

Everyone,

The following are the unconfirmed minutes of the Mack Surveillance Panel Meeting held on January 26, 2016 by teleconference. Please feel free to let me know if there are any changes or revisions needed. Thanks.

Call Participants:

Afton - Bob Campbell

ExxonMobil - Mike Alessi

Infineum - Bob Salgueiro (Secretary), Elisa Santos

Intertek - Jim Moritz, Juan Vega

Lubrizol - Jim Matasic, Nick Secue, Kevin O'Malley

Oronite - Mark Cooper (Chairman), Jim Rutherford

SwRI - Robert Warden

TEI - Mark Sutherland

TMC - Sean Moyer

Volvo/Mack - Greg Shank

Mack Surveillance Panel Meeting

The Surveillance Panel meeting was called to order at 10:30 AM Eastern, by Mark Cooper, Chairman of the Surveillance Panel. The agenda topics are listed below, with discussions and actions following.

Agenda:

- Update of status of additional T-12 reference tests for potential correction factor updates
- T-12 oil consumption versus Pb (Lead) versus bearing weight loss
- T-12 connecting rod bearing big end surface roughness

Update of status of additional T-12 reference tests for potential correction factor updates –

Intertek had delays will start their T-12 reference on VUYPC parts batches this week. Lubrizol started their T-12 reference today. Lubrizol will complete 2 T-12 references, one on the newer hardware batches and one on the older batches.

T-12 oil consumption versus Pb versus bearing weight loss –

Jim Moritz asked if the Pb and bearing weight loss relationship has changed relative to the past? LTMS data was reviewed in Spotfire, comparing final Pb values (untransformed) over the last two years by Avg. Upper Bearing weight loss. The 3 rod batch Y Pb results were all on the edges of the historic band of data. The Pb had to be coming from the rod and or main bearings so individual bearing parameters were looked at vs Pb. No strong correlations were apparent. Jim Moritz suggested possibly comparing the sum of all bearing weight loss (Rod upper and lower and Mains upper and lower) vs Pb. Only the averages of each were available to be summed. However, later during the call, Sean Moyer shared that the individual bearing weight loss parameters had been added to the TMC website. The results of the sum of the Avg. bearing weight loss parameters were similar to just the upper rod bearing results vs Pb. Delta Pb (250-300 hr) vs sum of all the bearing weight losses without the upper rod bearings did not improve the correlation.

Corrected Pb vs the total of all bearing weight loss parameters was also reviewed.

The comment was raised that if intent of test is measure corrosion and Pb doesn't correlate to bearing weight loss maybe we have wrong parameter. Pb seems to be affected by inconsistent oil consumption in the T-12. It was suggested that a model may be needed to take into account oil consumption effect for

a possible correction factor. Jim Rutherford plotted oil consumption vs EOT Pb. Oil consumption seemed to be aligned with the EOT Pb within the band of historic data.

The question was raised if the data is corrected for oil consumption do we need to account for outlier bearings?

Looking at oil consumption LTMS data over time it was clear the test used to be around 60 g/hr and as it slipped higher over time the data remained tight, but currently was very scattered with a 50% spread. Looking at oil consumption vs Delta Pb, oil consumption >85 g/hr showed a wide spread in Delta Pb values. Lab effect was examined but there was no clear correlation.

It was raised whether the task force should consider correcting Pb for oil consumption as we have been unable thus far to fix oil consumption. That was followed with a question if the task force should look at all the parameters in the T-12 relative to oil consumption to see which ones potentially need correction. Greg Shank expressed concern that below an oil consumption of 85 g/hr, there is a clearer correction between Pb and oil consumption but above 85 the data is widely spread and how does one correct for that?

A question about how much time remained before we started a new batch of top rings was raised and TEI confirmed we still had about 1000 top rings or about 1.5 years of inventory.

Jim Rutherford agreed to look at possibly correcting both T-12 Pb parameters for oil consumption. The correction should target where oil consumption was at start of CJ-4 and the T-12. The sum of all the individual bearing weight loss parameters will be summed and compared to the Pb parameters. The upcoming T-12 references that will complete the week of February 8 will be included in Jim's analysis.

T-12 connecting rod bearing big end surface roughness –

Jim Moritz shared that at 3 labs, big end rod bearings have spun. The rods supplied by Covert appear to be polished smoother than the batches which came directly from Mack. Jim shared a picture (attached) of the latest batch of remanufactured rods which shows the surface of the big end of the connecting rod much more polished than the other remanufactured rod which seemed to have a much rougher finish. Lubrizol shared they had some failed bearings, but they were not spun bearings. Intertek is screening the rod big end and rejecting any that are too big leaving the bearing loose. It was asked if the original print of the rod could be found and checked to see if there was a specification on the surface finish of the connecting rod big end. **Greg Shank agreed to look into it and discuss it internally.**

Jim will check to see if Intertek have any photos of the older Mack supplied rods with cross hatching on the big end of the rods. It was believed that the cross hatching would help with the friction and possibly preventing the bearing from spinning.

The Mack Surveillance Panel agreed to hold their next teleconference on February 25, at 10:30AM Eastern.