts and "1I-> , 2I->" etc. for intake camshaft caps. Caps must be kept in order.
2. Remove all valvetrain hardware from cylinder heads; camshafts, roller rockers, lash adjusters, valve springs & valves, and spark plugs.
3. Keep all camshaft bearing caps in order. Replace after valvetrain hardware removal. Do not use air or battery powered tools to tighten camshaft caps. Use a speed handle to lightly snug fasteners and torque M6 T30 fasteners to 9.5 Nm.
- 4 After removing all valvetrain gear and torquing all camshaft caps in their proper position, install the cylinder head in VCI bag and insert the assembly in the IMTS Packaging with proper inserts, Securely tape package and ship to: IMTS 8460 Ronda Dr. Canton, MI. 48187



Do not remove oil gallery plugs or freeze plugs



Top insert rotates 180° depending which head, left or right is in box.