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Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

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November 16th, 2021

Reply to:
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Richmond, VA 23219
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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, 2021 L-42 Surveillance Panel Meeting (Southwest Research Institute, Ann Arbor, 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

SwRI, Ann Arbor, MI and Virtual Meeting – Microsoft Teams

November 9, 2021

Attendees: voting members in **bold**

R. Banas (Exxon Mobil)

S. Bealko (LZ)

D. Beck (TMC)

D. Bell (Afton)

J. Carter (Meritor)

A. Comfort (US Army)

A. Goyal (BASF)

T. Haynes (IPAC)

P. Kanga (Retired)

T. Kostan (SwRI)

J. LaBond (Meritor)

A. Lange (Intertek)

J. Martinez

D. Moser (BASF)

C. Mueller (SwRI)

T. Muransky (AAM)

S. Neil (Detroit Diesel)

M. Sangpeal (Afton/C)

R. Slocum (LZ)

D. Uy (Shell)

W. Venhoff (LZ)

R. Warden (SwRI)

A. Zyski (Dana)

Call to Order

Review of Agenda

The meeting agenda is attached.

Review of Membership

No changes were necessary.

Approval of Meeting Minutes

Meeting minutes for approval:

- ▲ “20210811_SP” → August 11, 2021 – Virtual Surveillance Panel Meeting – Microsoft Teams

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

Motion: M. Sangpeal

Second: W. Venhoff

All in favor, no objections, no abstentions.

L-42-1 Development

C. Mueller presented on SwRI’s progress on electric L-42-1 test development. They have reached a point where they would like to run a new axle to determine scoring performance. Details can be found in the attached presentation.

L-42-1 Hardware Donation

Afton and LZ will each donate 4 axles from batch **C1L446 / P8AD132** to SwRI to be used for L-42-1 test development.

New Hardware Order (2022)

One lab is ready to place an order for a new batch of L-42 hardware from Dana. No other labs need hardware currently. M. Sangpeal will provide contact information for the Dana sales representative to the lab in need. It was stated that a large batch spread amongst the industry is the preferred method of purchasing test hardware. That is not possible in this case as only one lab needs hardware in the next two to three years.

Next time a large industry-wide batch order is placed, extra axles will likely be purchased by each lab for use in L-42-1 test development. Quantities will be determined later.

L-42 Hardware Print Review

Test hardware specifications were discussed. A. Zyski stated that Dana is not comfortable releasing hardware specs or tolerance ranges. The surveillance panel is free to define manufacturing tolerances for future orders. End users of the test hardware are free to measure any dimension or material property they choose. A. Zyski will research what data Dana has on file from previous orders that can be shared. This information could help define specs for future orders.

New/Open Issues

A question was raised about possibly rebuilding axle housings with loose ring/pinions and new bearings. R. Warden stated that a decision was previously made to avoid rebuilding axles until the electrified L-42-1 test is in use. Changing build procedures would introduce too many variables at this time.

Adjournment

A motion was made to adjourn.

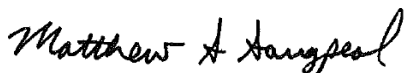
Motion: R. Warden

Second: A. Lange

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

SwRI and Microsoft Teams Virtual Meeting

Ann Arbor, MI

November 9, 2021

2:30 pm – 3:00 pm EST

Passion for Solutions™

Agenda

- ▲ **Call to Order**
- ▲ **Agenda**
- ▲ **Membership Review & Update**
- ▲ **Approval of Meeting Minutes**
 - ▲ 20210811 Virtual SP Meeting
- ▲ **L-42-1 Development Updates**
 - ▲ Update from SwRI
- ▲ **L-42-1 Development Hardware Donation**
- ▲ **New Hardware Order in 2022**
- ▲ **L-42 Hardware Print Review**
- ▲ **New Issues**
- ▲ **Adjournment**

L-42 SP Voting Members

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

Approval of Meeting Minutes

SP Meeting Minutes

- ▲ “20210811_SP” → August 11, 2021 – Virtual Surveillance Panel Meeting – Microsoft Teams

L-42-1 Development Updates: SwRI

L-42-1 Development Hardware Donation

Current batch at 2 of the 4 labs is C1L446 / P8AD132

- ▲ Afton has recently ordered a new batch, but has retained some of this batch

Development should ideally be done all on same batch

SwRI is ready to accept donated hardware

- ▲ How many axles does SwRI anticipate they will need?

How many can each lab provide to the cause?

2022? Hardware Order

- ▲ 1 lab has ~1 year of axles left in stock
- ▲ When do other labs anticipate they will need more axles?
- ▲ Could be long lead time from Dana

L-42 Hardware Print Review

Dana to determine what can be shared

- ▲ Data from previous batches on file at Dana?

Specs possibly ok to share

- ▲ Material
- ▲ Hardness
- ▲ Case depth
- ▲ Specific assembly/manufacturing requirements

Should we continue to pursue / create specs for future orders?

New Issues



Thanks!



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Electric L-42 Development November 2021 Update

SOUTHWEST RESEARCH INSTITUTE®

Caroline Mueller
November 9th, 2021



FUELS & LUBRICANTS RESEARCH

Outline

1. Review of August updates
2. High-speed data comparison—L-42 and electric L-42
3. Repeatability studies
4. Inertia limitations for current setup

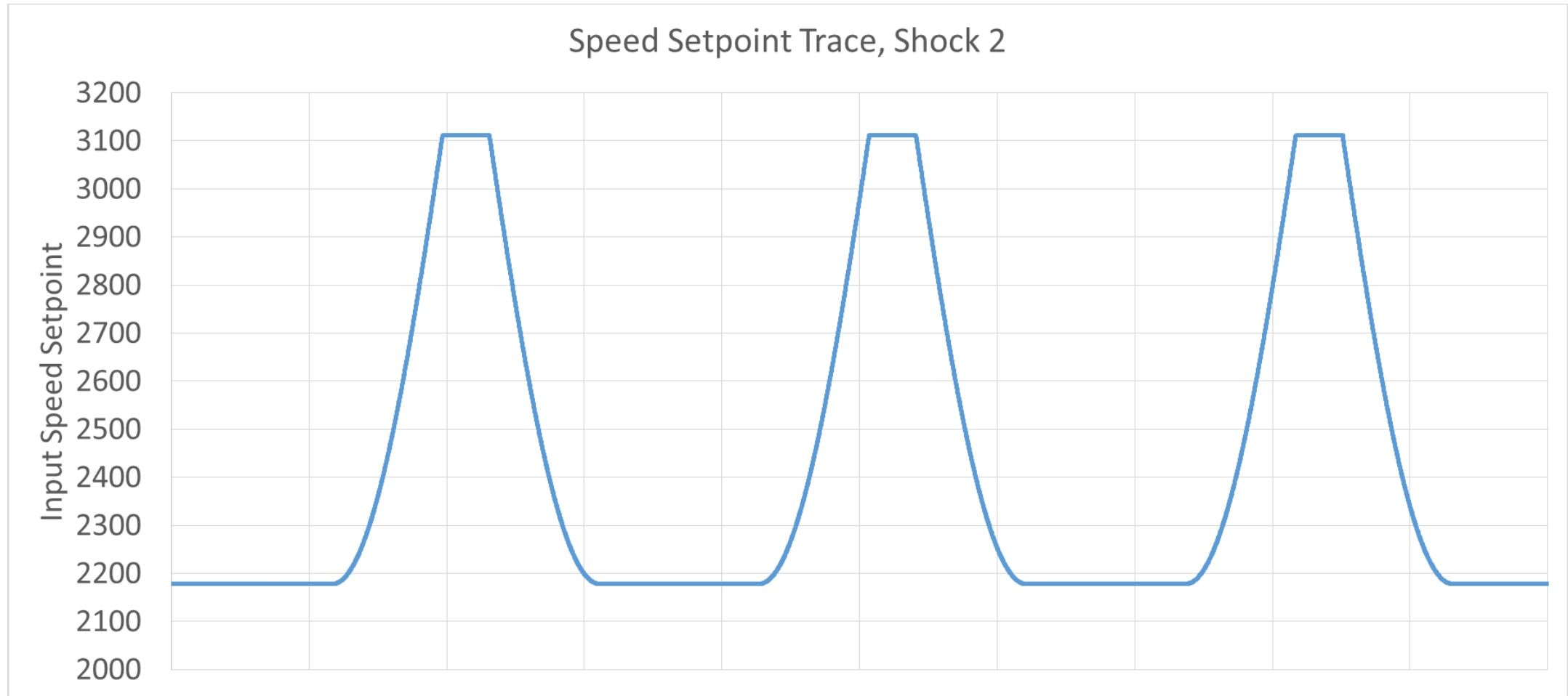


Review of Last Electric L-42 Update (08/2021)

