Sequence X Severity Task Force

Meeting Minutes

August 13, 2020

Alfonso Lopez

Attendance

- Ron Romano
- Rich Grundza
- Christian Porter
- Christine Eickstead
- Amol Savant
- Joe Gleason
- George Szappanos
- Jason Soto
- Alfonso Lopez

Minutes / Action Items

- Rich presented severity comparison plots - attached
  - From August of 2019 to present the cusum severity plot indicates a mild shift. All oils affected.
- Jason presented a critical hardware review – attached.
  - Action Item 1 – Labs to conduct an internal survey of what vintage hardware they are using and report at next meeting.
- Ron presented the different pistons and ring combinations we have seen in the Sequence IX and X. Attached below

Minutes / Action Items

- Hardware Discussion
  - Crank gears are out of production. Ron to review new part and availability. Action Item 2.
  - LZ out of cam gears. Other critical components may be in short supply. Action Item 3 – plan a group purchase of critical parts. Other non-critical hardware is being purchased through dealers. Long term availability is unknown.
  - Intertek has consumed all 2016 engines. The lab has switched to 2018 engines and retrofitting parts that are different – see attachment for details.
  - A spreadsheet of industry purchases in 2014 and 2017 was shown. This will be sent to all labs to help identify current hardware inventories. Action Item 4.

Minutes / Action Items

- Driveline alignment
  - Alignments done every cal period or when a shift in mounting is observed. Some labs have experienced problems in keeping stands in alignment in between tests.
  - Allowances have been made on driveline length provided the stiffness is maintained the same.
- Amol stated that their lab is ready to reference a stand and asked about the required TMC visit. The visit will be virtual.
- Rich checked fuel batch vs severity and did not see a trend.
- Intertek has completed a reference that is 4 sigma mild on oil 271. Jason is investigating validity.

X LAB Stand Differences

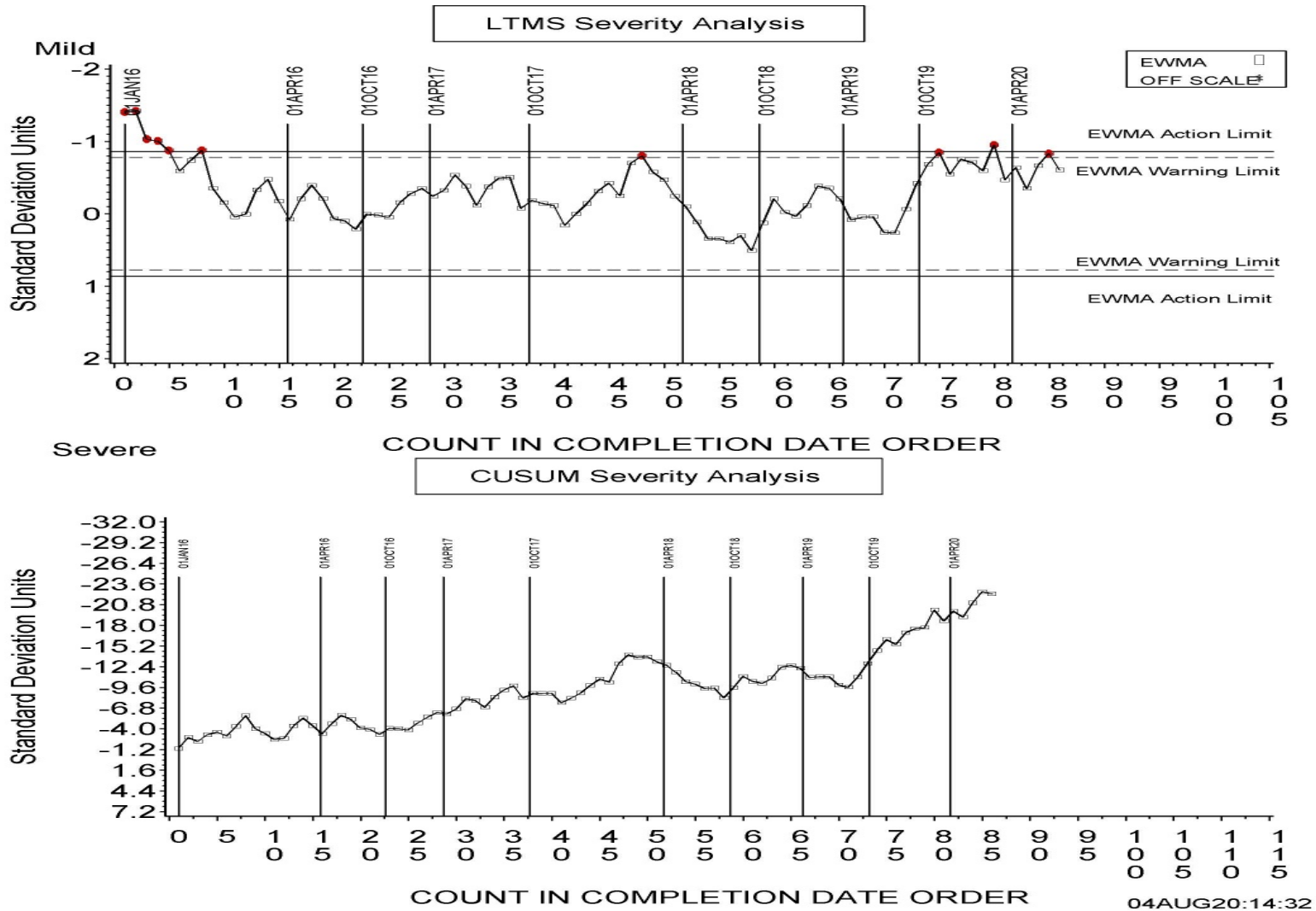
All Reference data reported through 7/31/20

