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Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

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August 12th, 2021

Reply to:
Matt Sangpeal
Afton Chemical Corporation
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Richmond, VA 23219
(804) 788-5364
(804) 788-6239 [FAX]
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:

August 11, 2021 L-42 Surveillance Panel Meeting (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

Virtual Meeting – Microsoft Teams

August 11, 2021

Attendees: voting members in **bold**

R. Banas (Exxon Mobil)

S. Bealko (LZ)

D. Beck (TMC)

D. Bell (Afton)

J. Carter (Meritor)

A. Goyal (BASF)

P. Kanga (Retired)

A. Lange (Intertek)

D. Moser (BASF)

C. Mueller (SwRI)

T. Muransky (AAM)

M. Sangpeal (Afton/C)

E. Sattler (US Army)

R. Slocum (LZ)

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:

- ▲ “20210512_SP” → May 12, 2021 – Virtual Surveillance Panel Meeting – Microsoft Teams
- ▲ “20210630_CC” → June 30, 2021 – 2021 Hardware Batch Approval Conference Call – WebEx

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

Motion: M. Sangpeal

Second: R. Slocum

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. A different electric drive motor and a braking resistor were installed. Speed setpoints were achieved and torque traces resemble the current engine-driven stand in most cases. Next steps are to increase spring stiffness and continue to adjust profile to get closer to current test rig performance. See attached slides for details.

L-42 Report Change

M. Sangpeal reviewed the change to L-42 test reports that was approved during the previous SP meeting (add rater calibration expiration date to test report). This change went into effect on 7/16/21.

New Hardware Order

M. Sangpeal reviewed the status of Afton's L-42 hardware order. All parts have been received and the batch has been approved for testing. Hardware is showing good repeatability and comparable performance to previous batch. The other three labs were asked about their current inventory of axles and when they might want to place another order for more. It was agreed to re-visit the topic in 6 months (February 2022).

L-42 Hardware Print Review

M. Sangpeal has been working with A. Zyski to identify what specs for L-42 axles can and should be shared with the SP. Metal alloy, surface hardness, case depth, and other specific assembly requirements might be appropriate. A. Zyski will take an action to search for any available data from previous batches that already exists within Dana.

New/Open Issues

No new issues.

Adjournment

A motion was made to adjourn.

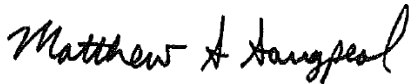
Motion: M. Sangpeal

Second: A. Zyski

All in favor, no objections, no abstentions.

Meeting adjourned.

Respectfully submitted,

A handwritten signature in black ink that reads "Matthew A. Sangpeal". The signature is written in a cursive style with a large initial 'M'.

Matt Sangpeal

L-42 Surveillance Panel Chairman



L-42 Surveillance Panel Meeting

ASTM D7452



Virtual Meeting

August 11, 2021

2:00 pm – 2:30 pm EST

Passion for Solutions™

Agenda

-  **Call to Order**
-  **Agenda**
-  **Membership Review & Update**
-  **Approval of Meeting Minutes**
 -  20210512 Virtual SP Meeting
 -  20210630 Conference Call
-  **L-42-1 Development Updates**
-  **L-42 Report Change**
-  **2020 Hardware Order Update**
-  **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

- ▲ “20210512_SP” → May 12, 2021 – Virtual Surveillance Panel Meeting – Microsoft Teams
- ▲ “20210630_CC” → June 30, 2021 – 2021 Hardware Batch Approval Conference Call – WebEx

Electric L-42 Development: August 2021 Update

SOUTHWEST RESEARCH INSTITUTE®

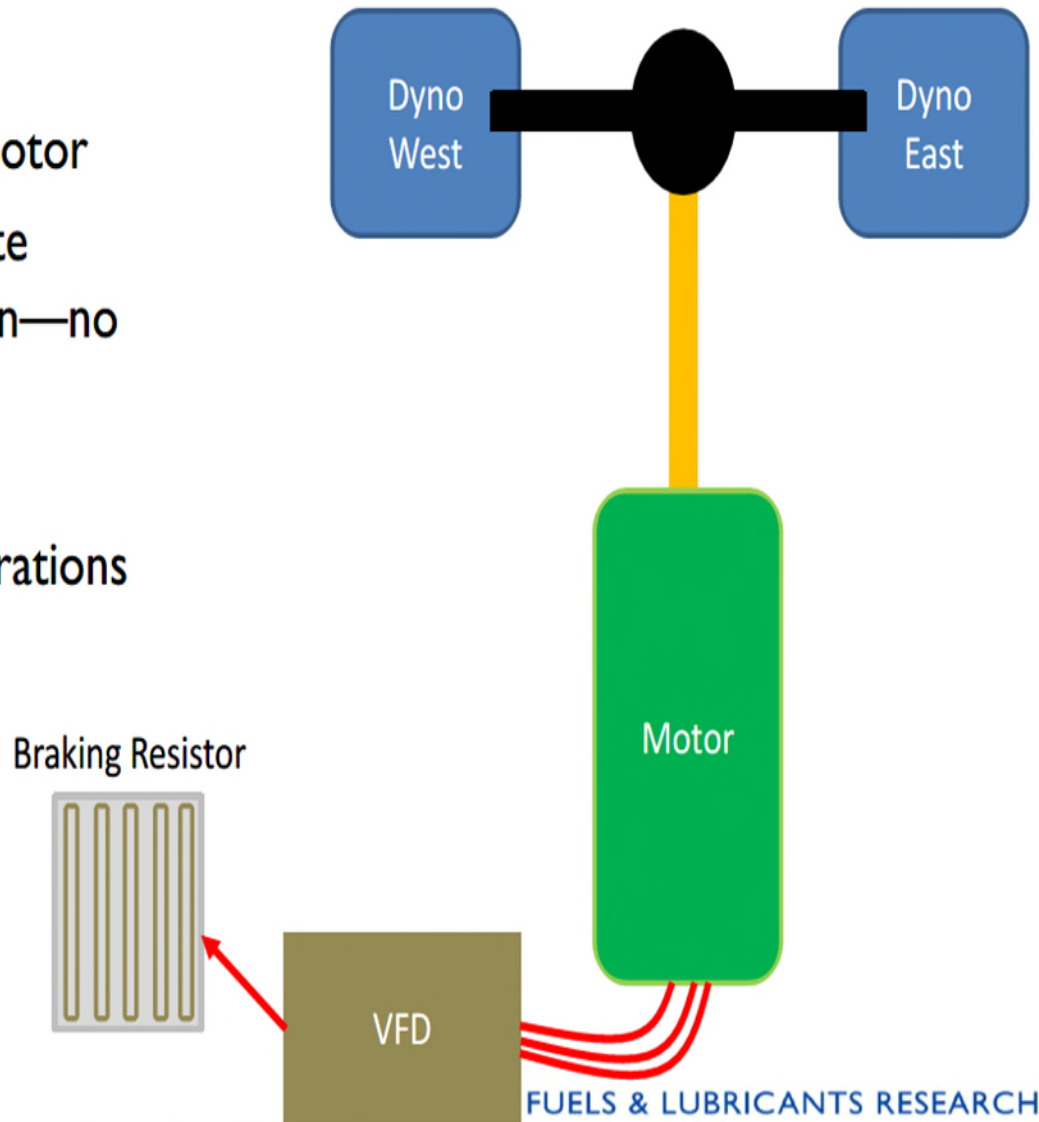
Caroline Mueller

August 11th, 2021



Test Stand Setup

- Changed to 5,000 rpm/250 hp motor
- Dynamometers, axle, and flexplate assembly as per L-42 specification—no changes made
- Addition of Braking resistor for absorbing power on hard decelerations



