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November 14<sup>th</sup>, 2022

Reply to:  
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[matt.sangpeal@aftonchemical.com](mailto:matt.sangpeal@aftonchemical.com)

ASTM D02.B0.03 L-42 Surveillance Panel  
Members and Guests:

Attached for your review and comment are the unconfirmed minutes of the:

**November 9, 2022 L-42 Surveillance Panel Meeting (Intertek AR, Plymouth, MI and Virtual Meeting – Microsoft Teams)**

Please direct any corrections or comments to my attention.

Very Respectfully,

Matt Sangpeal, Chairman  
L-42 Surveillance Panel

## L-42 Surveillance Panel Meeting Minutes

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

November 9, 2022

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

N. Ariemma (Lubrizol)	K. Drlja (Lubrizol)	S. Neil (Daimler)
<b>R. Banas (Exxon-Mobil)</b>	<b>A. Goyal (BASF)</b>	<b>M. Sangpeal (Afton/C)</b>
<b>D. Beck (TMC)</b>	D. Horvath (Afton)	E. Sattler (US Army)
D. Bell (Afton)	B. Jordan (Shell)*	N. Schaup (LZ)
T. Bender (Fuchs)	T. Kostan (SwRI)*	<b>R. Slocum (LZ)</b>
M. Caridi (BASF)	J. LaBond (Cummins-Meritor)	<b>D. Uy (Shell)</b>
<b>J. Carter (Cummins-Meritor)</b>	<b>A. Lange (Intertek)</b>	W. Venhoff (LZ)
M. Charron (SwRI)	<b>C. Louis (SwRI)*</b>	F. Yucebilgic (Fuchs)
<b>A. Comfort (US Army)</b>	J. Morris (Navistar)	G. Zarins (AAM)
P. Decker (Afton)	<b>T. Muransky (AAM)</b>	<b>A. Zyski (Dana)</b>

### Call to Order

### Review of Agenda

The meeting agenda is attached.

### Review of Membership

A motion was made to replace Rob Slocum with Nick Schaup as the voting member for Lubrizol.

Motion: M. Sangpeal

Second: A. Goyle

The group distribution list was examined, and several inactive contacts were removed.

### Approval of Meeting Minutes

Meeting minutes for approval:

- ▲ "20220810\_SP" → August 10, 2022 – Surveillance Panel Meeting – Warrendale, PA
- ▲ "20221012\_CC" → October 12, 2022 – Conference Call, L-42-1 Review – WebEx

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

Motion: M. Sangpeal

Second: J. Carter

All in favor, no objections, no abstentions.

### **TMC Reference Testing Review**

A report issued by the TMC on L-42 Reference Testing activity was reviewed. T. Kostan explained how to interpret industry control charts. Details can be found in the attached presentation.

### **L-42-1 Development**

C. Louis presented on SwRI's progress on electric L-42-1 test development. Two tests were run on C1L446/P8AD132 axles: one with TMC 117 oil (High Ref) and one with TMC 113 oil (Discrimination). Shock I was eliminated from the test profile. EOT Scoring results were in-line with previous L-42-1 development tests, indicating that Shock I had very little impact on EOT Scoring ratings. Fluid temperature was lower than normal in Shock II due to the elimination of Shock I, which adds significant heat to the oil.

Possible next steps were discussed. The group decided to reduce Shock II peak torque by ~10% in hopes of lowering scoring severity. Shock I will also be put back into the test profile. TMC 113 and 117 will be run with the lower Shock II torque level.

Five donated axles remain in stock at SwRI, with one being potentially unusable due to a manufacturing defect.

### **2023 Hardware Order**

Three labs will purchase new hardware from Dana in 2023. Cost is \$3266 per axle, 650 total axles ordered. Lead time is 8 months from receipt of all Purchase Orders. A different steel supplier and a different forge facility will be used this time. The same internal team within Dana will be managing this order. A. Zyski is involved within Dana with this project. She stated that she has no concerns with the steel supplier and that Dana is closely working with the new forging facility to ensure that the correct process is used.

### **New/Open Issues**

None.

### **Adjournment**

A motion was made to adjourn.

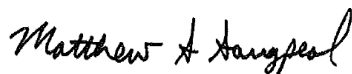
Motion: M. Sangpeal

Second: A. Goyle

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 Automotive Research

Plymouth, MI

November 9, 2022












11:30 AM – 12:00 PM EDT

Passion for Solutions™

# Agenda

-  **Call to Order**
-  **Agenda**
-  **Membership Review & Update**
-  **Approval of Meeting Minutes**
  - ▲ 20220810 SP Meeting - PRI, Warrendale, PA
  - ▲ 20221012 Conf. Call – WebEx
-  **TMC Reference Testing Review**
-  **L-42-1 Development Updates**
  - ▲ Update from SwRI
-  **2023 Hardware Order**
-  **New Issues**
-  **Adjournment**

## L-42 SP Voting Members

 Rob Banas:	ExxonMobil
 Dylan Beck:	TMC
 Allen Comfort:	US Army
 Arjun Goyal:	BASF
 Troy Muransky:	AAM
 Jason Carter:	Cummins-Meritor
 Matt Sangpeal:	Afton Chemical (Chair)
 Robert Slocum:	Lubrizol
 Anthony Lange:	Intertek
 Caroline Louis:	SwRI
 Amy Zyski:	Dana

# Approval of Meeting Minutes

## SP Meeting Minutes

- ▲ “20220810\_SP” → August 10, 2022 – Surveillance Panel Meeting – PRI, Warrendale, PA and Virtual Meeting via Microsoft Teams
- ▲ “20221012\_CC” → October 12, 2022 – Conference Call, L-42-1 Test Results Review - WebEx

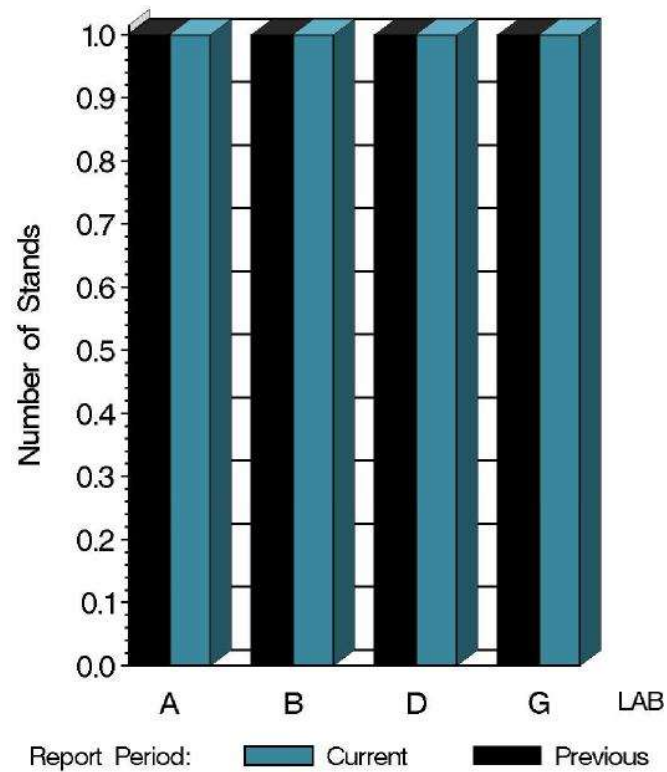
# TMC Reference Testing Review



# L-42 (D7452)

	Reporting Data	Calibrated on 9-30-22
Number of Labs	4	4
Number of Stands	4	4

BY-LAB STAND  
DISTRIBUTION



9:43:30 24OCT2022



**Test Monitoring Center**

203 Armstrong Drive, Freeport, PA 16229, USA

[www.astmtmc.org](http://www.astmtmc.org)  
412-365-1000

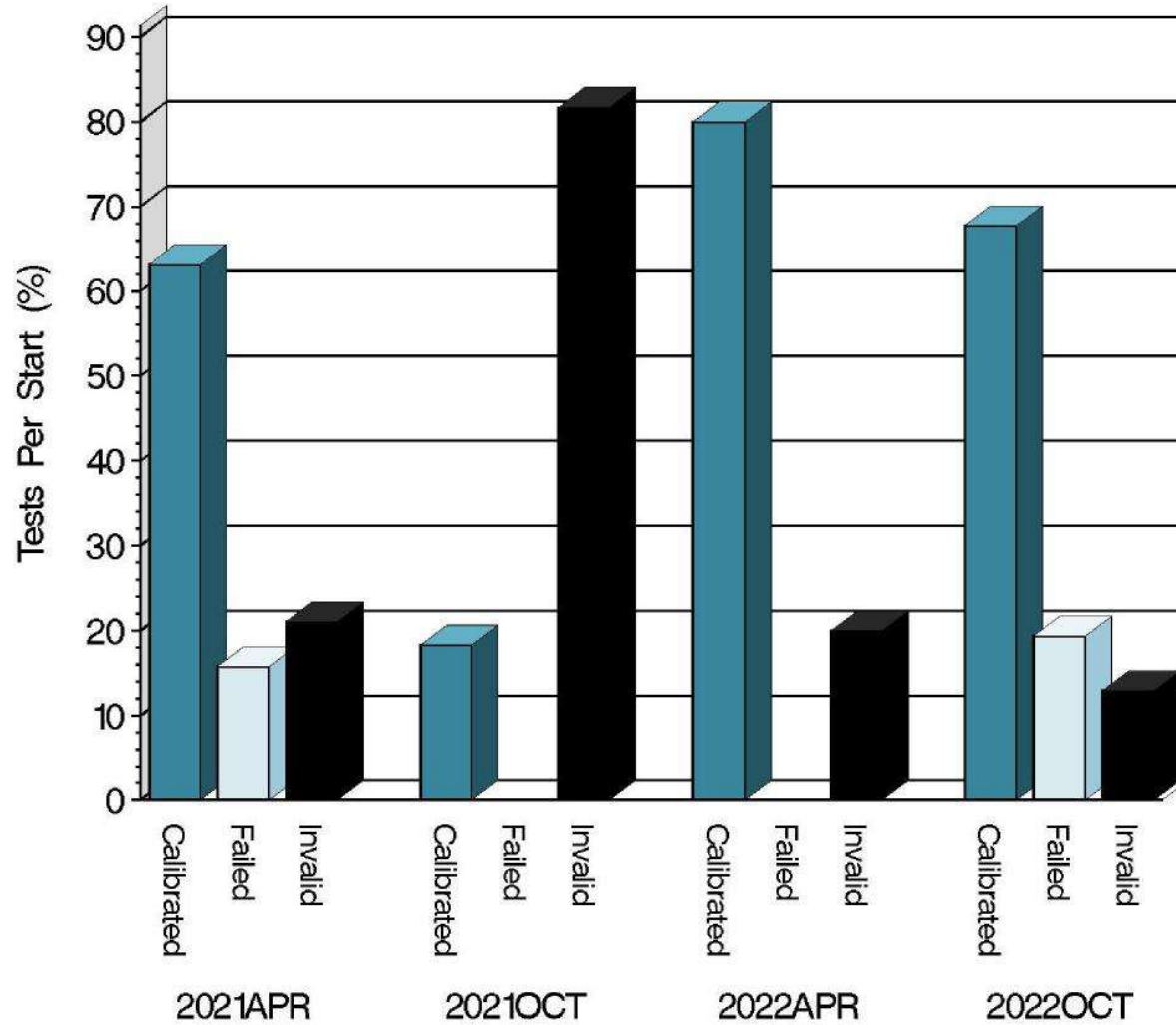
# L-42 (D7452)

## Test Distribution by Oil and Validity

					Totals	
					Last	This
					Period	Period
		113	117	119		
Accepted for calibration	AC	0	21	0	12	21
Rejected (Mild)	OC	0	3	0	0	3
Rejected (Severe)	OC	0	3	0	0	3
Rejected (Precision)	OC	0	0	0	0	0
Operationally Invalid (determined by lab)	LC	0	3	0	1	3
Accepted discrimination	AS	1	0	8	5	9
Unacceptable discrimination run	MS	0	0	0	1	0
Unacceptable calibration	MC	0	1	0	0	1
Aborted	XC	0	0	0	2	0
Aborted discrimination run	XS	0	0	0	1	0
<b>Total</b>		<b>1</b>	<b>31</b>	<b>8</b>	<b>22</b>	<b>40</b>

# L-42 (D7452)

## CALIBRATION ATTEMPT SUMMARY



Resolution

Report Period

9:43:30 24OCT2022



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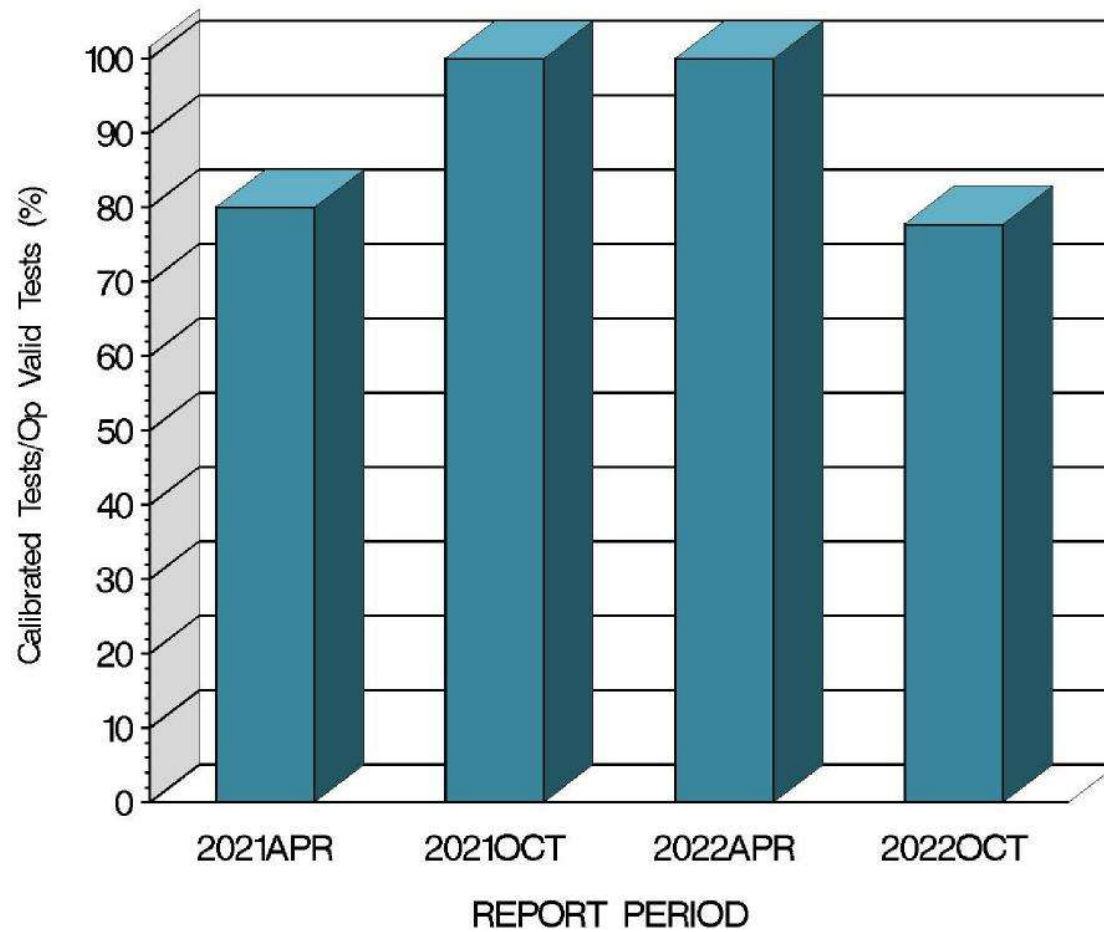
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# L-42 (D7452)

OPERATIONALLY VALID TESTS  
MEETING ACCEPTANCE CRITERIA



9:43:30 24OCT2022



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# L-42 (D7452)

## CAUSES FOR LOST TESTS

							Lost	Starts	%
Lab	Cause	113	117	XS	XC	LC			
A	Cond. 1 Torque out of limits		•			•	1	8	12%
G	Wheel speed out of spec		•			•	1	23	4%
B	Torque Issues		•			•	1	6	17%
Lost		0	3	0	0	3			
Starts		1	31	40	40	40			
%		0%	9.7%	0%	0%	7.5%			

# L-42 (D7452)

			Coast Side Pinion Scoring		
Oil	Gear Batch	N	Mean	Std. Dev.	Average $\Delta/s$
117	C1L446/P8AD132	5	23.0	4.95	0.00
117	C1L637/P8AD132	3	28.3	4.93	0.97
117	C1L925/P8AD078X	19	20.6	7.77	-0.44

		Pooled Standard Deviation			
Lab	Coast Side Pinion Scoring $\Delta/s$	df	Coast Side Pinion Scoring	Coast Side Ring Scoring	Shock Series I Coast Side Ring Scoring
A	0.00	4	4.95	3.77	0.00
B	1.28	3	9.90	8.06	0.00
D	0.97	2	4.93	3.46	0.00
G	-0.90	14	4.95	2.94	0.00

# L-42 (D7452)

## SUMMARY OF SEVERITY & PRECISION

### Severity

Pinion scoring remained within the limits this period.

