

L-42 Surveillance Panel Meeting Minutes

Intertek PSI, Plymouth, MI and Virtual Meeting – Microsoft Teams

May 8, 2024

Attendees: voting members in **bold**, * indicates virtual attendance

N. Ariemma (Lubrizol)	A. Comfort (US Army)	C. Mueller (SwRI)
R. Banas (Exxon Mobil)	E. Fry (Daimler Truck)	T. Muransky (AAM)
D. Beck (TMC)	J. Gingerich (Lubrizol)	W. Venhoff (Lubrizol)
D. Bell (Afton)	A. Goyal (BASF)	M. Sangpeal (Afton/C)
T. Bender (Fuchs)	H. Catania (Cummins-Meritor)	E. Sattler (US Army)
M. Burgman (Fuchs)	A. Jackson (Chevron Oronite)	N. Schaup (LZ)
B. Campbell (Afton)	A. Lange (Intertek)*	A. Stone (Afton)*
M. Caridi (BASF)	M. M-Pouv (Tribodens)*	R. Warden (Chevron Oronite)
J. Carowick (Cummins-Meritor)	D. Moser (BASF)	A. Zyski (Dana)

Call to Order

Review of Agenda

The meeting agenda is attached.

Review of Membership

No changes required.

Approval of Meeting Minutes

Meeting minutes for approval:

▲ “20240207_SP” → February 7, 2024 – Surveillance Panel Meeting – San Antonio, TX

A motion was made to approve the meeting minutes as presented.

Motion: M. Sangpeal

Second: J. Carowick

All in favor, no objections, no abstentions.

2023 Hardware Update

One lab discovered an axle from the 2023 batch did not have any backlash, although it was marked as 0.005” on the housing. Axle is not usable as it, it will need to be rebuilt. Dana was contacted, no action was taken. No other labs have had this issue to date.

Next Hardware Batch Order

Dana has requested preliminary quantities for the next hardware order. All four labs plan to order hardware, and all have submitted preliminary quantities to Dana.

Pictures of the axle in the test stand were sent to Dana (per their request). There may be opportunity to simplify some of the features to reduce cost and lead-time.

TMC 119 Reference Oil

TMC 119 is nearly depleted. One drum of re-blended reference oil, TMC 119-1, has been received by TMC. 119-1 has passed all of TMC's internal checks and is ready for validation in test stands. TMC will release 119-1 to test labs.

A motion was made to define the approval process for 119-1:

- A. Each lab will run one test with 119 and one test with 119-1 back-to-back on a referenced stand
- B. Labs have two choices on how the tests will be recorded:
 - 1. Two tests will be added to the 20-test reference period
 - 2. One test with 119 will be used as the low reference run in a four-test calibration sequence and one test will be added to the 20-test reference period (for the 119-1 test run)
- C. Due date to submit data: August SP meeting (August 7, 2024)

Motion: M. Sangpeal

Second: N. Schaup

All in favor, no objections, no abstentions.

L-42-1 Development

One additional TMC 117 reference test was run on the AC Regen rig to complete a four-test calibration sequence.

Results are as follows:

Stand Reference Oil Test History in Chronological Order												
	Test Date Started	Test Date Completed	Stand Run No.	CMIR No.	TMC Oil No.	Drive Side Scoring (%)		Coast Side Scoring (%)			Coast Side Torque (lbf-ft)	
						EOT Pinion	EOT Ring	EOT Pinion	EOT Ring	Shock Series 1 Ring	Shock Series 1 (Average)	Shock Series 2 (Average)
Discrimination	20240105	20240105	257	184767	119	0	0	85	55	0	-74.3	-334.0
Calibration Sequence Passing Tests Only	20240104	20240104	256	176820	117	0	0	36	24	0	-74.5	-333.5
	20240130	20240130	260	184759	117	0	0	22	14	0	-73.5	-332.4
	20240322	20240322	262	184761	117	0	0	34	25	0	-74.2	-333.5
Passing Reference Oil Test Average								31	21	0	-74.1	-333.1

EOT scoring is more severe when compared to the Fired-Engine rig at the same lab with similar peak torque levels.

Operational data from both the Eddy Current and AC Regen rigs was presented. Eddy Current rig severity was on the mild end of target, and AC Regen rig severity was on the severe end.

Some members of the committee expressed doubt that these two types of rigs could ever be used interchangeably for L-42-1 testing because of their inherent physical differences.

A single-test study on the AC Regen rig was also presented where only one repetition of Shock II was completed (the other parts of the test procedure were unchanged). EOT scoring is comparable to the normal procedure with 10 reps of Shock II.

Action Items for Next Meeting:

1. Overlay torque traces from Fired-Engine, Eddy Current, and AC Regen rigs
2. Present detailed specs on AC Regen rig motors / drives and Eddy Current rig motor / drive / dynos
3. Lower peak torque setpoint ~50 lbf-ft and run TMC 117 reference on AC Regen rig

New/Open Issues

One lab recently went through a safety audit of their L-42 test stand. The auditor pointed out that the engine is not shut down / locked out during mid-test ring gear inspections. The test procedure states that the engine is to be idling and the transmission is to be in Neutral. One suggestion was to install a clutch pedal lock or a shifter lock. More investigation is needed on other possible solutions.

Adjournment

A motion was made to adjourn.

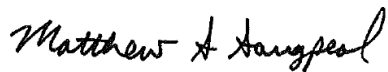
Motion: N. Schaup

Second: D. Beck

All in favor, no objections, no abstentions.

Meeting adjourned.

Respectfully submitted,



Matt Sangpeal

L-42 Surveillance Panel Chairman



L-42 Surveillance Panel Meeting

ASTM D7452

Intertek PSI

Plymouth, MI

May 8, 2024













2:00 – 3:00 PM EST

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Agenda

- ▲ **Call to Order**
- ▲ **Agenda**
- ▲ **Membership Review & Update**
- ▲ **Approval of Meeting Minutes**
 - ▲ “20240207 SP” – SwRI, San Antonio, TX
- ▲ **2023 Hardware Update**
- ▲ **Next Hardware Batch Order**
- ▲ **TMC 119 Reference Oil**
- ▲ **L-42-1 Development Updates**
- ▲ **New Issues**
- ▲ **Adjournment**

L-42 SP Voting Members

 Rob Banas:	Exxon Mobil
 Dylan Beck:	TMC
 Allen Comfort:	US Army
 Arjun Goyal:	BASF
 Troy Muransky:	AAM
 Jessica Carowick:	Cummins-Meritor
 Matt Sangpeal:	Afton Chemical (Chair)
 Nick Schaup:	Lubrizol
 Anthony Lange:	Intertek
 Caroline Mueller:	SwRI
 Amy Zyski:	Dana
 Rebecca Warden:	Chevron-Oronite

Approval of Meeting Minutes

SP Meeting Minutes

- ▲ “20240207 SP” → February 7, 2024 – Surveillance Panel Meeting - SwRI, San Antonio, TX and Virtual Meeting via Microsoft Teams

2023 Hardware Update

One test axle was found to have zero backlash

- ▶ Housing was marked 0.005"
- ▶ Unusable for testing unless rebuilt

Any other quality/performance issues?

- ▶ None so far for Afton
- ▶ Other labs?

