



**COMMITTEE D02 on PETROLEUM PRODUCTS, LIQUID FUELS, AND LUBRICANTS**

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**LSPI AGING INDUSTRY CONFERENCE CALL**

Date: 27 Jan 22

**ATTENDANCE**

<b>SWRI</b>	Christine Eickstead, Khaled Rais, Pat Lang
<b>INTERTEK</b>	Al Lopez, Jason Soto
<b>LUBRIZOL</b>	George Szappanos
<b>AFTON</b>	Ben Maddock, Todd Dvorak
<b>TMC</b>	Rich Grundza, Sid Clark
<b>FORD</b>	Mike Deegan, Rob Zdrodowski

**MEETING:**

George – Regarding the engines that will be used in the Aging matrix: engine 1 vs 2 – doesn’t specify which is new and used. Does it matter?

Mike – Doesn’t matter, just keep track of which is which. Rich agrees.

Christine – Does it matter what order the aging runs are run in? Would be nice to rebuild Engine 1 while Engine 2 is running. Group – fine. Just keep track of everything.

Al – Identify in matrix new vs. used instead of #1 and #2. Agreed.

Rich – When labs request oil, let Rich know vintage of engine and oil. Rich will put in comments.

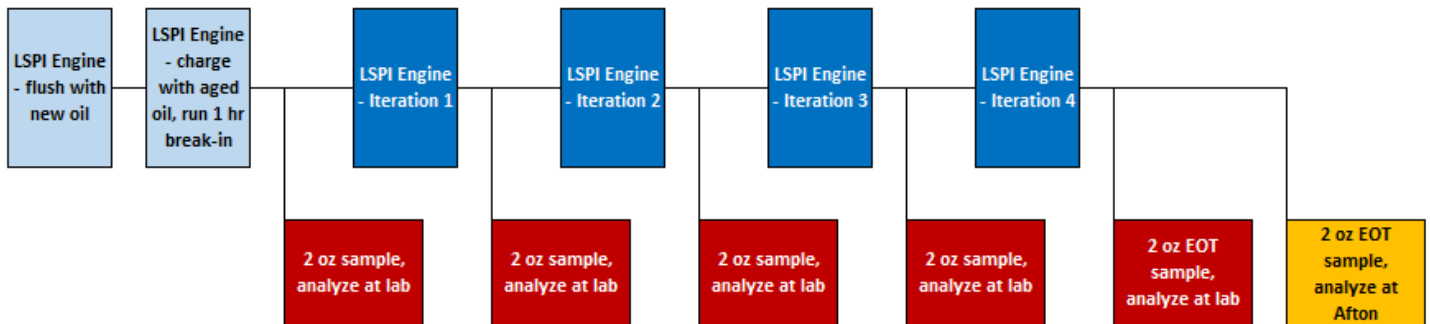
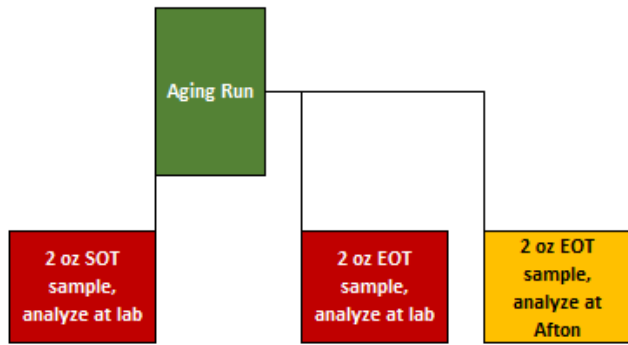
Ben – Just call #2 new and #1 used. Order of runs does not matter. Group agrees.

Al – Should update matrix to show run order.

Rich – as runs are completed, put testkeys in matrix.

Al – Make separate matrix outline for the Aging portion of the matrix. Current matrix is for LSPI runs.

Oil Samples:



Bob – want to take SOT sample after LSPI flushes? See what influence the flushes do to the Aging charge? George – yes.

Christine – what action from the data? No alternative to flushing with fresh oil.

Take sample after one hour break-in. Analysis by labs.

Al – We agreed to suction LSPI the engine after flushes.

Christine – When was this agreed to? Don't recall this discussion.

Group – Stick to LSPI procedure flushes (no suctioning).

Be strict on the time for flush drain.

Jason – 500 – 700 grams obtained with suctioning

Christine – do not see nearly that much at SwRI

Al – So 20% of the aged oil charge will be new oil. Won't be aged oil test anymore – will make test milder

Jason – Suction amount includes filter

Christine – That would match our numbers much more closely, we see 300 grams from the filter. Our "suction amount" does not include oil from the filter.

Jason – So about 200 grams from suction (considering filter and new filter size)

Mike – Good to go with aging procedure? Need to go in front of SP before starting?

Jason – Should we meet after everyone’s first aging run to look at data? AI – good idea.

Mike – Target matrix start for 1-2 wks?

What did we promise SP? Sid – which SP approves? IX or X? AI – should be IX, final deliverable is IX result.

Reconvene in 1 week, will decide which SP has jurisdiction and if funding is all set for the labs to begin testing.

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***Meeting time up, meeting adjourned.***

# Aged Oil LSPI Matrix Plan – 24 Tests

## Intent:

Develop an Engine Oil Aging Cycle for producing oil aged to 4000 typical vehicle miles that will be run on a Sequence IX LSPI Test.

