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OPERATIONAL TRIAL FTC FUEL PERFORMANCE CATALYST K D PERDANA OPERATIONS

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February 1993

Report prepared by:

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APPENDIX

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WesTrac Equipment - Laboratory Report

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Introduction

The purpose of this report is to evaluate and discuss the results of the various parameters measured during a trial of the FTC Combustion Catalyst on the Royal Malaysian Navy patrol boat, K.D. PERDANA.

The parameters investigated were:

- Bosch Smoke Measurement.
- * Lubricating Oil Analysis.
- * Main Engine Exhaust Temperatures.
- * Ship Performance.

and are set out and detailed in sections 1 to 4.

SUMMARY

The FTC Combustion Catalyst is a fuel treatment which will provide a more complete combustion of the fuel, providing potential maintenance and performance benefits. Our evaluation protocol was implemented to confirm that combustion was more complete following the addition of FTC and our reasoning for the various tests is discussed.

Bosch Smoke Measurement provides an engineering standard test method to evaluate changes in particulate (Soot) emissions from the engine. More complete combustion of the fuel should be evidenced by reduced carbon (Soot) emissions.

Lubricating Oil Analysis for iron wear rates and soot levels. A reduction of soot ingested into the lubricating oil is further evidence of more complete combustion. Reduced soot relates to a reduction in wear inducing material, hence our review of changes in iron wear rates. In both cases the results are factored for hours the oil is in service.

Main Engine Exhaust Temperatures/Ships Performance. More complete combustion will translate to an increase in power at a given throttle setting. If this additional power is not utilized then the engines will maintain the same power at a lower throttle setting, which translates to reduced exhaust temperature.

If the additional power provided by FTC usage is taken up, then ships speed will increase.

RPM	Base 1 13.5.92	Treated 1 25.8.92	Treated 2 29.9.92	Treated 3 24.11.92	Base 2 5.12.92
650 1050 1250	1.4 2.2 3.2	1.4 1.7 2.8	1.5 N/A N/A	1.6 1.6 1.5	2.1 N/A 3.1
Average	2.27	2.0	_	1.57	2.6

Table 2. Bosch Smoke Levels Main Engine No 2.

Graph II





RPM	Base 1 13.5.92	Treated 1 25.8.92	Treated 2 29.9.92	Treated 3 24.11.92	Base 2 5.12.92
650 1050 1250	1.1 0.6 1.1	0.5 0.6 0.7	0.7 0.6 0.8	0.7 0.6 0.6	1.1 0.7 0.9
Average	0.93	0.6	0.7	0.6	0.9

Table 3. Bosch Smoke Levels Main Engine No 3.

Graph III

BOSCH SHORE LIVES



Page 3

Table 5. Lube Oil Analysis Unit No: GEN-SET #1

Engine: Mercedes

Sump Cap.	0il Hours	0il Added	Fe ppm	Fe ppm Hours	Soot ppm	Soot ppm Hours
			()-++	- d		
			Untreate	20		
23	13	0	21	1.615	3	0.231
23	15	0	11	0.733	5	0.333
			FTC Trea	ted		
23	283	0	11	0.039	20	0.071
23	250	0	24	0.096	40	0.160
23	122	0	28	0.230	57	0.467
Average	e levels	Base		1.174		0.282
		Treated	1	0.122		0.233
ана ¹⁶ с 1		% Chan	ge	-89.6		-17.4
	· · · · · · · · · · · · · · · · · · ·		-	0 s		
Result:	Both ir	on wea	r and so	ot levels	are sign	ificantly

reduced.

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วท levels are significantly

Table 6. Lube Oil Analysis Unit No: GEN-SET #2 Engine: Mercedes

Sump Cap.	Oil Hours	0il Added	Fe ppm	Fe ppm Hours	Soot ppm	Soot ppm Hours
	*****	3 2	Untreate	ed		
23 23	302 179	0 0	28 37	0.093 0.207	13 19	0.043 0.106
			FTC Trea	ted		
23 23 23	382 250 294	0 0 0	36 13 33	0.094 0.052 0.112	17 19 20	0.045 0.076 0.068
Averag	ie levels	Base Treatec % Chan	ge	0.15 0.086 -42.7		0.075 0.063 -16.0
14 11 1 1 1 1 1 1 1 1 1				an any ang ang ang ang		

Result: Both iron wear and soot levels are significantly reduced.