- Motor upgrade to achieve higher input speed
- Addition of braking resistor to absorb power on decelerations
- Initial torque data for all portions of L-42 specification
 - Speed and input torque targets identical to L-42 spec
 - Issues with drive side shocking
 - Issues with achieving coast side shocking
 - Long cycle times to smooth acceleration in speed
- Suggestion to lock flex plates to increase shock severity

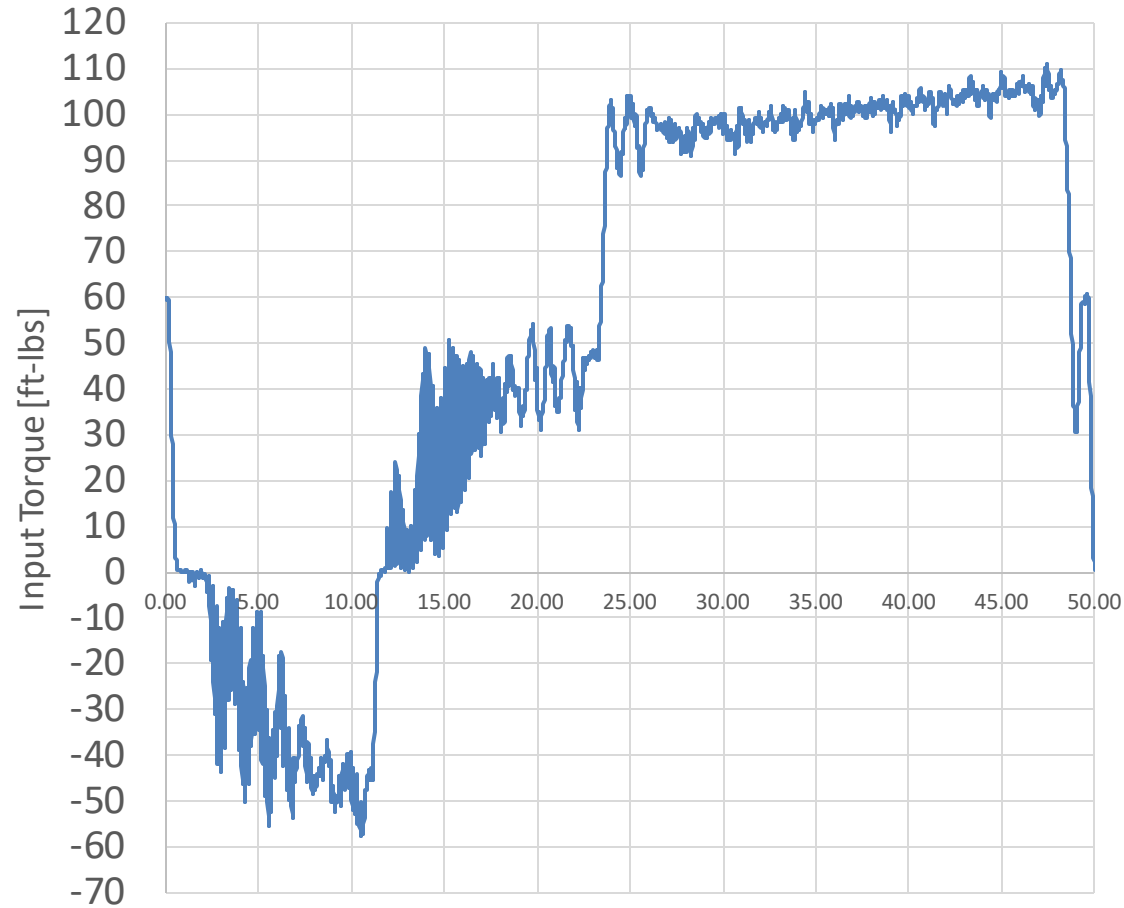
Speed Profile for Shocks

- Difficult to achieve coast side shocks without inducing severe drive side shocks

