

Cummins Surveillance Panel
ISB (ASTM D7484)
ISM (ASTM D7468)
10/18/2023

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Agenda

- ISM Low Viscosity Reference Oil Discussion
- ISB Low Viscosity Reference Oil Discussion
- ISB Adjusting Screw Update

ISM Low Viscosity Reference Oil

SAE Viscosity: 5W-20

TGA Soot % At 50 h: 3.2; TGA Soot % At 150 h: 6.1

Average TGA Soot % 0-200 h: 3.9

Total Oil Consumption, kg: 6.7

Supplier	Test	%P	%S	%SASH	Viscosity Grade	HTHS	Base Stock Group
1	ISB / ISM	0.076	0.246	0.8	5W-20		II

	Sludge	Crosshead	Injector Screw	Filter Plugging	Top Ring Mass Loss
Result:	9.3	5.6	153.6	14	38
Merits:	300	375	-1664	125	N/A
Previously Shared Expected Result (similar chemistry result range):	8.9 (9.1-9.2)	6.4 (4.5-7.3)	43 (34-80)	7.1 (1-8)	44 (29-68)
P/F Limit	Merit 1000				100 max

SAE Viscosity: 5W-20

TGA Soot % At 50 h: 3.6; TGA Soot % At 150 h: 6.2

Average TGA Soot % 0-200 h: 4.1

Total Oil Consumption, kg: 9.9

	Sludge	Crosshead	Injector Screw	Filter Plugging	Top Ring Mass Loss
Result:	9.3	4.6	77.8	10	36
Merits:	300	625	-458	225	N/A
Previously Shared Expected Result (similar chemistry result range):	8.9 (9.1-9.2)	6.4 (4.5-7.3)	43 (34-80)	7.1 (1-8)	44 (29-68)
P/F Limit	Merit 1000				100 max

CROSSHEAD WEAR AT 3.9% SOOT

Unit of Measure: Milligrams
CRITICAL PARAMETER

Reference Oil	Mean	Standard Deviation
830-2	5.1	1.5
830-3	5.1	1.5

OIL FILTER ΔP

Unit of Measure: LN(OFPD+1)
CRITICAL PARAMETER

Reference Oil	Mean	Standard Deviation
830-2	2.5209	0.3274
830-3	2.9653	0.3274

AVERAGE SLUDGE RATING

Unit of Measure: Merit Rating
CRITICAL PARAMETER

Reference Oil	Mean	Standard Deviation
830-2	9.00	0.15
830-3	8.24	0.50

INJECTOR ADJUSTING SCREW WEAR AT 3.9% SOOT

Unit of Measure: Milligrams
NON-CRITICAL PARAMETER

Reference Oil	Mean	Standard Deviation
830-2	29.5	5.7
830-3	29.5	5.7

ISB Low Viscosity Reference Oil

Supplier	Test	%P	%S	%SASH	Viscosity Grade	HTHS	Base Stock Group
1	ISB / ISM	0.076	0.246	0.8	5W-20		II

SAE Viscosity: 5W-20

TGA Soot % At 100 h: 3.1

Average TGA Soot % 25-350 h: 4.4

	Average Camshaft Wear	Average Tappet Mass Loss	Average Crosshead Mass Loss
Result:	81	107	6
Previously Shared Expected Result (similar chemistry result range):	58 (39-90)	90 (31-112)	
P/F Limit	55/59/61 max	100/108/112 max	Report

SAE Viscosity: 5W-20

TGA Soot % At 100 h: 3.3

Average TGA Soot % 25-350 h: 3.5

	Average Camshaft Wear	Average Tappet Mass Loss	Average Crosshead Mass Loss
Result:	71	138	4
Previously Shared Expected Result (similar chemistry result range):	58 (39-90)	90 (31-112)	
P/F Limit	55/59/61 max	100/108/112 max	Report

ISB Low Viscosity Reference Oil

Supplier	Test	Oil	%P	%S	%SASH	Viscosity Grade	HTHS	Base Stock Group	Cam Wear	Tappet Weight Loss
PC-12 Limits									55/59/61	100/108/112
A*	T-13	1A	0.081	0.202	0.85	5W-30	3.0	III		
		1B	0.077	0.206	0.85	5W-30	2.9	III		
	ISB	1C	0.073	0.196	0.85	5W-30	3.0	III	43.3°	88.0°
B**	T-13	A	0.078	0.29	0.95	5W-30	3.6	III		
		C	0.078	0.29	0.95	10W-40	4.3	II + III		
	ISB	A'	0.078	0.29	0.95	5W-30	3.0	III	12.0	81.6
E***	ISB	A	0.077	0.26	0.7	10W-30	3.1	II	58	93
		A'	0.077	0.26	0.7	10W-30	3.2	II	51	86

* (1A, 1B, 1C) are within minor modifications of one another. We would propose to offer Oil 1A and do not believe that the modifications will largely alter the result in the Cummins ISB.