Table 9. Lube Oil Analysis Unit No: Main Eng #2 Engine: MTU 16V 538TB90

Sump Cap.	Oil Hours	Oil Added	Fe ppm	Fe ppm Hours	Soot ppm	Soot ppm Hours
			Untreate	ad		
273.3 273.3	121 267	0	10 8	0.083 0.030	4 19	0.033 0.071
			FTC Trea	ted		
273.3 273.3 273.3	234 284 250	0 0 0	9 8 18	0.038 0.028 0.072	22 34 3	0.094 0.120 0.012
Average	e levels	Base Treated % Chan	ge	0.056 0.046 -17.9		0.052 0.075 +44.2

Result: The iron level shows only a small decline, however the soot has increased as a result of the 284 hour sample which could be an outlier as the companion iron reading is well down. The concern for soot levels is that it acts as an abrasive.

Table	10.	Lube	Oil	Analysis	Unit	No:	Main	Eng	#3
									Eng

gine: MTU 16V 538TB90

Sump Cap.	Oil Hours	0il Added	Fe ppm	Fe ppm Hours	Soot ppm	Soot ppm Hours
			Untreate	əd		
273.3 273.3	139 284	0 0	12 16	0.086 0.056	7 15	0.050 0.053
			FTC Trea	ted		
273.3 273.3 273.3	285 271 216	0 0 0.	16 8 11	0.056 0.030 0.051	11 14 10	0.039 0.052 0.046
Averag	ge levels	Base Treateo % Chan	d ige	0.071 0.046 -35.2		0.052 0.046 -11.5

Result: Iron level shows significant fall with only slight change in soot.

Table No 12. "Perdana" Oil Soot Sizes

0

Unit	Jnit Baselin				Treated (29	ated (29.9.92)		
	Hour	Soot Range Smallest	e (Micron) largest	Hour	Soot Range Smallest	(Micron) <i>Largest</i>		
Gen 1	13.00	< 0.15	1.0	122	0.2	2.0		
Gen 2	302.43	< 0.15	1.0	294	0.2	2.0		
Gen 3	180.00	0.2	2.0	67	0.2	2.0		
Main 1	122.00	< 0.15	2.0	250	< 0.15	2.0		
Main 2	121.00	< 0.15	2.0	250	0.4	2.0		
Main 3	139.55	< 0.15	2.0	216	< 0.15	2.0		
Main 4	140.35	< 0.15	1.0	205	< 0.15	2.5		

As noted in the above table, oil hours are not directly comparable for baseline and treated samples. The results generally show little change in particle size, contrary to our normal experience. However, it must be noted that soot content in the treated oil is lower than baseline.

3) Main Engine Exhaust Temperatures

These temperatures were recorded and logged by ships staff during routine running and whilst conducting Bosch Smoke Tests.

The results of the temperature observations are recorded in Table 13.

Table	13.	Record	of	Exhaust	Temperatures
	-		-		

Date	FTC	RPM	Exha	ust Ter	nperatures	°C
	+		M/E 1	M/E 2	2 M/E 3	M/E 4
	The Annual State	a analysis and a law and a law of	18 (1997) (B. 1997)			
6.5.92	Nil	650 (No load)	95	100	95	95
		650	155	160	155	155
		1050	350	350	355	350
		1250	460	460	465	465
30.6.92	Yes	650 (No load)	90	95	95	90
CONCIDE		650	155	155	155	155
		1050	345	345	350	345
		1250	450	455	455	455
8.7.92	Yes	650 (No load)	90	95	90	90
		650	150	150	150	150
		1050	345	345	350	345
		1250	450	450	450	450
i sana ang i					ж. ст. 105 жа	
15.7.92	Yes	650 (No load)	85	90	85	90
		650	145	145	145	150
		1050	340	340	345	340
		1250	445	445	450	445

Table 13 indicates that, exhaust temperatures have reduced progressively following the addition of FTC to the fuel, and increased again once FTC treatment ceased.