Test Stand Setup

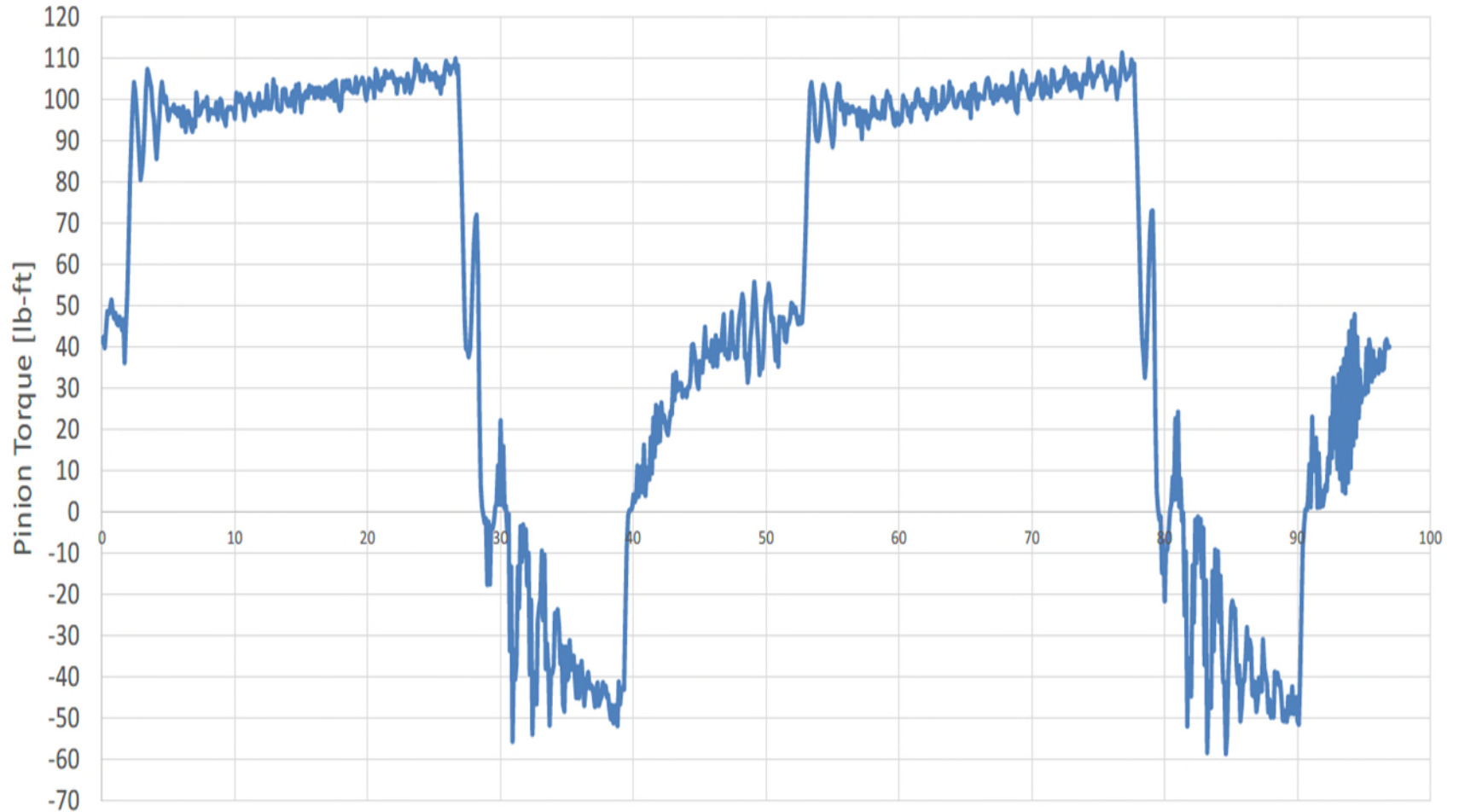


Conditioning 1 and Conditioning 3

- Both steady-state conditioning steps can be run as per L-42 specification
 - No changes to speed setpoints, torque setpoints, or duration
 - Pinion torque varies +/- 2 lb-ft for both Cond 1 and Cond 3