° Final test result containing ICF and SA

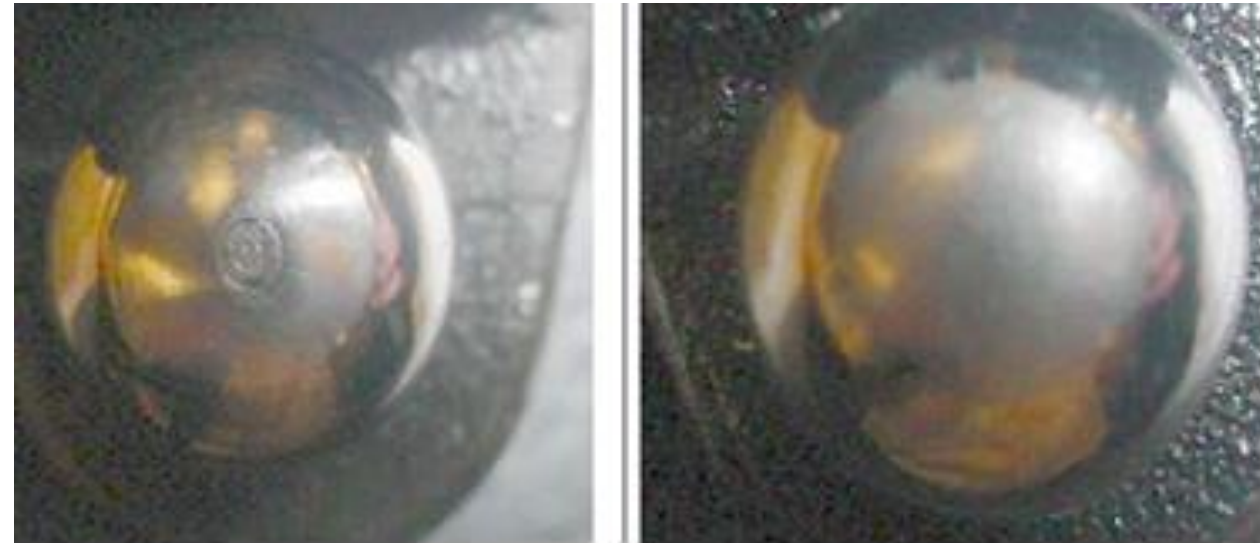
** Oil A' is an FA-4 5W-30 in the same Group III as Oil A with a small minor modification difference from Oil A

*** Oil A and A' are both FA-4 type oils where both runs are on the exact same additive package chemistry with only very small tweak in VM and base oil mix. We are proposing Oil A as the ISB reference fluid

Both Supplier A and B offerings have been accepted by Volvo Surveillance Panel for usage in Volvo T-13. Awaiting response from this SP.

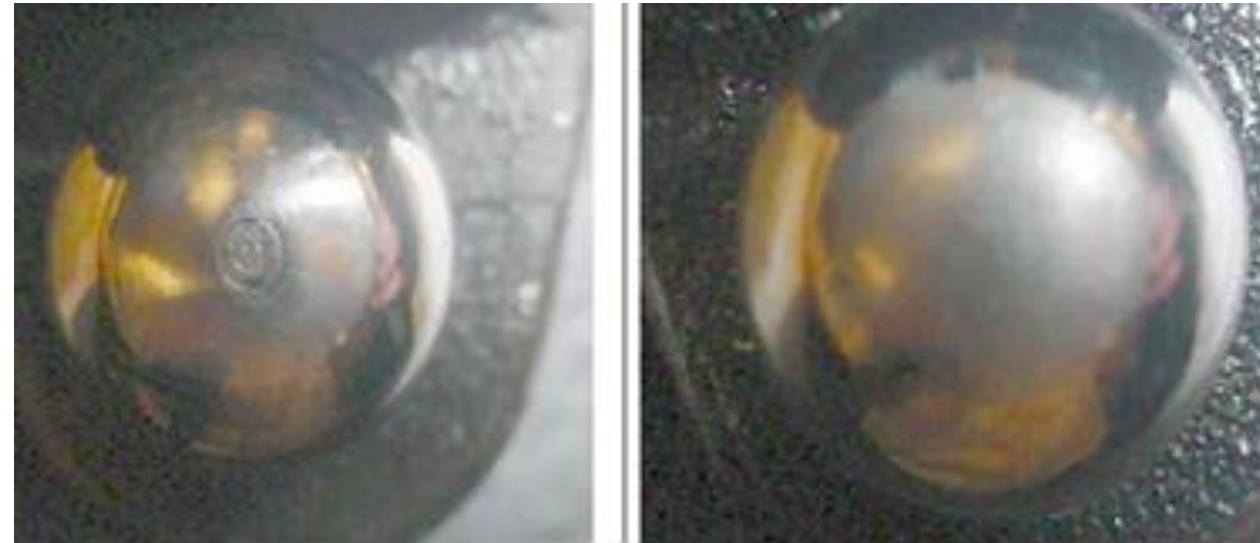
ISB Adjusting Screw Change

- Currently ISB Adjusting Screws are rejected if there are any markings on the ball surface
- There is over an 85% rejection rate on this part
- Cummins has moved to a sole source supplier, and this supplier process leaves the mark seen to the right on the screw



ISB Adjusting Screw Change

- The Cummins Engineers have approved the use of this part with the mark, statement below:
- *“[New] screws have a machining mark in the top center. This does not protrude above the crown radius and is not seen to impair the reliability of these parts. The concave surface of the push tube that contacts the adjusting screw is such that the wear pattern is a circle approximately 5mm internal diameter and width 2-3 mm. The machining mark in the center of the [New] screw would not come in contact with the push tube unless the surfaces were significantly worn.”*



ISB Adjusting Screw Change

- After reviewing EOT hardware the mark does NOT contact any wear surfaces



ISB Adjusting Screw Change

- This hardware is not batched
- TEI will need to change the inspection process to allow this mark since it is the only hardware available moving forward
- Any questions?

Concluding
Remarks