### Precision

Pinion scoring exceeded the warning limit with one test during this period, but has since returned within the limits.

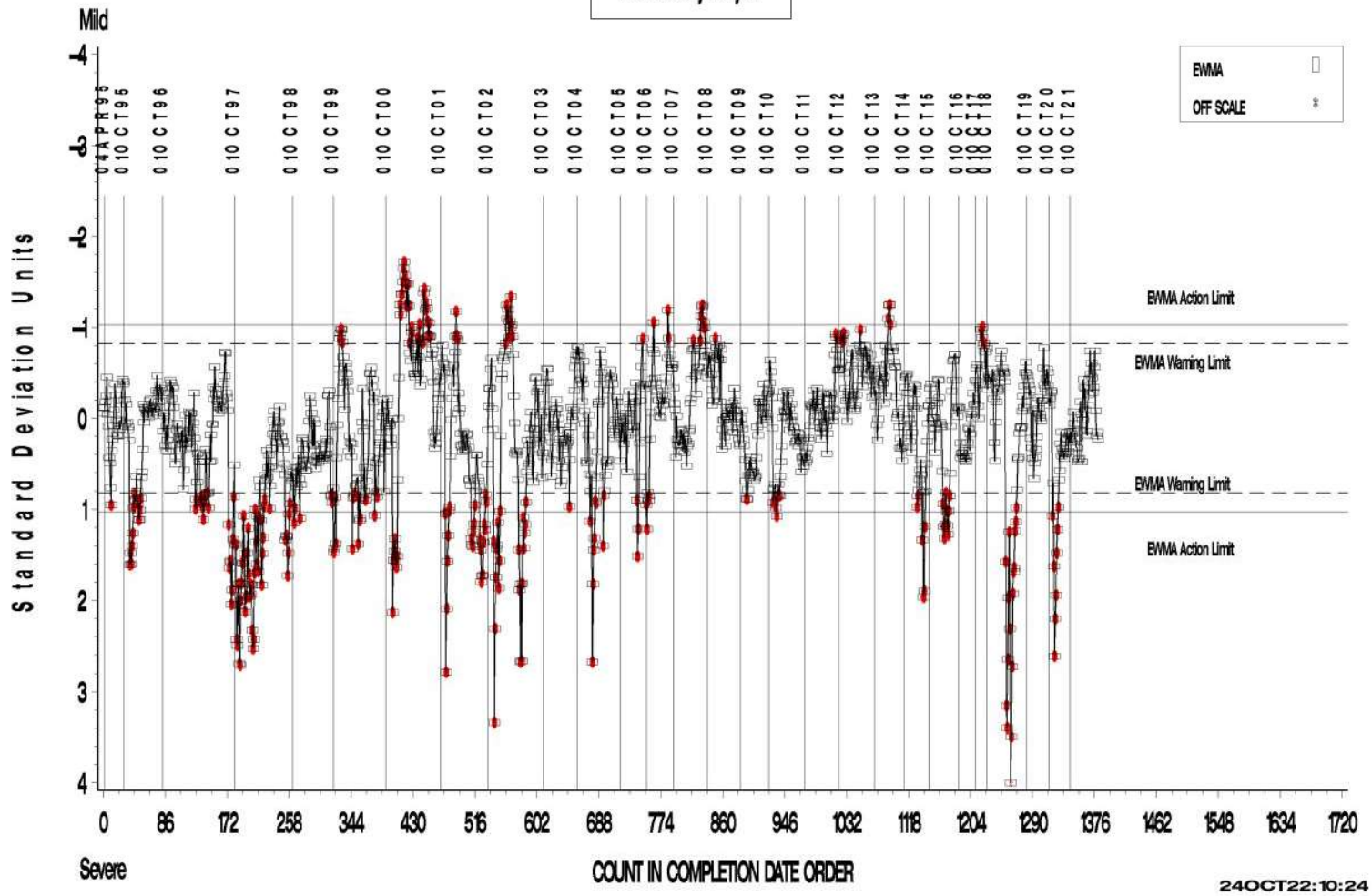
Industry control charts follow.

# L-42 (D7452)

L-42 INDUSTRY OPERATIONALLY VALID DATA

FINAL EOT PINION SCORING COAST SIDE

LTMS Severity Analysis



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412-365-1000

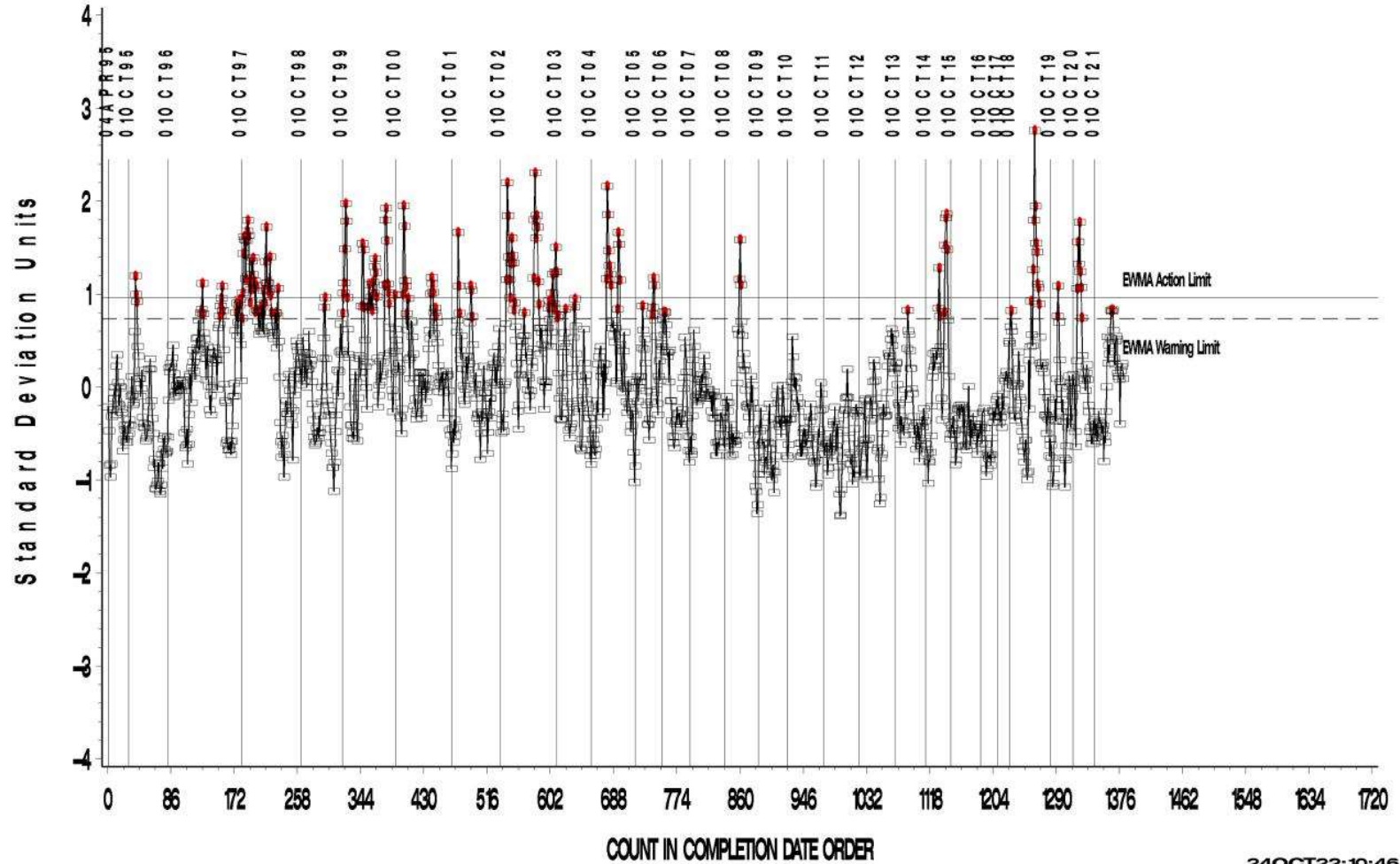


# L-42 (D7452)

L-42 INDUSTRY OPERATIONALLY VALID DATA

FINAL EOT PINION SCORING COAST SIDE

LTMS Precision Analysis



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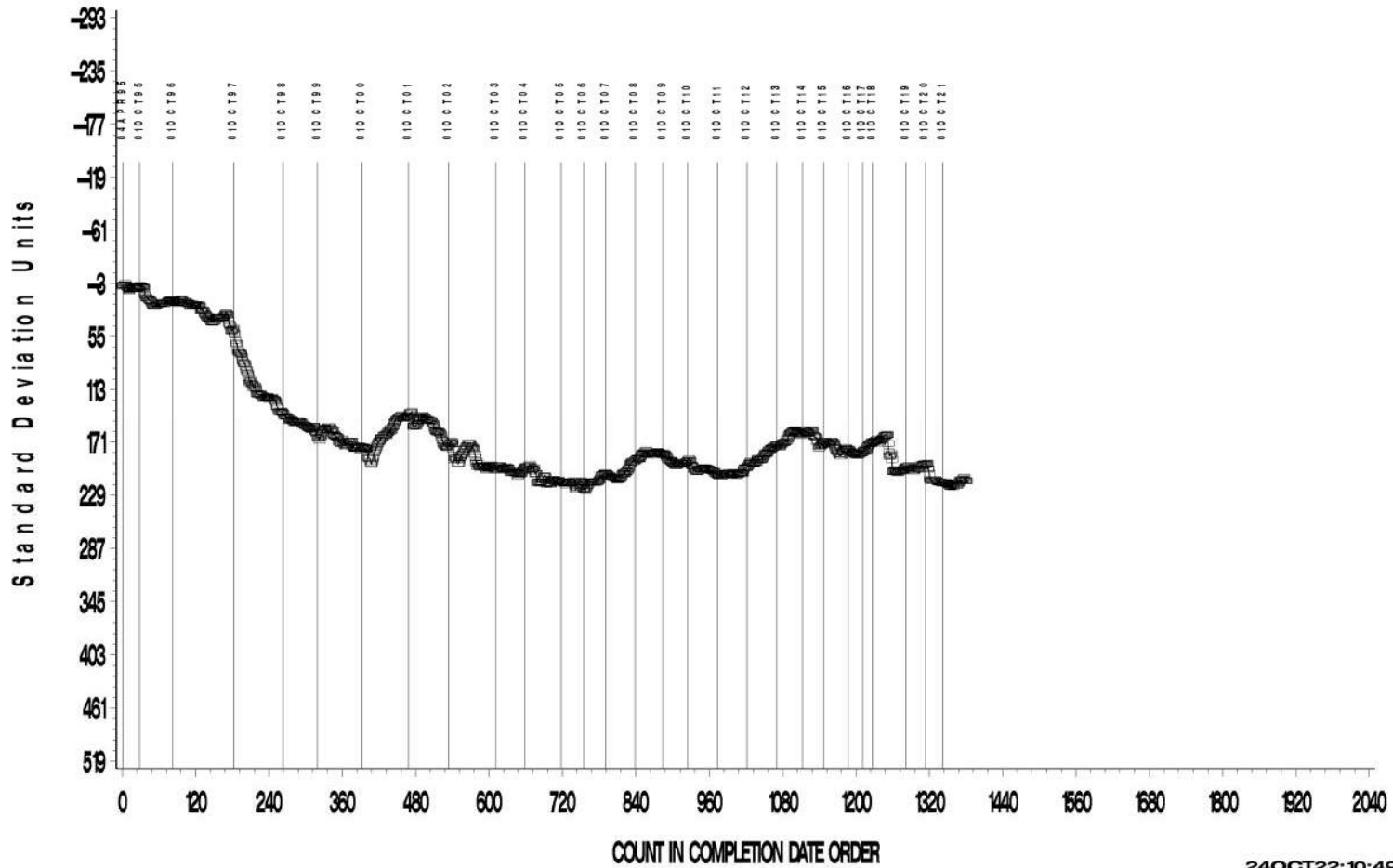
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412-365-1000

# L-42 (D7452)

L-42 INDUSTRY OPERATIONALLY VALID DATA

FINAL EOT PINION SCORING COAST SIDE

CUSUM Severity Analysis



24OCT22:10:49



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**Test Monitoring Center**

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412-365-1000

# L-42 (D7452)

## TIMELINE ADDITIONS

Effective Date	Information Letter	Event
May 19,2022	22-1	Removal of section 9.9 due to disagreement with section 11.3

# L-42 (D7452)

## LAB VISITS

Two lab visits were conducted during this reporting period. In both lab visits the stand configuration was inspected, and all aspects were found to be in accordance with the test procedure.

## INFORMATION LETTERS

Information letter 22-01 was issued in May 2022. The information letter removed section 9.9 of the test procedure. It was found that section 9.9 contained wording that contradicted section 11.3. The surveillance panel decided to keep section 11.3 and remove section 9.9 to eliminate this contradiction.