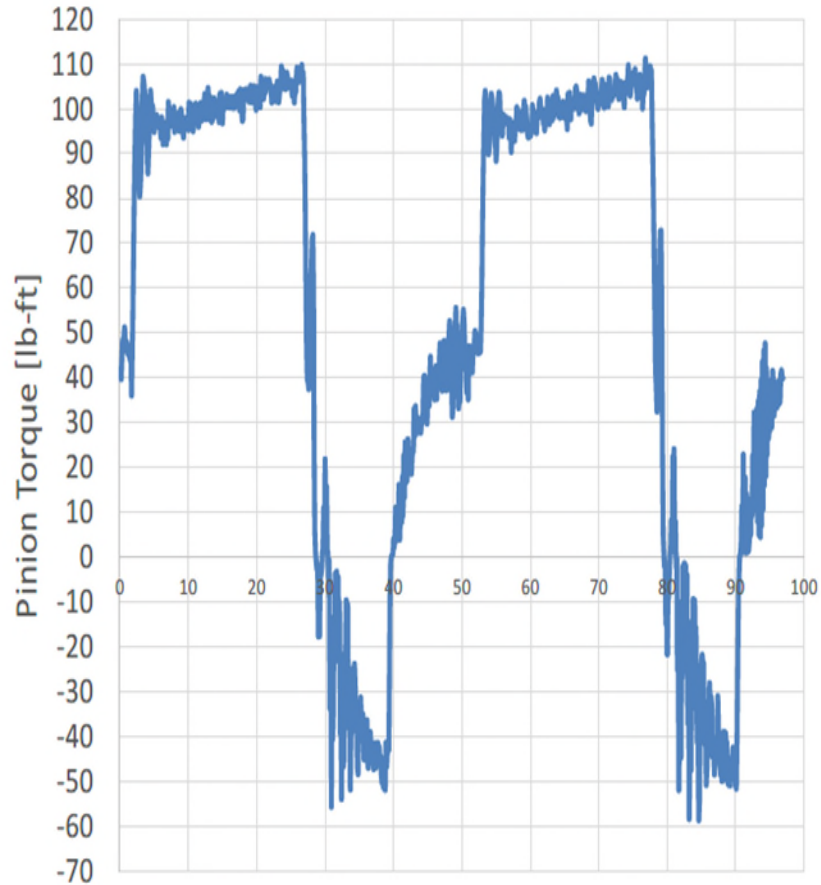
Conditioning 2

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

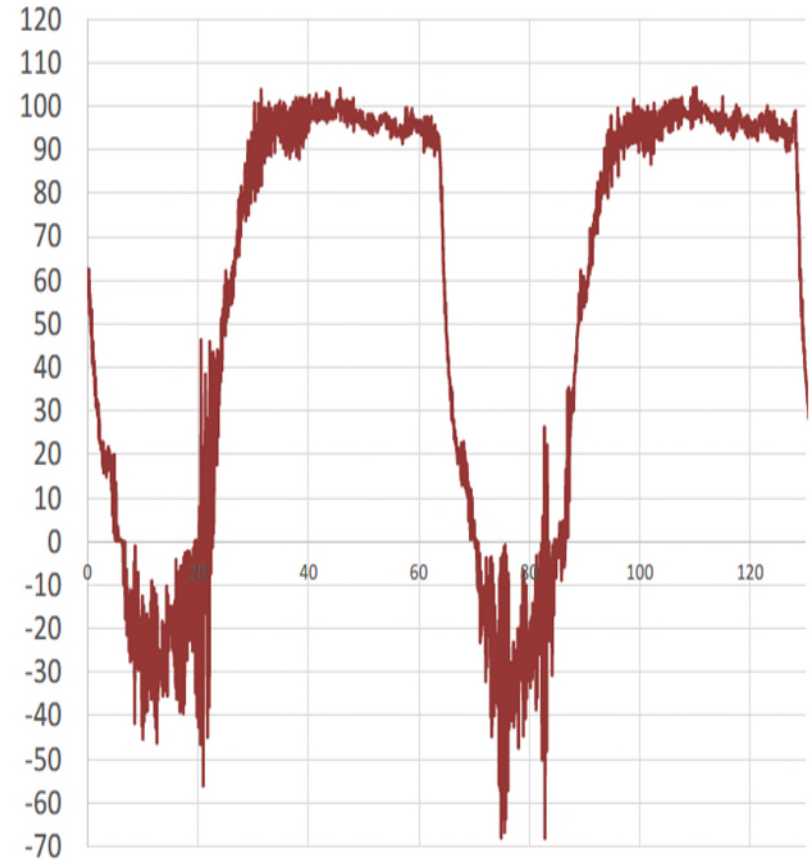


Conditioning 2—Electric vs. Engine Driven

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



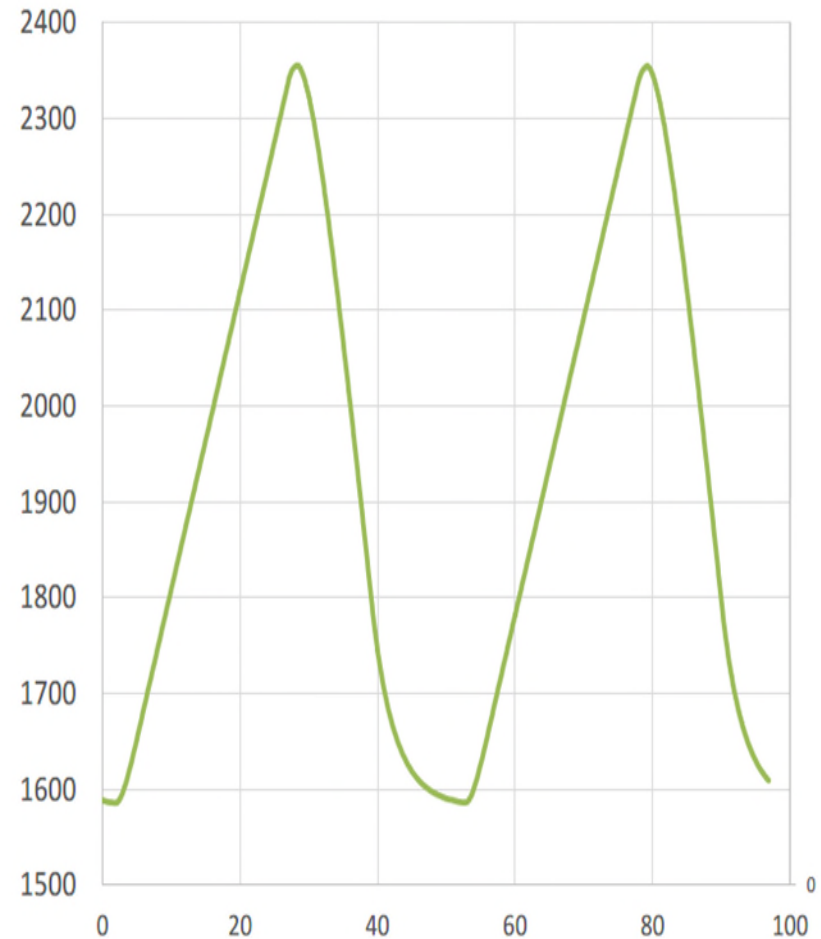
Input Torque Trace, Conditioning 2,
Engine [lb-ft]



Conditioning 2

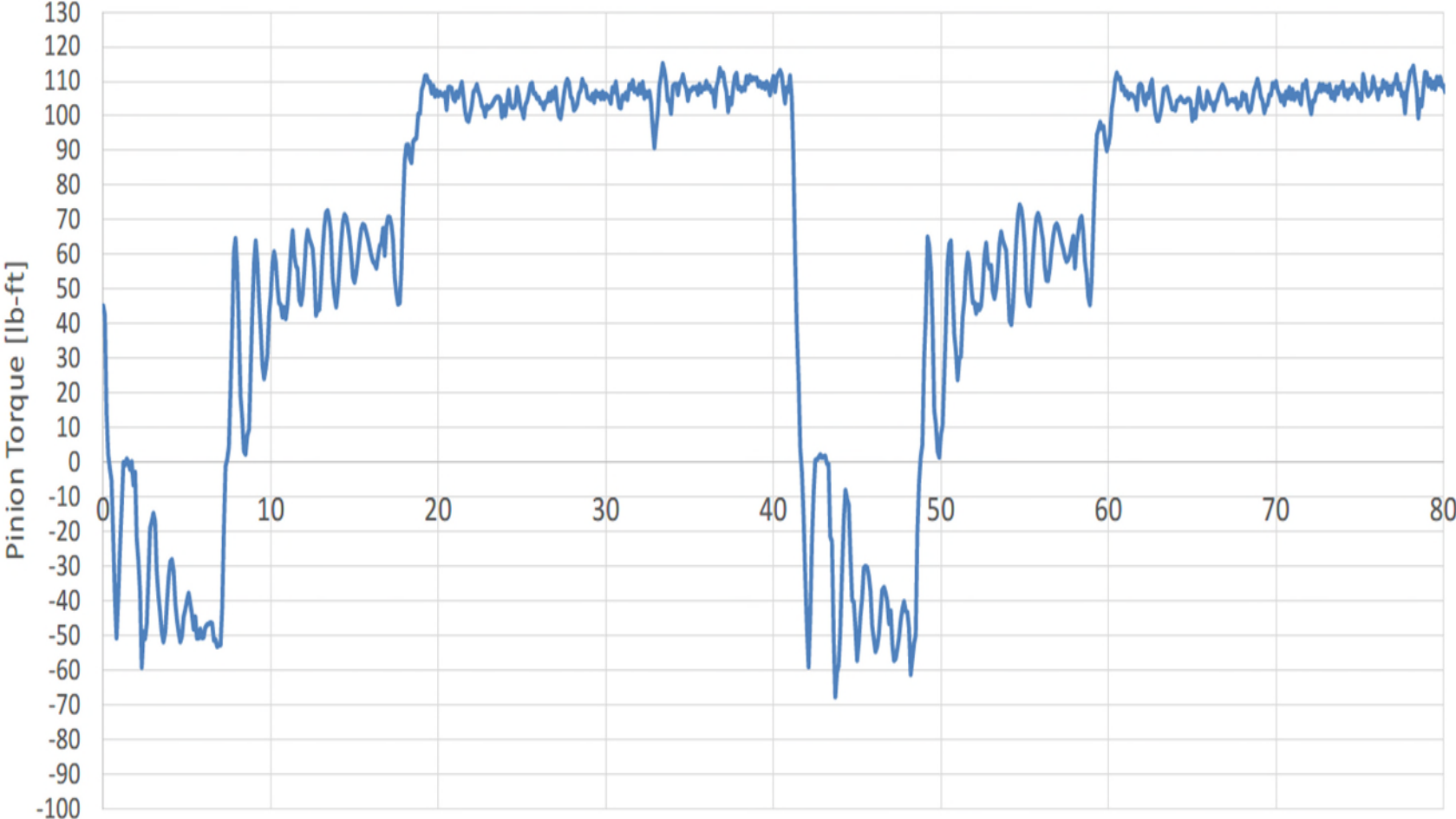
- Electric stand produces repeatable peak coast side torque within 10 lb-ft
- Total cycle time from high speed to low speed is slightly longer than for L-42
 - Smooth/slow turns in speed to avoid torque spikes
 - Torque climbs up towards 50 lb-ft for several seconds while making slow turn into acceleration segment