Next Hardware Batch Order

Dana is requesting estimated order quantities for next order

- ▲ Moved up from agreed upon timeline of November 2024
- ▲ SwRI: 300
- ▲ IAR:
- ▲ Afton: 150 (tentative)
- ▲ Lubrizol: 100

Last two orders were severely under-filled due to loss

- ▲ Need to determine if batch will be on-target

Dana requested pictures of the axle in the test stand

- ▲ Afton sent pictures
- ▲ May be able to reduce cost / complexity

TMC 119 Reference Oil

▲ First batch of TMC 119 received in 2018

- ▲ One drum in total

▲ Currently, >8 gallons remain in inventory

▲ Re-blend (TMC 119-1) from supplier has been received by TMC

- ▲ 1 drum available

▲ TMC will run quality checks once oil is received

- ▲ Update from TMC

▲ Surveillance Panel needs to decide on approval process

- ▲ Each lab run back-to-back 119 and 119-1 with current stand set-up?
 - Give data to Stats group for recommendation on approval



L-42-1 Development Update

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Regenerative AC T-Rig

- ▲ Rigid Axle Mounts (no spring plates)
- ▲ HBM T40B torque transducers
- ▲ 225 kW Input Motor
- ▲ 180 kW Output Motors



Test Details

Run #	Description	CMIR	TMC Oil Code	Note	Axle Batch	Profile	Pinion Scoring [%]	Ring Scoring [%]	Shock I Avg Tq [lbf-ft]	Shock II Avg Tq [lbf-ft]
254	Reference	176818	117	Pass Oil	MSPLO/P2AD01 (2023)	Engine Rig Data Setpoints	16	8	-72.4	-277.0
255	Reference	176822	119	Disc. Oil	MSPLO/P2AD01 (2023)	Engine Rig Data Setpoints	41	29	-74.7	-280.7
256	Reference	176820	117	Pass Oil	MSPLO/P2AD01 (2023)	Ramp Rate / Torque Setpoints	36	24	-74.5	-333.5
257	Reference	184767	119	Disc. Oil	MSPLO/P2AD01 (2023)	Ramp Rate / Torque Setpoints	85	55	-74.3	-334.0
258	80W-90	-	-	J2360	MSPLO/P2AD01 (2023)	Ramp Rate / Torque Setpoints	14	7	-74.8	-333.3
259	75W-80	-	-	J2360	MSPLO/P2AD01 (2023)	Ramp Rate / Torque Setpoints	15	9	-74.1	-333.5
260	Reference	184759	117	Pass Oil	MSPLO/P2AD01 (2023)	Ramp Rate / Torque Setpoints	22	14	-73.5	-332.4
261	80W-90	-	-	Poor Perf.	MSPLO/P2AD01 (2023)	Ramp Rate / Torque Setpoints	67	61	-74.1	-333.8
262	Reference	184761	117	Pass Oil	MSPLO/P2AD01 (2023)	Ramp Rate / Torque Setpoints	34	25	-74.2	-333.5

 One additional Hi-Ref run since last meeting (262)

Test Result Summary: AC Regen vs Fired Engine

AC Regen Rig

Stand Reference Oil Test History in Chronological Order												
	Test Date Started	Test Date Completed	Stand Run No.	CMIR No.	TMC Oil No.	Drive Side Scoring (%)		Coast Side Scoring (%)			Coast Side Torque (lbf-ft)	
						EOT Pinion	EOT Ring	EOT Pinion	EOT Ring	Shock Series 1 Ring	Shock Series 1 (Average)	Shock Series 2 (Average)
Discrimination	20240105	20240105	257	184767	119	0	0	85	55	0	-74.3	-334.0
Calibration Sequence Passing Tests Only	20240104	20240104	256	176820	117	0	0	36	24	0	-74.5	-333.5
	20240130	20240130	260	184759	117	0	0	22	14	0	-73.5	-332.4
	20240322	20240322	262	184761	117	0	0	34	25	0	-74.2	-333.5
Passing Reference Oil Test Average								31	21	0	-74.1	-333.1

2023 Hardware (MSPLO / P2AD01)

Current Fired-Engine T-Rig

Stand Reference Oil Test History In Chronological Order												
	Test Date Started	Test Date Completed	Stand Run No.	CMIR No.	TMC Oil No.	Drive Side Scoring (%)		Coast Side Scoring (%)			Coast Side Torque (lbf-ft)	
						EOT Pinion	EOT Ring	EOT Pinion	EOT Ring	Shock Series 1 Ring	Shock Series 1 (Average)	Shock Series 2 (Average)
Discrimination ^A	20231019	20231019	2701	176821	119	0	0	50	35	0	-67.0	-328.2
Calibration Sequence Passing Tests Only ^B	20231019	20231019	2699	176817	117	0	0	18	13	0	-70.4	-329.2
	20231019	20231019	2700	176819	117	0	0	19	16	0	-79.3	-338.7
	20240129	20240129	2721	184760	117	0	0	24	14	0	-69.3	-331.0
Passing Reference Oil Test Average								20	14	0	-73.0	-333.0

2021 Hardware (C1L637 / P8AD132)

*Correction Factors Applied



Operational Data Comparison by Lab

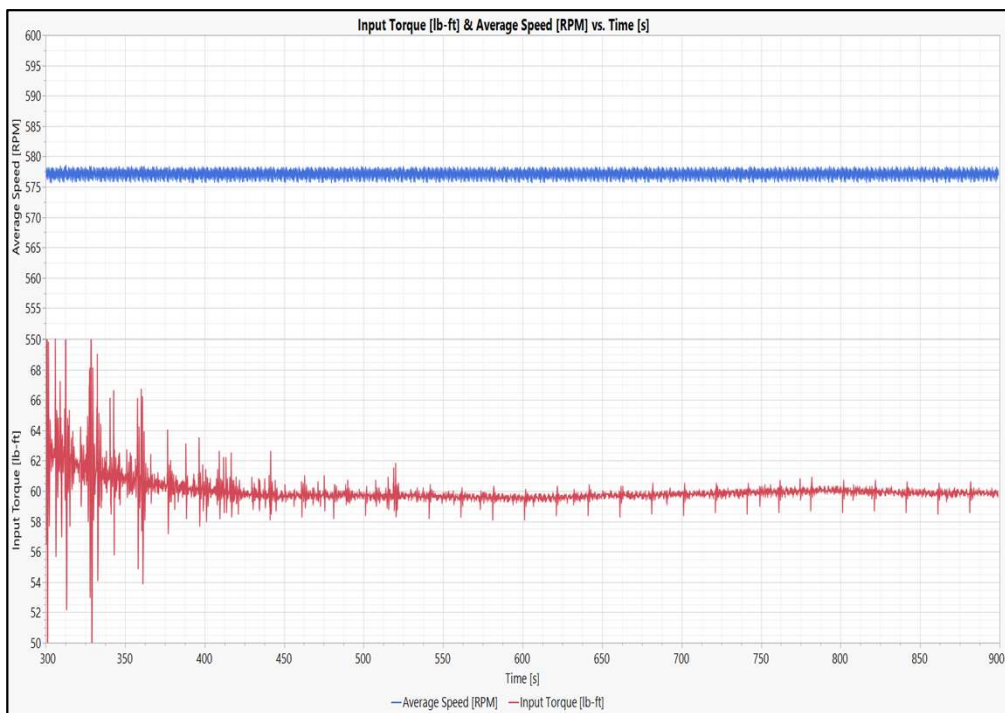
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Comparison

