

L42 Task force conference call 5-15-2006

Attendees:

C. Koglin
D. Bartlett
D. Lind
B. Koehler
D. Smith
D. Kreinbring
K. Miller

This conference call was setup to discuss questions from the test labs to Dana regarding the 2006 L42 hardware order. Subsequent notes can be found at the end of this document.

Dana is going to hold Danaven (supplier of carriers) to the print dimensions, audit current carriers, and come up with X number of good carriers to use. Depending on the number of good carriers after auditing, the group has the choice of building out those good carriers or specifying a quantity to be built. This may require danaven to make more carriers.

Dana has sent approximately 20 carriers, which Dana has already audited themselves, to Danaven for audit/comparison purposes.

The group discussed how many pilot runs would it take to feel comfortable with the changes Dana is proposing. Don Lind requested we give him a list of parameters to compare so he can come up with the correct number of tests. The group decided that 40 gearsets would be more than enough.

Ken/Don would prefer that Dana FWP audits all 1200 carriers rather than Danaven

Kenny Miller is gathering and looking at FWP documentation to determine current stress on driveside of gearset. Once FEA design work starts it will take about 3 days in order to complete.

The original total order of gearsets was 959, but with dana asking for a pilot run, the group decided a total of 1000 gearsets would be needed. This includes the pilot gears.

Note: Bruce Hall isn't scheduler at FWP anymore.

All,

I spoke with Kenny Miller and Don Kreinbring of Dana yesterday about the L42 hardware order update. The following is a summary of our discussion and traded emails.

Dana has completed the DOE to determine sensitivity of current gearsets with the wide range of dimensions on the current batch of carriers. Attached is a PowerPoint presentation with the results.

I will refer to the photo's as follows:

Upper left=1-driveside

Upper right=2-driveside

Lower left=3-coastside

Lower right=4-coastside

<< File: 044GA103X FWP 5-3-06 MN-7J.ppt >>

Slide 1: Determine if differences exist between plant test machines.

Gearset 7J, and is not one of the relapped gearsets. Pictures 1&3 are taken using the Lugoff gleason tester, Pictures 2&4 are using the FWP gleason tester. Note, different compounds are used. Lugoff has a lighter grease, while FWP has a heavier grease. Observer must concentrate on very dark shaded areas of pictures 2&4 to compare with pictures 1&3. In Kenny's opinion, the contact patterns are very close to one another (backlash .0075" vs .008").

Slide 2, 3, 4: Determine backlash sensitivity as well as vertical offset sensitivity (hi/low offset which simulates the same offset as the current carriers) The numbers next to DS and CS in the slides represent the dimension differences in the current carriers.

Slide 5, 6, 7: Gearset from 604/637 gear batch, testing same sensitivity of backlash and vertical offset. Labs agree that this gearset performed well. Sensitivity to carrier tolerance limits don't seem to move pattern around as much as current ring/pinion lot

Conclusions from DOE

- FWP had a small gauging error in gleason tester which would contribute to ~23% fallout of pinion/rings. Coast side pattern would be toward L1
- The Danaven supplied carriers were skewed toward the print high limit, this skew tends to move coast side pattern towards L3 position (not true of the low limit carriers).
- The carrier high/low conditions in combination with "positioning sensitive" driveside development is creating drive patterns too far toward toe
- Gearset 604/637 #196 from statesville seems to have modified gear geometry. Current drawings do not reflect this. Possibility that out of tolerance carriers were known at this time, modifications made to gear geometry, but not documented.

The ASTM labs do not want split lots of Ring/Pinion or split batches.

ASTM Surveillance Panel would like to receive hardware not later than 6months from May 1, 2006

Recommendations/Next steps:

- Have Danaven sort carriers to print limits, hold danaven to specifications & build new units that are **NOT** out of spec.