## Engine Oil Aging Procedure for LSPI Testing (See existing modified Sequence X Procedure):

- 2.0l Engine used for each aging test.
  - New or rebuilt engine required for each Aging Procedure (same as scoping tests).
  - Engine to be properly broken-in prior to aging.
  - Engine will use Sequence X fuel and either reference or customer oil for break-in and aging.
  - Each lab will have (2) different Aging Engines, one that is 'New' (Eng #2) and other with approx. '5' (Eng #1) CW tests completed previously.
  - Each lab will have (1) Aging Stand.
  - **Aging cycle will follow Sequence X Stage 2 for 72 hours.**
    - Meet the same Operational Data, QI's.
  - Cycle(s) will be run to produce enough oil to run a full Sequence IX test.

**Reference** Aged Oils A or B must meet the following proposed targets, based on scoping results, to calibrate stand:

Proposed Aging Factors	Proposed Limits	
	Aged A	Aged B
TBN-D4739	>40%	>60%
TAN-D664	>0.5%	>25%
TGA Soot- D5967 Annex A4	0.3-0.5	0.6-0.8
Oxidation-D7414	>7.5	>8.5
Nitration-D7624	>15	>12.5
Fuel Dilution-D3525	>2.0	>2.0
KV 100C-D445	Stay in Grade	

- Reference Oils are based on GF6 based oils from noted SAE Papers.
  - For PM each lab will measure the before and after aging properties. In addition, a single lab will measure all after aging samples. Two (2) oz. samples taken after each test. One to lab that ran test, and One to Afton.
  - Suctioning of engine and pan, along with draining oil filter will be done to ensure adequate oil for Seq IX test.
- Candidate Oils will be evaluated for same targets but will not be held to targets as they will age differently than the reference oils.

# Aged Oil LSPI Matrix Plan – 24 Tests

## Sequence 'IX-Annex A' General Information:

- No Change to Sequence IX except:
  - Flush with **new** candidate/reference oil prior to fill and run with **Aged** Candidate/Reference Oil. No suctioning after flush.
  - Provide drain weight after flushes. 20 minutes of drain out of pan.
  - After flush, add aged oil test charge, then one hour break-in, the Test Oil Sample will serve as LSPI Initial Test Sample. 2 Oz Sample to be checked at each lab.
- Sequence IX test run.
  - No changes to test procedure.
  - LSPI Matrix will start on the 1<sup>st</sup> test after an acceptable reference.
  - Each lab will have a minimum of (1) stand.
- Aged Oil must meet current Sequence IX limits to pass.
  - Average number of events for four iterations:
    - 5 (max)
  - Number of events per iteration:
    - 8 (max)
- Assume BOI/VGRA carries over.
- Intend to review data to for LTMS either include with 'New oil' results or as a separate 'Aged Oil' TMC.
- EOT Oil Samples:
  - Two (2) oz. samples at EOT of test. One to lab that ran test, and One to Afton.

<b>Precision Matrix Status:</b>		Lab B	Lab D	Lab G	
LSPI Stand 1	LSPI Stand 2	LSPI Stand 1	LSPI Stand 1	LSPI Stand 1	LSPI Stand 2
<b>Test 1-Oil A</b> Aged Oil Eng #1	<b>Test 2-Oil B</b> Aged Oil Eng #1	<b>Test 3-Oil A</b> Aged Oil Eng #1	<b>Test 4-Oil B</b> Aged Oil Eng #2	<b>Test 5-Oil A</b> Aged Oil Eng #2	<b>Test 6-Oil B</b> Aged Oil Eng #2
API	API	Ford	Ford	API	API
<b>Test 7-Oil B</b> Aged Oil Eng #2	<b>Test 8-Oil A</b> Aged Oil Eng #2	<b>Test 9-Oil B</b> Aged Oil Eng #2	<b>Test 10-Oil A</b> Aged Oil Eng #1	<b>Test 11-Oil B</b> Aged Oil Eng #1	<b>Test 12-Oil A</b> Aged Oil Eng #1
ASTM	ASTM	ASTM	ASTM	ASTM	Infineum
<b>Test 13-Oil B</b> Aged Oil Eng #1	<b>Test 14-Oil A</b> Aged Oil Eng #1	<b>Test 15-Oil B</b> Aged Oil Eng #1	<b>Test 16-Oil A</b> Aged Oil Eng #2	<b>Test 17-Oil B</b> Aged Oil Eng #2	<b>Test 18-Oil A</b> Aged Oil Eng #2
Oronite	GM	Lab B	Lab D	Oronite	GM
<b>Test 19-Oil A</b> Aged Oil Eng #2	<b>Test 20-Oil B</b> Aged Oil Eng #2	<b>Test 21-Oil A</b> Aged Oil Eng #2	<b>Test 22-Oil B</b> Aged Oil Eng #1	<b>Test 23-Oil A</b> Aged Oil Eng #1	<b>Test 24-Oil B</b> Aged Oil Eng #1
Lab A	Lab A	Lab B	Lab D	Lab G	Lab G

**Reference Oils:** Oil A=TMC API01, Oil B=TMC API02

Each matrix test will be charged a TMC test review fee.

<b>Agging Factor Sample Plan (Analysis done by Afton)</b>				
Sample Description		# of Samples	Provided By	Funded By
API01 & API02	New Oil	2	TMC	API
Used Oil	EOT of Aging Test	24 total (one/test)	Labs	API
Used Oil	EOT of LSPI	24 total (one/test)	Labs	API