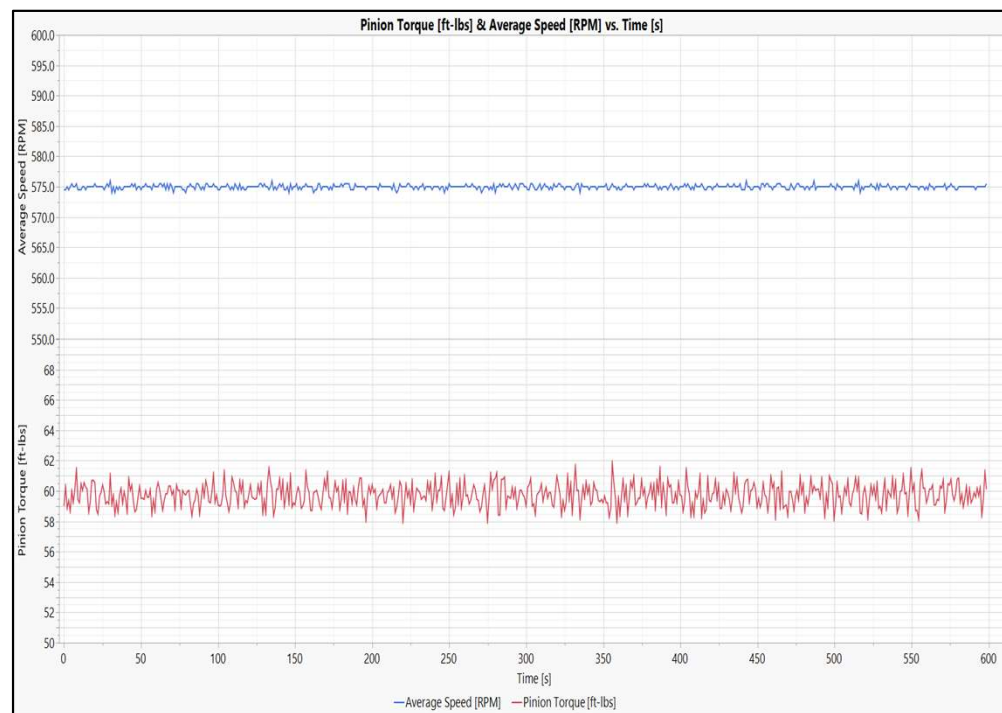
- ▲ TMC 117 (High Ref Oil)
- ▲ 2023 Hardware (MSPLO / P2AD01)
- ▲ Eddy Current Rig with active spring plates
- ▲ AC Regen Rig with rigid mounts

