

ISM Wear Proposal
Cummins Surveillance Panel Telecon
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Summary of Issues

- **Correction factors implemented for CWL & IAS wear parameters for tests that completed on or after June 28, 2007 appear to have significantly changed the level of performance needed to qualify candidate oils**
 - ❑ **Factors are +1.7 mg (7.1 max) CWL and +19.1 mg (49 max) IAS**
 - ❑ **Data is trending severe for CWL**
 - **Not statistically significant for reference – TMC 830-2 (carried forward from CI-4 / M11-EGR) has very strong CWL performance**
 - **Valid registered candidate data at independent labs is trending severe compared to pre-correction factor candidate tests**
 - **Data shown on registered candidate data from two laboratories**
 - ❑ **Correction factor does not seem to affect P/F rates for IAS wear**
 - **However, IAS correction “unbalances” ISM merit calculation**
- **Recent testing with new filter batch shows severe OFDP results**

ISM Reference Oil Data (TMC 830-2 "AC" Test Results)

TESTKEY	LAB	LTMSDATE	ENKIT	Merits pre (I)	Merits w/CI	ACWL	ACWLCF	CWL	Merit (pre)	Merit (DB)	SAIAS	SAIASCF	IAS	Merit (pre)	Merit (DB)	FPD	FDP Merit	ASR	AS Merit
47644	D	20040901	ISM-012	1442	1442	5.7	0	5.7	350	350	19.4	0	19.4	592	592	9	250	9.2	250
50224	A	20040903	ISM-010	1215	1215	4.6	0	4.6	625	625	35.5	0	35.5	215	215	10	225	9	150
51799	G	20040905	ISM-013	1300	1300	4.4	0	4.4	675	675	33.3	0	33.3	250	250	12	175	9.1	200
52996	B	20041002	ISM-016	1535	1535	2.4	0	2.4	700	700	25.9	0	25.9	385	385	7	300	9	150
52997	D	20041126	ISM-025	800	800	7	0	7	25	25	26.2	0	26.2	375	375	11	200	9.1	200
54195	B	20041219	ISM-026	1265	1265	4.7	0	4.7	600	600	29.2	0	29.2	315	315	13	150	9.1	200
54204	G	20041226	ISM-031	537	537	4.9	0	4.9	550	550	40.4	0	40.4	137	137	27	-200	8.8	50
50226	A	20050709	ISM-073	1224	771	6.4	0	6.4	175	175	17.6	19.1	36.7	649	196	6	300	8.9	100
55570	A	20050716	ISM-069	1125	753	7.1	0	7.1	0	0	9.3	19.1	28.4	700	328	8	275	9	150
55571	A	20050730	ISM-070	1175	815	6.1	0	6.1	250	250	8.5	19.1	27.6	700	340	10	225	8.7	0
52791	B	20060131	ISM-099	1800	1244	3.5	1.7	5.2	700	475	7.3	19.1	26.4	700	369	11	200	9.1	200
55568	G	20060409	ISM-143	1575	1041	3	1.7	4.7	700	600	13.2	19.1	32.3	700	266	14	125	8.8	50
54189	D	20060502	ISM-083	1573	808	4	1.7	5.7	700	350	20	19.1	39.1	573	158	11	200	8.9	100
56718	A	20060612	ISM-150	1643	768	4.6	1.7	6.3	625	200	17.8	19.1	36.9	643	193	12	175	9.1	200
56719	A	20060806	ISM-162	1675	1226	2.9	1.7	4.6	700	625	9.4	19.1	28.5	700	326	10	225	8.8	50
55572	B	20070228	ISM-131	1625	1367	1	1.7	2.7	700	700	5	19.1	24.1	700	442	20	-25	9.2	250
55573	B	20070311	ISM-132	1775	1099	3.7	1.7	5.4	700	425	11.1	19.1	30.2	700	299	12	175	9.1	200
55574	D	20070429	ISM-220	1475	698	4.9	1.7	6.6	550	125	8	19.1	27.1	700	348	14	125	8.9	100
55569	G	20070509	ISM-217	1675	1471	0.7	1.7	2.4	700	700	3.3	19.1	22.4	700	496	10	225	8.8	50
61892	C	20070615	ISM-201	1625	1351	2	1.7	3.7	700	700	5.5	19.1	24.6	700	426	20	-25	9.2	250
54577	A	20070705	ISM-205	1425	723	5.9	1.7	7.6	300	-125	5.6	19.1	24.7	700	423	8	275	9	150
63706	C	20070810	ISM-146	1375	493	6.1	1.7	7.8	250	-175	14.6	19.1	33.7	700	243	10	225	9.1	200
54576	A	20070816	ISM-177	1850	1494	2.5	1.7	4.2	700	700	8.3	19.1	27.4	700	344	7	300	9	150
54578	A	20070826	ISM-239	1850	1529	2.2	1.7	3.9	700	700	7	19.1	26.1	700	379	6	300	9	150
63288	G	20070906	ISM-237	1700	1139	3	1.7	4.7	700	600	14.9	19.1	34	700	239	13	150	9	150
63226	D	20080203	ISM-267	1525	1102	2.4	1.7	4.1	700	700	12.5	19.1	31.6	700	277	16	75	8.8	50
62504	B	20080324	ISM-229	1700	1449	2	1.7	3.7	700	700	4.8	19.1	23.9	700	449	15	100	9.1	200
56721	A	20080912	ISM-298	950	62	7.2	1.7	8.9	-25	-450	15	19.1	34.1	700	237	10	225	8.8	50
64411	G	20081013	ISM-301	1386	514	4.4	1.7	6.1	675	250	18	19.1	37.1	636	189	18	25	8.8	50
68200	A	20081025	ISM-300	1625	974	4.8	1.7	6.5	575	150	4	19.1	23.1	700	474	7	300	8.8	50
63707	C	20081114	ISM-275	1800	1095	3.6	1.7	5.3	700	450	14.5	19.1	33.6	700	245	13	150	9.2	250
66132	D	20090303	ISM-292	1825	1551	2.5	1.7	4.2	700	700	5.5	19.1	24.6	700	426	8	275	9	150
62999	B	20090316	ISM-297	1875	1173	4.4	1.7	6.1	675	250	5.6	19.1	24.7	700	423	6	300	9.1	200
68201	A	20090419	ISM-299	1525	852	5.6	1.7	7.3	375	-50	4.7	19.1	23.8	700	452	6	300	9	150
68649	G	20090723	ISM-360	1800	968	4.5	1.7	6.2	650	225	11.5	19.1	30.6	700	293	7	300	9	150
70663	A	20090807	ISM-351	1850	1672	1.7	1.7	3.4	700	700	2.5	19.1	21.6	700	522	7	300	9	150