# L-42 (D7452)

## STATUS OF REFERENCE OIL SUPPLY

Oil	Cans @ Labs	@ TMC	
		Cans	Gallons
113	0	55	27.9
117	28	549	274.9
119	10	63	31.7
Total	38	669	334.5

Oil 117 meets J2360 specifications, and produces somewhat milder scoring than its predecessor 116-1. Oil 117 has been implemented for use as the new “pass” oil with a correction factor +6% for the pinion scoring result and +4% for the ring scoring result.

119 oil has been approved as a replacement for discrimination oil 113. The remaining inventory of 113 at the test labs will be used, and then replaced by shipments of 119 oil.

# L-42-I Test Summary

SOUTHWEST RESEARCH INSTITUTE®

Caroline Mueller  
November 9<sup>th</sup>, 2022



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FUELS & LUBRICANTS RESEARCH

# All Tests Summary

Test Number	Oil Code	EOT Date	Final Pinion Rating (Adjusted)	Final Ring Rating (Adjusted)	On L-42 Target?
01-0003	TMC 117 (High Ref)	4/22/22	22%	15%	Y
01-0004	TMC 113 (Disc. Oil)	4/25/22	52%	42%	Y
01-0005	TMC 117 (High Ref)	6/16/22	30%	18%	Y
01-0006	TMC 113 (Disc. Oil)	6/17/22	46%	36%	N
01-0007	TMC 117 (High Ref)	6/20/22	30%	20%	Y
01-0008	TMC 113 (Disc. Oil)	6/20/22	43%	33%	N
01-0009	TMC 117 (High Ref)	9/27/22	33%	18%	N
01-0010	TMC 113 (Disc. Oil)	9/28/22	61%	49%	N
01-0012	TMC 117 (High Ref)	10/19/22	35%	23%	N
01-0011	TMC 113 (Disc. Oil)	10/19/22	60%	48%	N



# Discussion and Next Steps

## Discussion

- Between runs 0009 & 0010 and 0011 & 0012, Shock 1 was removed. All other steps were left as is.
- No drive side scoring indicates conditioning is appropriate for drive side.
- Coast side scoring appears not to have a significant change by removal of SI and lower temperature start (n = 4).
- Overall results were ~5% severe of L-42 scoring range for high ref oil.
- Discrimination oil was OK in absolute terms, not high enough relative to immediately preceding high ref run.

## Next Steps

- Continue without Shock 1:
  - Define temperature starting point for Shock 2.
  - For 0011 & 0012, post-conditioning inspections reduced oil temp at 215 °F before Shock 2.
- Reduce Shock 2 coast torque by approximately 20 ft-lbs and rerun high ref/discrimination.





# REFERENCE

# All Operational Data



# Test Number 01-0011, TMC 113 (Discrimination Oil)



# Stats—01-0011

Conditioning 1			
Input Torque [ft-lb]		Input Speed [rpm]	
Target	60 ± 5	Target	2363
Avg	60.0	Avg	2361
Min	42.8	Min	2357
Max	80.0	Max	2365

Conditioning 3			
Input Torque [ft-lb]		Input Speed [rpm]	
Target	70 ± 5	Target	3350
Avg	70.0	Avg	3346
Min	66.8	Min	3344
Max	77.5	Max	3349

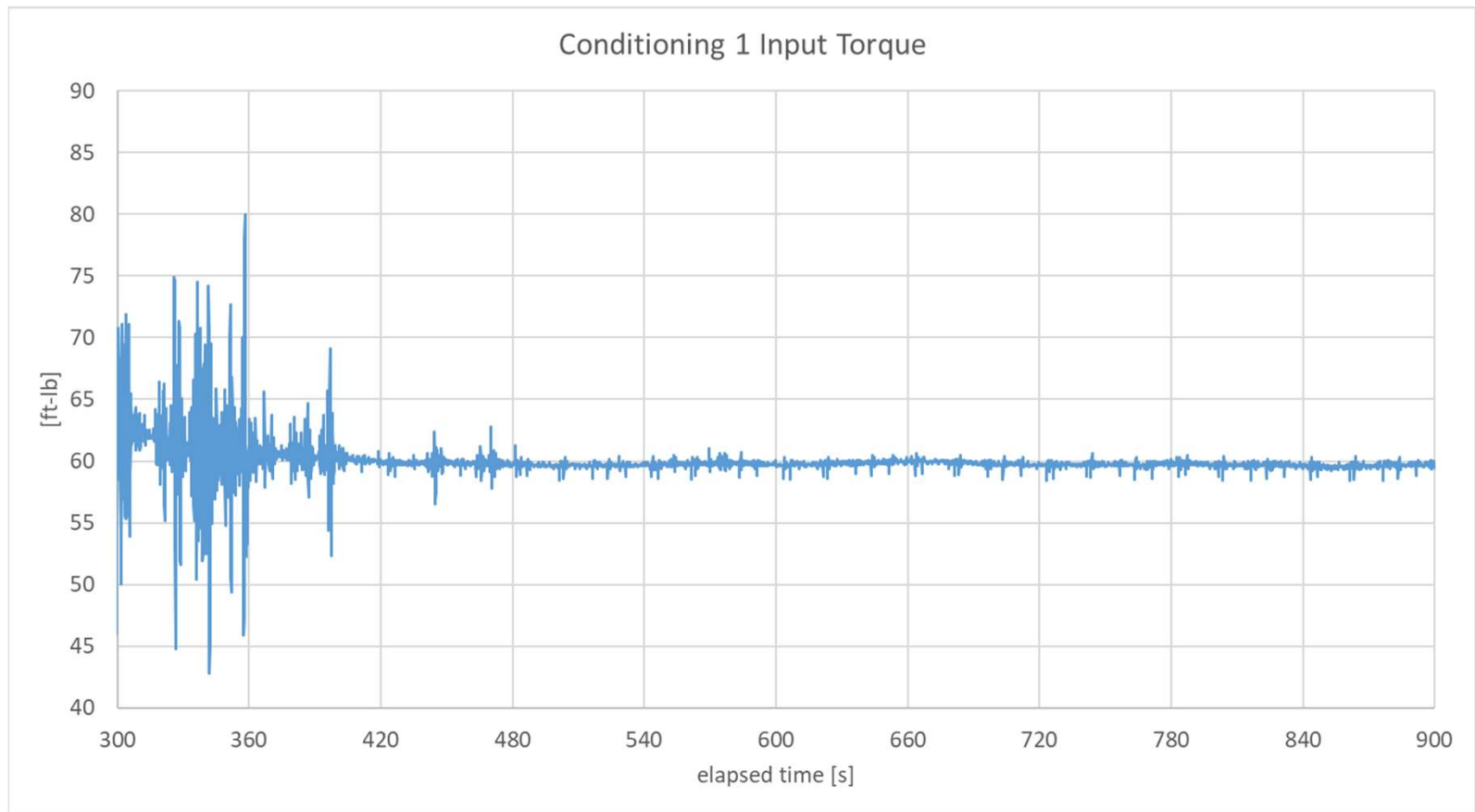
Conditioning 2							
Peak Input Torque Drive [ft-lb]		Peak Input Torque Coast [ft-lb]		Maximum Input Speed [rpm]		Minimum Input Speed [rpm]	
Target		Target		Target	2363	Target	1562
Avg	111.9	Avg	-59.6	Avg	2367	Avg	1581
Min	111	Min	-60.9	Min	2366	Min	1581
Max	112.2	Max	-57.4	Max	2367	Max	1582

Conditioning 4							
Peak Input Torque Drive [ft-lb]		Peak Input Torque Coast [ft-lb]		Maximum Input Speed [rpm]		Minimum Input Speed [rpm]	
Target		Target		Target	3350	Target	2754
Avg	115.5	Avg	-69.5	Avg	3352	Avg	2753
Min	114.7	Min	-75.1	Min	3352	Min	2752
Max	116.4	Max	-58.8	Max	3353	Max	2754

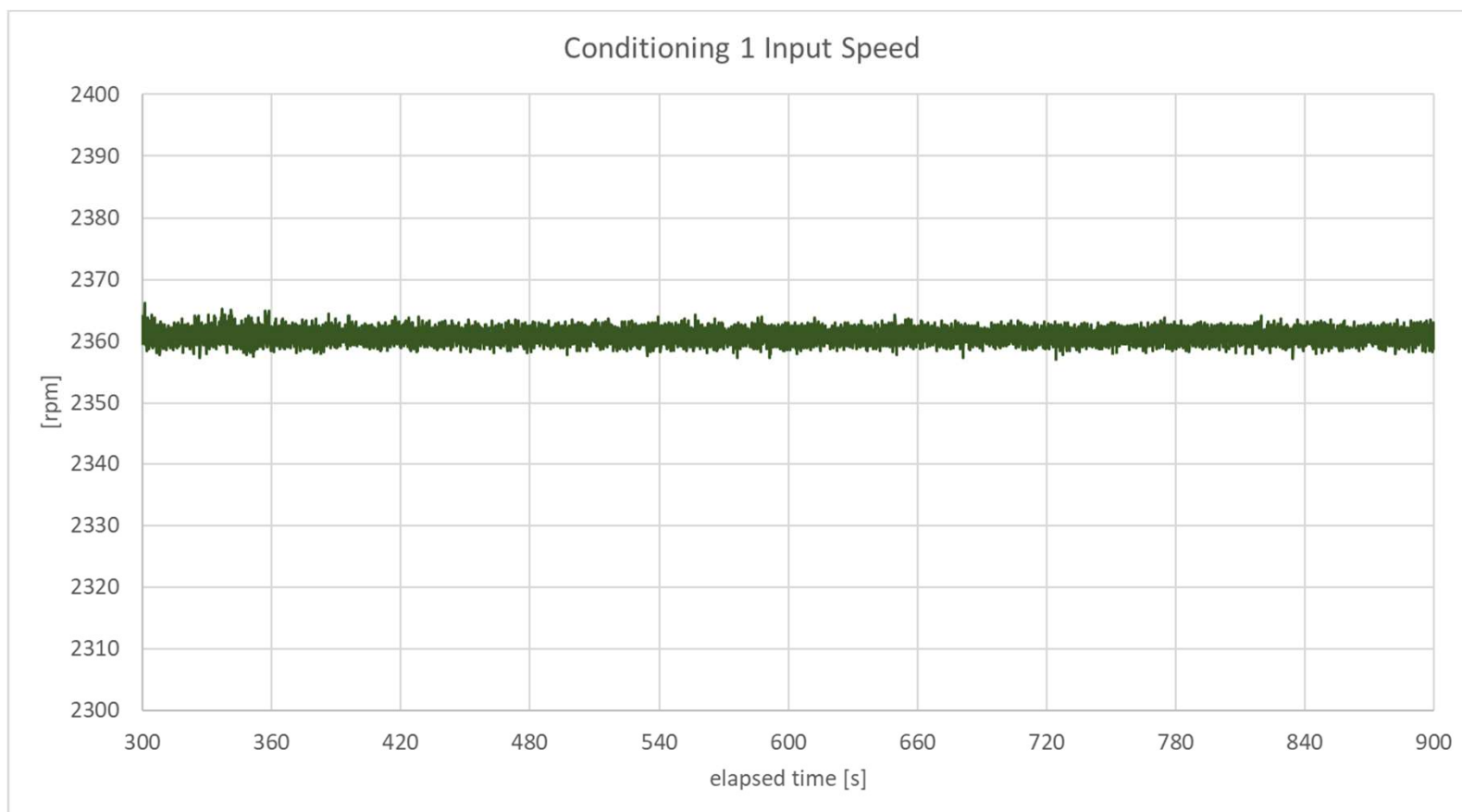
Shock 2							
Peak Input Torque Drive [ft-lb]		Peak Input Torque Coast [ft-lb]		Maximum Input Speed [rpm]		Minimum Input Speed [rpm]	
Target		Target		Target	3083	Target	2178
Avg	228.1	Avg	-228.5	Avg	3080	Avg	2168
Min	226.3	Min	-234.5	Min	3075	Min	2166
Max	231.1	Max	-214.4	Max	3086	Max	2173