Conditioning 1

Eddy Current Rig

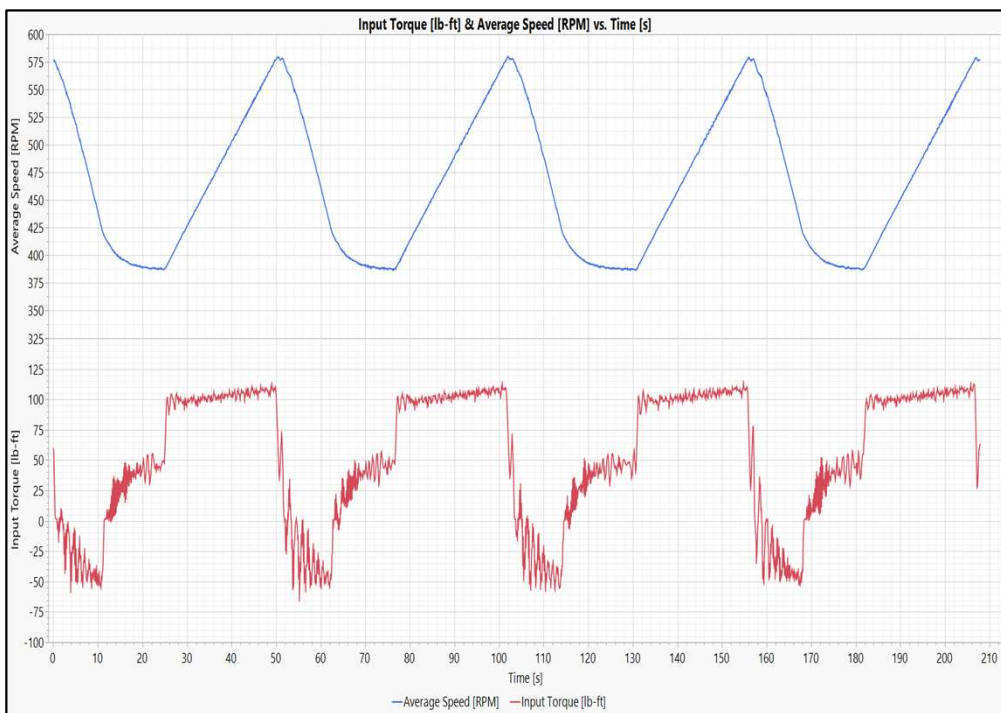


AC Regen Rig

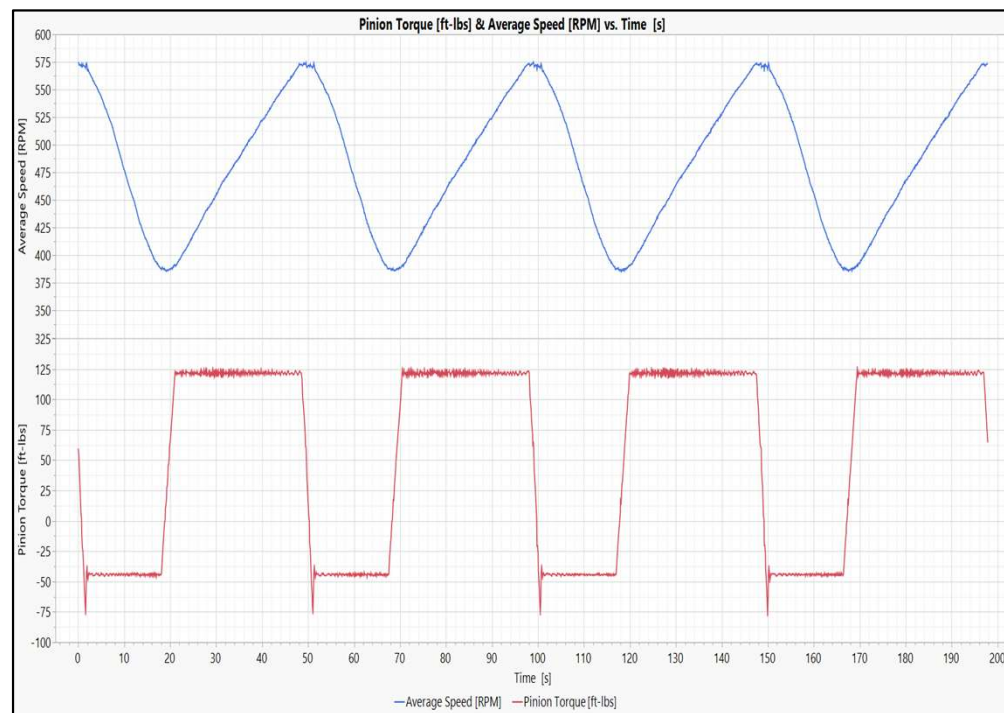


Conditioning 2

Eddy Current Rig

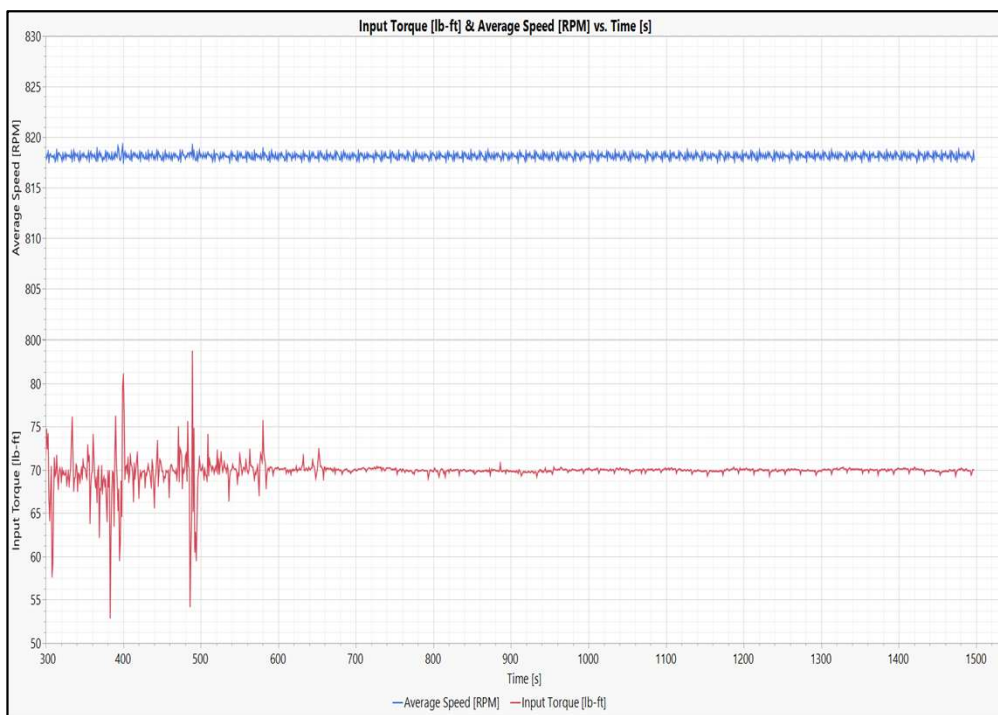


AC Regen Rig

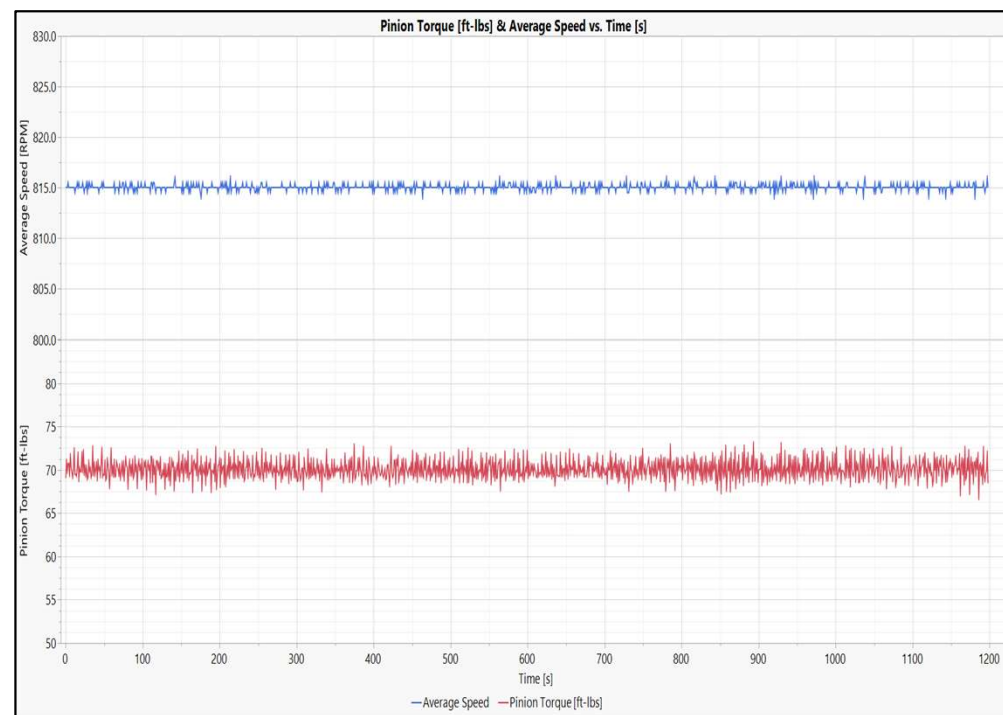


Conditioning 3