Temperatures have reduced 10°C following FTC treatment at low RPM's and up to 20°C for the higher RPM range. Again this is consistent with our experience in this area.

Graphical representation of this exhaust temperature data is provided in the following pages.

Exhaust temps. for M/E 2.

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Days elapsed

Exhaust temps. for M/E 4.



Days elapsed

Appendix

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WESTRAC EQUIPMENT - LABORATORY REPORT

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128-134 Great Eastern Highway, South Guildford, Western Australia, 6055 Telephone: (09) 377 9549, 377 9571 Facsimile: (09) 377 2405

					EQUIP. # 1	
					JOBSITE PERD	ANA
					MAKE	
	FUE	L TECH	VOLOGY		MODEL	
	ATT	MR BOI	B PLATT		SERIAL No. MAIN	ENGINE NO 1
	P۵	BOX 12	71		COMPARTMENT ENGI	NE-PRIMARY
	FRE	MANTLE			OIL BRAND & TYPE	1
	WA	6160			OIL CHGD?	
					ORDER No.	
					LABEL # 4-4	
					LAB I.D. # 92J7	8404
					EVALUATION CODE	
DATE TAKEN OIL ADDED	TOTA	AL HO RS ON	URS OIL		COPPER IS HIGH. SODIUM IS HIGH. ALL OTHER ELEMENTS TES NORMAL.	T RESULTS APPEAR
				CURRENT	THIS COULD BE CAUSED BY THE UIL ADDITIVE PACKAGE.	
REC'D			770			
271092	N	335	222			
DATE TAKEN			н		VERY LITTLE CHANGE	
29-69-72 REC'D				PREVIOUS #1	CONTINUE SAMPLING AT THE NORMAL INTERVAL.	
271092	N	250	250			
DATE TAKEN					COPPER IS HIGH. SODIUM IS HIGH.	
28-08-92 REC'D				PREVIOUS #2	THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE.	
271092	N	284	284			
DATE TAKEN					COPPER IS HIGH. SODIUM IS HIGH.	
REC'D 271092	N	50	50	PREVIOUS #3	THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE. CONT NORMAL INTERVAL. NOTE: NEW OIL CONTAINS HIGH LEVELS OF COPPER AND SODIU	INUE SAMPLING AT THE

1																								
			CONC	ELE ENTR/	MENT	IN PP	M									OIL	Condi % 0	tion/C	ontan Owabi	Minan Le	rs			
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271092	105	8	0	4	2	3	-	457	- #2	× *	n	N	N	-	18	13	-	45	-	-	-	-	-	
271092	110	12	0	5	2	5	-	400	- #3			N	N	-	10	7	-	34	-	-	-	-	-	
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EVALUATION CODES: A - ACCEPTABLE B - REPORTABLE C - UNACCEPTABLE X - URGENT

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													JC)BSITE MAKE		P	ERDAN	A			
	FUI At Po Fri Wa	EL TE T MR BOX Emant 616	ECHNI BOB 127 ILE	OLOGY PLATT 1								CO OIL BR/	N Seri Mpart And & Oil (Model Al No. TMENT TYPE CHGD?		M	AIN E NGINE	NGINE -PRIM	ND 1 Ary /		
													ORD	ER No.							
													LA	BEL #		4	-2				
												EVALU	Lab Jation	I.D. # CODE		9 B	2J784	83			
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DATE TAKEN									COPPER IS H	IGH. SODIU	4 IS H	HIGH.								÷	
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DATE TAKEN						i Life			COPPER IS H	IGH. SODIU	1 IS H	HIGH.			-	3 2	2				
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WesTrac Equipment Pty Ltd A.C.N. 009 342 572

128-134 Great Eastern Highway, South Guildford, Western Australia, 6055 Telephone: (09) 377 9549, 377 9571 Facsimile: (09) 377 2405