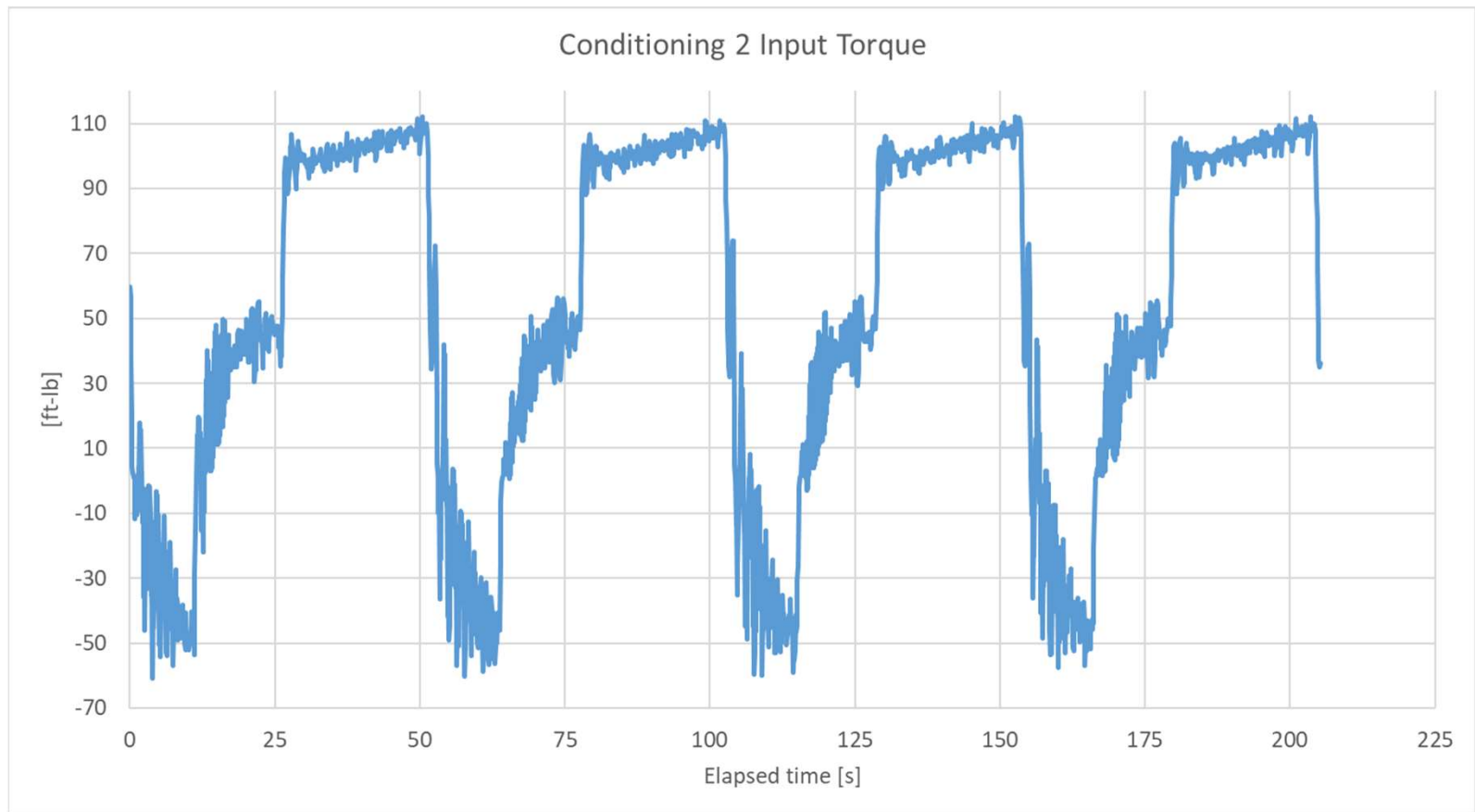
# Conditioning 1—01-0011



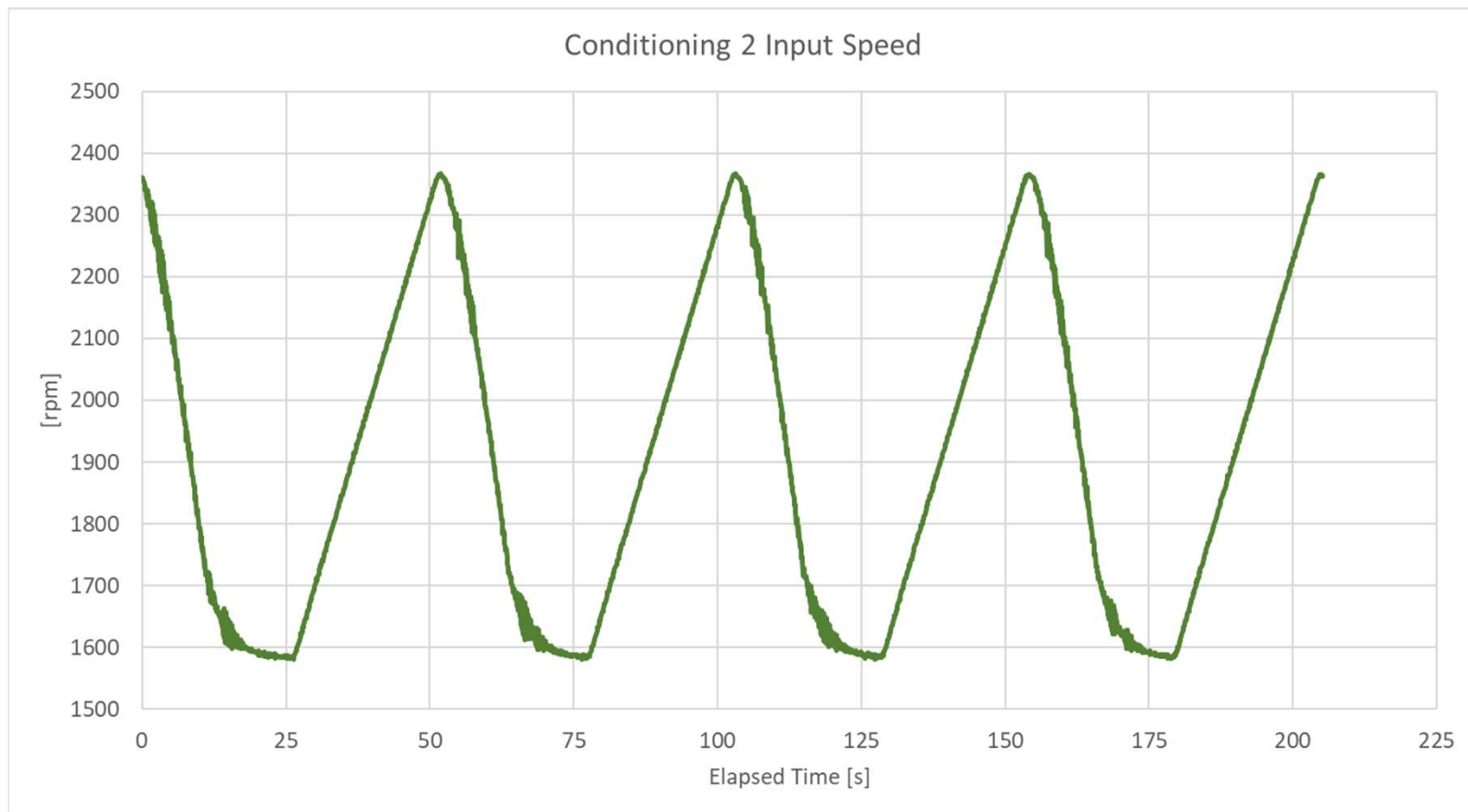
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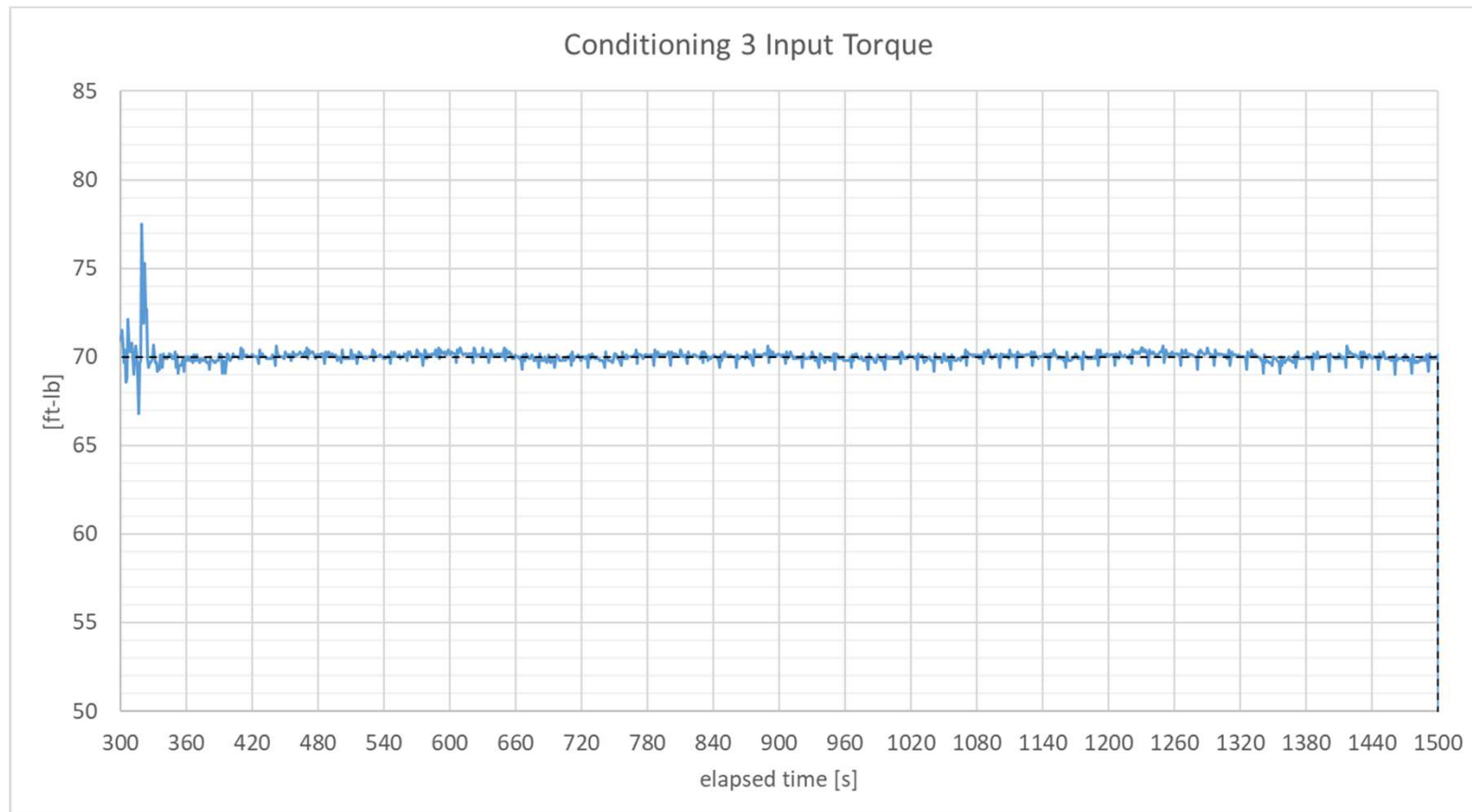
# Conditioning 2—01-0011



# Conditioning 2—01-0011

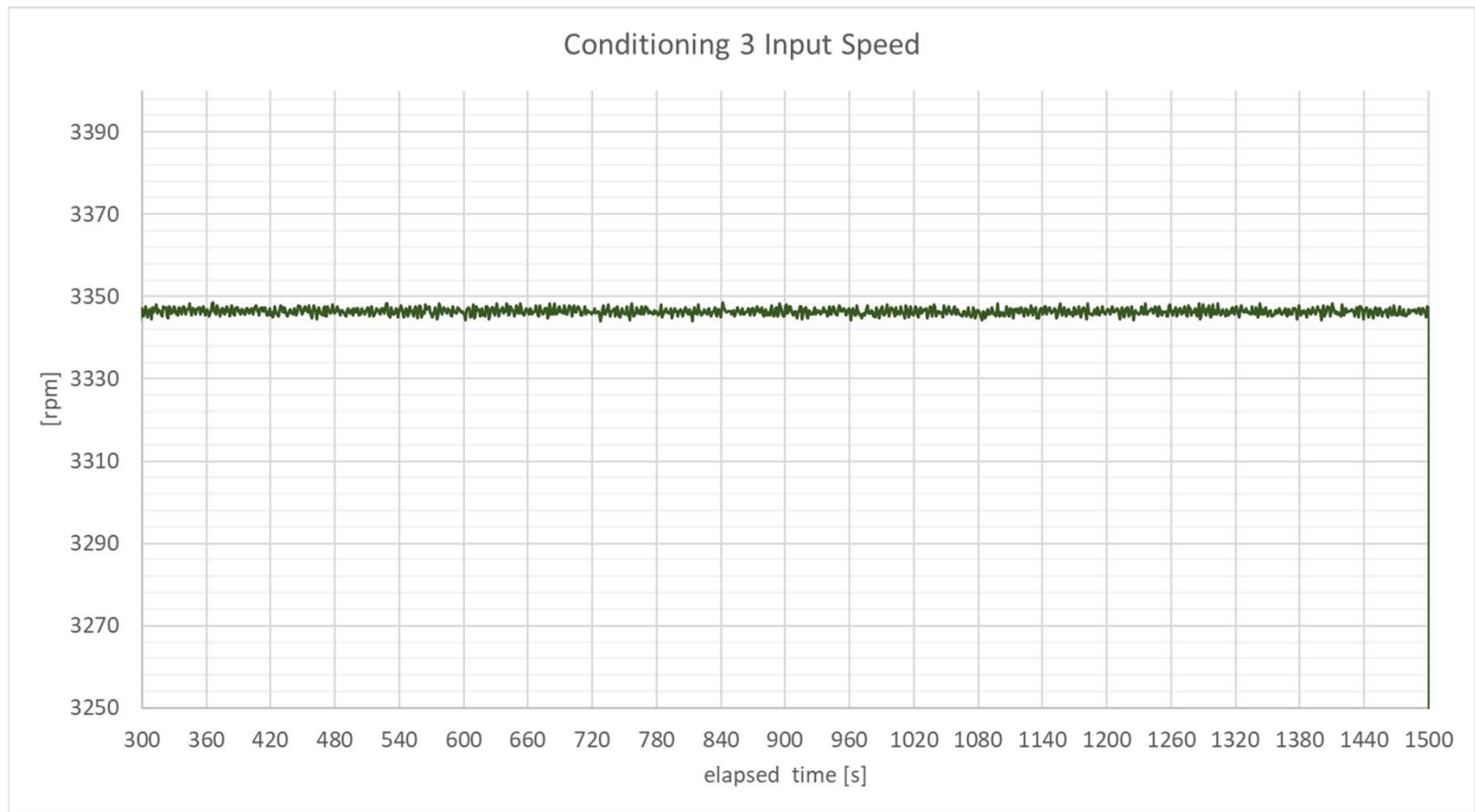


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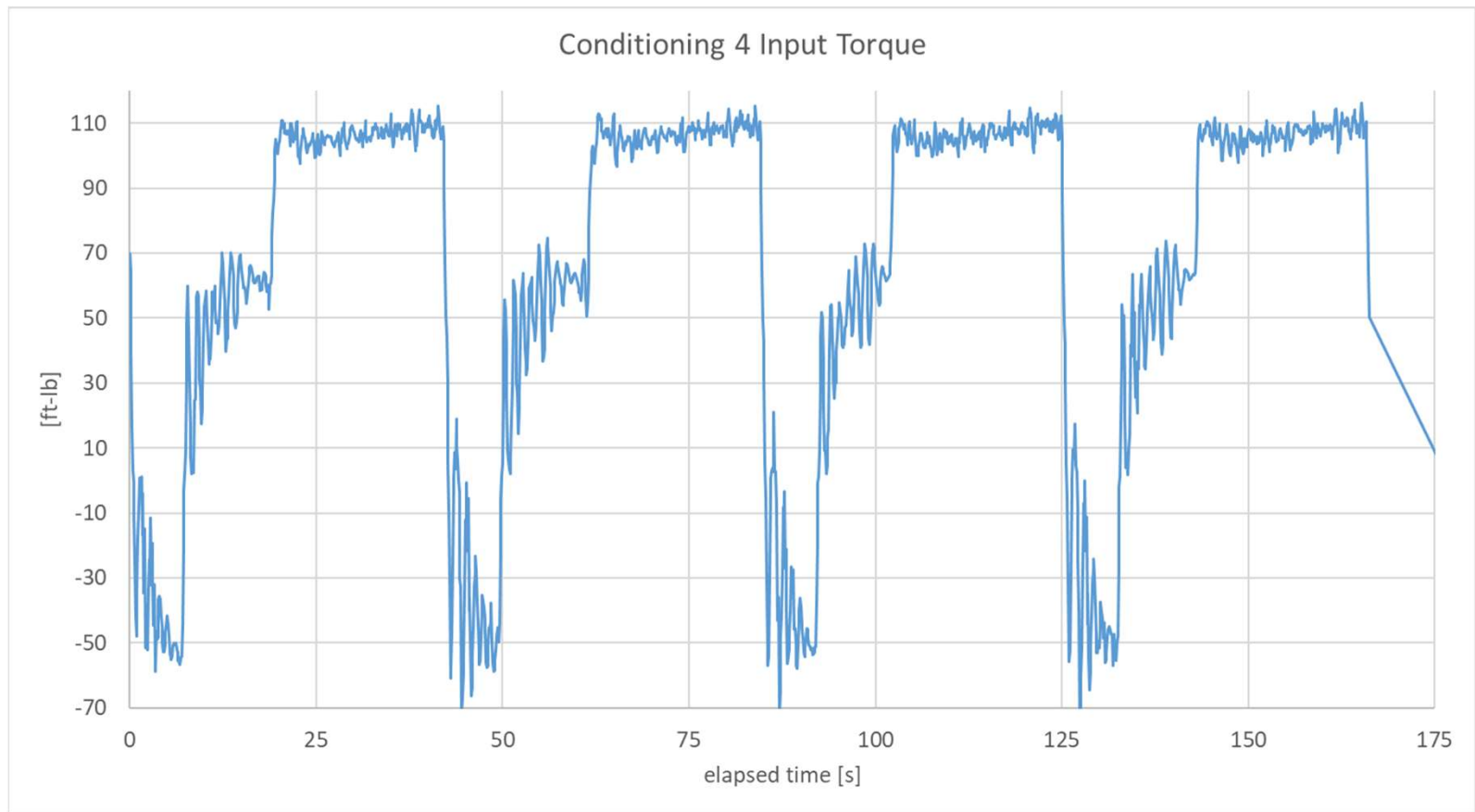