Eddy Current Rig

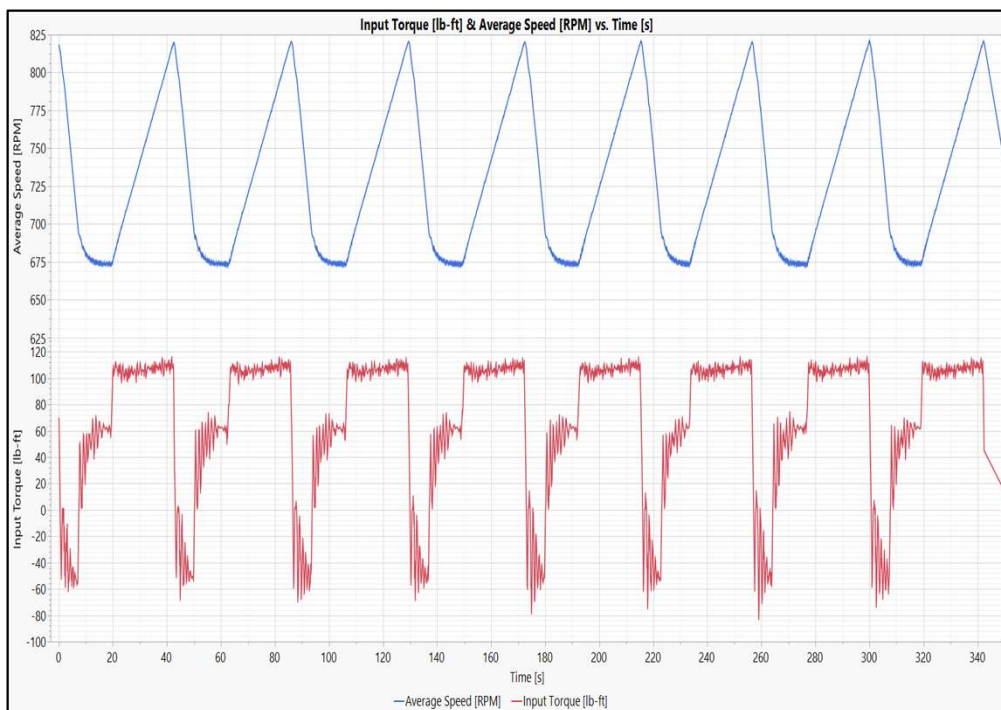


AC Regen Rig



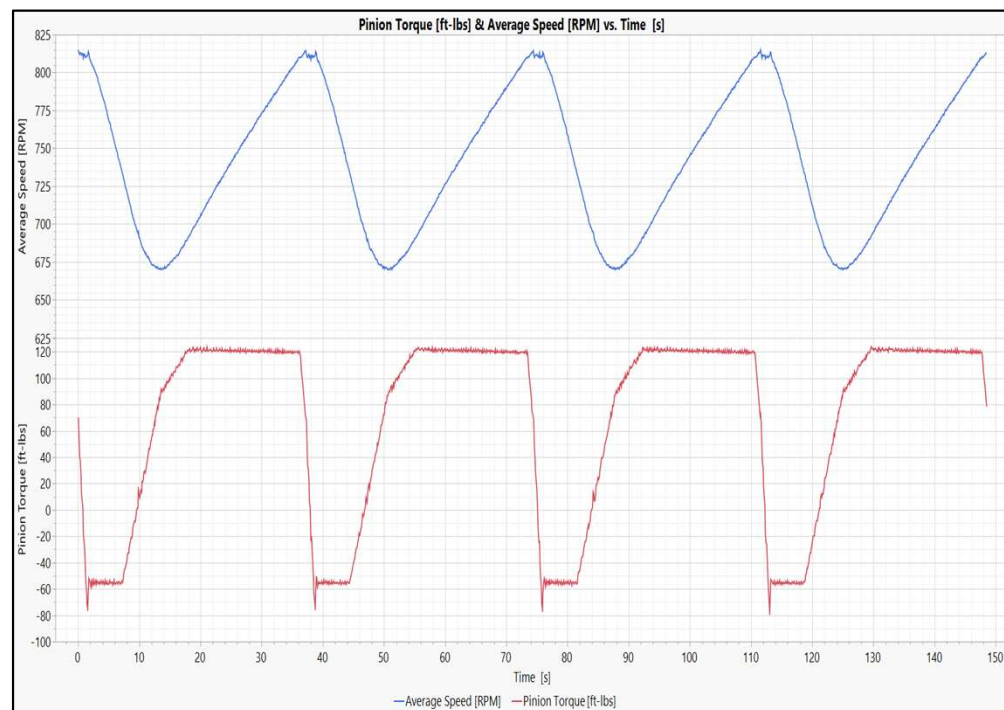
Conditioning 4

Eddy Current Rig



*8 Reps

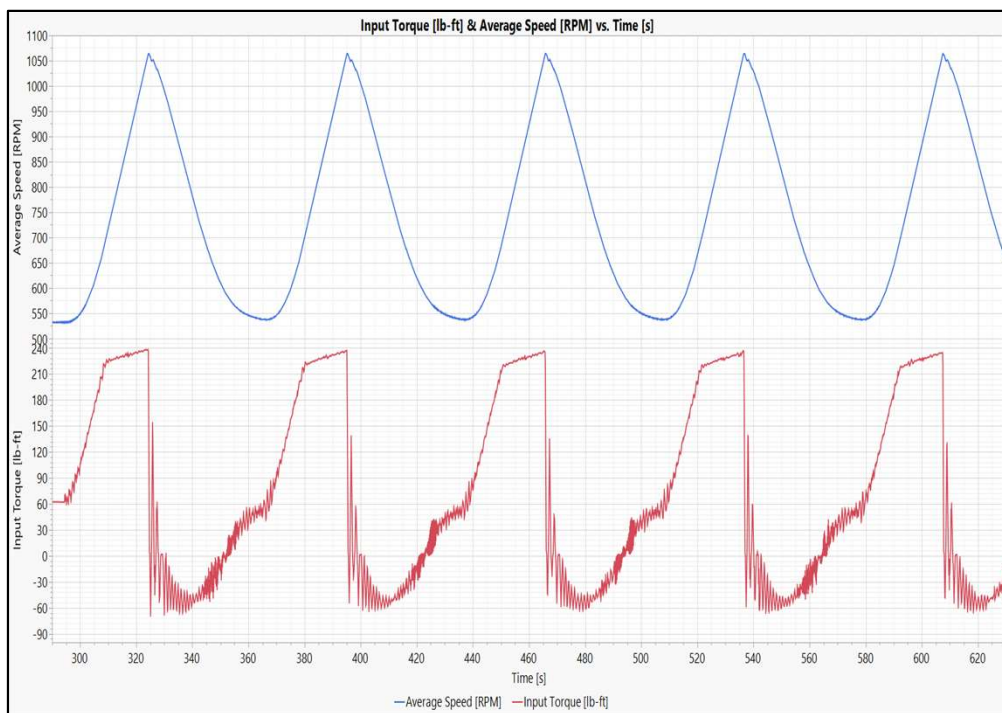
AC Regen Rig



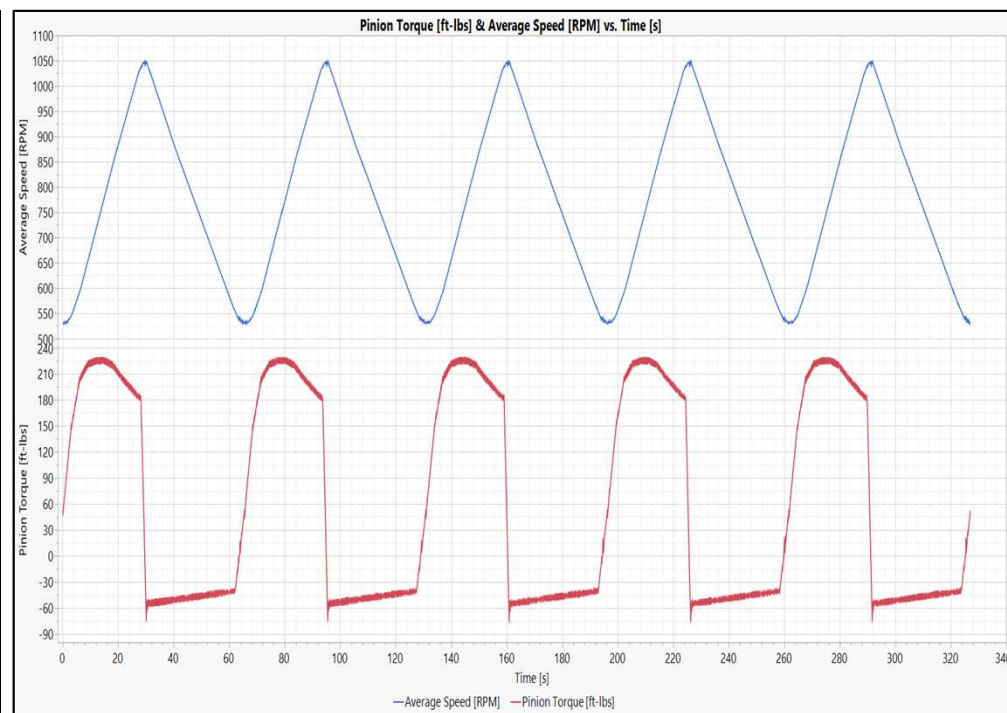
*4 Reps

Shock 1