Pinion Speed



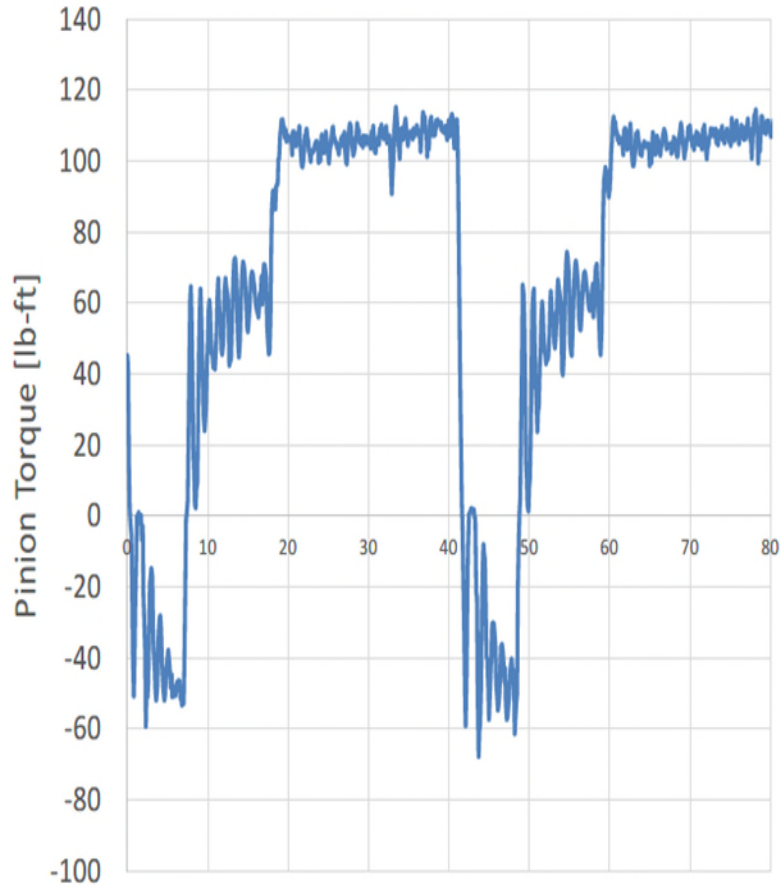
Conditioning 4

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

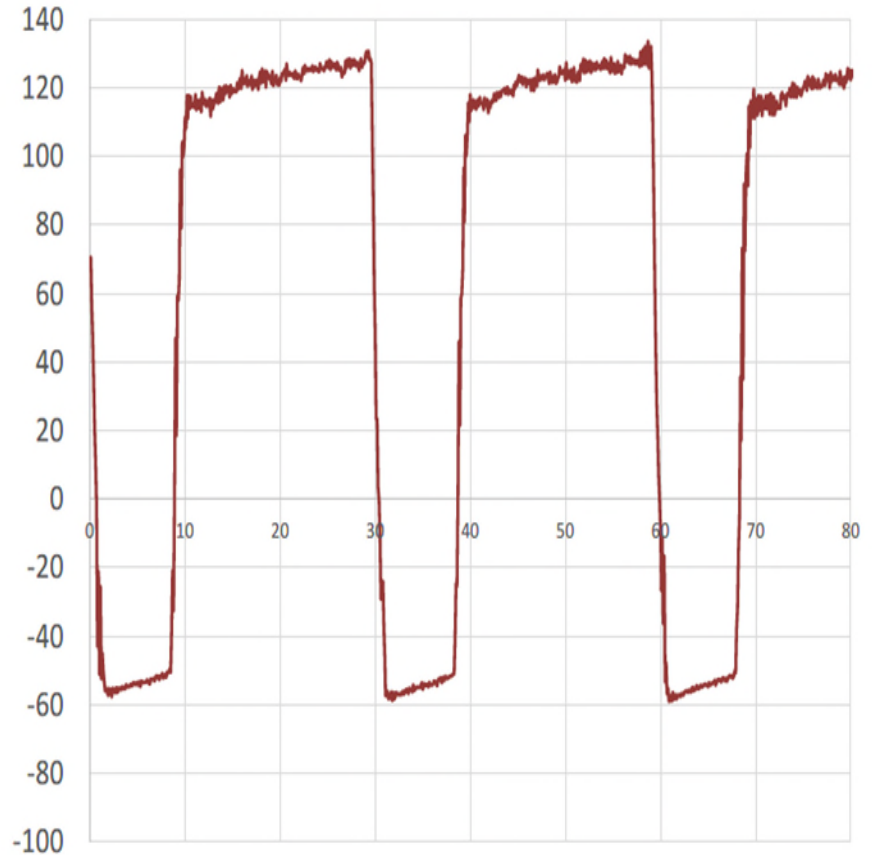


Conditioning 4—Electric vs. Engine Driven

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

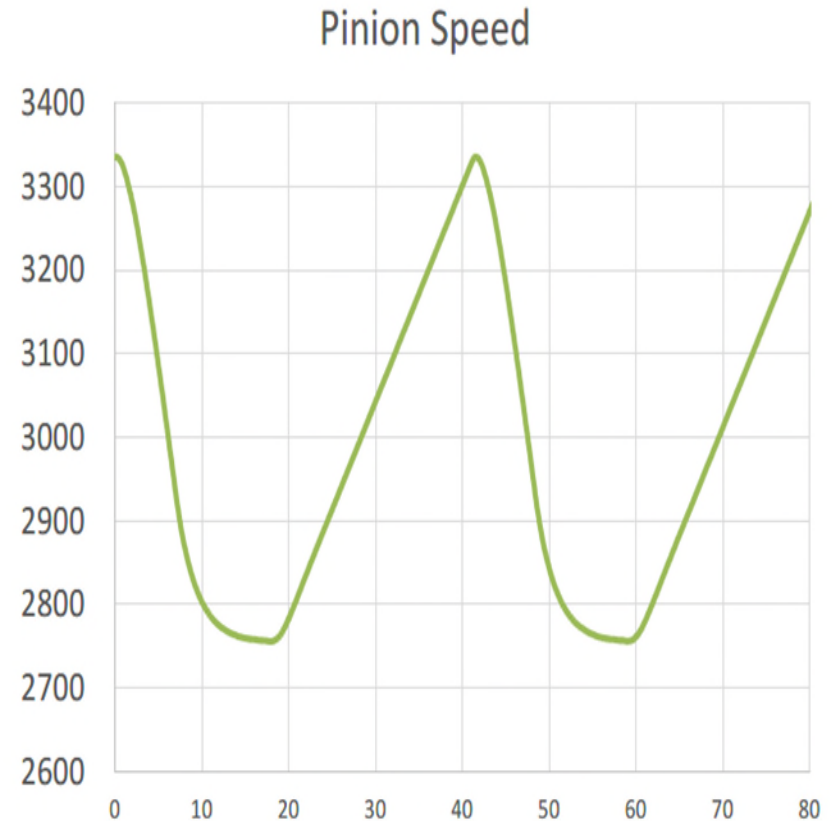


Input Torque Trace, Conditioning 4,
Engine [lb-ft]



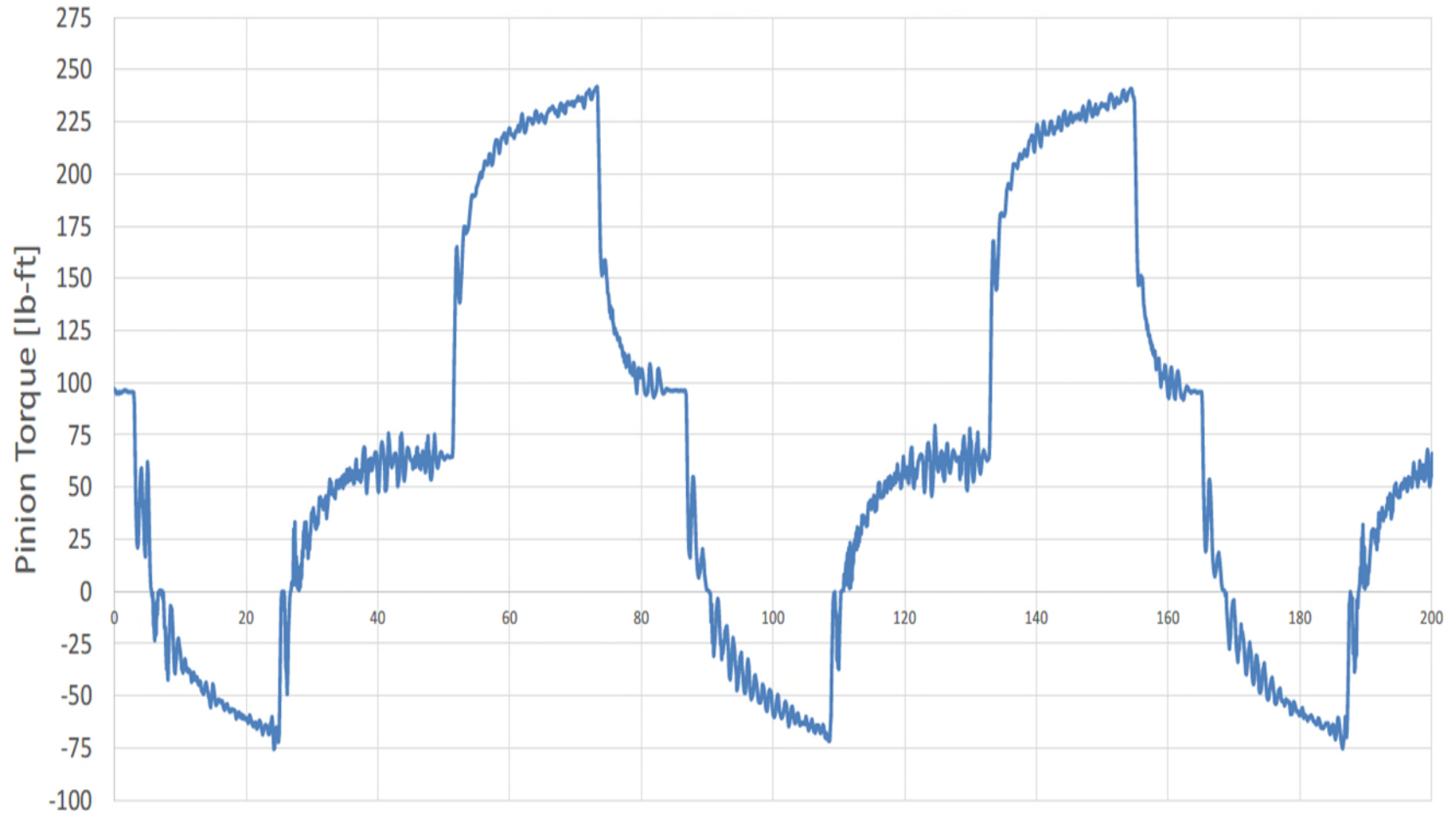