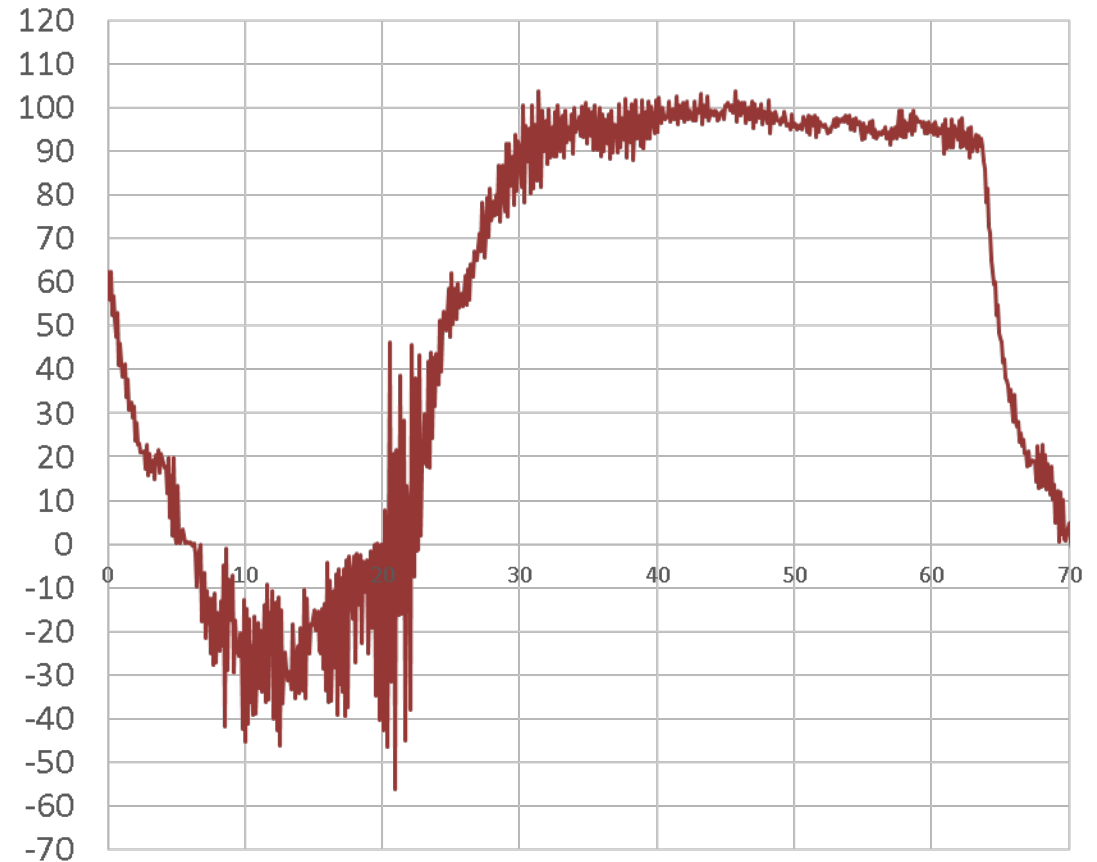


Conditioning 2, Electric vs. Engine Powered

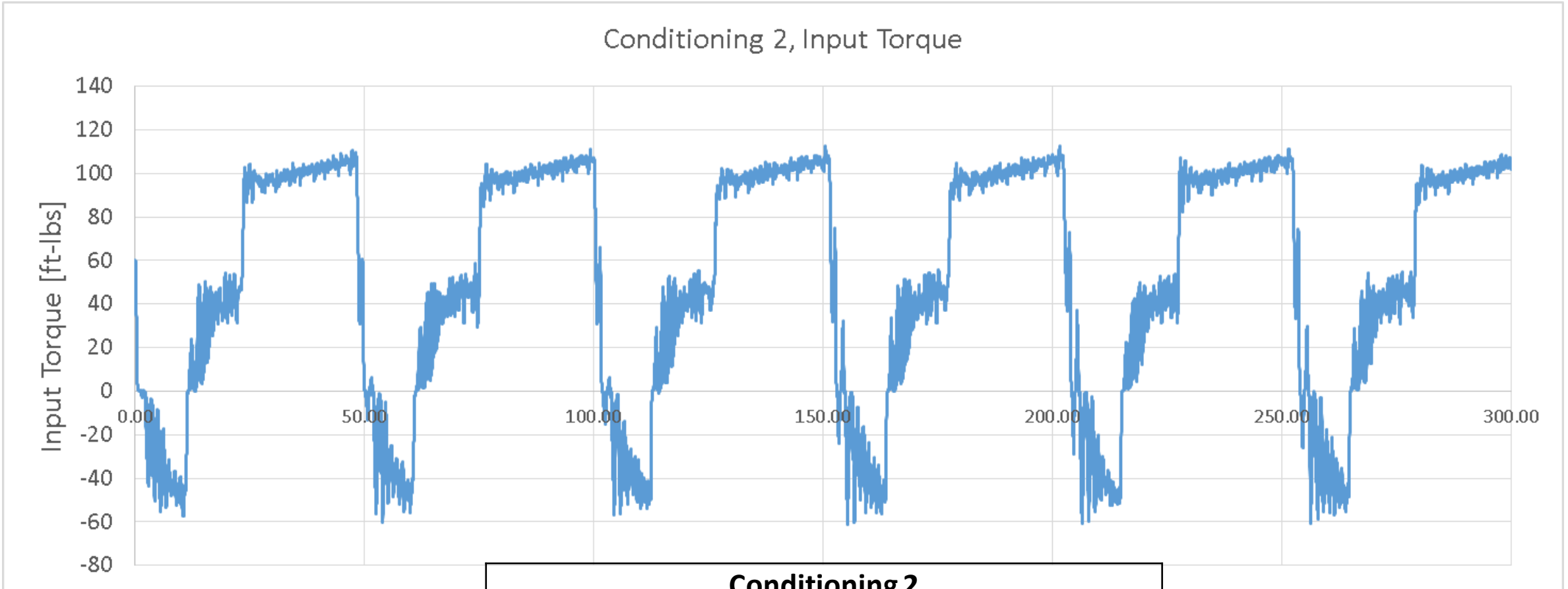
Conditioning 2, Input Torque



Input Torque Trace, Conditioning 2, Engine [lb-ft]



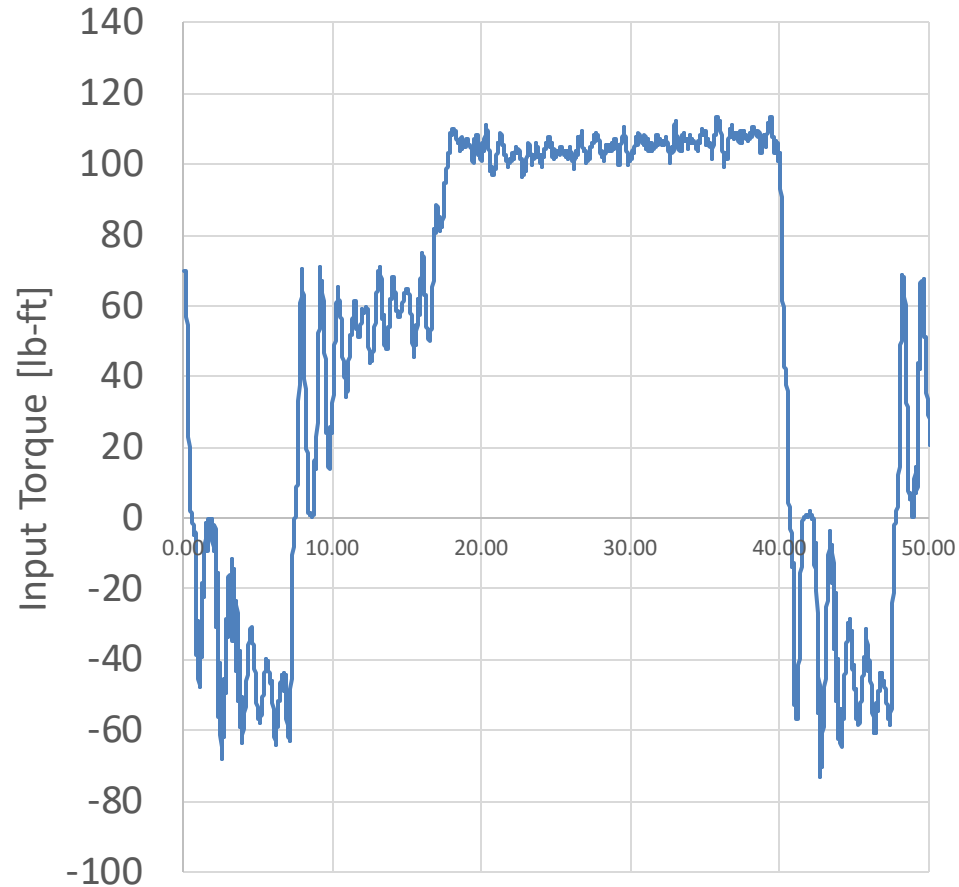
Conditioning 2 Repeatability



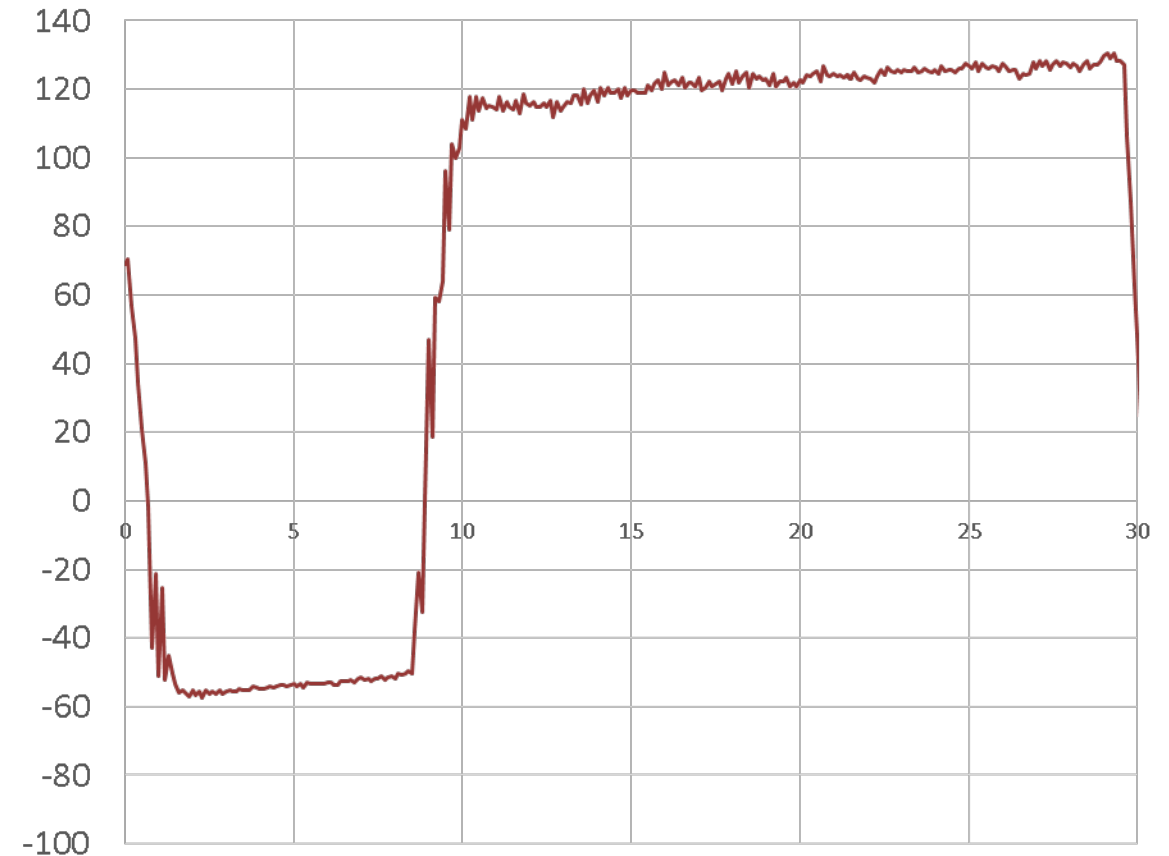
Conditioning 2		
	Coast Side	Drive Side
<i>min</i>	-65.4	109.4
<i>max</i>	-57	113.4
<i>average</i>	-61.8	111.4