Summary of Review

- All data (matrix and subsequent reference data) Modeled using Standardized (Yi) results and lab/stand (LTMSLAB(LTMSAPP))
- Differences noted by Lab (A significantly different from G)
- No differences between stands in a lab noted
- Trend appears to have begun about August last year. All oils affected approximately the same amount. Labs A, D and G also showing results mild of target Since August 2019.

SEQUENCE X INDUSTRY OPERATIONALLY VALID DATA

END OF TEST CHAIN WEAR FINAL RESULT

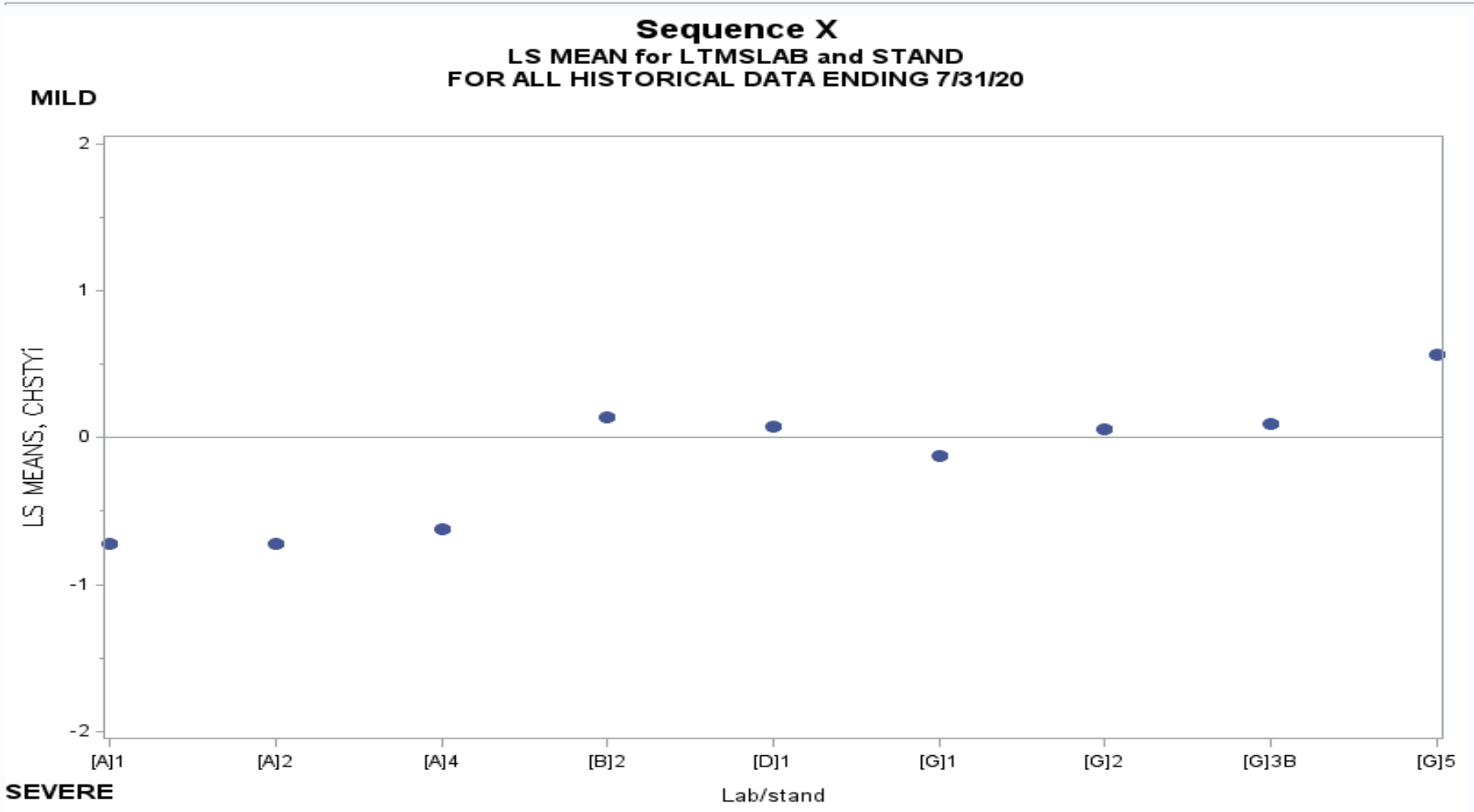


Estimates for lab and Stand Models

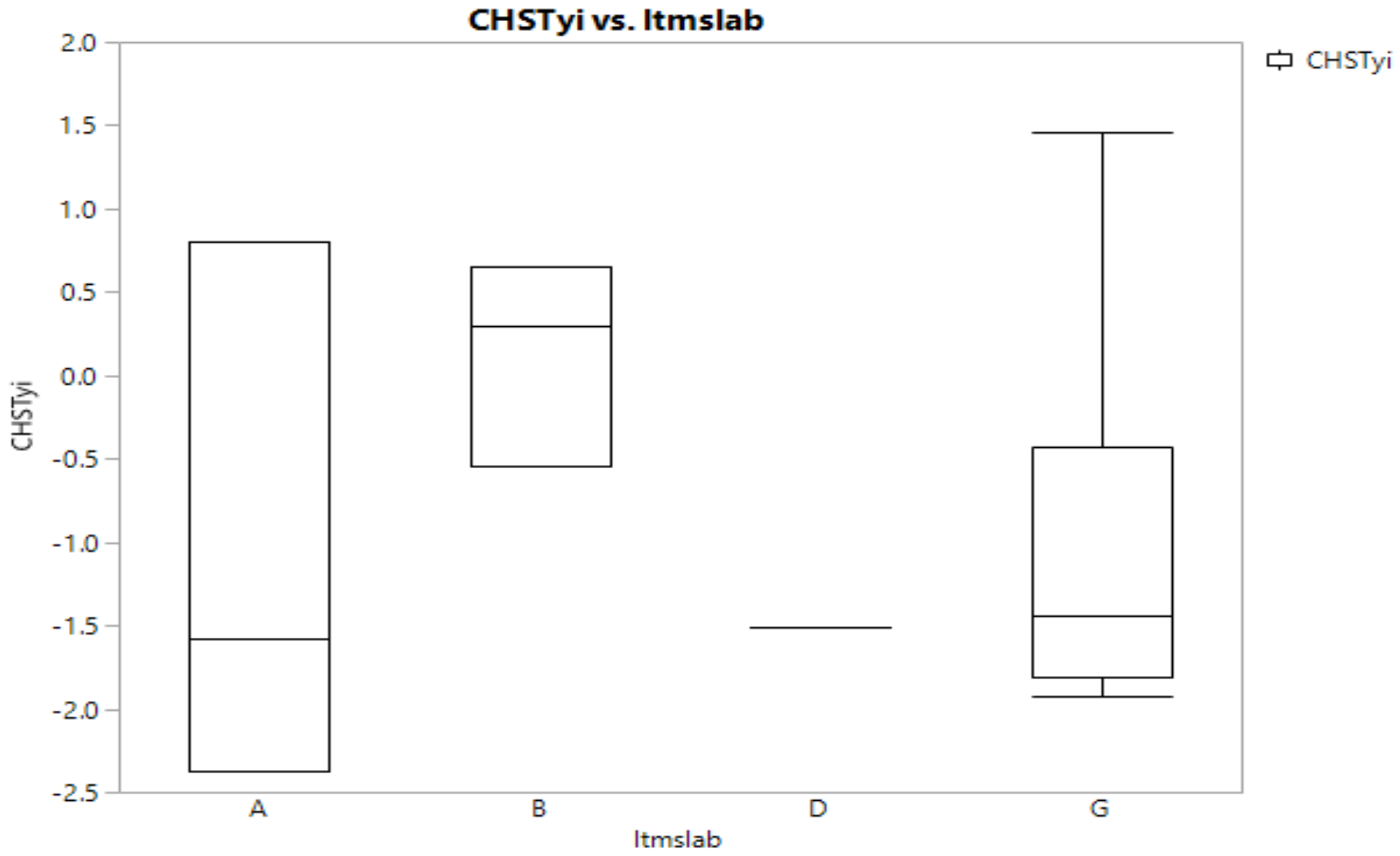
Source	DF	Type I SS	Mean Square	F Value	Pr > F
ltmslab	3	11.32378912	3.77459637	3.83	0.0134
ltmslab*LTMSAPP	5	1.69248346	0.33849669	0.34	0.8847