Eddy Current Rig

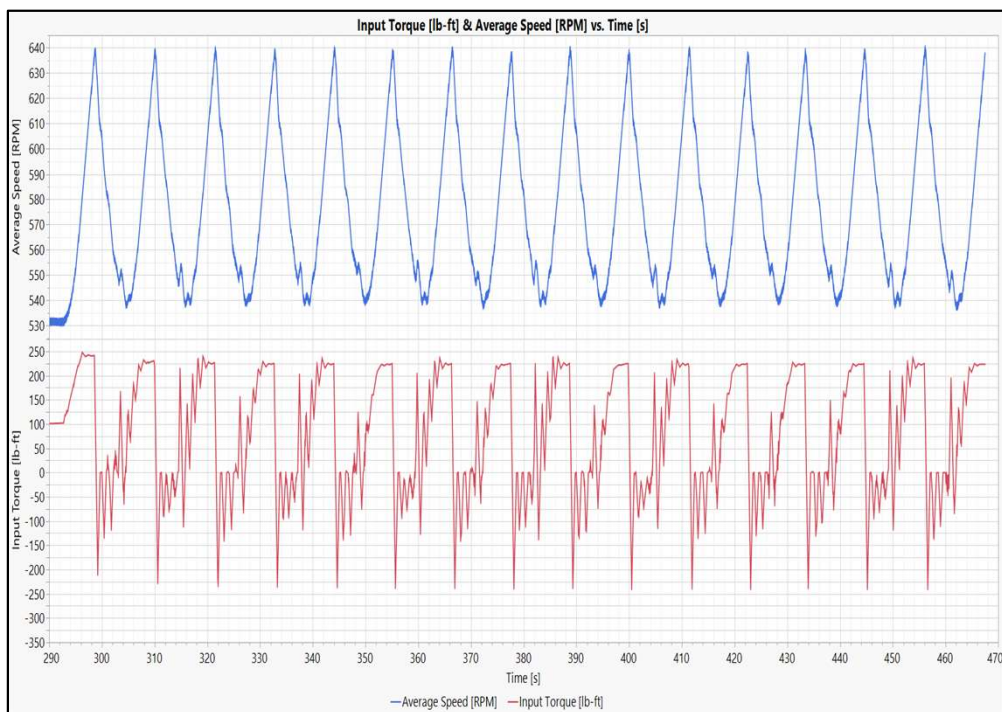


AC Regen Rig



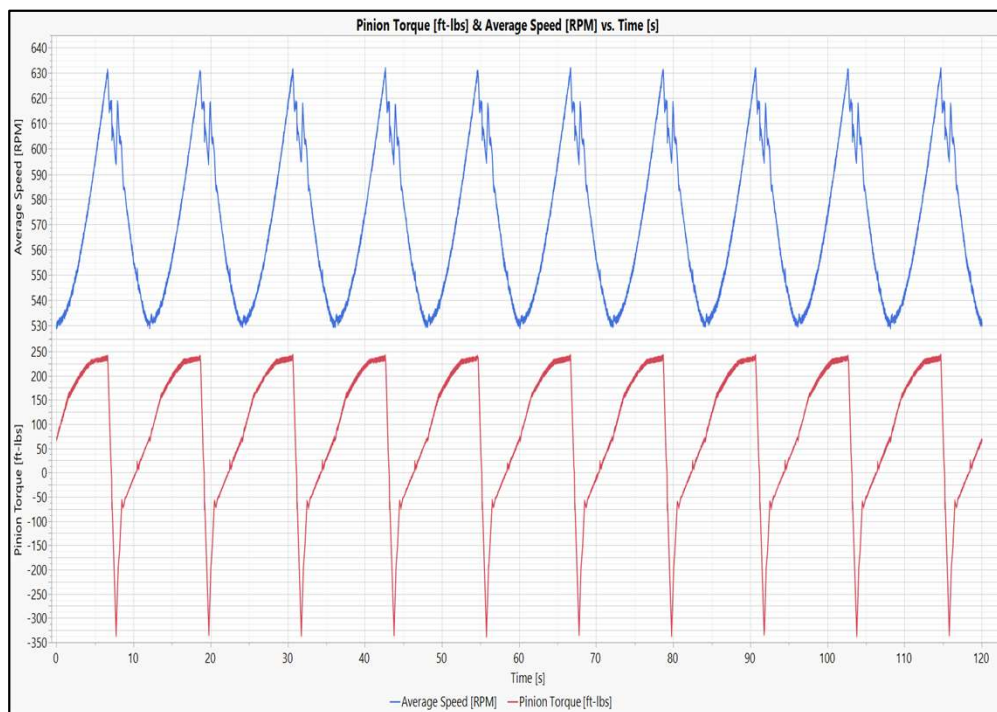
Shock 2

Eddy Current Rig



*15 Shocks

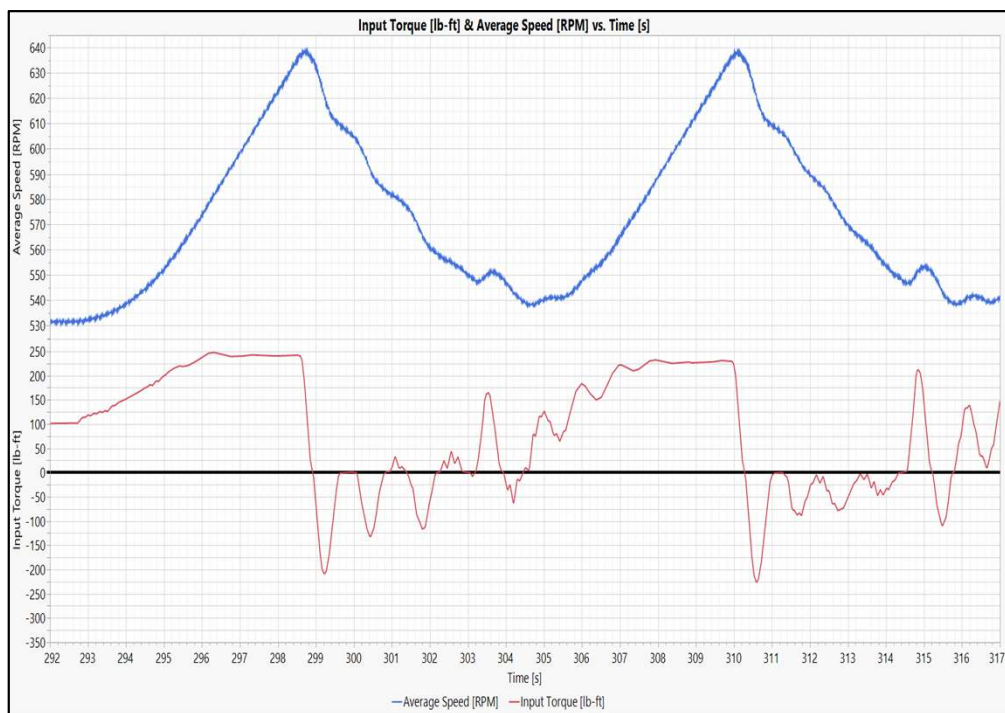
AC Regen Rig



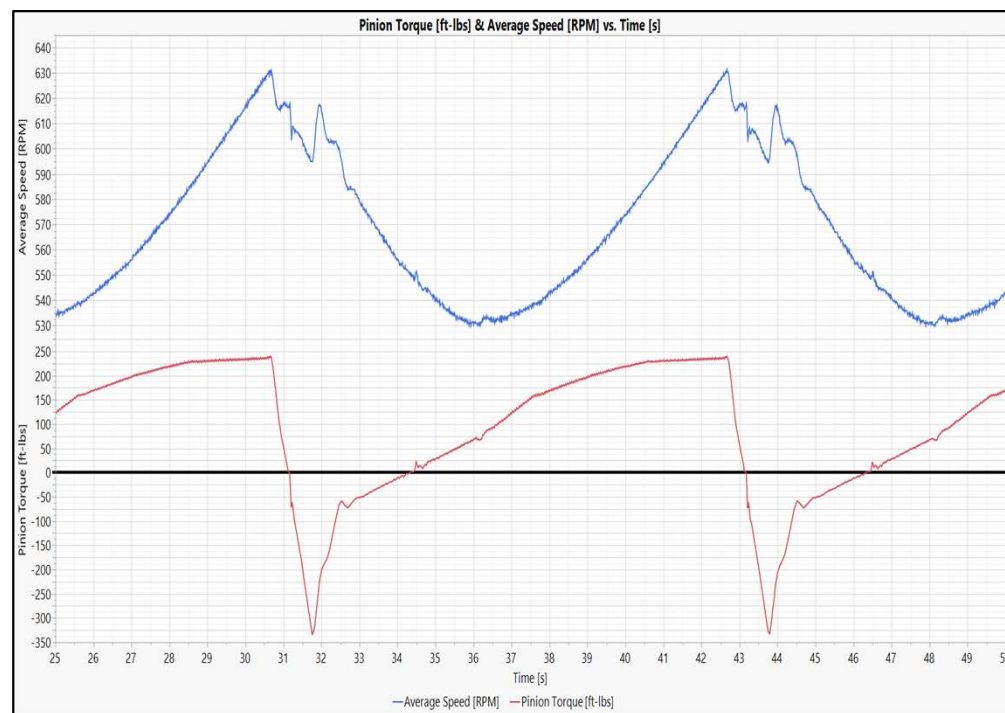
*10 Shocks

Shock 2 (Zoom)