Conditioning 4

- Repeatable peak coast side torque within 10 lb-ft
- Total cycle time from high speed to low speed is longer than for L-42
 - Smooth/slow turns in speed to avoid torque spikes
 - Torque hovers near 60 lb-ft for several seconds while making slow turn into acceleration segment



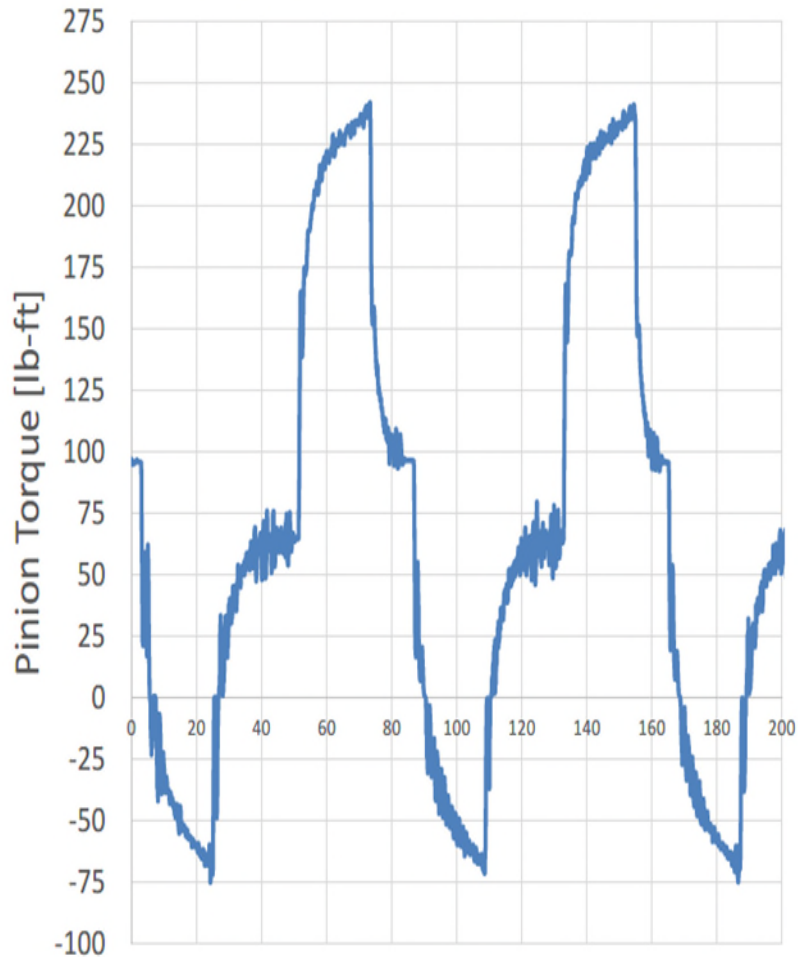
Shock I

Input Torque Trace, Shock 1 [lb-ft]