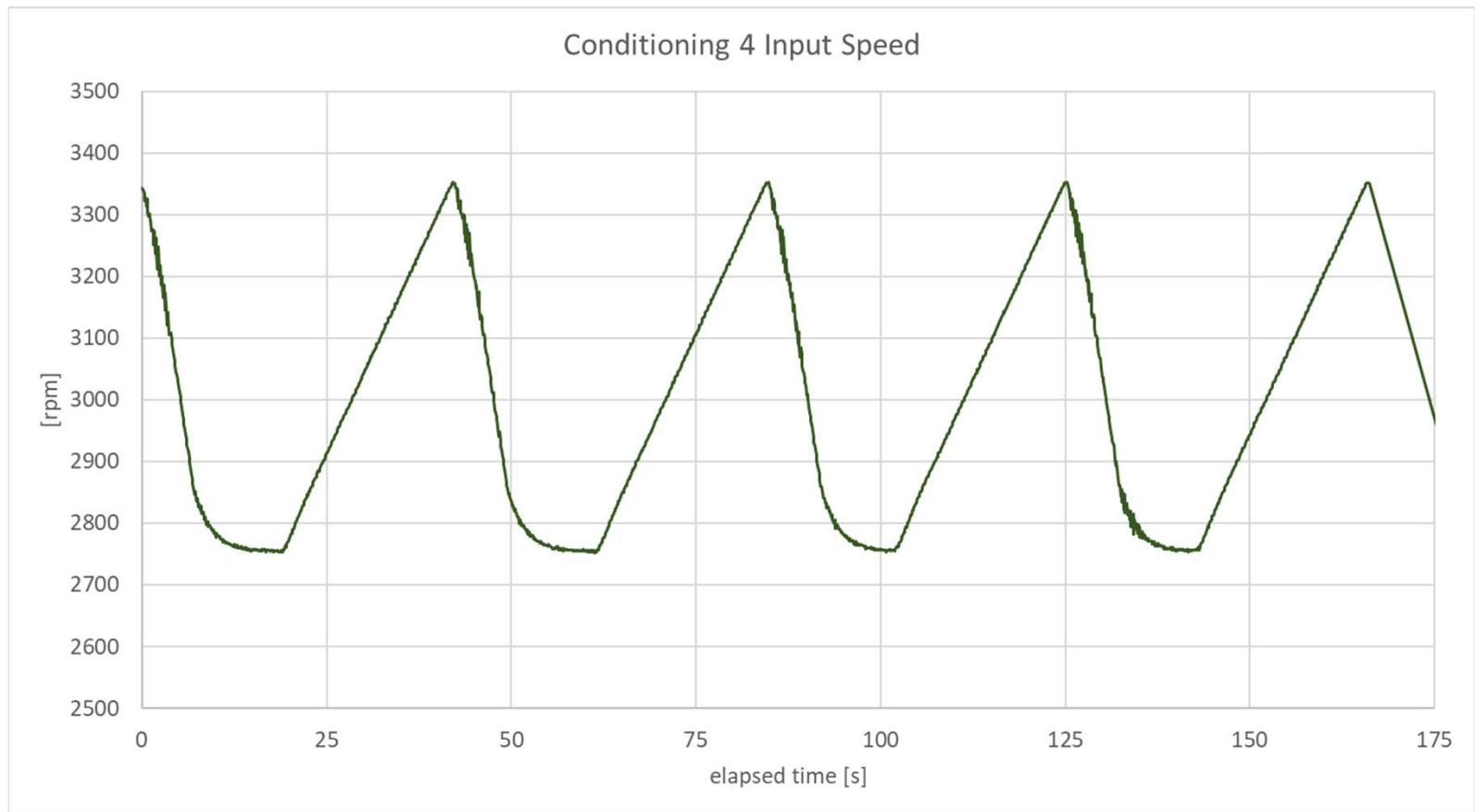
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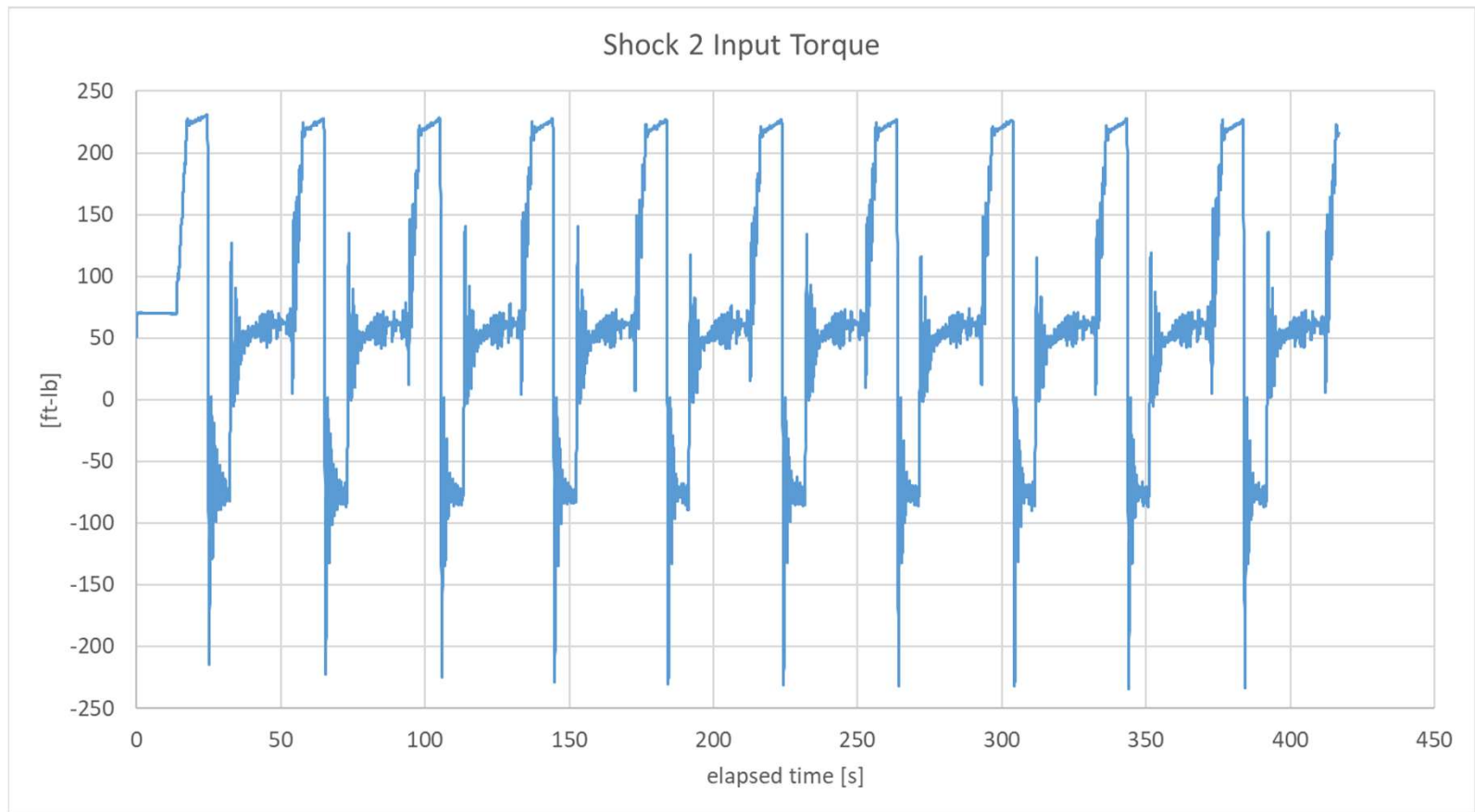
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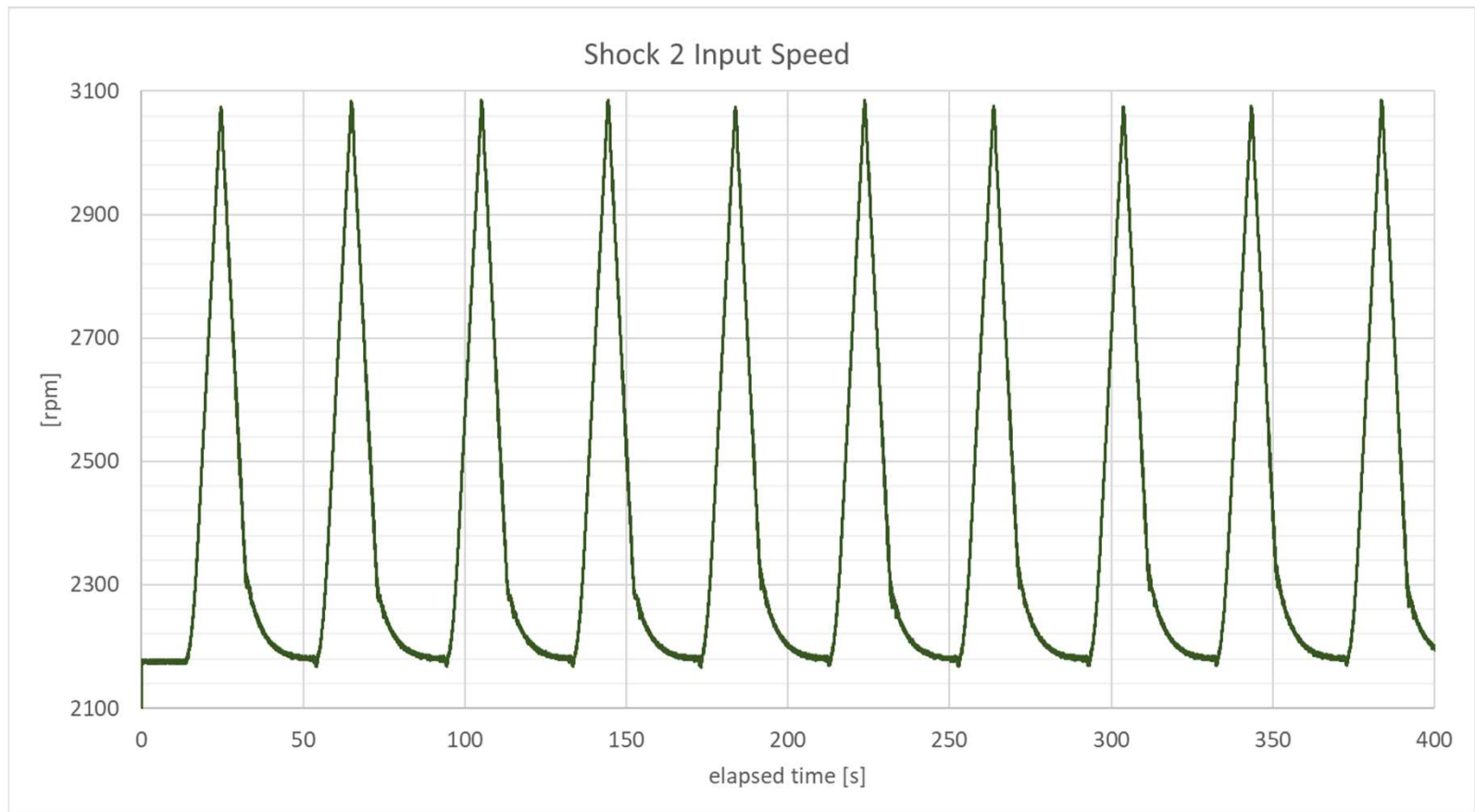
# Conditioning 4—01-0011



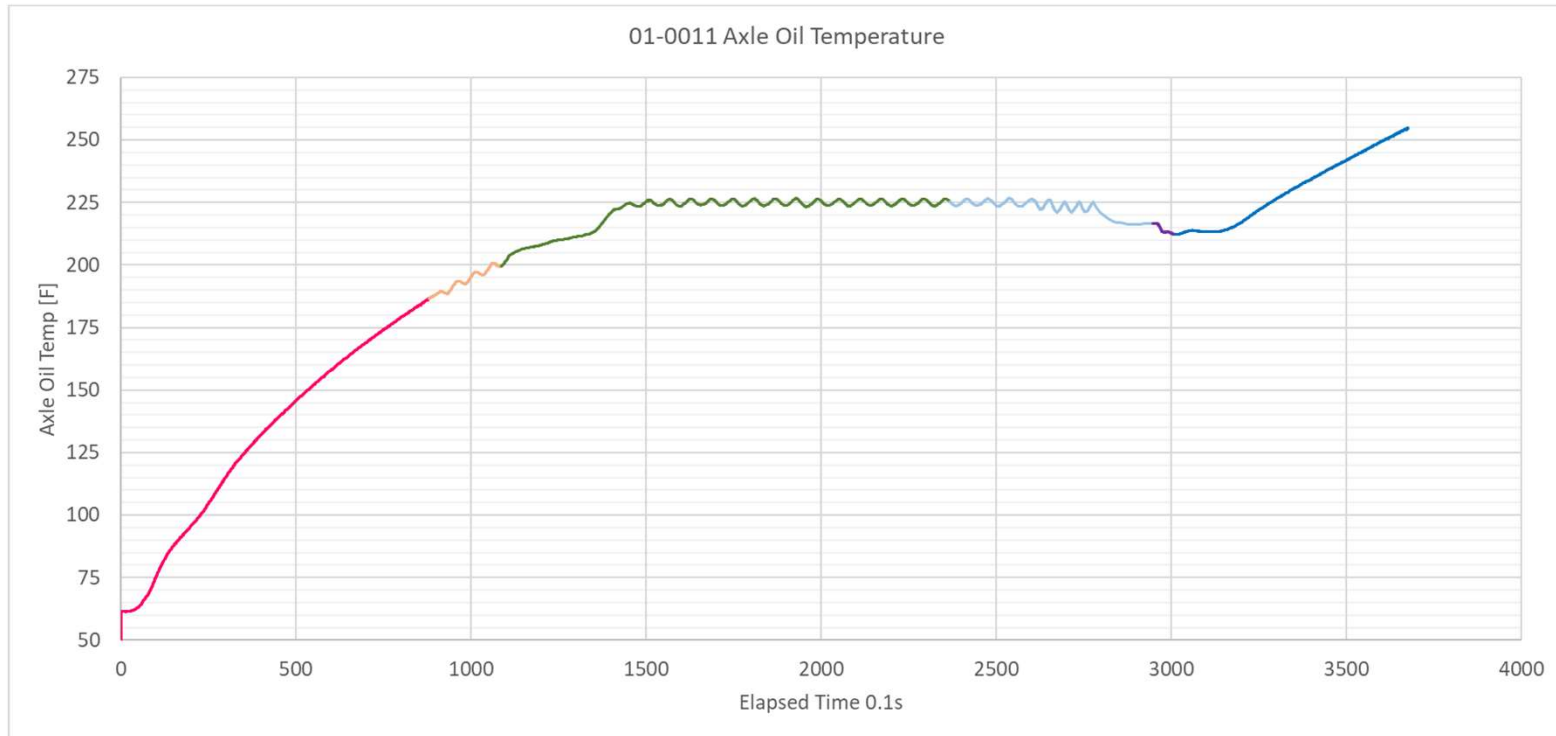
# Shock 2—01-0011



# Shock 2—01-00011



# Temperature Plot—01-0011



Phase	Min Temp	Max Temp
Shock 1	n/a	n/a
Shock 2	215.9	255.1

# Test Number 01-0012, TMC 117 (High Reference Oil)



# Stats—01-0012

Conditioning 1			
Input Torque [ft-lb]		Input Speed [rpm]	
Target	60 ± 5	Target	2363
Avg	59.7	Avg	2361
Min	58.2	Min	2357
Max	61.6	Max	2364

