

Jeff Clark

From: Fetterman, Pat [Glen.Fetterman@Infineum.com]
Sent: Tuesday, December 21, 2010 3:56 PM
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Cc: ronald.brock@us.mahle.com; eric.garzelloni@us.mahle.com
Subject: Unconfirmed minutes of our December 21, 2010 teleconference.
Attachments: RE: Mack Surveillance Panel Teleconference - December 21, 2010, 10:30 AM - 11:00 AM Eastern

Participants –

Zack Bishop; Doyle Boese; Brad Carter; Chris Castanien; Jeff Clark; Mark Cooper; Riccardo Conti; Pat Fetterman; Ken Goshorn; Jim Gutzwiller; Jim Matasic; Jim Moritz; Scott Richards; Andy Ritchie; Greg Shank; Eric Garzelloni; Ron Brock

Discussion –

Before the teleconference Jeff Clark circulated a report from Mahle covering their findings to date regarding the bearing cracking problem in the T-12 test. I've attached Jeff's note above for completeness. The meeting started with an extensive discussion regarding the sourcing and quality of the connecting rods used in the T-12 test:

- 0 Early rods were all manufactured in-house by Mack.
- 0 Tooling has been removed and limited supply of new parts may be available from a third party aftermarket supplier.
- 0 Rods are now supplied from the Mack re-manufacturing facility in Millertown, PA.
- 0 Most rods are remaned, but some new rods are used as required to meet demand.
- 0 Ken Goshorn is not willing to accept that we have a problem with the remaned rods – we may have a problem, but it hasn't been proven.
- 0 Ken Goshorn does not know if there is a sufficient supply of new rods to allow the use of only new rods in T-12 testing, but he will check and find out.
- 0 Reman may or may not involve milling and reboring the large end of the rod. All rods have new small end bushings installed, reamed and burnished. Burnishing operation is both difficult to do and vital to rod performance. It is unlikely that another shop can perform rod rebuilds.
- 0 If the big end of a rod has been milled, 0.0025 in is cut from both the rod and the cap, and the bearing hole is rebored making the big end centerline to small end centerline slightly shorter. Each time a big end is machined, a dimple is drilled into the side of the cap.
- 0 All open market rods should have no more than one dimple indicating one machining of the big end. Rods with multiple machinings should be restricted to rebuilt engines using decked blocks.
- 0 Labs are asked to identify any rods on hand.
- 0 Ken Goshorn will double check the coding used on remaned rods.

Following the rod discussion, the group moved to the Mahle report and a discussion of the bearings. Mark Cooper thanked Mahle for their excellent work and quality report shared with the group. Bearing issues:

- 0 The current bearings were designed for a peak firing pressure of 2550 psi, but phase 2 of the T-12 test uses up to 3500 psi peak firing pressure.
- 0 Mahle work suggests that rather than conventional bearing fatigue cracking of the overlay, the entire bearing is being subjected to a bending stress which leads to the bearing cracking.
- 0 If Mahle were designing a new bearing for this application, they would recommend a different overlay composition (called C2) which adds indium and aluminum oxide to improve fatigue resistance. However, this overlay would not correct the problem if the entire bearing is bending.
- 0 Rods do bend under loading – are we overloading their design strength?

- 0 Rods have been running under this loading for 5 to 6 years, what's changed?
- 0 Cracks have occurred with both "old" and "new" date coded bearings.
- 0 Lots of discussion regarding desire for "better" quality rods and bearings.
- 0 Test conditions / firing pressure have not changed over the last five years.
- 0 If the group wants to try a different bearing overlay, we're looking at 14 to 16 weeks (or more) from early January for delivery.
- 0 It is unlikely that the HTCBT test can be used to screen for performance (corrosion) differences between bearings.
- 0 TEI still has T-10 rod bearings with an 80/20 lead/tin flashing which could be used, and they will donate parts kits for any tests using them.
- 0 TEI will send samples of the T-10 bearings to Mahle for analysis.
- 0 When any new T-12 tests are run, the test lab should document the "pedigree" of all rods used.
- 0 All labs are to check stored bearings from previous T-12 tests to look for possible cracking which always occurs on the upper bearing just above the oil hole.

Tom Wingfield reported that he thinks Afton is ready to start a T-11 test using the PC-9 HS fuel, but that needs to be confirmed by Bob Campbell.

Our next teleconference is planned for 10:30 am EST on Friday, January 7, 2011.

Respectfully submitted,

Pat

P.S. Happy Holidays to all!!