Source	DF	Type III SS	Mean Square	F Value	Pr > F
ltmslab	3	11.68877234	3.89625745	3.95	0.0115
ltmslab*LTMSAPP	5	1.69248346	0.33849669	0.34	0.8847

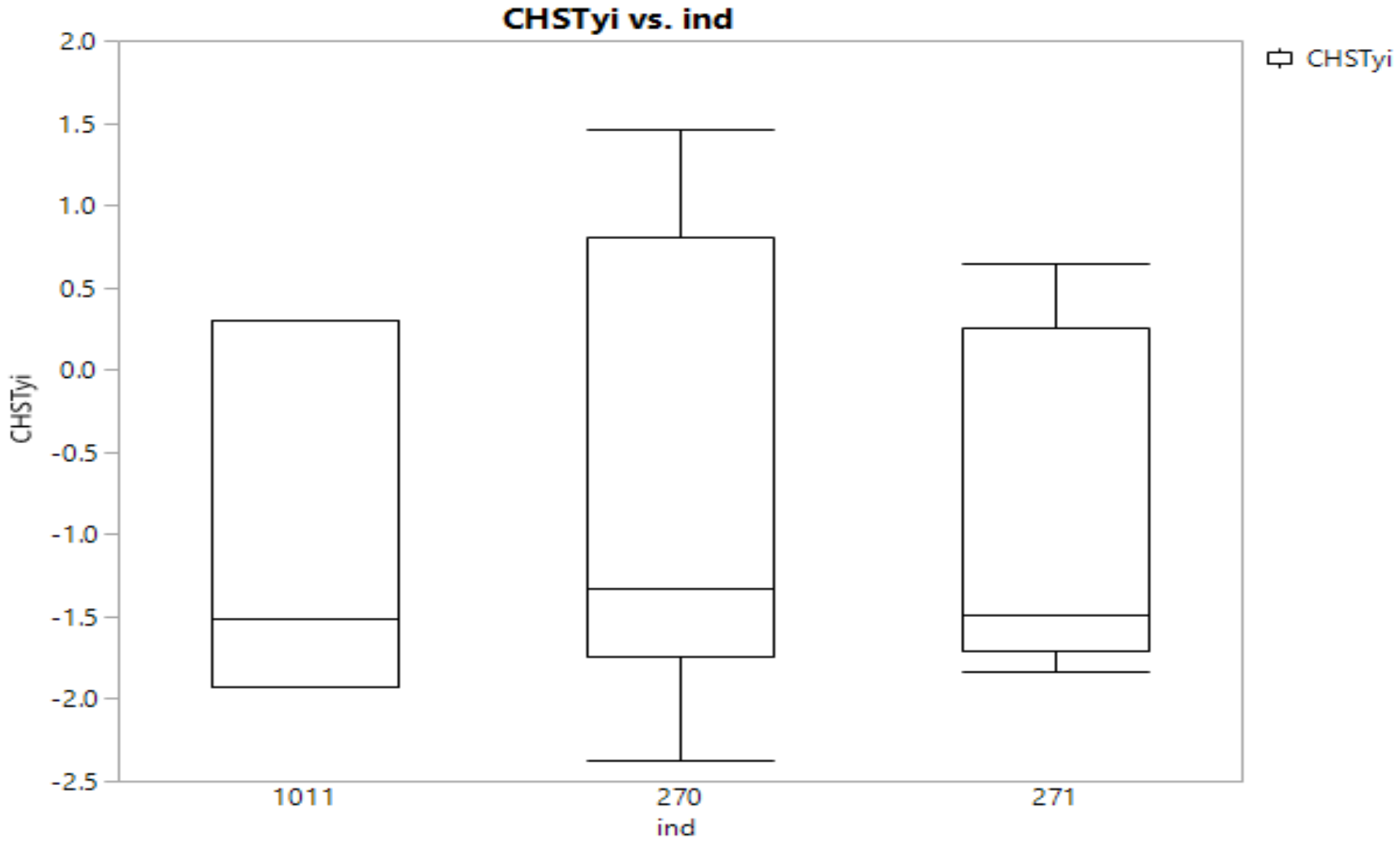
CHSTYi by Apparatus (lab/stand), including Matrix