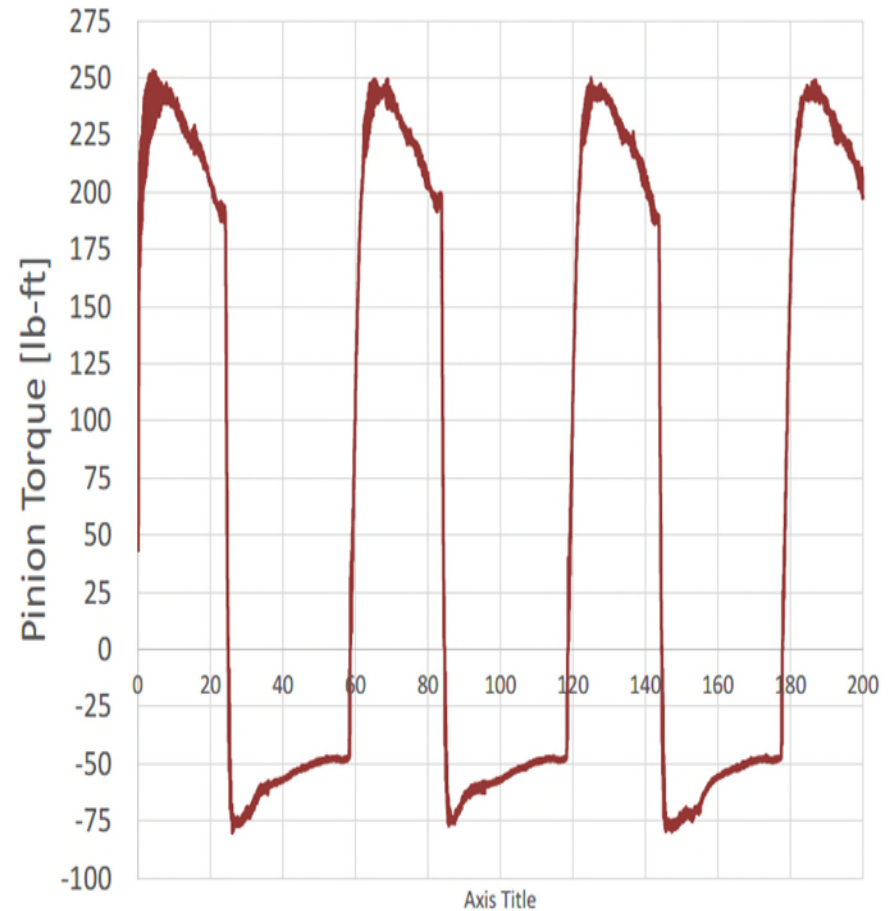


Shock I—Electric vs. Engine Driven

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

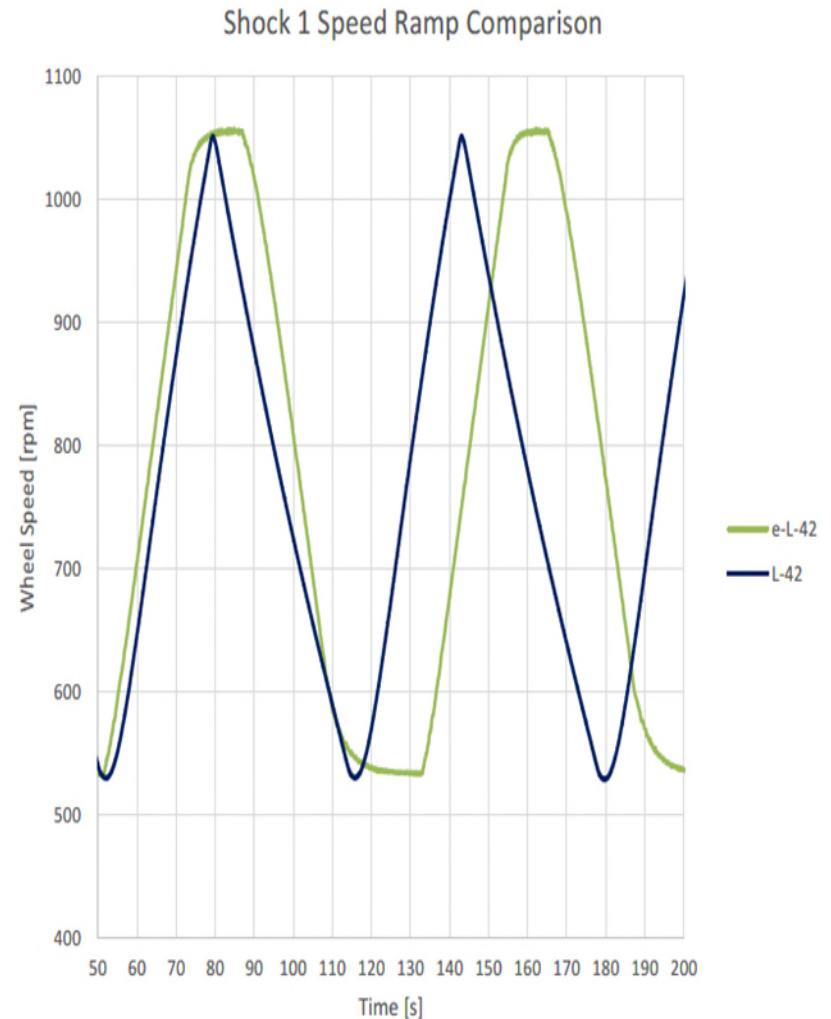


Input Torque Trace, Shock 1, Engine [lb-ft]