					EQUIP. # 2
					JOBSITE PERDANA
					МАКЕ
	FUEL	TECHN	IOLOGY		MODEL
	ATT	MR BOE	PLATT		SERIAL No. MAIN ENGINE ND 2
	PO I	BOX 127	1		COMPARTMENT ENGINE-PRIMARY
	FRE	ANTLE			OIL BRAND & TYPE
	WA	6160			OIL CHGD?
					ORDER No.
					LABEL # 4-B
					LAB I.D. # 92378409
					EVALUATION CODE B
DATE TAKEN OIL ADDED	TOTA	L HOU IS ON	IRS OIL	CHRRENT	COPPER IS HIGH. SODIUM IS HIGH. ALL OTHER ELEMENTS TEST RESULTS APPEAR NORMAL. THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE.
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271892	N	267	267		
DATE TAKEN 79-89-97				ningen er en service en service. I	IRON ACCEPTABLE BUT INCREASING DXIDATION AND SULPHUR ARE HIGH
REC'D				PREVIOUS #1	CHECK FOR THE CORRECT COOLANT PRESSURE/TEMP.
271092	N	250	250		
DATE TAKEN	н Т.			PREVIOUS	COPPER IS HIGH. SODIUM IS HIGH. ALL OTHER ELEMENTS TEST RESULTS APPEAR NORMAL. THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE.
REC'D				#2	
271092	N	234	234		
DATE TAKEN				enance of the second	CDPPER IS HIGH. SODIUM IS HIGH.
				PREVIOUS	THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE.
REC'D				#3	
271092	N	122	122		

			CONC	ELE ENTR/	MENT	in pp	M								OIL	Condit % 0	fion/c F all	ontan Owabl	/INANT _E	rs			
DATE	CU	FE	CR	PB	AL	SI	MO	NA	MG SN		W	F	A	ST	OXI	NIT	SUL	ŧŧŧ	ŧŧŧ	TAN	TBN	VIS	
271092	105	8	8	4	2	3	-	420	-CUR		N	N	-	19	14	-	34		-	-	-		0
271092	110	18	8	8	5	7	-	548	-#1	-	N	N	_	3	62	÷ -	84	-,	 	-	-	- T.	6
271092	186	9	0	4	2	4	-	450	-#2	-	N	N	-	22	12	-	51	-	-	-	-	, - ``	
271892	103	8	6	6	2	2	-	332	- #3		N	N	-	18	17	-	28	-	-	-	-	-	
AL — A CR — C FE — IF	aluminiu Chromiun Ron	M M		CU - PB - MO	- Copp - Lead - Moly	er Bdenl	JM		Wear SI — Silici NA — Sod	METAL ABB ON DIUM	BREVIA	Ations W — W F — Fu A — AM	/ATER EL NTIFREE	ZE		S S	T — S(U — SL)ot Jlphur			0X NI	oxidati Nitratic	ion Dn

EVALUATION CODES: A - ACCEPTABLE B - REPORTABLE C - UNACCEPTABLE X - URGENT





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	FUE	L TECH	NOLOGY		EQUIP. # Jobsite Make Model	3 Perdana		
	ATT PO I	MR BOI BOX 12	B PLATT 71		SERIAL NO. COMPARTMENT	MAIN ENGINE NO 3 ENGINE-PRIMARY		
	FREP WA	6168			OIL BRAND & TYPE OIL CHGD? ORDER No.			
					LABEL # LAB I.D. #	4-14 92J78414		
9					EVALUATION CODE	B		
DATE TAKEN OIL ADDED	tota Houf	al hou Rs on	urs Oil		COPPER IS HIGH. SODIUM IS HIGH. THIS COULD BE CAU PACKAGE.	SED BY THE OIL ADDITIVE		- m (
REC'D				CURRENT	IKUN ALLEPTABLE BUT INCKEASING	e se g e		
271092	N	284	284					
DATE TAKEN					COPPER IS HIGH. SODIUM IS HIGH.	-	-	
29-89-92 REC'D				PREVIOUS #1	THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE.			
271092	N	216	216					
DATE TAKEN	k	5			COPPER IS HIGH. SODIUM IS HIGH.	÷	-	а
28-68-92				PREVIOUS	THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE.			1
REC'D 2711092	N	211	211 27	(#Z			1	
DATE TAKEN					COPPER IS HIGH. SODIUM IS HIGH.		1	
REC'D				PREVIOUS #3	THIS COULD BE CAUSED BY THE DIL ADDITIVE PACKAGE.			
271092	N	139	139				2	