CHSTYi by LAB, Since August 2019



Results by Oil Since August 2019



Ford 2.0L Ecoboost 2016 vs 2018 Engines

By: Jason Soto

05/21/2018

Pistons

- 2016 engines came with a mix of BC and BB pistons.
- BC pistons are used for CW and BB pistons for FLSPI.
- 2018 engines came with CA and AA pistons.
- BC, CA, and AA pistons all use the same piston rings.
- BB pistons use different rings. A limited lifetime purchase was made.

Pistons cont.

- BB and BC pistons have a cast top. AC and AA pistons have a machined top.

- BB and BC pistons have four smoke holes. AC and AA pistons have six smoke holes.

Crankshaft Balancer

- 2018 on the left and 2016 on the right.
- We will continue to use the 2016 style balancer. 2018 balancers will not be used.
- 2016 style balancers can be reused or purchased from the dealership.

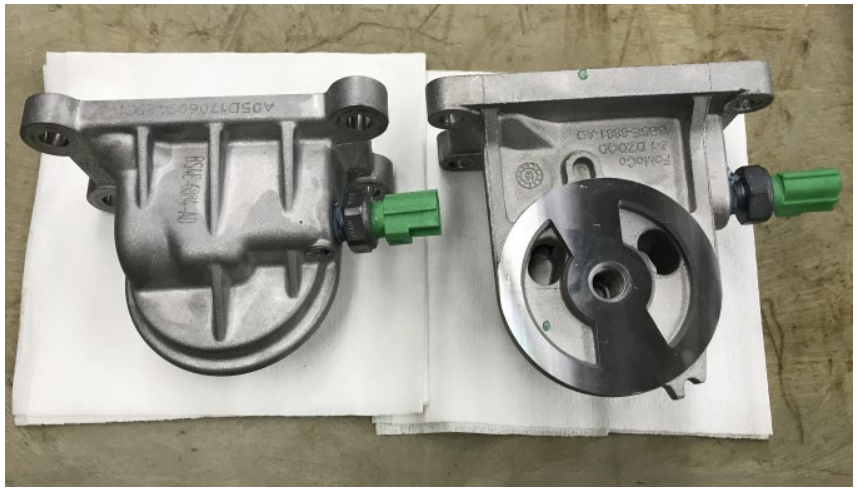
Timing Chain Tensioner

- 2018 tensioner on the left and 2016 on the right.
- The timing chain tensioner is a critical batched component for the chain wear test. Only the 2016 style batched tensioners should be used for CW. Save the 2018 style tensioners for potential use in FLSPI.

