Chain Wear Task Force Conference Call July 28, 2015

Attendees:

SWRI – Felt Mounce

Intertek - Al Lopez, Bill Buscher

Ford – Ron Romano

Afton – Ed Altman, Christian Porter

Lubrizol – George Szappanos, Kevin O'Malley

Infineum – Gordon Farnsworth, Doyle Boese

TEI – Zach Bishop, Dan Lanctot

TMC – Rich Grundza

Ashland – Amol Savant

OHT – Jason Bowden, Matt Bowden

Test Procedure Readiness:

Geroge wants to make sure ramping and stabilization is consistant as well as steady state conditions. George proposed a linear ramp up to conditions over 25 minute period with a 5 minute stabilization. Total of 30 minutes before beginning "Test Condition" data recording for QI's.

Speed an Load Ramps are to be 30 seconds, recording data a minimum of every 2 seconds. Temperature ramping and stabilization data will be recorded every 30 seconds. On Test time data will be recorded once a minute.

Several questions concerning procedure readiness are addressed below in Blue

- Control limits to be reasonable, appropriate, and achievable
  - several of the proveout tests run thusfar would be considered invalid by the limits specified below Yes but hopefully we learned something.
  - based on the fact that some labs could achieve the limits, it appears the limits are reasonable and achievable
- Test procedure availability
  - Is the R6 procedure on the TMC site current? Is there an update? (March 25 is latest)You should look at R6, Sections 6&7 and Partlist
  - Does the "section 6&7" document supercede the R6 procedure? Section 6&7 should replace everything before Engine break on page 14 and all the figures in R6. Jason

rewrote the rest of R6 and is combining that with sections 6&7 so all the tables and figures match up. This should be complete this week. (Jason, not to put any pressure on you)
    - A final document needs to be available at the time the PM starts, and all PM test to follow it
- Engine build
    - There should be a surface finish specification and range (there is angle, but couldn't find finish) this is on page 5 of R6 and Sections 6&7, "Deglazing is performed after ultrasonic cleaning under the following conditions to achieve a 9ra to 13ra and 30+5 degree crosshatch" Should there be more than this?
    - If labs are cutting rings, there should be wording to indicate that the sharp edge left by the cutting operation not be chamfered or dressed, only that the burr be removed; this will impact blowby. Please look at section 7.8.5.2 in Section 6&7 document and let us know if this will suffice or more detail is needed
- Stand build
    - When installing the accelerator pedal sensor simulator, the voltage signals must be run through a voltage isolator otherwise interference will occur between the lab DAC system and the engine ECU and throttle control will be erratic (speed and/or load). Could we just add another note to the table that show the voltages something like "The voltage signals must be run through a voltage isolator otherwise interference will occur between the lab DAC system and the engine ECU and throttle control will be erratic"
    - Is PCV flow important (like IVD and VG tests)? If so, should the valves be checked pre-test? Yes, we should be flowing these before each test or using a new valve for each test. Felt, Jason and I will come up with flow requirements this week.
- Test operation
    - What is the data recording rate, 1 sample per minute? Only during the non-ramp stages? I believe we're recording 1 sample every 30 seconds, including the ramps. I thought that the data that was sent to Rich had to have the ramp data removed. Jason, Felt, Amol, Christian, correct me if I'm wrong on this.
    - Should have a table for max time constants on critical parameters We need to create this but we should be able to use what we have in other test procedures for these parameters since we're using basically a lot of the same equipment
    - There is a 30 sec speed/load ramp between conditions, but a 30 min temperature ramp
        - What are the limits on the temperature ramp? Would a lab that ramps the temp in 10-20 minutes be comparable/valid? The temp ramp should be a 30 minute liner ramp. Next stage conditions shouldn't be achieved in 10-20 minutes. Jason, Felt, Amol, Christian, correct me if I'm wrong on this.
        - Ramping slower (to 30 min) means the first few steady state temps may be high or low if the ramp isn't followed perfectly. Sorry not being in the lab running these I would have thought a slower ramp would be easier to control but I could be wrong on this.
        - This might explain the variable temperature data on some labs/tests. Wouldn't this just be tuning. On some tests there weren't any problems hitting the temps
        - Can/should the temperature ramp be shortened? Would this change the test?
    - What is ramp for coolant and blowby temp (30 min), coolant flow and EBP (30 sec?) I would think coolant flow and EBP would go along with the 30 sec SL ramp, although we don't say that in the procedure. Jason, Felt, Amol, Christian are coolant flow and EBP 30 sec ramps?