			CONC	ELE ENTR/	MENT	in Pp	М									OIL	Condi % 0	rion/c F all	ontan Owabi	/INAN _E	rs			
DATE	CU	FE	CR	PB	AL	SI	MO	NA	MG SN			W	F	A	ST	OXI	NIT	SUL	ŧŧŧ	ŧŧŧ	TAN	TBN	VIS	- 1 -
271092	114	16	0	7	2	2	-	292	- CUR		2	N	N	-	15	12	-	75	-	-	-	-	-	Å
271092	112	11	8	5	1	2	-	414	-#1	:		N	N	-	10	12	-	96	-	-	-	-	-	
271092	184	8	0	4	1	2	-	412	- #2			N	N	-	14	18	-	49	-	-	-	-	-	2
271092	109	12	0	6	2	3	-	250	- #3	R)		N	N	-	7	20	-	40	-	-	-	-	-	
AL CR - (FE - 1	ALUMINIU CHROMIUI RON	M M		CU - PB - MO	- Copp - Lead - Moly	PER BDENL	JM		WE SI — SI NA — S	AR MET	AL ABE	BREVIA	Tions W — W = — Fu A — AM	ATER El TIFREI	EZE	5) * 14	500	it — S(IU — S()ot Jlphuf	1		0X — NI —	oxidat Nitrați	TION ON

EVALUATION CODES: A - ACCEPTABLE B - REPORTABLE C - UNACCEPTABLE X - URGENT

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	FU At Po Fri Na	el te i Mr Box Emant 617	ECHNO BOB 1271 LE	LDGY PLATT										CO OIL BR. EVALL	JC JC SERI, MPART AND & OIL (ORDI LA LAB JATION	DBSITE MAKE MODEL AL NO. MENT TYPE CHGD? ER NO. BEL # I.D. # CODE		4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ERDAN AIN E Ngine -13 22J784	A NGINE -PRII 13	e nd 3 Iary J		
DATE			-				3		53	IPPER	IS HIGH	I. SODIU	MISI	HIGH.								2	
29-89-90 ADDED REC'D 271892	TO HO	TAL URS	HOURS ON OIL	216	CI	JRRI	ENT		Tł	115 CO	ULD BE	CAUSED	BY TH	E DIL	ADDI	TIVE	PACKA	GE.					
DATE		-					- 188 (1.17)			0000				17.00			. 9						2
TAKEN 28-08-92 REC'D 271092	N	21	1	211 ²⁻	21 71	REVI #	DUS I	-1	TH	IS CO	ULD BE	CAUSED	n 15 M	E OIL	ADDI	TIVE	PACKA	IGE.					
DATE		1				N .		1	C0	PPER	IS HIGH	I. SODIU	MISH	IIGH.	÷.,.*			4					
REC'D 271892	抖	13	9	139	PI	REVI #2	DUS 2		TH	IS CO	ULD BE	CAUSED	BY THE	E DIL	ADDI	TIVE	PACKA	IGE.	2 2 2				
DATE Faken Rec'd					PI	REVI #∶	0US 3	A. 8	2 2	u n		9 10 9		9 E	12 14			10 10 12 12	· · · · · ·				99.82
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Scheduled Oil Samplin