Conditioning 4, Electric vs. Engine-Powered

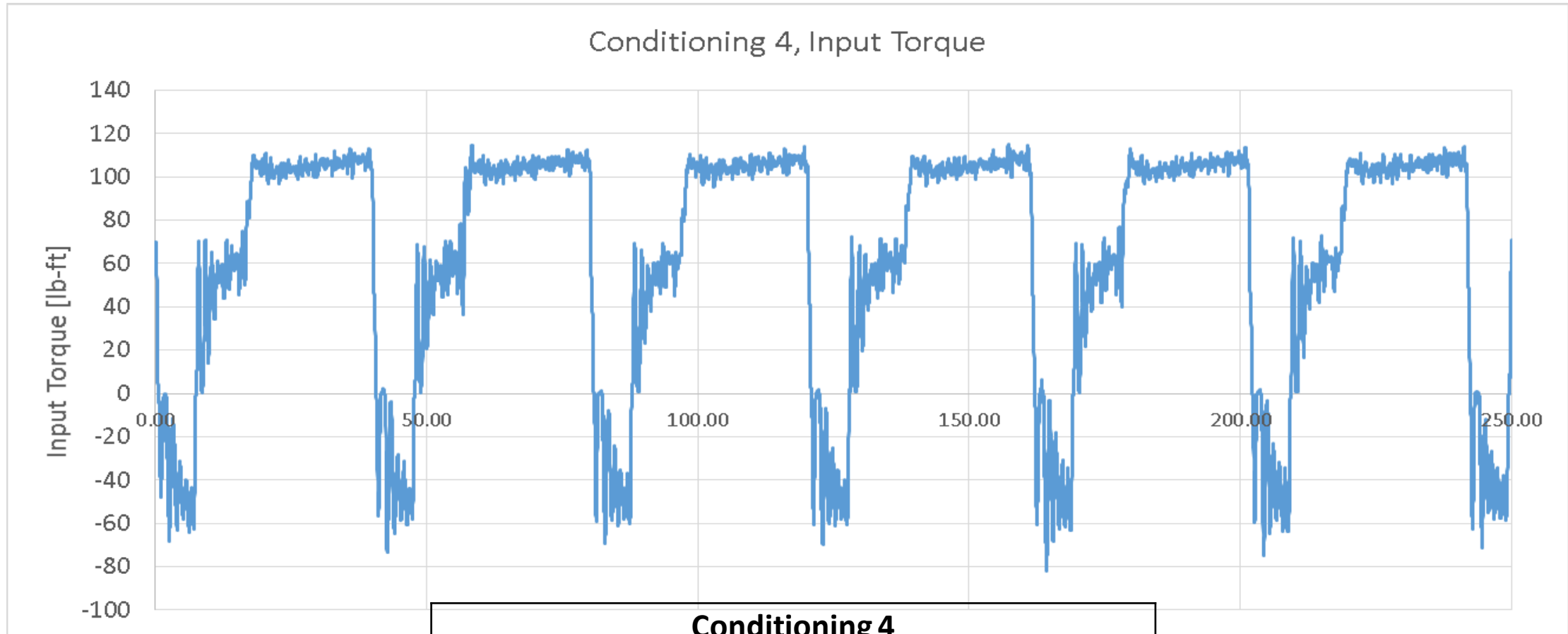
Conditioning 4, Input Torque



Input Torque Trace, Conditioning 4, Engine [lb-ft]