- Kenny Miller to redesign drive-side microgeometry with FEA software (similar to L37) with the goal of: Maintain or reduce drive side current design stress (possibly reduce drive side scoring) and enhancing manufacturability (reduce drive-side sensitivity to carrier error) **Leave Coast side AS IS**
- Dana to order enough raw material/blanks for both pilot batch and current order
- FWP to produce pilot batch of new pinions/rings with new geometry/Lugoff to assemble gearsets with audited carriers
- ASTM labs to run X tests on pilot batch to assure expectations are met
- FWP to produce new batch of pinions/rings with new geometry/Lugoff to assemble gearsets with audited carriers
- FWP establish new process documentation and soft & hard masters, Zeiss files, and machine settings
- Dana to work on establishing criteria/specs for precision carriers in future

Questions

- Timing of pilot batch/expected delivery?
- Revised timing of batch delivery

Dana is asking the Surveillance panel if it is OK to redesign drive-side microgeometry with the goal of possibly reducing drive side scoring while increasing manufacturability. This will also help to eliminate recurrence in the future.

Dana off-highway has this as a high priority and would like to see the customers get the correct hardware. The recommendation of redesigning geometry and making new rings/pinions reflects this.

Please reply to me ASAP or if more information is needed, please request a conference call.

Cory



Note: Left side pictures are from Lugoff tester,
Right side pictures are from FWP tester.
This is the direct comparison.



Set 7J DS 0,0 B/L = .0075

Set 7J DS 0,0 B/L = .008

044GA103X, 4.09 LH, ASTM L-42 non-lubrited FWP audit

5/03/2006

1) FWP audit to compare Gleason test patterns with Lugoff tester patterns 2) FWP audit taken at (2) backlash values & at carrier spec. high & low limits for offset (FWP lap & test B/L of .005" and Lugoff test & build B/L of .008") 3) Same audit of Statesville produced set

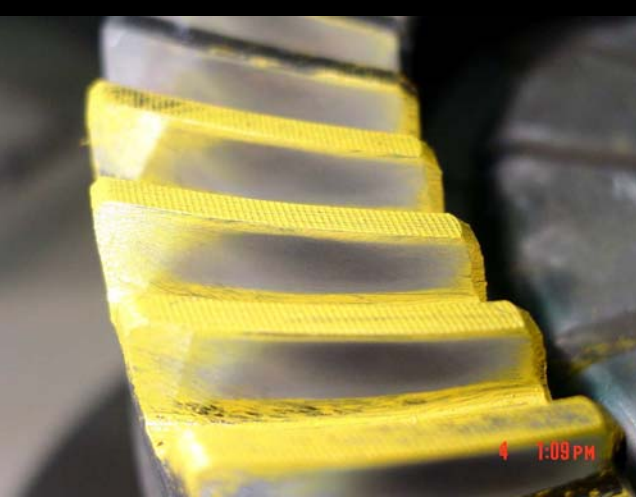
Set 7J CS 0,0 B/L = .0075

Set 7J CS 0,0 B/L = .008



Set 7J is from current FWP lot





Note: FWP process B/L = .005
Lugoff test B/L = .008



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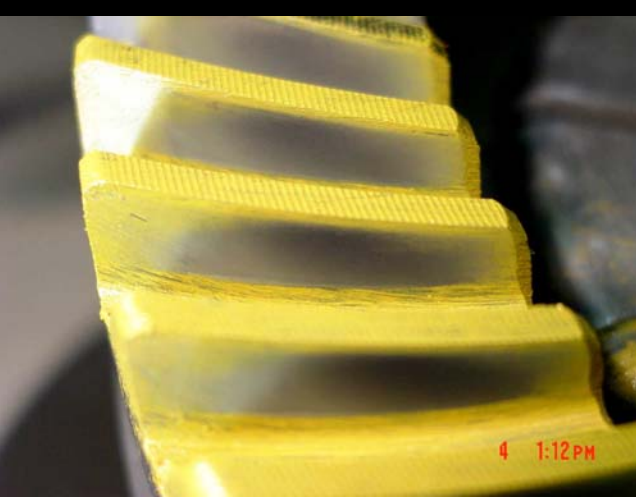
Set 7J CS 0,0 B/L = .005