Conditioning 3			
Input Torque [ft-lb]		Input Speed [rpm]	
Target	70 ± 5	Target	3350
Avg	69.9	Avg	3346
Min	68.2	Min	3344
Max	70.8	Max	3349

Conditioning 2							
Peak Input Torque Drive [ft-lb]		Peak Input Torque Coast [ft-lb]		Maximum Input Speed [rpm]		Minimum Input Speed [rpm]	
Target		Target		Target	2363	Target	1562
Avg	113.3	Avg	-58.6	Avg	2366	Avg	1581
Min	113.1	Min	-60.1	Min	2365	Min	1581
Max	113.5	Max	-57.4	Max	2367	Max	1582

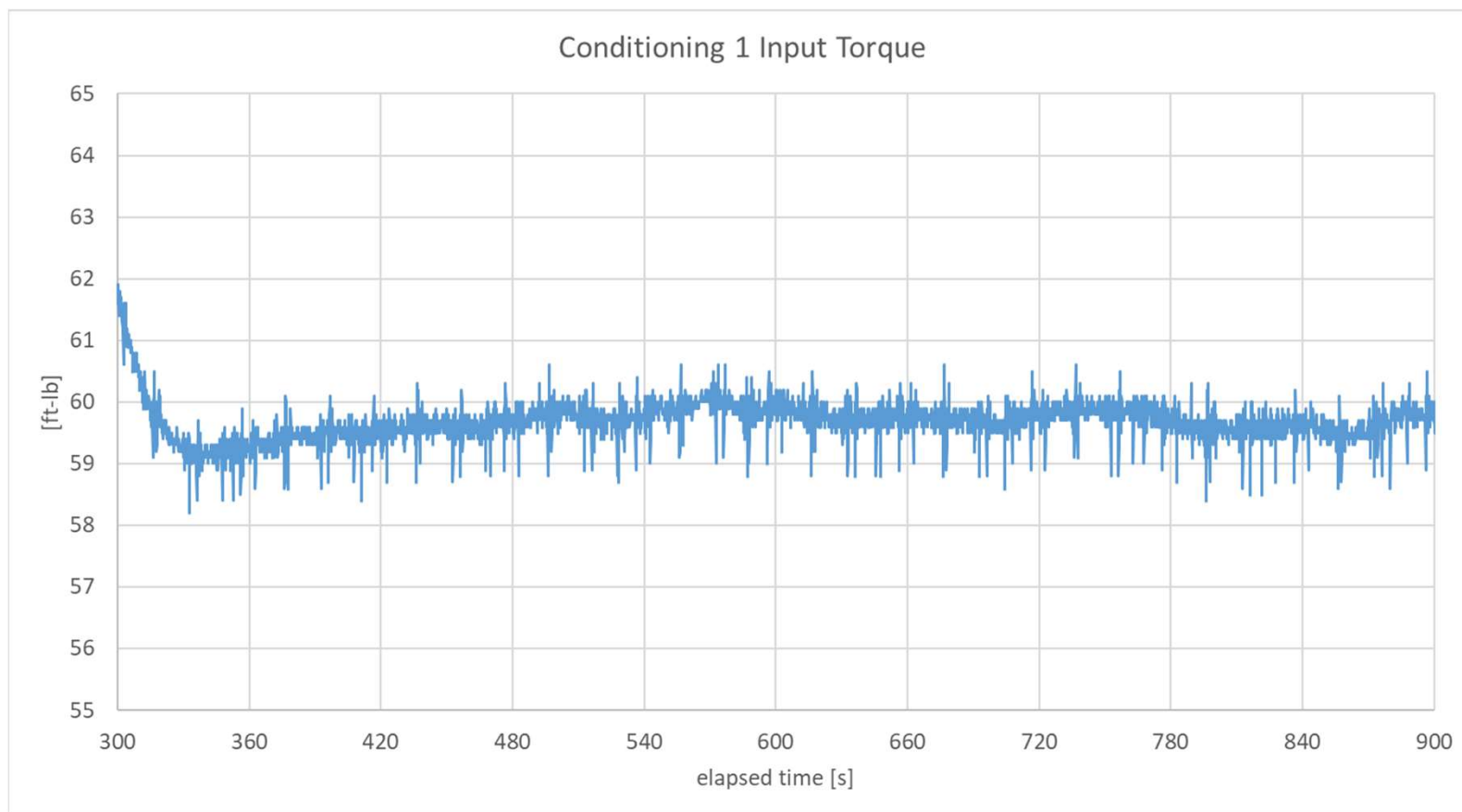
Conditioning 4							
Peak Input Torque Drive [ft-lb]		Peak Input Torque Coast [ft-lb]		Maximum Input Speed [rpm]		Minimum Input Speed [rpm]	
Target		Target		Target	3350	Target	2754
Avg	114.5	Avg	-66.2	Avg	3352	Avg	2751
Min	113.8	Min	-70.7	Min	3348	Min	2751
Max	115.3	Max	-59.5	Max	3355	Max	2752

Shock 2							
Peak Input Torque Drive [ft-lb]		Peak Input Torque Coast [ft-lb]		Maximum Input Speed [rpm]		Minimum Input Speed [rpm]	
Target		Target		Target	3083	Target	2178
Avg	228.9	Avg	-227.6	Avg	3075	Avg	2168
Min	227.1	Min	-229.9	Min	3074	Min	2165
Max	232.5	Max	-222.7	Max	3075	Max	2169