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		ATT M PO BO FREMA	R BOB X 127 NTLE 160	PLATT 1									0	con Il bra	Seria IParti ND & OIL C	UDEE L No. MENT TYPE HGD?		M	AIN E Ngine	NGINE -Prim	NO 3 Ary /			
		" " "	100										E	EVALU	ORDE LAB LAB ATION	R No. EL # I.D. # CODE		U 4 9 8	NTREA -11 2J784	TED 11				
DATE TAKEN									CO	PPER IS	HIGH. S	GODIUM	IS H	IGH.										
REC'D 271892	DDED	HOURS	ON 0	139	CI	JRRE	NT		TH	IS COULD) BE CAL	JSED BY	(THE	DIL	ADDI	TIVE	PACKA	GE.		3				
DATE									le construction de la construcción											y				
TAKEN REC'D					PF	REVIO #1	OUS																	
DATE									2) 2)	<u></u>			57 18 18 18 -							9				
TAKEN					PF	REVI	OUS																	
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DATE TAKEN	1				V.																			
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REC'D						#:	3														¥.			
			CON	ELE	MENT	IN PPM	Λ									OIL (CONDIT % 0	TION/CO	ontan Wabl	1INAN1 E	S			
DATE	CU	FE	CR	PB	AL	51	MO	NA	MG	SN		¥	F	A	ST	DXI	NIT	SUL	***	ŧŧŧ	TAN	TBN	VIS	
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									#	43														
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	r F F	ATT M Po Bo Rema	IR BO	B PLAT	Γ									(coi Dil Br/	Seri Mpart And &	AL No. MENT TYPE		M E	IAIN E Engine	NGINE -PRIM	e no 4 Mary /			
	þ	1A 6	160													oil (ordi La	CHGD? Er No. BEL #		4	-20					
															EVALL	LAB JATION	I.D. # CODE		9 E	2J784 1	28				
DATE TAKEN			× .						C	OPPE	RISH	IGH, S(DIUM	IS H	IGH.										
OIL ADDE	Ð	total Hours	H0 ON	urs I oil	C	URRI	ENT		ĩ	HIS	COULD	BE CAUS	GED B	Y THE	OIL	ADDI	TIVE	PACKA	AGE.						
REC'D 271092	N		319	319																					
DATE TAKEN									C	OPPE	R IS H	IGH. SC	DIUM	IS H	IGH.							<i>a.</i>			
REC'D					P	REVI #	ous I		T	HIS	COULD I	BE CAUS	GED B	Y THE	OIL	ADDI	TIVE	PACKA	A6E.						
271892	N		284	284																					
DATE TAKEN 79-89-97		2.				12			C	OPPE	R IS H	16H. SC	DIUM	IS H	IGH.							8 39			
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DATE TAKEN 28-88-92						600 610 0 × 0			C	OPPEI	R IS H	IGH. SC	DIUM	IS H	IGH.			5			-				
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AL — AL CR — CH FE — IRO	AL – ALUMINIUM CU – COPPER CR – CHROMIUM PB – LEAD FE – IBON MO – MOLYBDENUM								S	WI SI — S NA —	ear met Ilicon Sodium	TAL ABB	REVIA V F	Tions N — W. ^E — Fue A — An	ater El Itifrei	EZE	N.	0.00	ST — S(SU — SI)ot Jlphur			0X - NI -	OXIDATIO NITRATION	N J

EVALUATION CODES: A - ACCEPTABLE B - REPORTABLE C - UNACCEPTABLE X - URGENT





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	FI A Pi Fi	UEL 1 TT MF D BO) REMAN A 61	TECHI R BOI K 123 NTLE	YOLDGY 3 Platt 71									0	COI IL BR/	N Seri <i>i</i> Mpart ND & Oil C	NODEL AL No. MENT TYPE CHGD?		۲ E	IAIN E Engine	NGINE -PRIM	nd 4 Ary /		
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DATE TAKEN									C	OPPER I	IS HIGH.	SODIUM	IS H	IGH.									S. #1
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DATE TAKEN									C	OPPER I	S HIGH.	SODIUM	IS H	IGH.									₹÷
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DATE TAKEN							с.		C	OPPER I	S HIGH.	SODIUM	IS H	IGH.									- ×
REC'D 271092	N	1	40	140	PĘ	REVI ∉2	ous 2		Ţ	HIS COU	ILD BE CA	USED B	Y THE	OIL	ADDI	TIVE	PACKA	6E.					
DATE TAKEN		5		v	PI	REVI	ous			х Х		1								9		c	
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271092	99	5	Ş	3	1	2	-	477	-{	UR		N	N	-	18	8	-	32	-	-	-	_	-
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al — All Cr — Chr Fe — Iron Evaluatio This ana	IMINIUN IOMIUM I ON COE LYSIS I	M DES: IS INTE	A — A ENDEL	CU PB MO ACCEPTA D AS AN	- Copp - Lead - Moly Ble B Aid in F	er 18denu - Rep(Predic	im Drtabi Fing M	.e c — Echanic	S N UNACI CAL W	Wear 51 — Silic NA — Soe Ceptable Ear. No (r metal ar Con Dium E X — Urg Guarantee	BBREVIA F F ENT E, EXPRE	TIONS W — W = — FUI A — AN SS OR	ater El Itifre Implie	eze Ed, is i	MADE A	S	t — so U — si t faill	dot Jlphur Jre of	THIS P	IECE OF	0X — NI — I	oxidation Vitrațion