Set 7J CS 0,0 B/L = .008



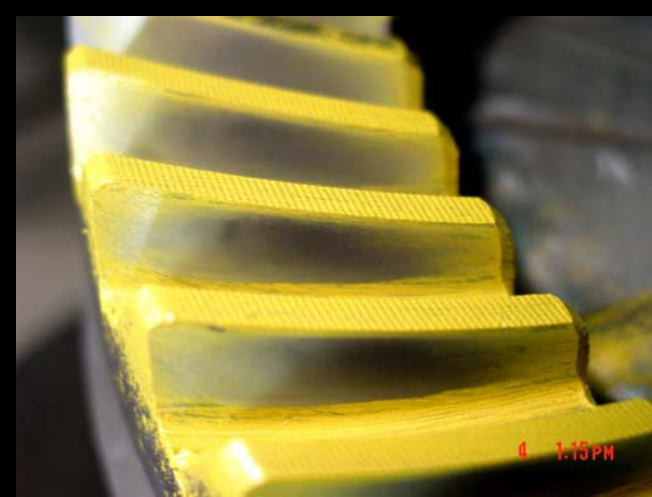
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Note: FWP process B/L = .005
Lugoff test B/L = .008

Pictures on this page represent
Carrier HI-LO spec low limit of
1.499



Set 7J DS -.001, 0 B/L = .005

Set 7J DS -.001, 0 B/L = .008

044GA103X, 4.09 LH, ASTM L-42 non-lubrited FWP audit

5/03/2006

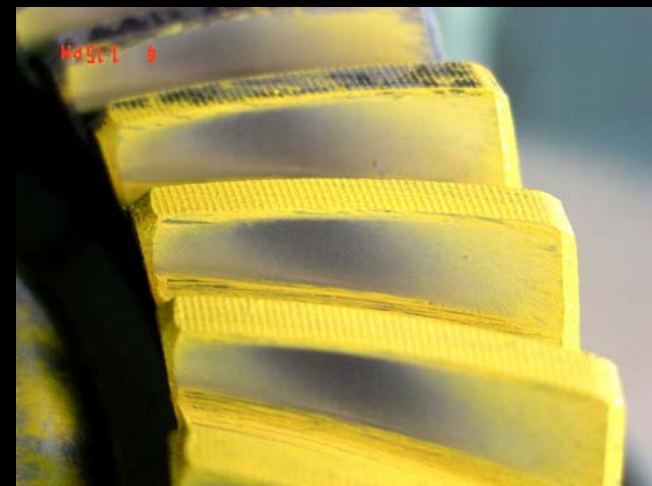
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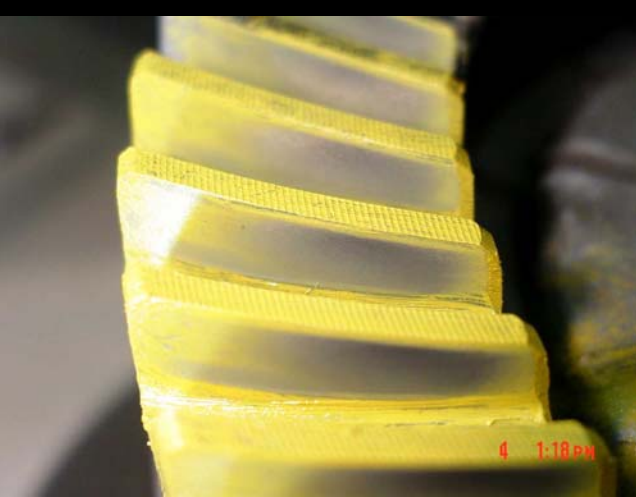
Set 7J CS -.001, 0 B/L = .005