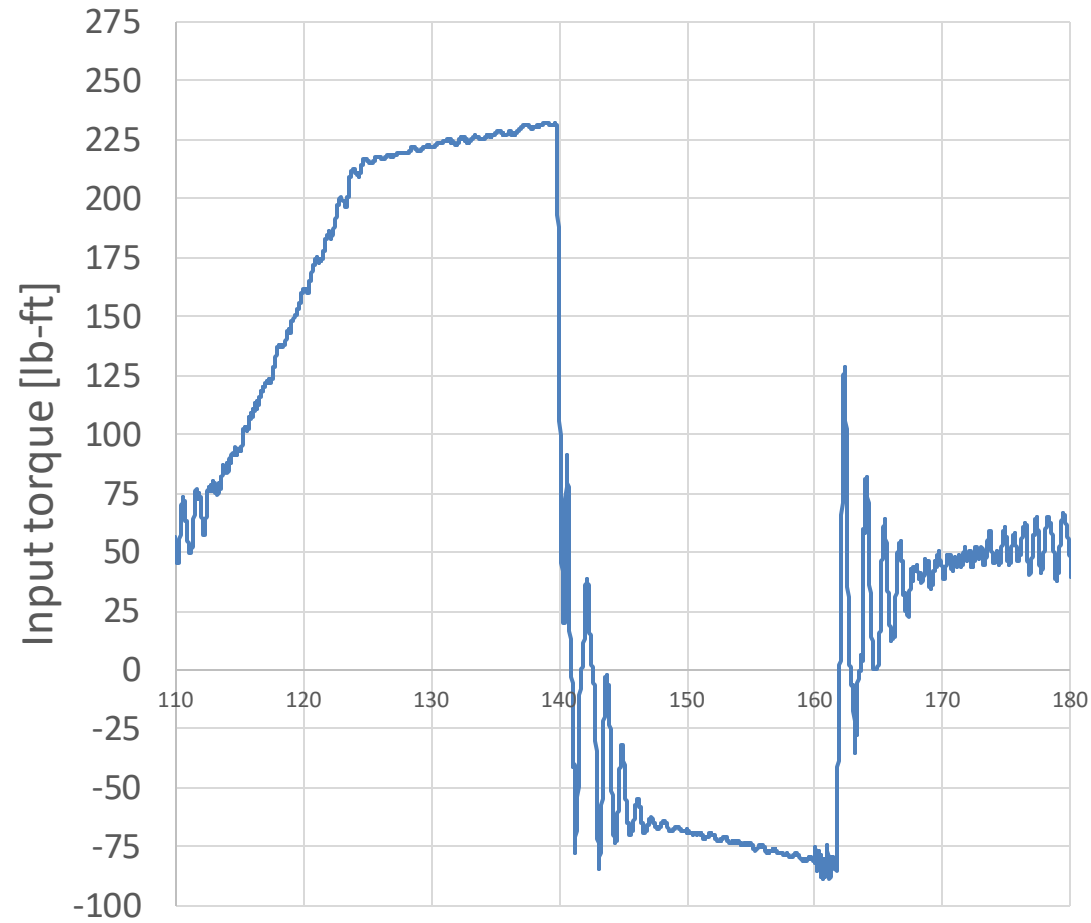
Conditioning 4 Repeatability



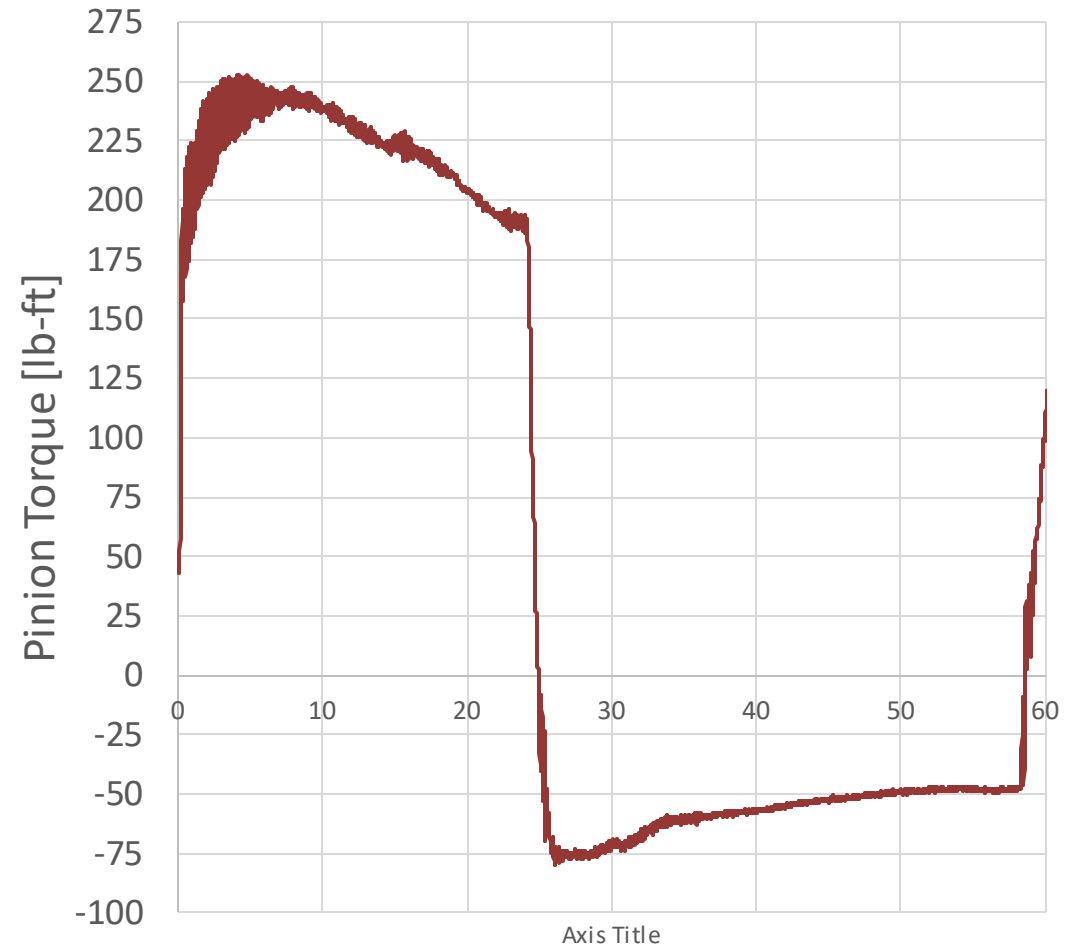
Conditioning 4		
	Coast Side	Drive Side
<i>min</i>	-82.0	112.7
<i>max</i>	-68.1	115.2
<i>average</i>	-73.3	113.8

Shock 1, Electric vs. Engine Powered

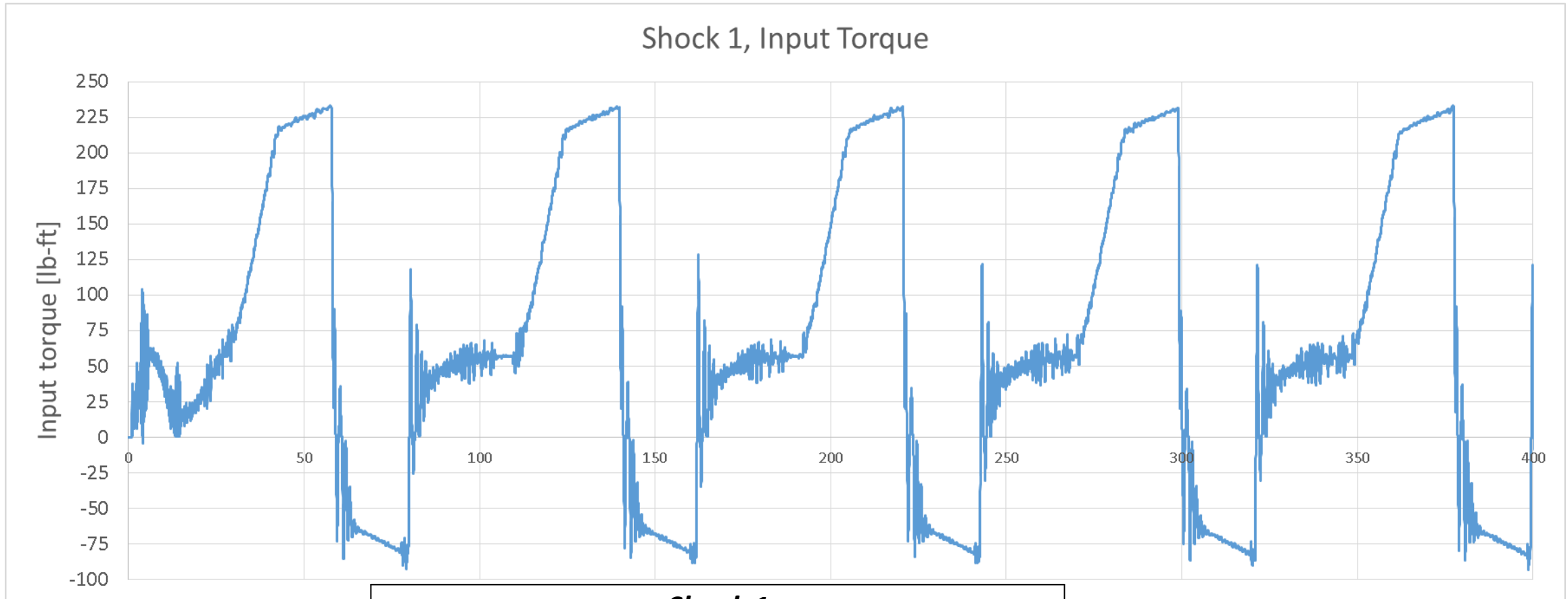
Shock 1, Input Torque



Input Torque Trace, Shock 1, Engine [lb-ft]