Eddy Current Rig

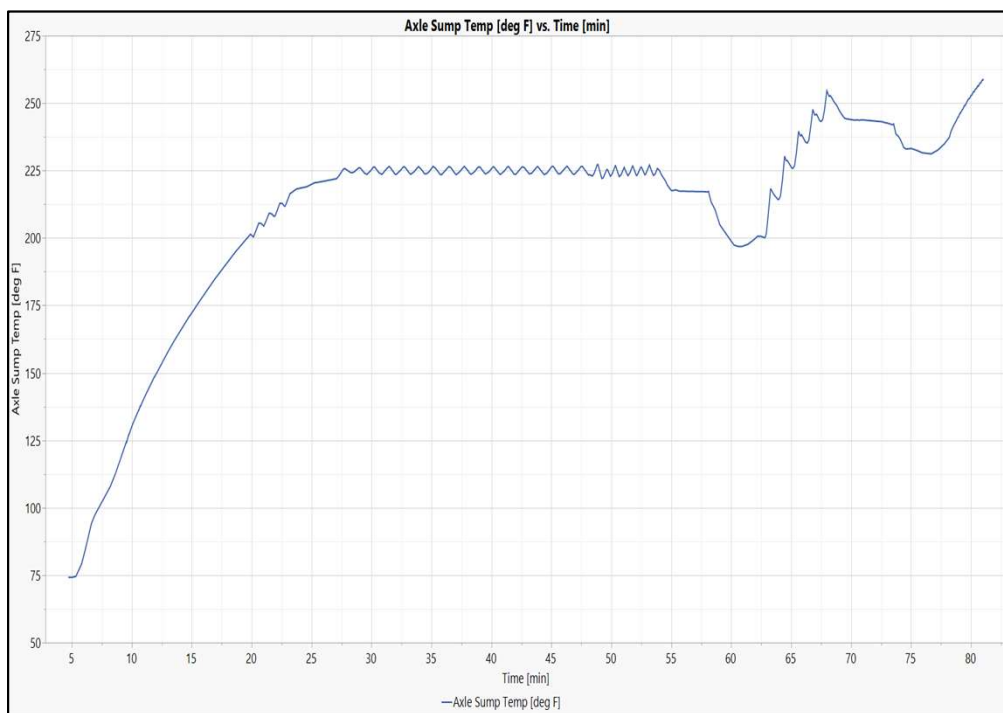


AC Regen Rig

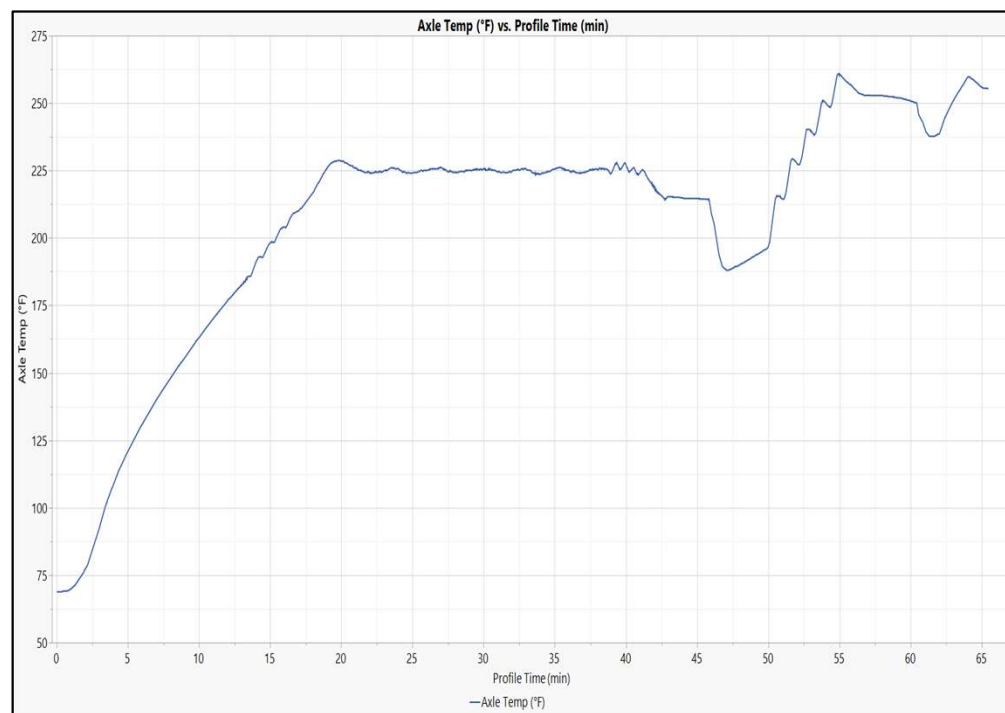


Oil Temperature

Eddy Current Rig



AC Regen Rig



Test Result Summary: AC Regen vs. Eddy Current

AC Regen Rig

Stand Reference Oil Test History in Chronological Order												
	Test Date Started	Test Date Completed	Stand Run No.	CMIR No.	TMC Oil No.	Drive Side Scoring (%)		Coast Side Scoring (%)			Coast Side Torque (lbf-ft)	
						EOT Pinion	EOT Ring	EOT Pinion	EOT Ring	Shock Series 1 Ring	Shock Series 1 (Average)	Shock Series 2 (Average)
Discrimination	20240105	20240105	257	184767	119	0	0	85	55	0	-74.3	-334.0
Calibration Sequence Passing Tests Only	20240104	20240104	256	176820	117	0	0	36	24	0	-74.5	-333.5
	20240130	20240130	260	184759	117	0	0	22	14	0	-73.5	-332.4
	20240322	20240322	262	184761	117	0	0	34	25	0	-74.2	-333.5
Passing Reference Oil Test Average								31	21	0	-74.1	-333.1

Eddy Current Rig

Stand Reference Oil Test History in Chronological Order												
	Test Date Started	Test Date Completed	Stand Run No.	CMIR No.	TMC Oil No.	Drive Side Scoring (%)		Coast Side Scoring (%)			Coast Side Torque (lbf-ft)	
						EOT Pinion	EOT Ring	EOT Pinion	EOT Ring	Shock Series 1 Ring	Shock Series 1 (Average)	Shock Series 2 (Average)
Discrimination	20231103	20231103	24		119	0	0	34	24	0	-64.8	-230.2
Calibration Sequence Passing Tests Only	20231103	20231103	23		117	0	0	15	10	0	-67.6	-235.2
	20240111	20240111	25		117	0	0	16	10	0	-64.4	-228.9
	20240112	20240112	26		117	0	0	14	11	0	-66.9	-229.4
Passing Reference Oil Test Average								15	10	0	-66.3	-231.2

Targets:

*Correction Factors Applied

Mean = 23.0
Std Dev = 5.49

U. L. = 32
L. L. = 13

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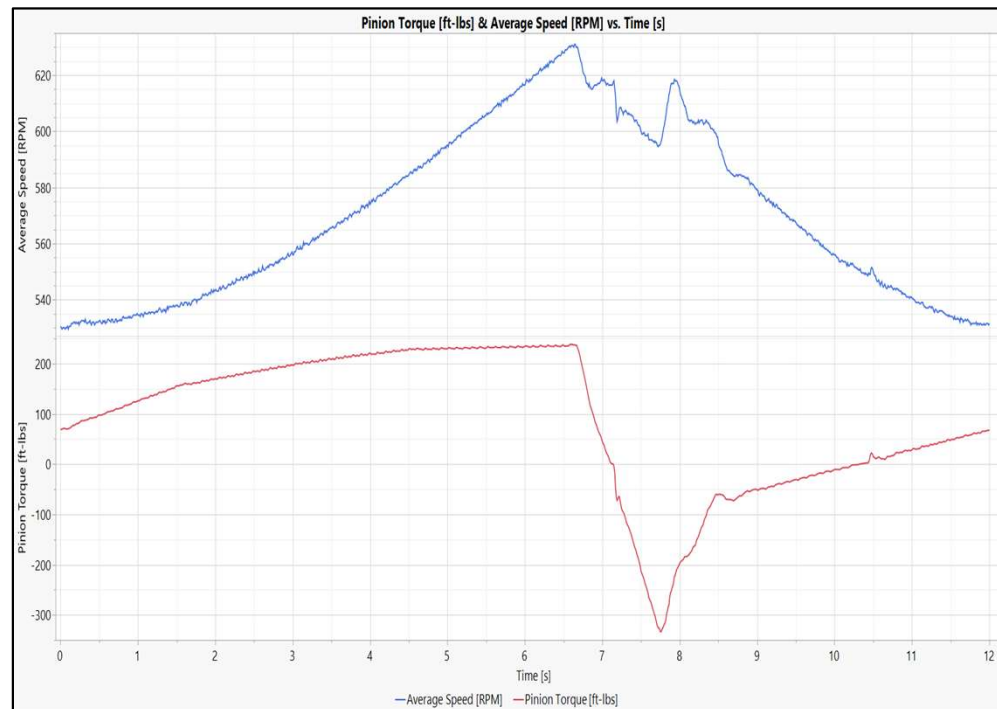


Shock II Repetition Study

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Do Repetitions Matter in Shock II?