Shock I

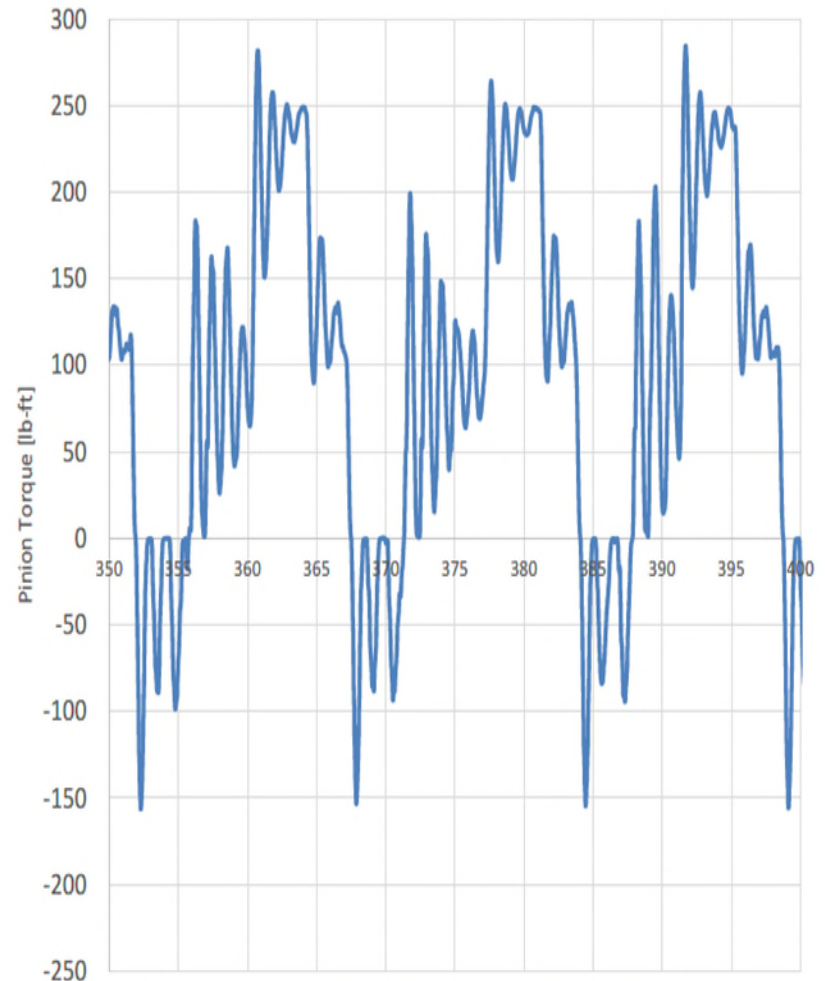
- Repeatable on coast side peak torque and drive side peak torque within 10 lb-ft
- Total cycle time from high speed to low speed is longer than for L-42
 - Smooth/slow turns in speed to avoid torque spikes
 - Torque climbs up towards 50 lb-ft for several seconds while making slow turn into acceleration segment



Shock 2

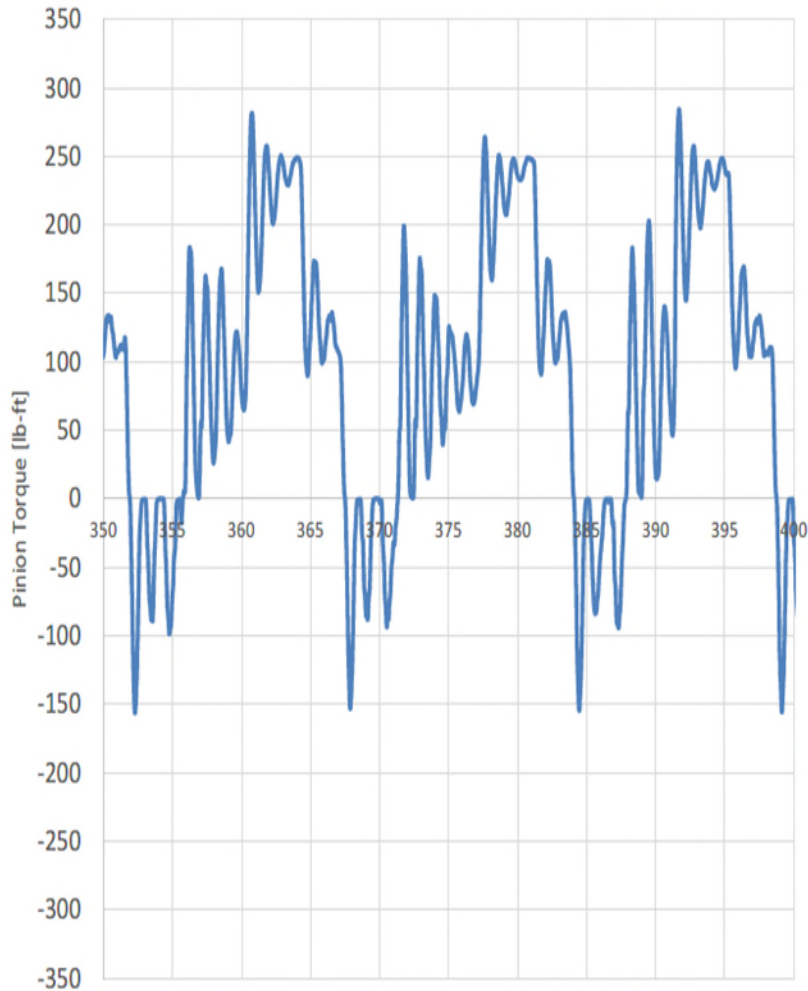
- Attempting to maintain speeds and ramp rates from L-42 specification with dynos locked at initial pinion torque of 90 lb-ft (specification is 70 lb-ft)
- Use of braking resistor to achieve steep ramps in pinion speed
- Difficult to induce ringing in coast side torque with appropriate magnitude
- Care must be taken to achieve smooth rise to appropriate magnitude drive side torque

Input Torque Trace, Shock 2

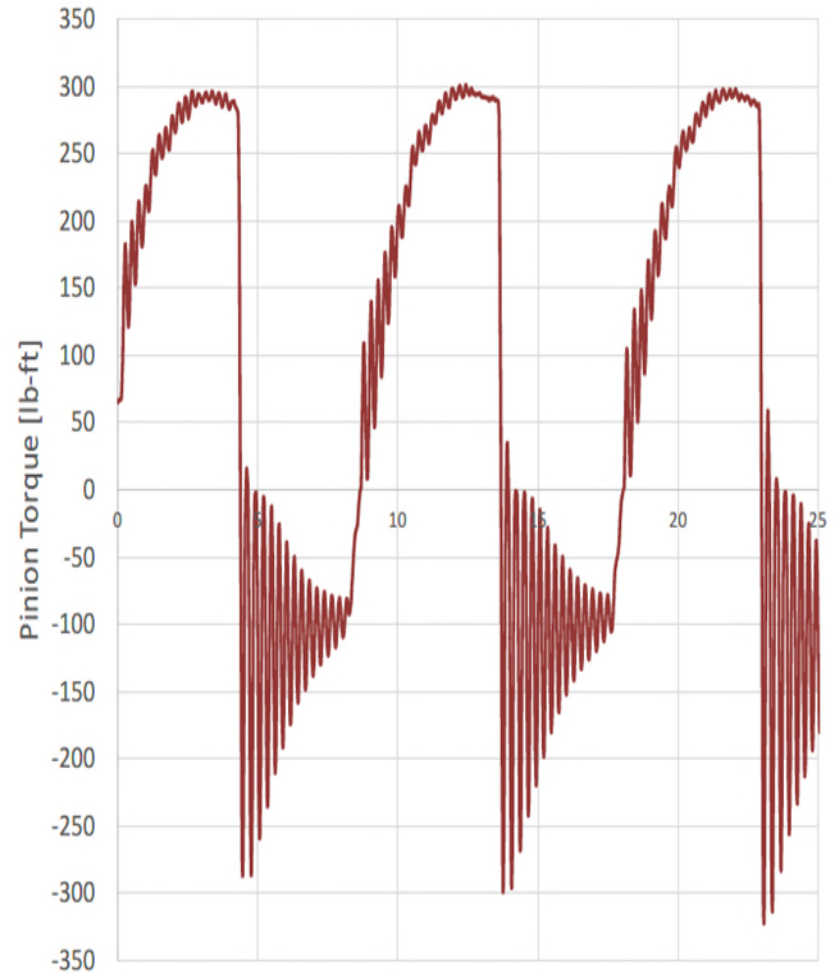


Shock 2—Electric vs. Engine Driven

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






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



Shock 2—Next Steps

1. Increase stiffness of mounting assembly for axle
 - Move bolts on flex plate
 - Turn from accel to decel more quickly without inducing axle hop
 - More severe shocks
 - Sharper turns in speed could eliminate drive side torque ‘steps’
2. Maintain initial pinion torque from L-42 specification (70 lb-ft) and increase speed range covered by shock 2
 - Maintain use of braking resistor to achieve ramps at approximately 100 pinion rpm/sec

L-42 Report Change

-  Add rater calibration expiration date to test reports
-  Effective 7/16/21
-  Any issues?