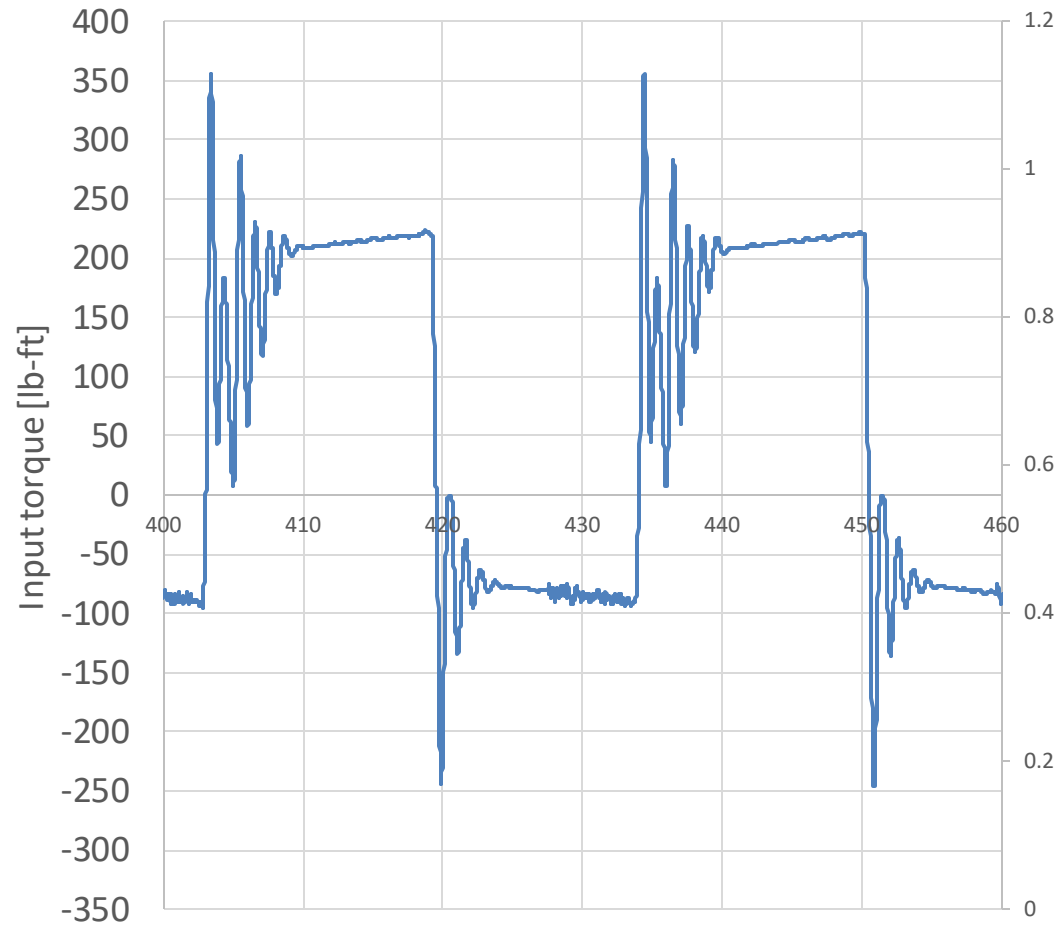
Shock 1 Repeatability



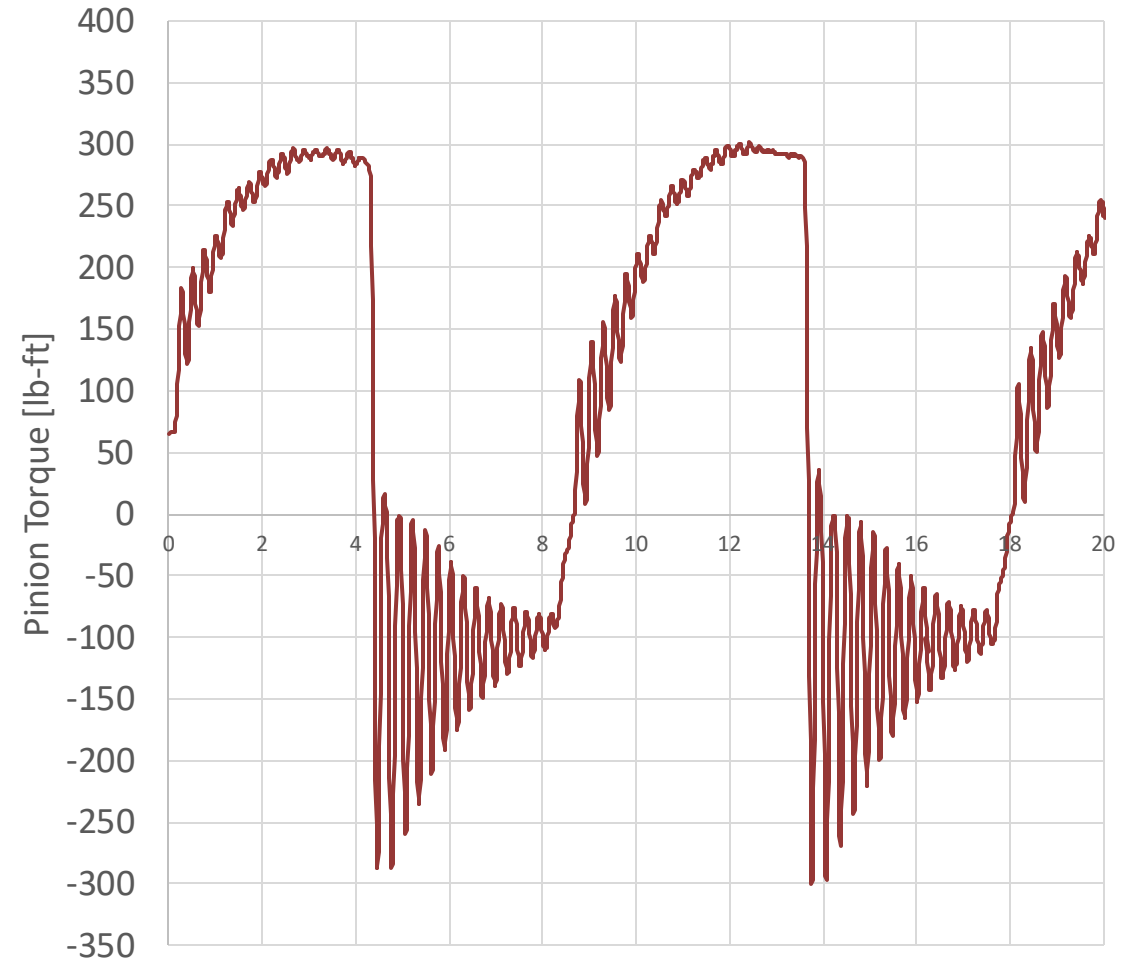
Shock 1		
	Coast Side	Drive Side
min	-93.3	230.6
max	-87.5	235.9
average	-90.3	232.2

Shock 2, Electric Vs. Engine Powered

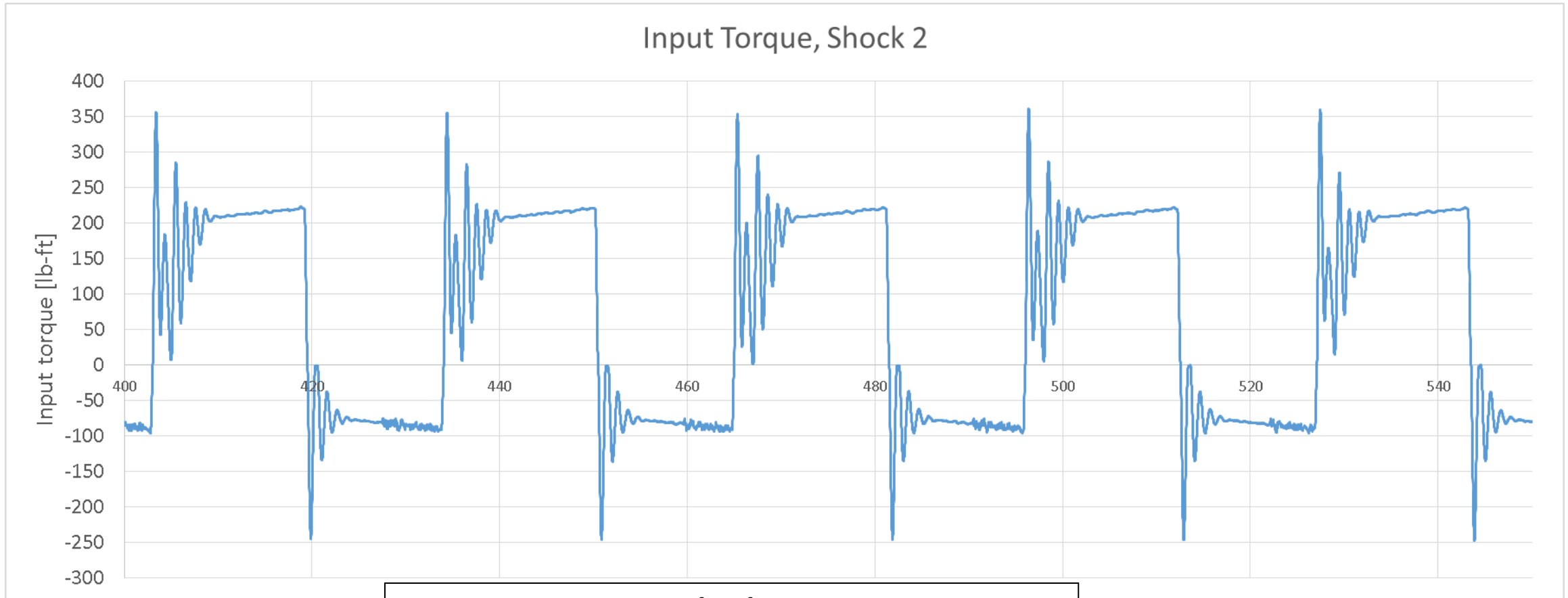
Input Torque, Shock 2



Input Torque Trace, Shock 2, Engine [lb-ft]