Crankshaft Timing Gear

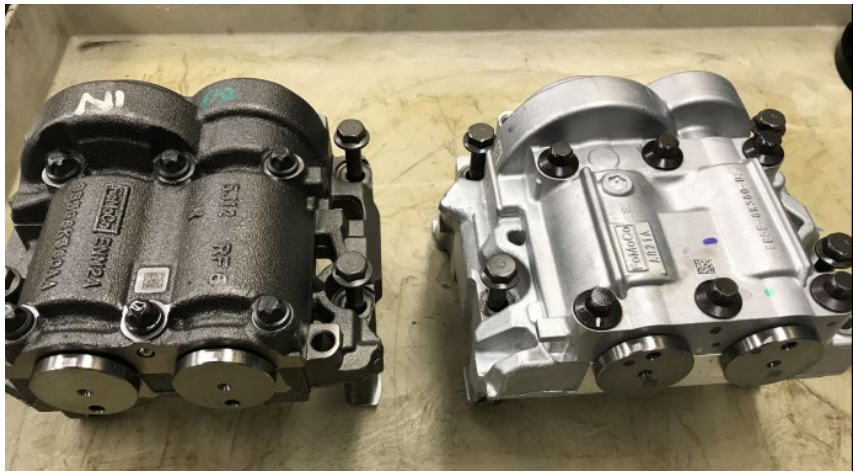
- 2018 timing gear on the left and 2016 on the right.
- The 2018 gear does not us a diamond washer.
- The crankshaft timing gear is a critical batched component for the chain wear test. Only the 2016 style gear should be used. Save the 2018 style timing gears for potential use in FLSPI.

Oil Filter Housing



- 2018 oil filter housing on the left and 2016 on the right.
- The 2018 oil filter housing does not accept an oil cooler.
- Only the 2016 style oil filter housing should be used for CW and FLSPI.

Balanced Shaft Assembly



- 2016 balanced shaft assembly on the left and the 2018 on the right.
- The shaft assembly is not used in the CW test.
- Only the 2016 style assembly should be used for FLSPI.

Conclusion

- Ron is looking into having additional AC2 pistons made. Continue to use BC pistons for CW and BB pistons for FLSPI in the meantime.
- Only the 2016 style crankshaft balancer should be used for CW and FLSPI testing.
- Only the batched timing chain components should be used for CW.
- Only use the 2016 style oil filter housing that accepts an oil cooler for CW and FLSPI testing.
- Only use the 2016 style balanced shaft assembly for FLSPI.

Sequence IX, X Pistons

Sequence IX Pistons

BB Pistons

AG9Z-6148-A AG9E-6148-AA "Dot" Rings

SPN AG9Z- 6108-N EPN AG9E 6110 HB

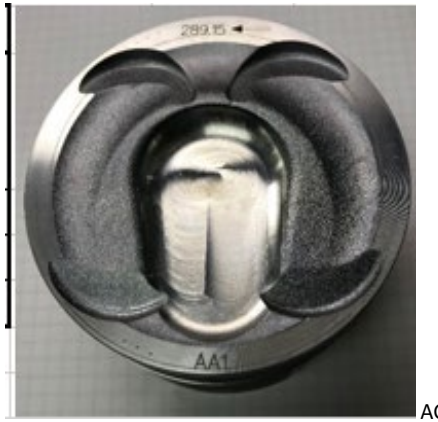
AB1

AG9Z-6148-A AG9E-6148-AA "Dot" Rings

SPN AG9Z- 6108-D EPN AG9E 6110 AB1

Seq IX (Cont)

AA1



AG9Z-6148-A AG9E-6148-AA "Dot" Rings

SPN AG9Z- 6108-D EPN AG9E 6110 AA1

AC2

AG9Z-6148-A AG9E-6148-AA "Dot" Rings

SPN AG9Z- 6108-H EPN AG9E 6110 AC2

Sequence IX, X Pistons

Seq IX (Cont)