EQUIPMENT OR A COMPONENT PART THEREOF.

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DATE TAKEN 28-08-00 271092 N DATE TAKEN REC'D DATE TAKEN REC'D DATE TAKEN REC'D	L HOURS S ON OIL		CU	IRRI IEVII #1			UN	KNOWN HOURS Is could be	S ON OIL E CAUSED	SAMPL BY TH	EVALU,	ATION PER	CODE	GH. 9	9 B Odium	20784 IS H	21 16H.			
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al — Aluminium cr — Chromium fe — Iron Evaluation codes:	A - ACC	CU PB MO EPTABL	Coppe Lead Molye E B -	er Bdenu - Repc	im Drtabl	LE C-	SI NA UNACCE	WEAR META - Silicon - Sodium Eptable X	L ABBREV URGENT	ATIONS W — V F — FL A — A	ater Vater Iel Ntifree	ZE		S	r — so J — su	ot Lphur			0X — NI — N	oxidation Itration



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					EQUIP. # GEN1		
					JOBSITE PERDANA		
					MAKE		
	FUE	L TECH	NOLOGY		MODEL		
	ATT	MR BOI	B PLATT		SERIAL NO. GEN NO1		
	PD	BOX 12	71		COMPARTMENT ENGINE-GEN SET		
	FRE	MANTLE			OIL BRAND & TYPE /		
	₩A	6160			OIL CHGD?		
					ORDER No.		
					LABEL # 4-23		
					LAB I.D. # 92J78424		
					EVALUATION CODE		
DATE TAKEN 29-89-90	тот	al Ho	URS		ELEMENTS SLIGHTLY ELEVATED SLIGHT OXIDATION INDICATED,	xt -	
ADDED	HOU	JRS ON	OIL	CUDDENT	CHECK FOR THE CORRECT COOLANT PRESSURE/TEMP. CHECK FOR CORRECT SHUT DOWN	4	
REC'D				CONNENT	PROCEDURE.		
271092	N	122	122				
DATE					COPPER IS HIGH. SODIUM IS HIGH.	1	
TAKEN							
				PREVIOUS	THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE.		
REC'D				#1			
271092	N	15	15				
DATE					ELEMENTS ELEVATED SHOWS FUEL DILUTION SUGGEST CHECK FOR SOURCE SCHEDULE		1
				normono	UNIT FOR INSPECTION AS SOON AS POSSIBLE.		
				PHE VIUUS	RESAMPLE AFTER 100 HOURS.		
REC'D				#2			1
271892	N	13	13			1	1000 A. 1111
DATE					UNKNOWN HOURS ON OIL SAMPLE, COPPER IS HIGH, SODIUM IS HIGH,	a.	a as
28-08-92				partitolic			
				FREVIOUS	THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE.		1
REC'D				#3			
271092	N						