Shock 2 Repeatability



Shock 2		
	Coast Side	Drive Side
min	-247.9	325.5
max	-242.5	364.1
average	-245.9	356.7

Severity Limitations

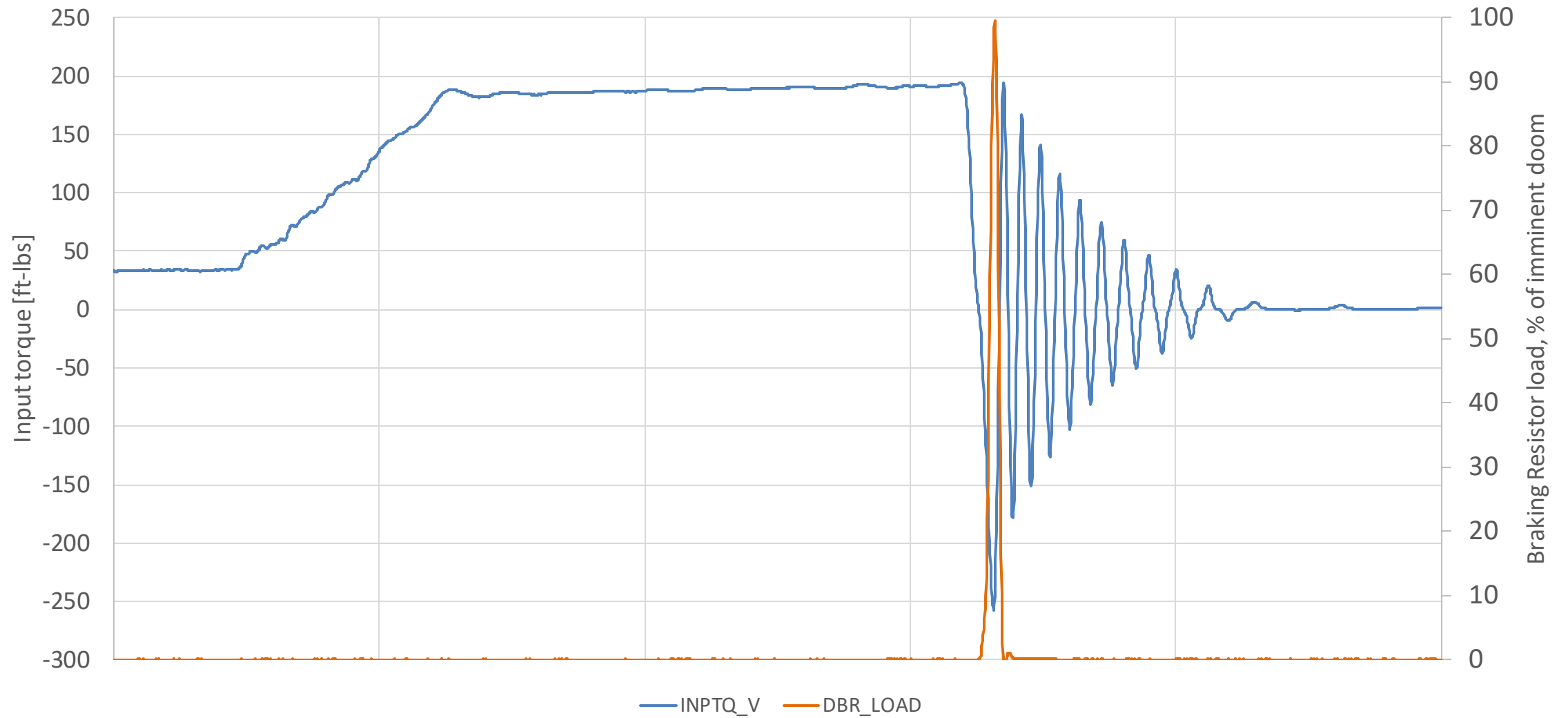
- Stand as built cannot absorb enough power at peak of the speed trace to achieve historic batch levels of coast-side shock (shock 2)
- SwRI measures power being dissipated by the braking resistor
 - Scaled from 0%, no power being dissipated
 - To 100%, imminent overvoltage of the VFD and interruption of test
- Current shock 2 profiles repeatedly spike to 90%+ of maximum power dissipation during initial coast-side shock, but are not hitting spec severity
- Very difficult to decouple drive side shock from coast side shock—we can increase severity at the coast side, but at the cost of increasing severity at the drive side



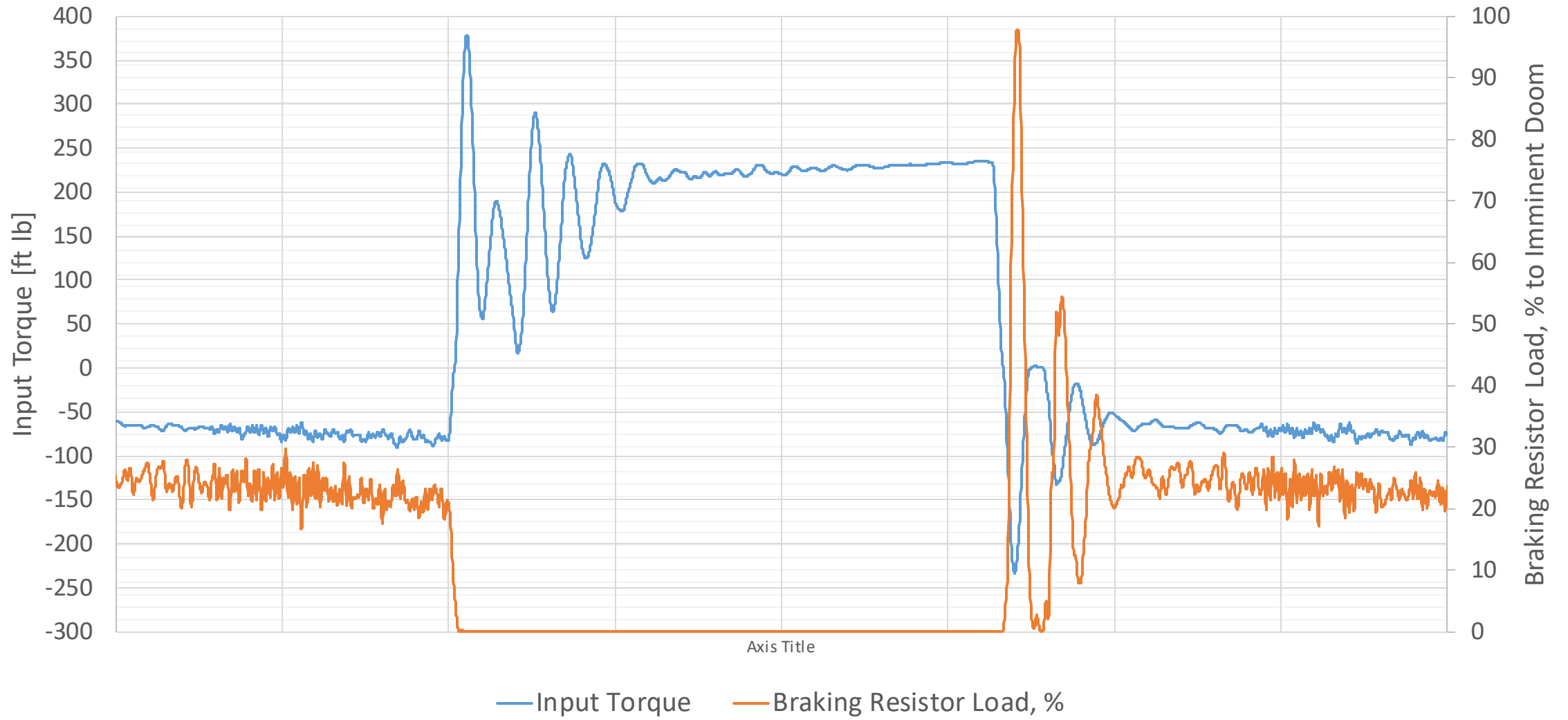
Shock 2 Inertia Experimentation

- Comparison between shock 2 cycles run between 530 & 750 rpm wheel speeds
 - Current setpoint for input torque: 70 ft-lbs
 - Low inertia torque setpoint: 35 ft-lbs
 - High inertia torque setpoint: 140 ft-lbs
- Predicted outcome:
 - High torque setpoint would yield milder shocks and gentler slopes in speed
 - Low torque setpoint would yield harsher shocks and more nimble speed control
- Actual outcome:
 - Low inertia torque setpoint overvolted VFD immediately, resulting in shock at approximately -260 ft lbs which oscillated down to 0 in a short period of time
 - High inertia torque setpoint smoothed over torque curve a little, did not affect coast side severity very much