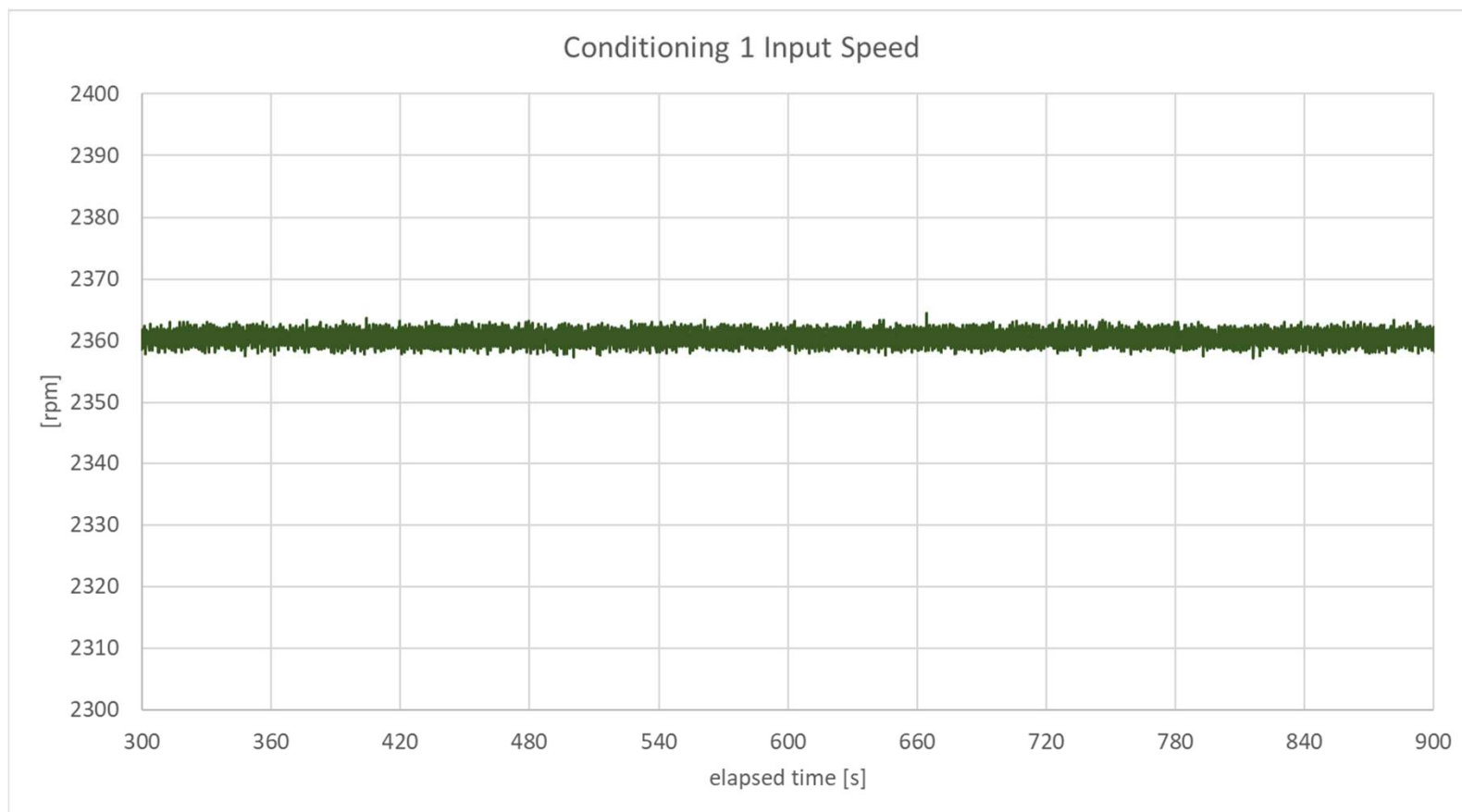




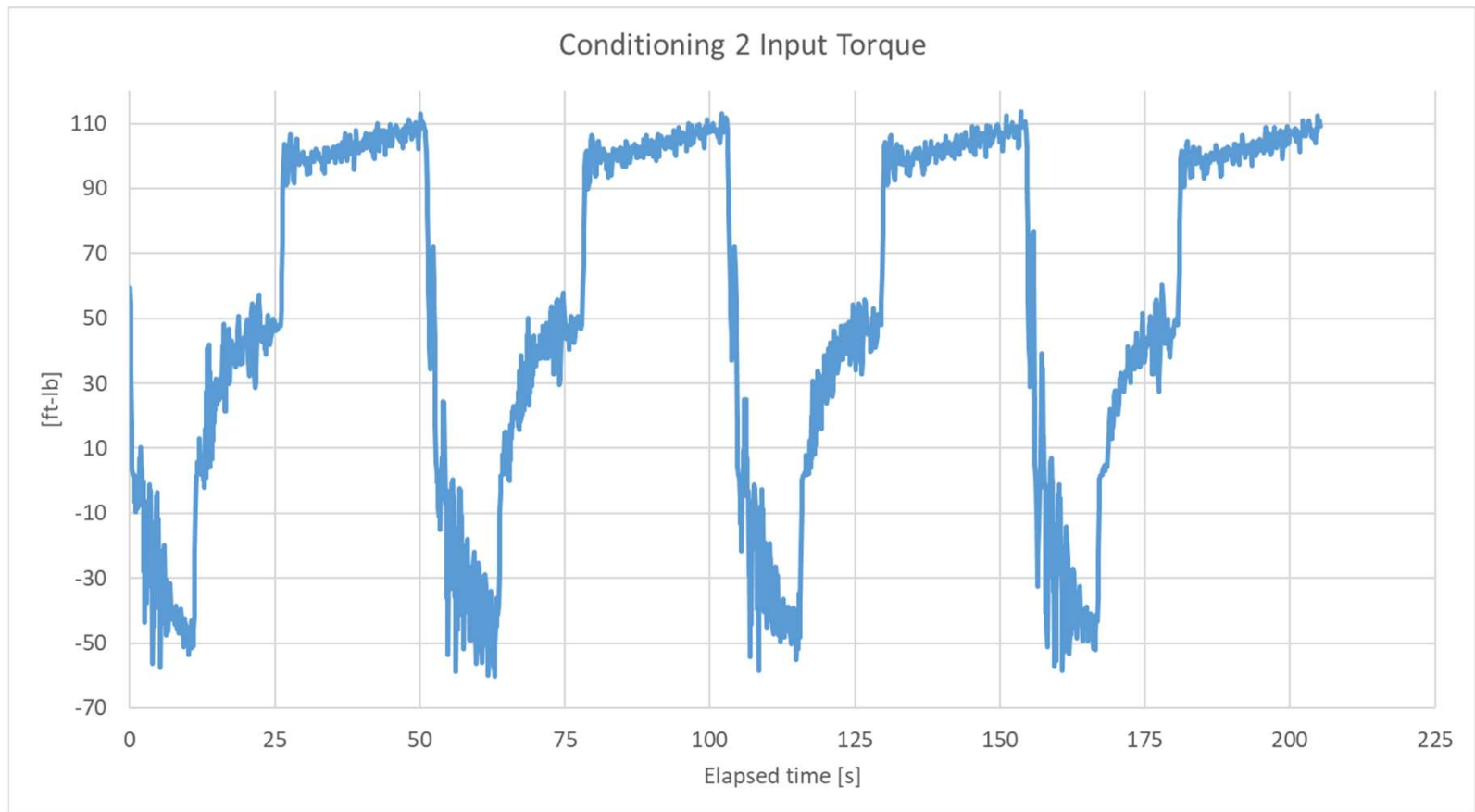
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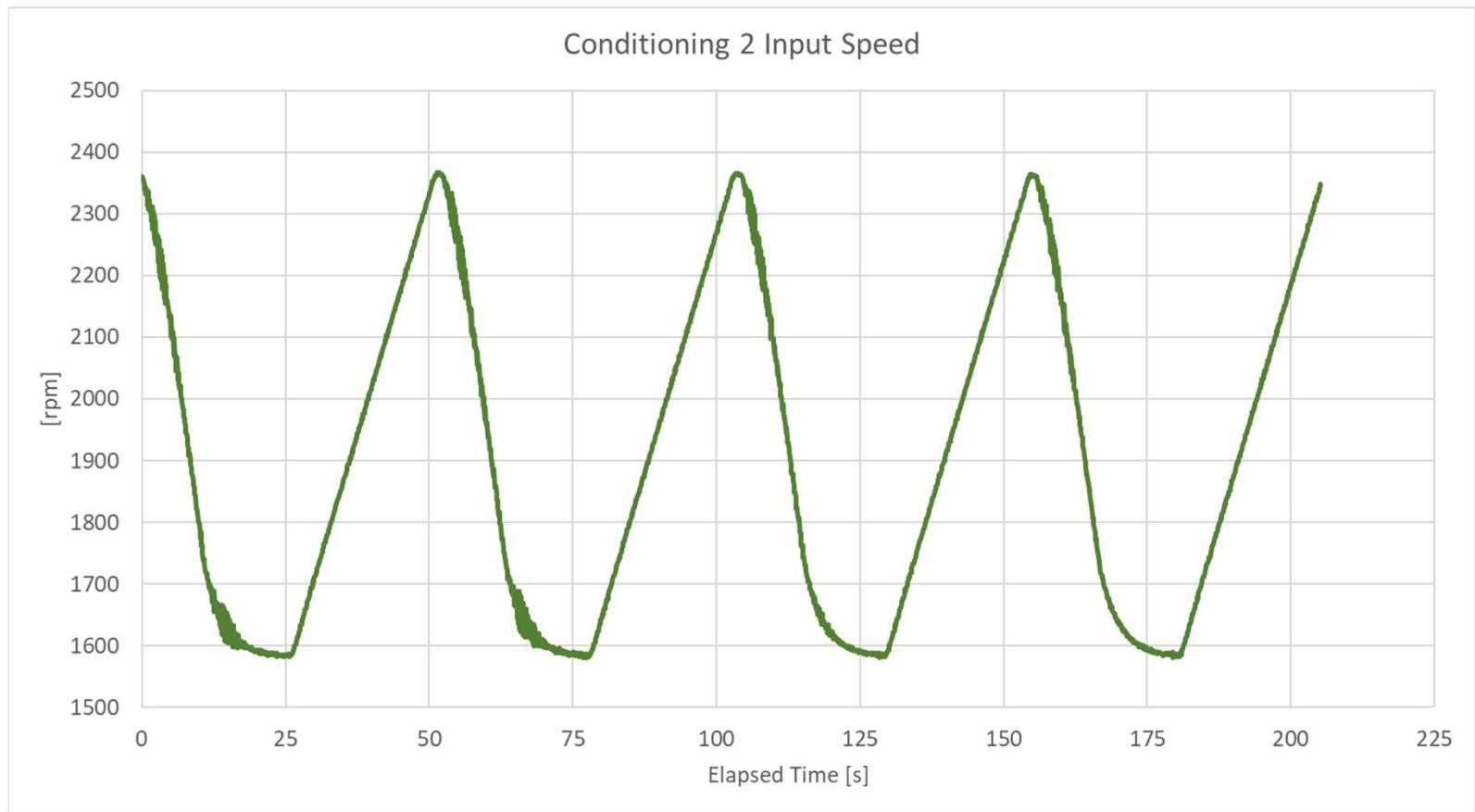
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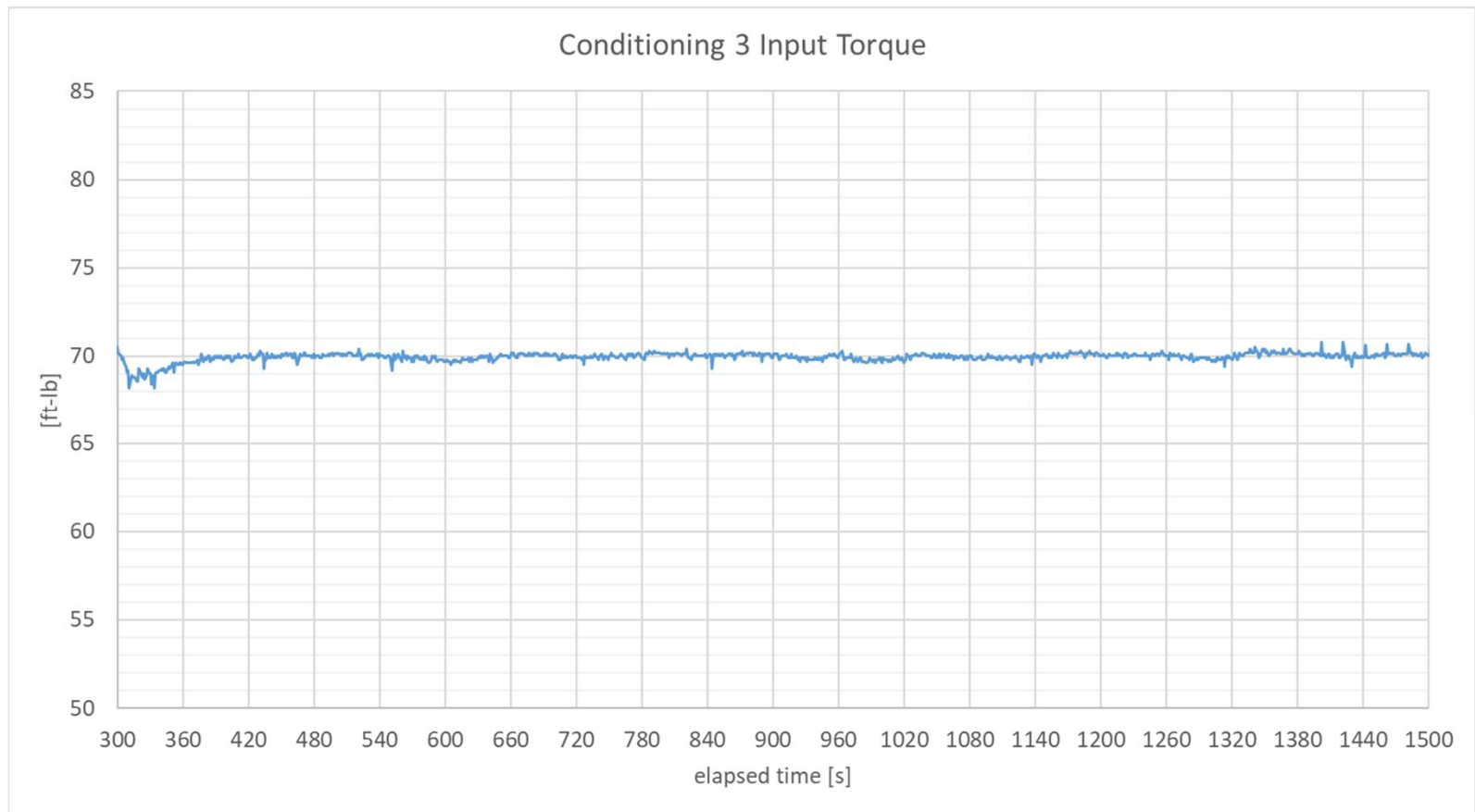
# Conditioning 2—01-0012