Set 7J CS -.001, 0 B/L = .008



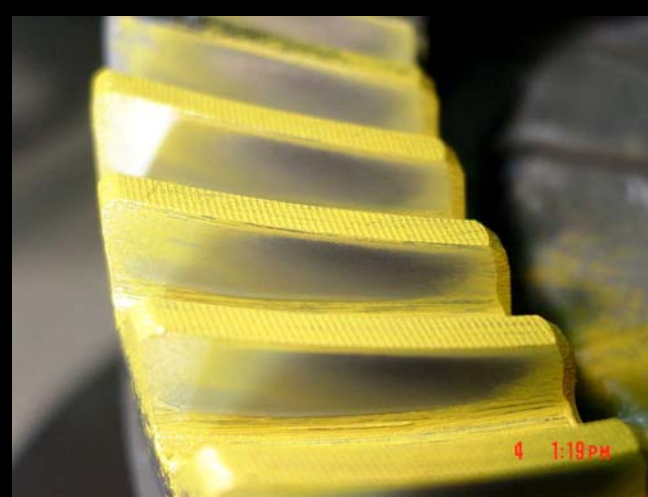
Set 7J is from current FWP lot





Note: FWP process B/L = .005
Lugoff test B/L = .008

Pictures on this page represent
Carrier HI-LO spec high limit of
1.502



Set 7J DS +.002, 0 B/L = .005

Set 7J DS +.002, 0 B/L = .008

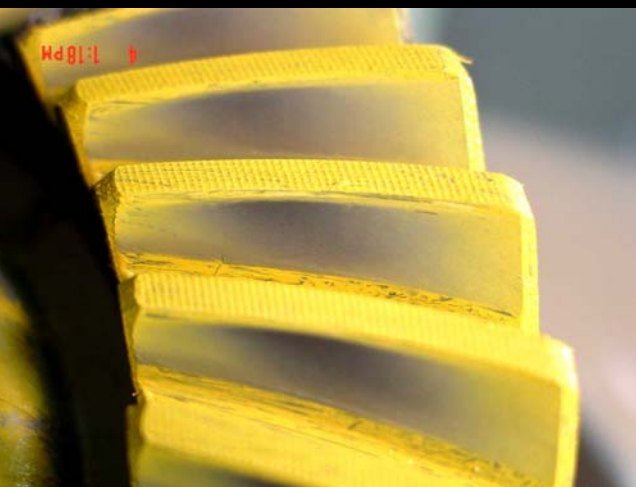
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Note: FWP process B/L = .005
Lugoff test B/L = .008



Set 196 DS 0,0 B/L = .005

Set 196 DS 0,0 B/L = .008

044GA103X, 4.09 LH, ASTM L-42 non-lubrited FWP audit

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Set 196 CS 0,0 B/L = .005

Set 196 CS 0,0 B/L = .008



Set 196 is from Statesville
production, Fall 2000





Note: FWP process B/L = .005
Lugoff test B/L = .008

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Carrier HI-LO spec low limit of
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Set 196 DS -.001, 0 B/L = .005

Set 196 DS -.001, 0 B/L = .008

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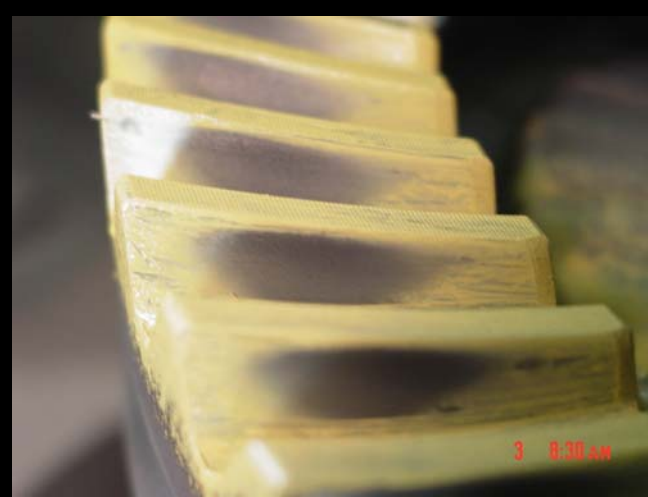
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