- The control limit table needs added I sent thisout in an e-mail and will be added to the draft released this week.
  - Charge air temperature needs a limit, suggest ±0.5°C Sorry missed that one should be ±0.5
- Limits for oil consumption? We discussed this in the small group during a review of the procedure and thought we should just specify a dipstick level instead of an oil volume or weight. Based on the PO tests 100mm dipstick level looks like a good min level. With everyone using the OHT pan these should be consistent.
- Should measure ECU parameters yes
  - Std parameters: intake air temp, AFR, coolant temp, spark timing
  - Special parameters: camshaft positions, injection timing
    - Will require Ford to supply "decoder" info for those special parameters Today I just got permission to publish the mode 22 parameters so we'll provide a table on how to read the following from the canbus. Only the last 3 are mode 22 the other are published in an SAEJ1979
    - Absolute Throttle Position B
    - Ignition Timing Advance for #1 Cylinder
    - Absolute Throttle Position
    - Engine Coolant Temperature
    - Intake Air Temperature
    - Equivalence Ratio (Lambda)
    - Absolute Load Value
    - Intake Manifold Absolute Pressure
    - Actual Intake (A) Camshaft Position Bank 1
    - Actual Exhaust (B) Camshaft Position Bank 1
    - Charge Air Cooler Temperature Bank 1 Sensor 1 - Raw.

We will be removing Blowby Coolant Flow rate from the specifications, since we're controlling blowby temperature.

One lab is still struggling to achieve blowby temperature fast enough and plans to change the control system on order to attain temperature.

Robert Stockwell provided some suggestions and questions of the procedure:

Page 4, do you really want to allow the labs to clean 50 engines between cleaning fluid changes (30 minute clean, change fluid every 25 hours)? Seems to be ok. I'll ask SWRI and IAR how dirty he fluid gets.

Page 5 the crankshafts are polished then cleaned. It is unlikely that they are being cleaned well enough to remove abrasives. The labs like shiny journals, but this may not be what is best for the test, or the test engine. Cleaning after lapping the valves has a similar concern, but cleaning these parts is easier than cleaning crank oil holes. I can have the labs check the cranks for grit after cleaning to see if there is anything left. The cross-hatch angle should be defined as 30±5 degrees (Note: ± is hold down the alt key and enter 241 on the keypad, most look like an underlined +, e.g. ±) I agree, I'll change this

Page 6, number six at the top pick one, either clean with hot water, or hot water plus Tide, not either. They are using tide when cleaning. Now that you point it out it is misleading should be "with warm/hot water plus Tide, or hot water plus Tide"

Page 8 (&12) Intercooler – pick one. The web site says 52 has thicker metal in the intercooler which reduces efficiency. I would recommend requiring the heavy duty one, type 52. We had a lot of discussion about this, for some reason some of the labs are having a problem reaching temp with the one we picked so we are now letting them use whichever they want and have a spec for temp entering the T/B and pressure loss across the intercooler.

Page 15, next to last sentence you want "break-in", not "break". Thanks for catching this. I'll check if Jason caught it in draft 7

Page 16 Table 6 needs control ranges. You mentioned requiring ±0.5°C for the temperatures, acceptably ranges for all controlled parameters needs to be added, and the pressures should say gauge pressure. Added to draft 7

Page 17 Scheduled shutdowns should say "shut down", not "shut". Thanks for catching this. I'll check if Jason caught it in draft 7

Table 8 should have test hours as 24, 48… The time to take the oil sample should be something like 25±2 minutes. I'll add the ± . I'll talk to the labs about what hours to put in there. It's like that because for the 6th cycle the last stage 2 is shut down 30 minutes early so the engine only runs 23.5 hour, etc and the last 30 minutes when the engine is shut down is counted as test time but it's for the oil dip. I guess if we put 24 hours there someone might run to 24 hour before shutting down.

Next Chain Wear Conference Call is:

Tuesday August 4th, 10:00 am Eastern

888-628-3668

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