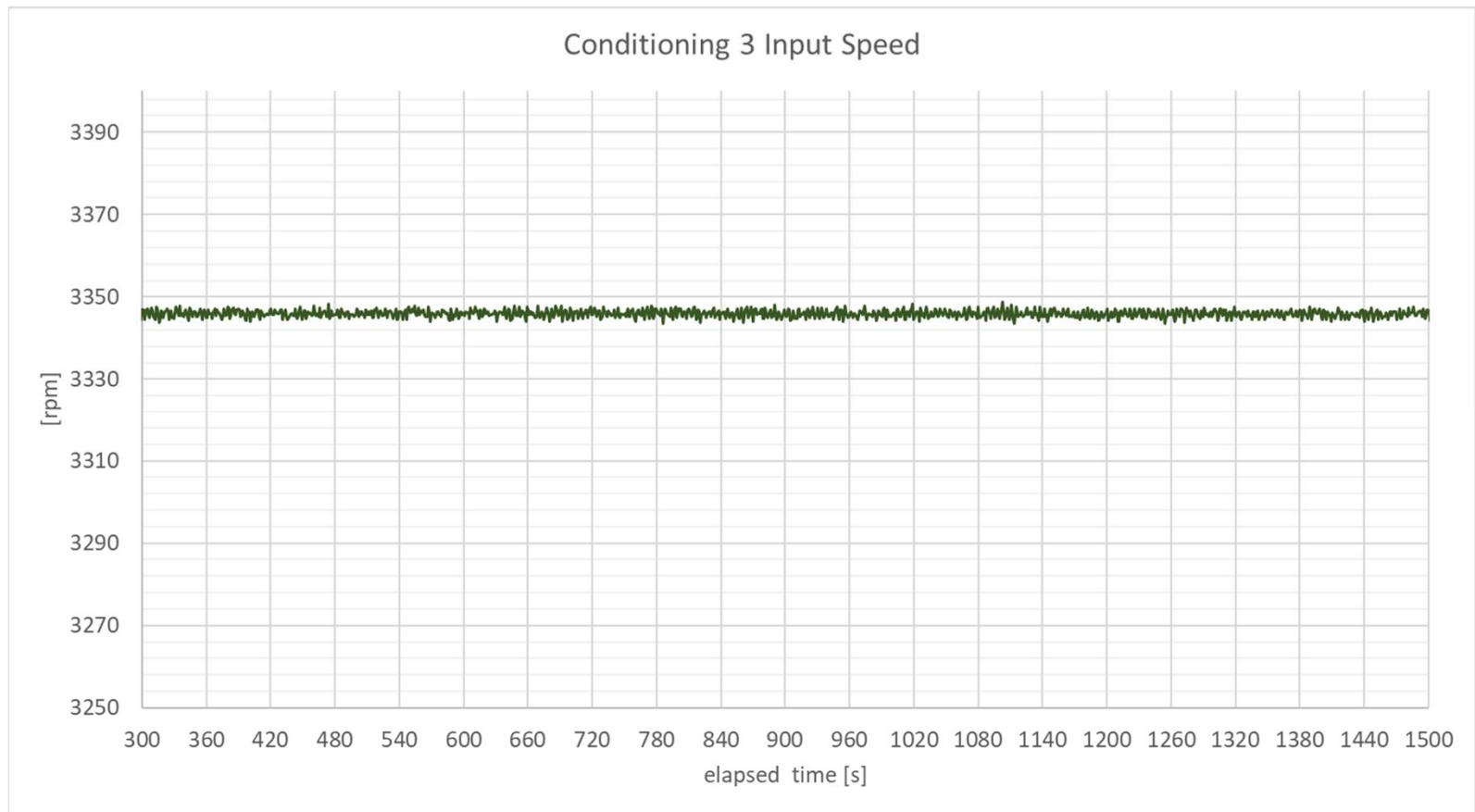
# Conditioning 2—01-0012



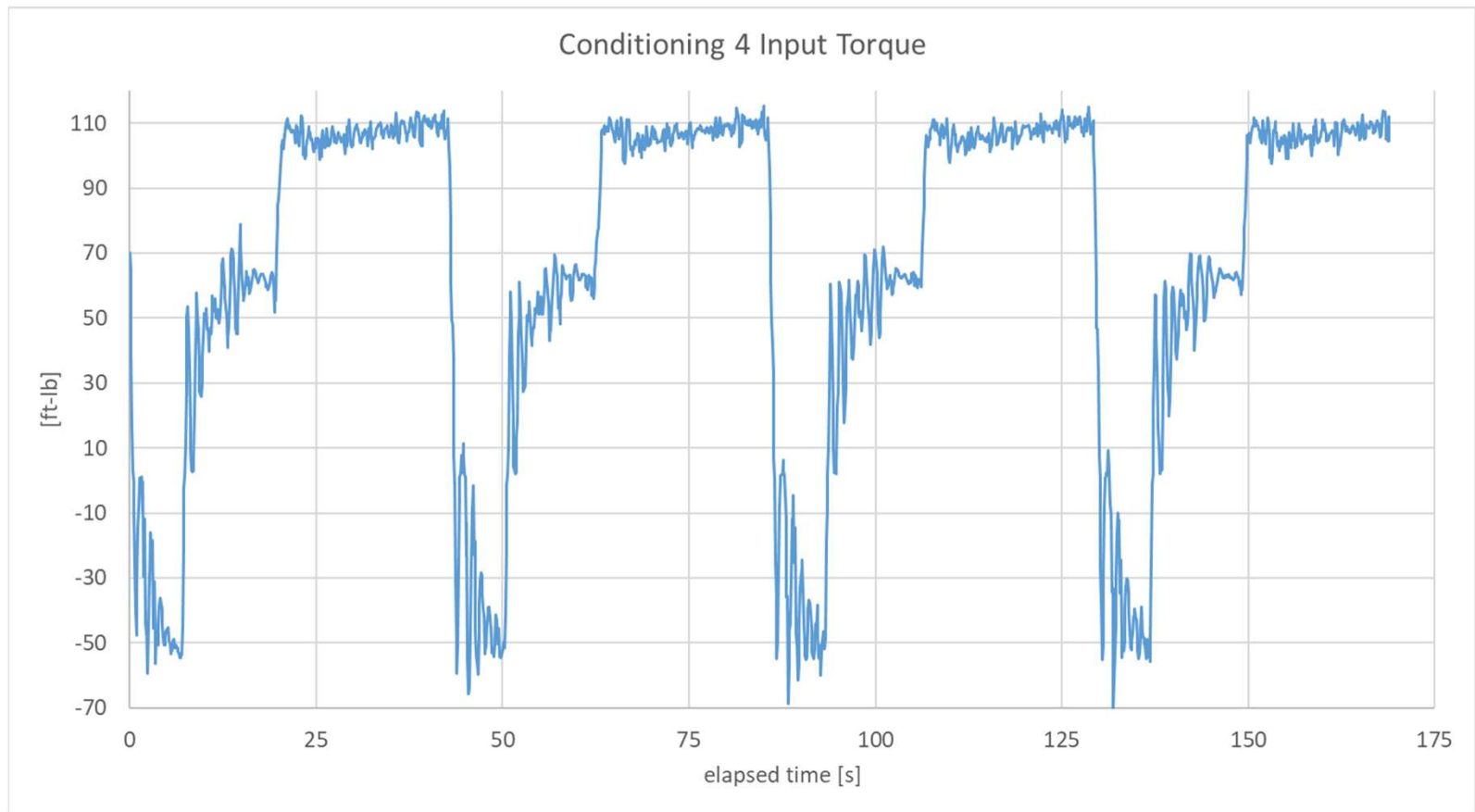
# Conditioning 3—01-0012



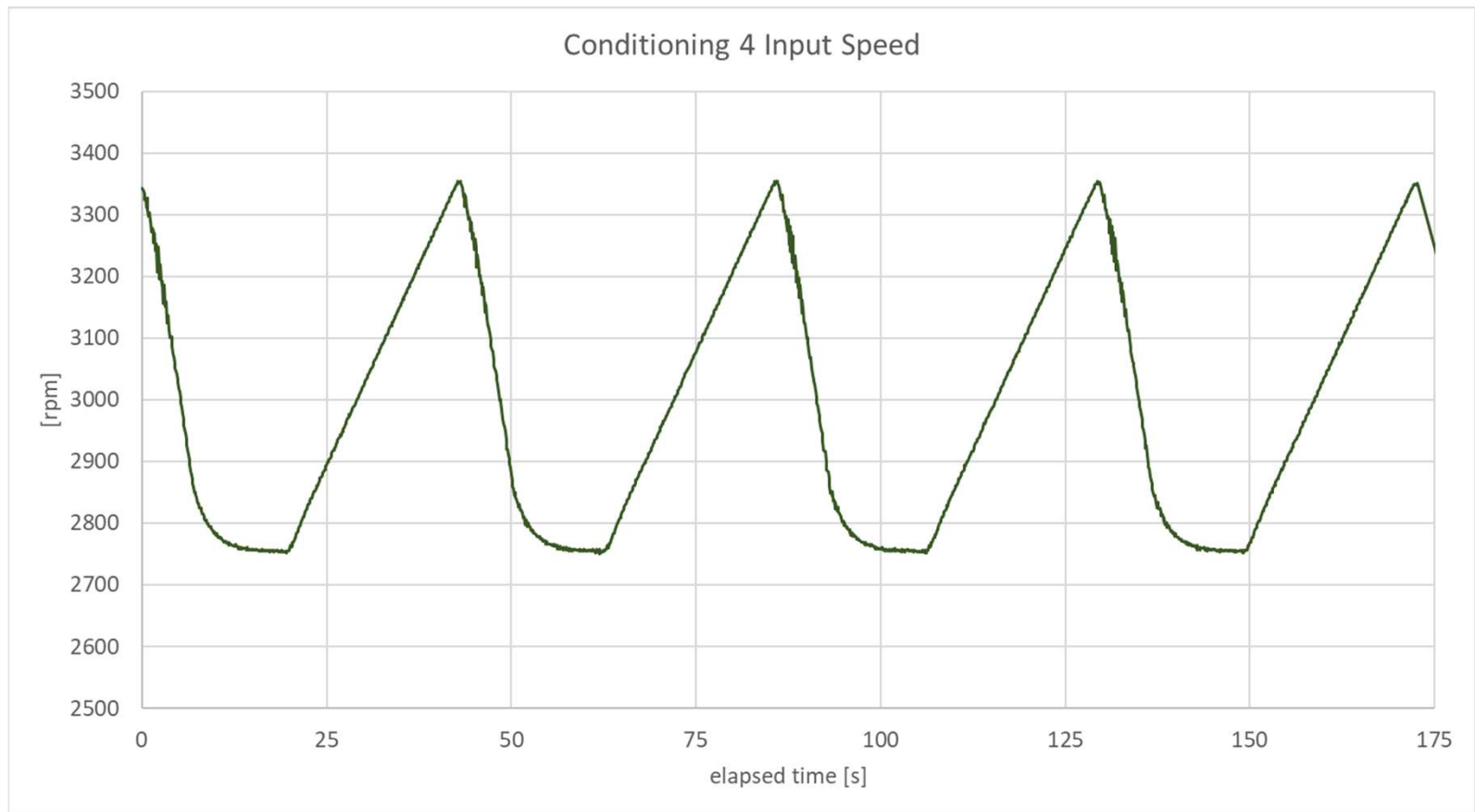
# Conditioning 3—01-0012



# Conditioning 4—01-0012

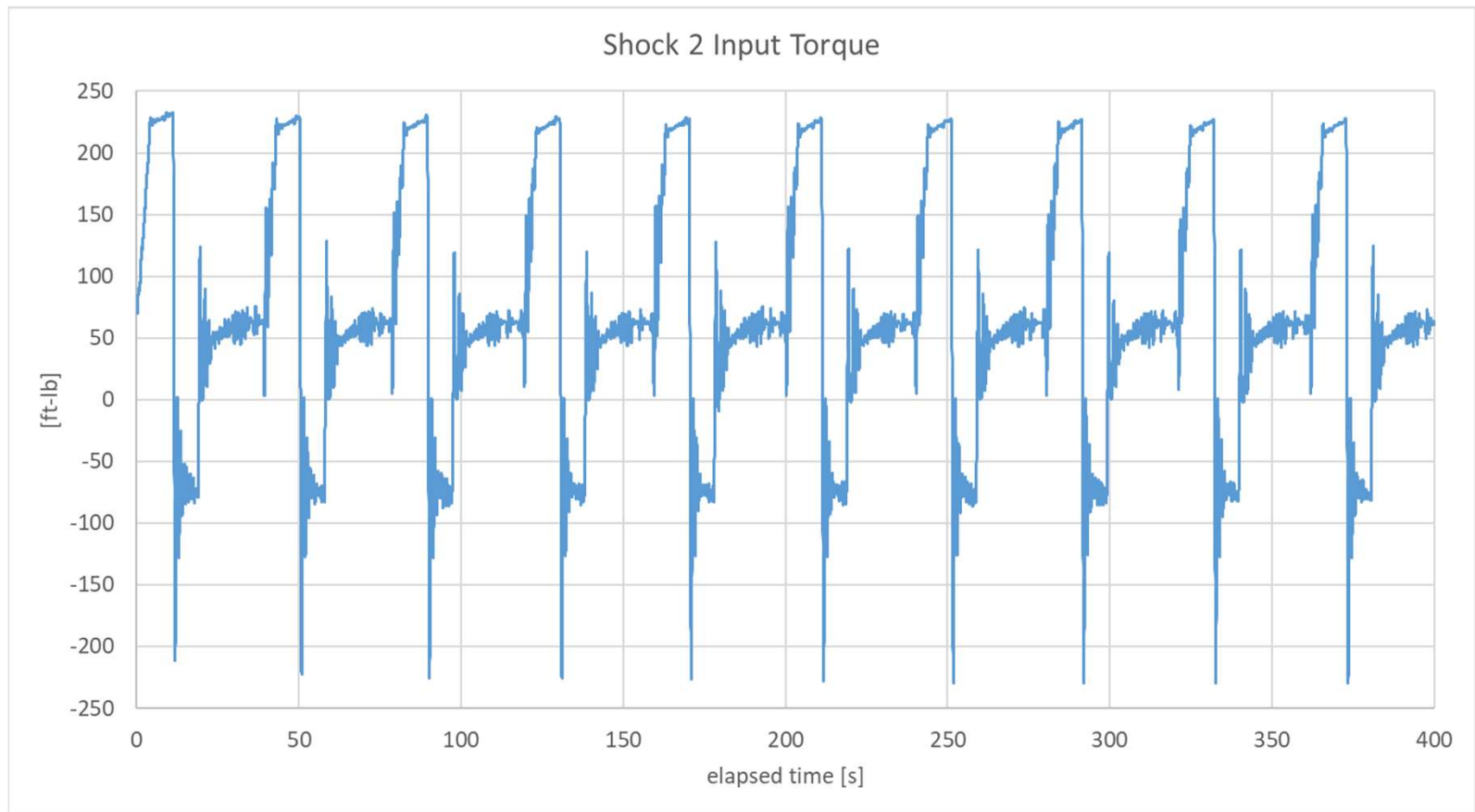


# Conditioning 4—01-0012

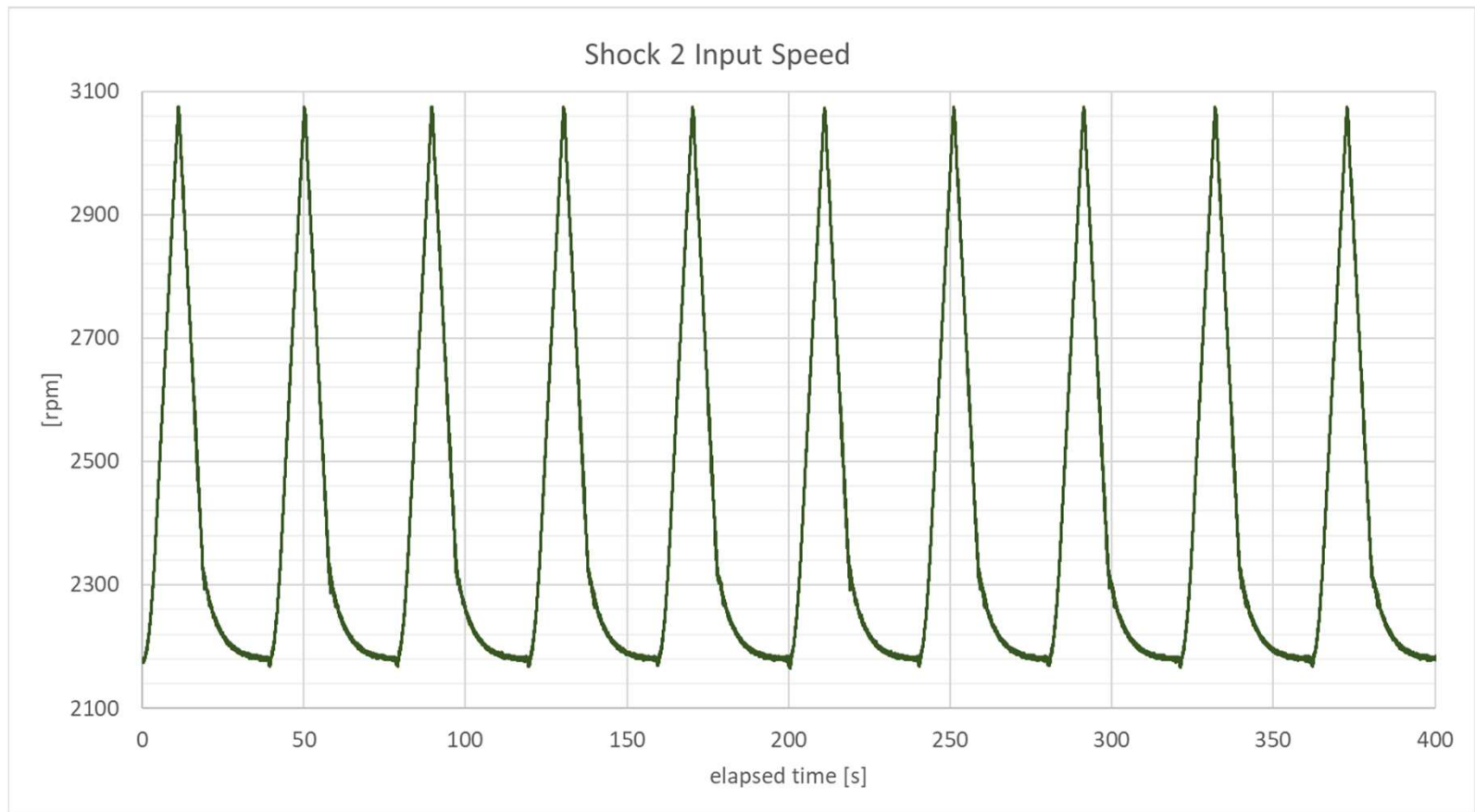




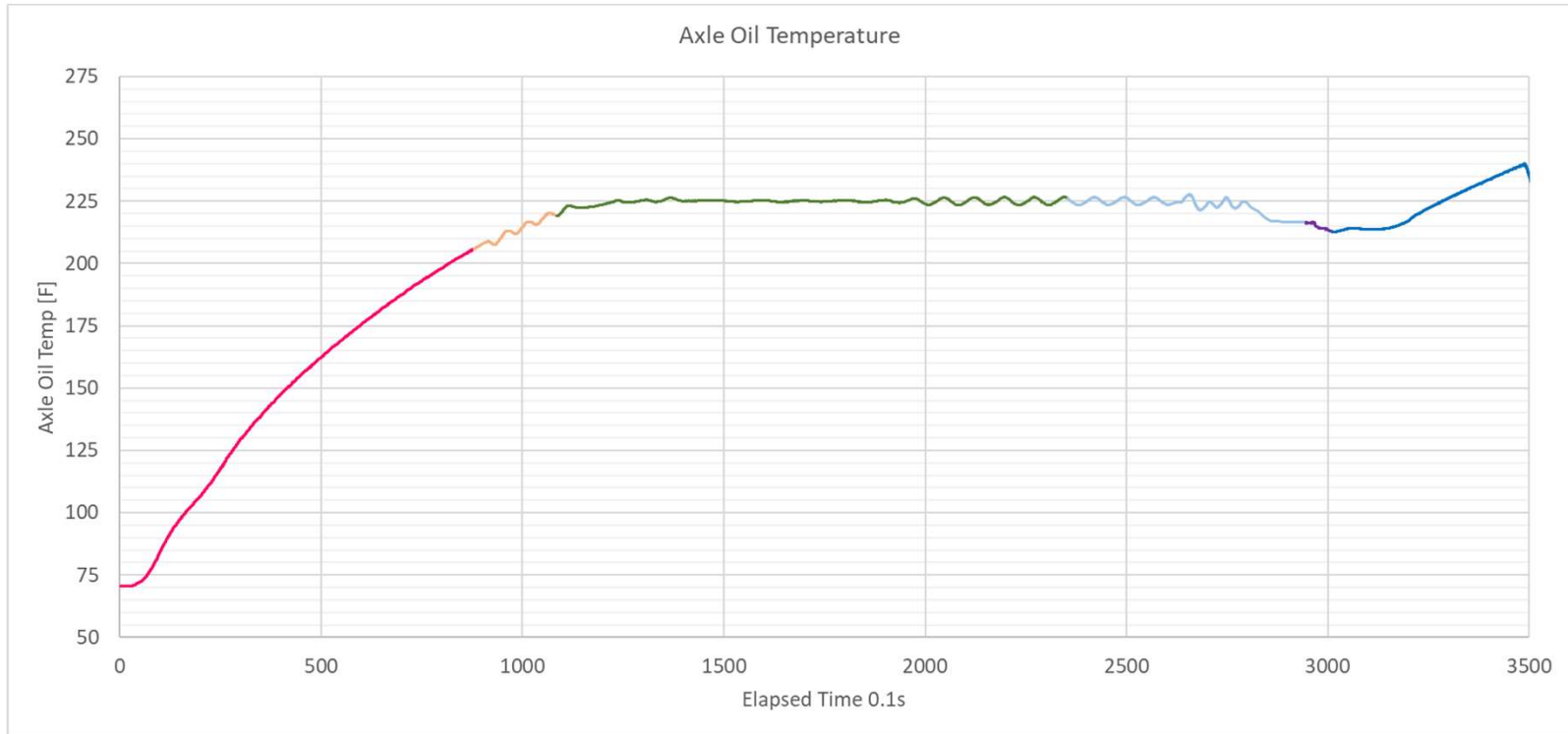
# Shock 2—01-0012



# Shock 2—01-0012



# Temperature Plot—01-0012



Phase	Min Temp	Max Temp
Shock 1	n/a	n/a
Shock 2	214.5	238.8

## 2023 Hardware Order

- ▲ **Three labs will purchase hardware in 2023**
- ▲ **\$3266 each (~35% increase from 2020)**
- ▲ **650 total axles ordered**
- ▲ **8-month lead time from receipt of POs**
- ▲ **Dana will be using a different steel supplier and a different forge facility**
  - ▲ Dana has worked with both suppliers in the past, just not with L-42 hardware
  - ▲ Same team within Dana will be managing order

# New Issues



Thanks!



*Passion for Solutions™*

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