2018 China pistons

AG9Z-6148-A AG9E-6148-AA "Dot" Rings

No stamp/etch on crown

Seq X

AC2

AG9Z-6148-A AG9E-6148-AA "Dot" Rings

SPN AG9Z- 6108-H EPN AG9E 6110 AC2

BC

EJ7Z6148A EJ7E6148AA "N" Rings

SPN AG9Z- 6108-P EPN AG9E 6110 HC

CA/AA

EJ7Z6148A EJ7E6148AA "N" Rings

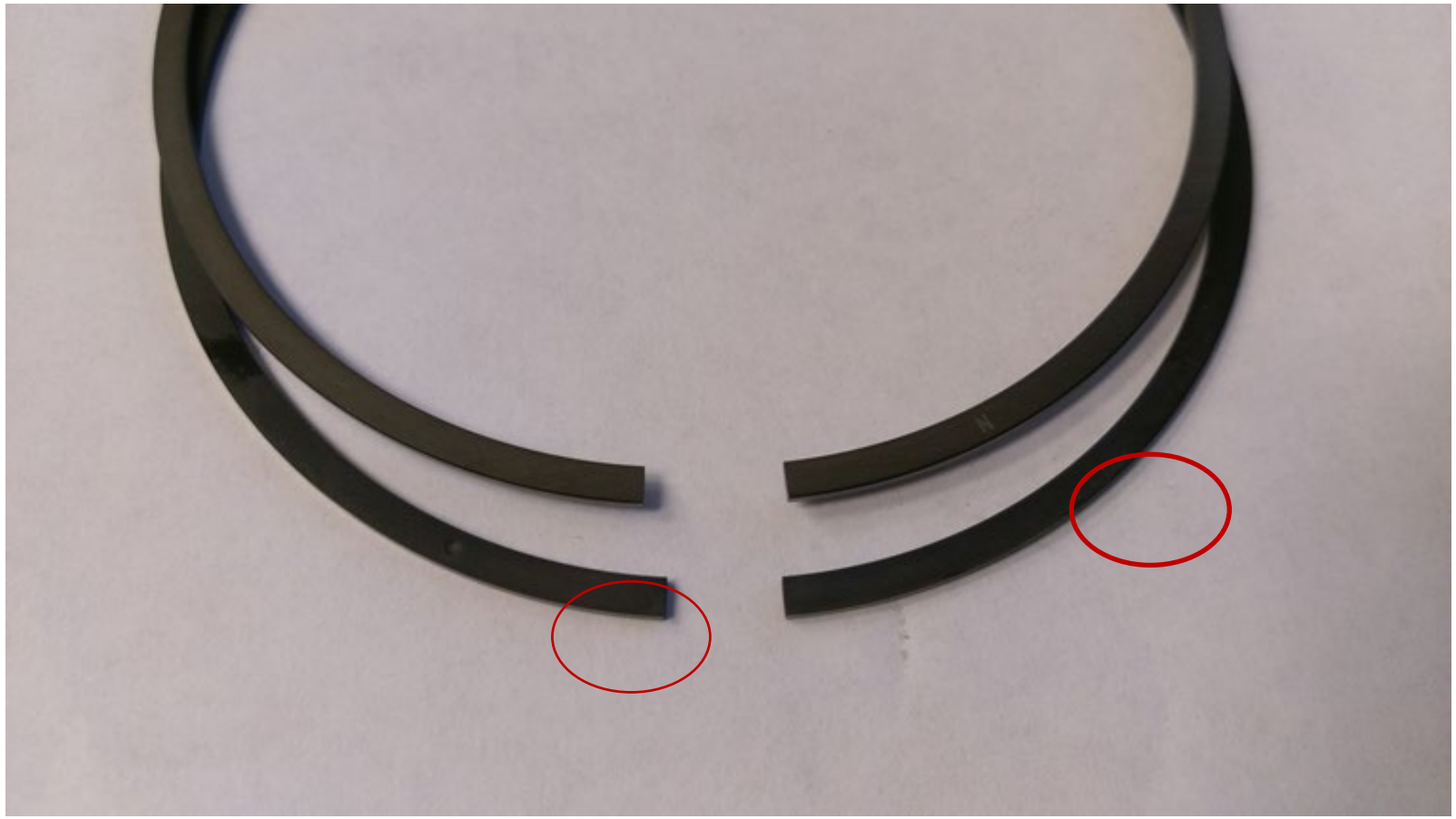
CA or AA etched on crown

SPN GM5Z-6108-A EPN GM5E-6110-CA SPNAG9Z-6108-Q EPN GM5E-6110-AA

Rings

AG9Z-6148-A AG9E-6148-AA "Dot" Rings

Sequence IX, X Pistons



AG9Z-6148-A AG9E-6148-AA "Dot" Rings
EJ7Z6148A EJ7E6148AA "N" Rings