Test Method D7452 L-42 Form 4 Measurement Summary										
Lab:		Stand No.:			Stand Run No.:					
Oil Code:										
Axle Codes										
Assembly Date		Match No.		Serial Number		Pinion Batch		Ring Batch		
Contact Pattern Measurements										
		Drive Side				Coast -Side				
Length Rating	As Received									
	As Tested									
F flank Rating	As Received									
	As Tested									
Contact Pattern Rater Initials										
Test Axle Build Data										
Backlash (in.)	Mfg. Specification	Mfg. Measurement	Laboratory's Position Measurements							
			1	2	3	4	Min	Max	Avg.	
Initial	.004 -.012 in.									
Final										
Increase										
Initial Pinion Torque (lbf -in)			Break Turn							
Inspection	Ring% Scoring				Pinion % Scoring					
	Drive Side		Coast Side		Drive Side		Coast Side			
Inspection 1										
Inspection 2										
EOT										
EOT Rating Date			EOT Rater Initials			Rater Calcxp				

L-42 2020 Hardware Order Update

Order is complete, hardware has been approved

- ▲ Conference call on June 30, voted to approve hardware for testing
- ▲ See Memo mem21-026

Good quality, repeatable results

- ▲ Very similar to C1L446 batch

When will other labs be ready for next order?

- ▲ 2 years?

L-42 Hardware Print Review

▲ Working with Dana to determine what can be shared

▲ Specs possibly ok to share

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

New Issues



Thanks!

**L-42 Surveillance Panel Membership/Attendance
Virtual Meeting, Microsoft Teams
August 11, 2021**

Present = P Accept = A Tent. = T Decline = D	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
P	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
P	Bealko, Steven	NV	The Lubrizol Corporation	Phone:	
				E-mail:	
P	Beck, Dylan	V	ASTM Test Monitoring Center	Phone:	724-355-1854
			6555 Penn Ave Pittsburg, PA 15206	E-mail:	djb@astmtmc.cmu.edu

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P	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
P	Carter, Jason	V	Meritor	Phone:	
				E-mail:	Jason.Carter@meritor.com
	Clark, Jeff	NV	ASTM Test Monitoring Center	Phone:	412-365-1032
			6555 Penn Ave Pittsburg, PA 15206	E-mail:	jac@astmtmc.cmu.edu

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	Cereghino, Brian	NV	IPAC Inc.	Phone:	
				E-mail:	bcereghino@ipac-inc.com
	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
			6555 Penn Ave Pittsburg, PA 15206	E-mail:	fmf@astmtmc.cmu.edu
	Foecking, Brian	NV	The Lubrizol Corporation	Phone:	440-347-2130
			29400 Lakeland Boulevard Wickliffe, OH 44092	E-mail:	bjf@lubrizol.com

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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
P	Goyal, Arjun	V	BASF	Phone:	914-785-2083
			500 White Plains Rd Tarrytown, NY 10591	E-mail:	arjun.goyal@basf.com
	Horvath, Dan	NV	Afton Chemical	Phone:	248-514-2551
			2000 Town Center, Suite 1160 Southfield, MI 48075	E-mail:	dan.horvath@aftonchemical.com
	Jackson, Matt	NV	Southwest Research Institute	Phone:	210-522-6981
				E-mail:	matt.jackson@swri.org
	Joy, Tisha	NV	BASF	Phone:	914-785-2206
				E-mail:	tisha.joy@basf.com

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P	Kanga, Percy	NV	Retired	Phone:	
				E-mail:	
	Koehler, Brian	NV	Southwest Research Institute	Phone:	210-522-3588
			P.O. Drawer 28510 San Antonio, TX 78228-0510	E-mail:	Bkoehler@swri.org
	Kuchta, Tyler	NV	The Lubrizol Corporation	Phone:	440-347-5868
			29400 Lakeland Boulevard Wickliffe, OH 44092	E-mail:	tyler.kuchta@lubrizol.com
	LaBond, Jessica	NV	Meritor	Phone:	248-872-3055
			2135 W. Maple Rd Troy, MI 48084	E-mail:	Jessica.LaBond@meritor.com
P	Lange, Anthony	V	Intertek Automotive Research	Phone:	210-634-1103
			5404 Bandera Rd. San Antonio, TX 78238	E-mail:	anthony.lange@intertek.com

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	Lonsway, Chris	NV	The Lubrizol Corporation	Phone:	440-347-4517
			29400 Lakeland Boulevard Wickliffe, OH 44092	E-mail:	chris.lonsway@lubrizol.com
	Morris, Jeanelle	NV	Navistar	Phone:	331-332-1661
			2701 Navistar Dr Lisle, IL 60532	E-mail:	jeanelle.morris@navistar.com
P	Mosher, Donna	NV	BASF	Phone:	269-217-1715
			100 Park Ave Florham Park, NJ 07932	E-mail:	donna.mosher@basf.com
P	Mueller, Caroline	NV	Southwest Research Institute	Phone:	843-471-6283
			6220 Culebra Rd. Antonio, TX 78238	San	E-mail:
P	Muransky, Troy	V	AAM	Phone:	734-564-8406
			1840 Holbrook Detroit, MI	E-mail:	troy.muransky@aam.com

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August 11, 2021**

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P	Sangpeal, Matt	V/Chair	Afton Chemical	Phone:	804-788-5364
			500 Spring St. Richmond, VA 23219	E-mail:	matt.sangpeal@aftonchemical.com
P	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
			500 Spring St. Richmond, VA 23219	E-mail:	daniel.schwenk@aftonchemical.com
P	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
	Uy, Dairene	NV	Shell	Phone:	
				E-mail:	
P	Venhoff, Wes	NV	The Lubrizol Corporation	Phone:	440-347-4879
			29400 Lakeland Boulevard Wickliffe, OH 44092	E-mail:	wes.venhoff@lubrizol.com
P	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 84340-2925	E-mail:	khaled.zreik@gm.com

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Present = P Accept = A Tent. = T Decline = D	Name	Voting Non-Voting	Company Name Company Address	Contact information	
P	Zyski, Amy	V	Dana Incorporated	Phone:	419-887-3432
			3939 Technology Dr Maumee, OH 43537	E-mail:	amy.zyski@dana.com
				Phone:	
				E-mail:	
				Phone:	
				E-mail:	
				Phone:	
				E-mail:	
				Phone:	
				E-mail:	

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				Phone:	
				E-mail:	
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				E-mail:	
				Phone:	
				E-mail:	