Shock 2 Inertia Experimentation, 35 ft lb input torque



Shock 2 Experimentation, 140 ft lb input torque



Potential Steps Forward

- From recent experiments, reducing output inertia should allow for increased severity
 - Install a spool or locker and run one output dyno instead of two—effectively nearly 50% reduction in system inertia
- Add secondary brake somewhere on input shaft—more difficult to control but would allow for direct input braking
 - Limitations with current set-up
- Increase number of shocks for shock sequences

Suggestions welcome!

Hardware Status and Request

- With test development in current state, it would be helpful to run a few axles through and get an idea of where test severity lies now
 - Expect to be in the ballpark
 - Possibly mild on coast side



**L-42 Surveillance Panel Membership/Attendance
SwRI, Ann Arbor, MI and Microsoft Teams Virtual Meeting
November 9, 2021**

	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
Present	Banas, Rob	V	ExxonMobil Fuels, Lubricants & Specialties	Phone:	678-493-3930
			114 Arcadia Park Dr. Canton, GA 30114	E-mail:	rob.a.banas@exxonmobil.com
	Barrera, Tony	NV	Intertek Automotive Research	Phone:	210-523-4653
			5404 Bandera Rd. San Antonio, TX 78238	E-mail:	tony.barrera@intertek.com
Present	Bealko, Steven	NV	The Lubrizol Corporation	Phone:	
				E-mail:	
Present	Beck, Dylan	V	ASTM Test Monitoring Center	Phone:	724-355-1854
			6555 Penn Ave Pittsburg, PA 15206	E-mail:	djb@astmtmc.org

**L-42 Surveillance Panel Membership/Attendance
SwRI, Ann Arbor, MI and Microsoft Teams Virtual Meeting
November 9, 2021**

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Present	Bell, Don	NV	Afton Chemical	Phone:	804-788-6332
			500 Spring St. Richmond, VA 23219	E-mail:	don.bell@aftonchemical.com
	Cabaj, Mike	V	Linamar	Phone:	313-820-0119
			32233 W. 8 Mile Road Livonia, MI 48152	E-mail:	michael.cabaj@linamar.com
	Camposo, Lucas	NV	Evonik	Phone:	215-706-5809
			723 Electronic Dr Horsham, PA 19044	E-mail:	lucas.camposo@evonik.com
Present	Carter, Jason	V	Meritor	Phone:	
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	Clark, Jeff	NV	ASTM Test Monitoring Center	Phone:	412-365-1032
			6555 Penn Ave Pittsburg, PA 15206	E-mail:	jac@astmtmc.org

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	Cereghino, Brian	NV	IPAC Inc.	Phone:	
			E-mail:	bcereghino@ipac-inc.com	
Present	Comfort, Allen	V	US Army CCDC	Phone:	586-282-4225
				E-mail:	allen.s.comfort.civ@mail.mil
	Drlja, Kristijan	NV	The Lubrizol Corporation	Phone:	440-391-6374
			29400 Lakeland Boulevard Wickliffe, OH 44092	E-mail:	krdr@lubrizol.com
	Farber, Frank	NV	TMC	Phone:	412-365-1030
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	Friesen, Terry	NV	IPAC Inc.	Phone:	925-556-5530
			7600 Dublin Blvd, Suite 240 Dublin, CA 94568	E-mail:	tfriesen@ipac-inc.com
Present	Goyal, Arjun	V	BASF	Phone:	914-785-2083
				500 White Plains Rd Tarrytown, NY 10591	E-mail:
Present	Haynes, Troy	NV	IPAC Inc.	Phone:	
					E-mail:
	Horvath, Dan	NV	Afton Chemical	Phone:	248-514-2551
				2000 Town Center, Suite 1160 Southfield, MI 48075	E-mail:
	Jackson, Matt	NV	Southwest Research Institute	Phone:	210-522-6981
					E-mail:

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	Joy, Tisha	NV	BASF	Phone:	914-785-2206
			E-mail:	tisha.joy@basf.com	
Present	Kanga, Percy	NV	Retired	Phone:	
				E-mail:	
	Kuchta, Tyler	NV	The Lubrizol Corporation	Phone:	440-347-5868
			29400 Lakeland Boulevard Wickliffe, OH 44092	E-mail:	tyler.kuchta@lubrizol.com
Present	LaBond, Jessica	NV	Meritor	Phone:	248-872-3055
				2135 W. Maple Rd Troy, MI 48084	E-mail:
Present	Lange, Anthony	V	Intertek Automotive Research	Phone:	210-634-1103
				5404 Bandera Rd. San Antonio, TX 78238	E-mail:

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Present	Mosher, Donna	NV	BASF	Phone:	269-217-1715
			100 Park Ave Florham Park, NJ 07932	E-mail:	donna.mosher@basf.com
Present	Mueller, Caroline	NV	Southwest Research Institute	Phone:	843-471-6283
			6220 Culebra Rd. Antonio, TX 78238	San E-mail:	caroline.louis@swri.org
Present	Muransky, Troy	V	AAM	Phone:	734-564-8406
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			500 Spring St. Richmond, VA 23219	E-mail:	matt.sangpeal@aftonchemical.com
	Sattler, Eric	NV	CCDC-GVSC	Phone:	586-282-2272
			Warren, MI	E-mail:	eric.r.sattler.civ@mail.mil
	Schwenk, Daniel	NV	Afton Chemical	Phone:	804-788-6326
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Present	Slocum, Robert	V	The Lubrizol Corporation	Phone:	440-347-5102
			29400 Lakeland Boulevard Wickliffe, OH 44092	E-mail:	robert.slocum@lubrizol.com
	Smith, Dale	NV	Intertek Automotive Research	Phone:	412-855-6854
			5404 Bandera Rd. San Antonio, TX 78238	E-mail:	dale.smith@intertek.com

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	Thrash, Steven	NV	US Army CCDC	Phone:	586-282-5170
			6501 E. 11 Mile Rd. Warren, MI 48397	E-mail:	steven.j.thrash.civ@mail.mil
Present	Uy, Dairene	NV	Shell	Phone:	
				E-mail:	dairene.uy@shell.com
Present	Venhoff, Wes	NV	The Lubrizol Corporation	Phone:	440-347-4879
			29400 Lakeland Boulevard Wickliffe, OH 44092	E-mail:	wes.venhoff@lubrizol.com
Present	Warden, Rebecca	V	Southwest Research Institute	Phone:	210-522-6266
				E-mail:	rebecca.warden@swri.org
	Zreik, Khaled	NV	General Motors	Phone:	248-977-9214
			823 Joslyn Ave Pontiac, MI 48340-2925	E-mail:	khaled.zreik@gm.com

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November 9, 2021**

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Present	Zyski, Amy	V	Dana Incorporated	Phone:	419-887-3432
			3939 Technology Dr Maumee, OH 43537	E-mail:	amy.zyski@dana.com
Present	Kostan, Travis	NV	Southwest Research Institute	Phone:	210.522.2407
				E-mail:	travis.kostan@swri.org
Present	Neil, Suzanne	NV	Daimler Trucks/Detroit Diesel	Phone:	
				E-mail:	suzanne.neal@daimler.com
Present	Martinez, Jo G.	NV		Phone:	
				E-mail:	
				Phone:	
				E-mail:	

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				E-mail:	