Calculated ISM Merits	Avg	Pre CF	Post CF	Avg	Pre CF	Post CF	557	351	192	143
		1403	1049		536	333				
	Max	1800	1672	700	700	700	522	300	250	
	Min	537	62	0	-450	137	189	-200	0	
	Std Dev	326	446	238	381	196	105	113	70	

Average Merits for TMC 830-2 when treated as a candidate oil:

	Total	CWL	IAS	FDP	ASR
Pre (20 tests)	1402.9	536.3	556.7	165.0	145.0
Post (16 tests)	1049.3	332.8	350.9	225.0	140.6
Post - Pre CF ²	-353.6	-203.4	-205.8	60.0	-4.4

Proposals for Wear Parameters

○ Injector Screw Wear (IAS)

- No change to ICF (19.1 mg)
- Maintain hard fail at 49 mg
- Adjust Anchor & Full Merit points to make higher merits more accessible for candidates showing strong performance

<i>IAS Merit Calculations:</i>	Current	Proposed	Merits
Cap (Hard Fail)	49	49	0
Anchor	27	33	350
Full Merits	16	25	700

○ Crosshead Wear (CWL)

- Reduce ICF from 1.7 mg to 1.2 mg since 2 independent analyses suggest that CWL is overcorrected by ~0.5 mg
- Maintain hard fail at 7.1 mg
- Consider Anchor & Full Merit values adjustments to improve consistency of merits pre & post ICF introduction

<i>CWL Merit Calculations:</i>	Current	Proposed	Merits
Cap (Hard Fail)	7.1	7.1	0
Anchor	5.7	6.0	350
Full Merits	4.3	4.9	700

Impact of Proposals for Wear Parameters

○ Current ICF & Merit Calculation:

Average Merits for TMC 830-2 when treated as a candidate oil:

	Total	IAS	CWL	FDP	ASR
Pre (20 tests)	1402.9	556.7	536.3	165.0	145.0
Post (16 tests)	1049.3	350.9	332.8	225.0	140.6
Post - Pre CF	-353.6	-205.8	-203.4	60.0	-4.4

○ IAS Merit Calc Adjustment + CWL ICF Reduction:

Average Merits for TMC 830-2 when treated as a candidate oil:

	Total	IAS	CWL	FDP	ASR
Pre (20 tests)	1402.9	556.7	536.3	165.0	145.0
Post (16 tests)	1312.4	537.4	409.4	225.0	140.6
Post - Pre CF	-90.5	-19.2	-126.9	60.0	-4.4

○ IAS Merit Calc Adjustment + CWL ICF Reduction & Merit Calc Adjustment:

Average Merits for TMC 830-2 when treated as a candidate oil:

	Total	IAS	CWL	FDP	ASR
Pre (20 tests)	1402.9	556.7	536.3	165.0	145.0
Post (16 tests)	1338.6	537.4	435.5	225.0	140.6
Post - Pre CF	-64.3	-19.2	-100.7	60.0	-4.4