- ▶ How many times does the coast-side need to be hit to achieve proper scoring levels?
- ▶ One repetition of Shock II was run
 - ▶ All other parts of the test procedure were held constant



Pinion Comparison (TMC 117)

1 Rep



Scoring = 23
Avg Tq = -333.3 ft-lb
Run # 263

10 Repts



Scoring = 22
Avg Tq = -332.4 ft-lb
Run # 260

Ring Comparison (TMC 117)

1 Rep



Scoring = 15
Avg Tq = -333.3 ft-lb
Run # 263

10 Repts



Scoring = 14
Avg Tq = -332.4 ft-lb
Run # 260



Summary / Conclusions / Next Steps

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Summary

▲ Two reference sequences now complete on both rig types

▲ Shock II Average Min Torque [ft-lbs]

- Eddy Current: -231.2
- AC Regen: -333.1

▲ Cond 4 and Shock II repetitions are different between rig types

- Eddy Current: Cond. 4: 8 Shock II: 15
- AC Regen: Cond. 4: 4 Shock II: 10

▲ Other operational data is comparable

▲ EOT Scoring Average

- ▲ Eddy Current: P: 15 R: 10
- ▲ AC Regen: P: 31 R: 21

▲ Good discrimination between Hi and Low Ref oils on both

- ▲ Eddy Current: P: 34 R: 24
- ▲ AC Regen: P: 85 R: 55

▲ Shock II Repetition Study on AC Regen Rig

- ▲ One rep of Shock II shows comparable scoring to 10 reps

Next Steps

Align on path going forward

- ▲ Define test procedure
 - Repetitions of each phase
 - Torque levels
 - Rigid Mounts vs. Spring Plates
 - Likely rig-dependent
- ▲ Define test oil matrix
 - J2360 oils
 - Poor-performing oils (non-reference)
 - Afton is willing to donate non-reference oils
- ▲ Outline responsibilities
 - Hardware donations

New Issues



Thanks!



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Present	Name	Voting Non-Voting	Company Name Company Address	Contact information	
	Aguirre, Nancy	NV	Intertek Automotive Research	Phone:	
			5404 Bandera Rd. San Antonio, TX 78238	E-mail:	nancy.aguirre@intertek.com
NA	Ariemma, Nick	NV	The Lubrizol Corporation	Phone:	
			29400 Lakeland Boulevard Wickliffe, OH 44092	E-mail:	Nick.Ariemma@Lubrizol.com
POB	Banas, Rob	V	ExxonMobil Product Solutions	Phone:	770-833-5920
			535 Thomas Lane Waleska, GA 30183	E-mail:	rob.a.banas@exxonmobil.com
DB	Beck, Dylan	V	ASTM Test Monitoring Center	Phone:	724-355-1854
			203 Armstrong Drive Freeport, PA 16229	E-mail:	djb@astmtmc.org
DB	Bell, Don	NV	Afton Chemical	Phone:	804-788-6332
			500 Spring St. Richmond, VA 23219	E-mail:	don.bell@aftonchemical.com

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Present	Name	Voting Non-Voting	Company Name Company Address	Contact information	
TB	Bender, Tobias	NV	Fuchs Lubricants	Phone:	708-737-1681
			17050 Lathrop Ave Harvey, IL 60426	E-mail:	Tobias.Bender@fuchs.com
MB	Burgman, Maxim	NV	Fuchs Lubricants	Phone:	248-846-3120
			17050 Lathrop Ave Harvey, IL 60426	E-mail:	maxim.burgman@fuchs.com
BC	Campbell, Bob	NV	Afton Chemical	Phone:	804-788-5340
			500 Spring St. Richmond, VA 23219	E-mail:	Bob.Campbell@aftonchemical.com
	Camposo, Lucas	NV	Evonik	Phone:	215-706-5809
			723 Electronic Dr Horsham, PA 19044	E-mail:	lucas.camposo@evonik.com
MC	Caridi, Margaret	NV	BASF	Phone:	914-785-2336
			500 White Plains Rd Tarrytown, NY 10591	E-mail:	margaret.caridi@basf.com

**L-42 Surveillance Panel Membership/Attendance
Intertek PSI, Plymouth, MI and Microsoft Teams Virtual Meeting
May 8, 2024**

Present	Name	Voting Non-Voting	Company Name Company Address	Contact information	
	Carowick, Jessica	V	Cummins-Meritor	Phone:	248-872-3055
			2135 W. Maple Rd Troy, MI 48084	E-mail:	Jessica.LaBond@cummins.com
	Cereghino, Brian	NV	IPAC Inc.	Phone:	
				E-mail:	bcereghino@ipac-inc.com
	Charron, Michael	NV	Southwest Research Institute	Phone:	832-444-2180
			6220 Culebra Rd. San Antonio, TX 78238	E-mail:	michael.charron@swri.org
	Clark, Jeff	NV	ASTM Test Monitoring Center	Phone:	412-365-1032
			203 Armstrong Drive Freeport, PA 16229	E-mail:	jac@astmtmc.org
	Comfort, Allen	V	US Army DEVCOM	Phone:	586-282-4225
				E-mail:	allen.s.comfort.civ@army.mil


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Present	Name	Voting Non-Voting	Company Name Company Address	Contact information	
	<i>Remove</i> Drlja, Kristijan	NV	The Lubrizol Corporation	Phone:	440-391-6374
			29400 Lakeland Boulevard Wickliffe, OH 44092	E-mail:	krdr@lubrizol.com
<i>JG</i>	Gingerich, Jason	NV	The Lubrizol Corporation	Phone:	440-391-0101
			29400 Lakeland Boulevard Wickliffe, OH 44092	E-mail:	Jason.Gingerich@lubrizol.com
<i>Arjun</i>	Goyal, Arjun	V	BASF	Phone:	914-785-2083
			500 White Plains Rd Tarrytown, NY 10591	E-mail:	arjun.goyal@basf.com
	Grundza, Rich	NV	ASTM Test Monitoring Center	Phone:	412-365-1031
			203 Armstrong Drive Freeport, PA 16229	E-mail:	reg@astmtmc.org
	Hahn, Hyeok	NV	Chevron Oronite	Phone:	408-507-2848
				E-mail:	hyeok.hahn@chevron.com

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Present	Name	Voting Non-Voting	Company Name Company Address	Contact information	
	Haynes, Troy	NV	IPAC Inc.	Phone:	
			E-mail:	thaynes@ipac-inc.com	
	Horvath, Dan	NV	Afton Chemical	Phone:	248-514-2551
			2000 Town Center, Suite 1160 Southfield, MI 48075	E-mail:	dan.horvath@aftonchemical.com
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