			CONC	ELE ENTRA	MENT	IN PP	M								OIL	Condit % 0	Fion/C	ontan Owabl	/INANT _E	rs		
DATE	CU	FE	CR	PB	AL	SI	MD	NA	MG SN		¥	F	A	ST	OXI	NIT	SUL	***	ŧŧŧ	TAN	TBN	VIS
271092	103	28	0	9	4	13	-	536	-00 R		N	N	-	57	39	-	73	-	-	-	· -	-
271892	96	11	0	5	2.	12	-	525	- # t	3 8951	N	N	-	5	14	-	4		-	-	-	-
271892	91	21	8	11	4	15	-	464	-#2		N	3%	-	3	12	-	4	-	-	-	-	-
271892	99	24	0	7	4	14	-	538	- #3		N	N	-	40	24	-	56	-	-	-	-	-
L									WEAT	R METAL A	RRRFVI	TIONS										
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		FUEL ATT M PO BO FREMA WA 6	TECHNO R BOB X 1271 NTLE 160	DLOGY Platt										CC OIL BF EVAL	EC J(SERI)MPAR AND & OIL ORD LA LAB UATION	UIP. # DBSITE MAKE MODEL AL NO. IMENT TYPE CHGD? ER NO. BEL # I.D. # I CODE			GEN1 PERDA GEN N ENGIN UNTRE 4-21 92J7E X	NA 101 IE-GEN ATED 1422	SET		
	D	TOTAL HOURS	Hour: On Oil	S L	C	URR	ENT	1 86 20	E Li R	LEMEN INIT F	TS ELEV OR INSP LE AFTE	VATED SH Pection Er 100 H	DWS FU AS SDO DURS.	el di N As	LUT I POSS	ON SU	66ES1	CHEC	K FOF	SOUR	CE SCI	IEDULI	
271072	N		13	13																			
DATE TAKEN			ă. Ă		ł e				U	NKNON	N HOURS	G ON OIL	SAMPL	E. CC	IPPER	IS H	IGH.	SODIU	M IS	HIGH,		ï	
28-08-92					Pi	REVI	OUS	s š	Ţ	HIS C	DULD BE	E CAUSED	BY TH	E OIL	ADD	ITIVE	PACK	AGE.					
REC'D 271892	N					#																	
DATE TAKEN					а. 						2			10	8				2	8 9 ¹⁷		۰ بر	
					PI	REVI	OUS														Ϋ́, "		
REC'D						#	2																
DATE TAKEN					PI	REV	1005	*					-	N W		e, oo ki		12 23 12					
REC'D						-77*	5																
			CONC	ELE	MENT	IN PP	'n	× ,								OIL	CONE %	ition/	CONTA	MINAN BI F	ITS		122 - V
DATE	CU	FE	CR	PB	AL	SI	MD	NA	MG	SN		벍	F	A	ST	DXI	NIT	SUL	***	ŧŧŧ	TAN	TBN	VIS
271092	91	21	Ø	11	4	15	-	464	-	CUR		N	32	-	3	12	-	4		-	-	-	
271092	99	24	Ø	7	4.	14	-	538	-	#1		N	N	-	40	24	-	56	-	-	- 1.2 1.2	-	. .
						4				#2				e.		3						10	· · · ·
							-		9	#3								1	* · F · · · · · · · · · · · · · · · · ·				
al — Ali cr — Chi fe — Iro Evaluati This Ana Equipmei	Jminiu Romiu N On Co Lysis NT Or	JM M DES: IS INT A COM	A — AC ENDED /	CU - PB - MO CEPTAE AS AN T PART	- Copp - Lead - Moly Ble B AID IN F There	PER) YBDENI — REP PREDIC EOF.	JM ORTAB TING M	LE C IECHANI	UNAC	WE SI — SI NA — S CEPTAR EAR. N	AR META Licon Odium Ble X — D guara	URGENT NTEE, EXP	IATION: W - V F Fl A A	s Vater Jel Ntifre	eze Ed, Is	MADE	AGAIN	st — s su — s st fail	Soot Sulphu .ure o	ir F This	PIECE 0	0X - NI -	- Oxidation Nitration

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THIS AN EQUIPME	IALYS ENT C	odes Sis IS IN DR A C	NTENC	DED A	S AN / PART	AID IN F THERE	PREDICT OF.	TING M	ECHANI	CAL WEA	R. NO G	UARANTE	E, EXPRE	SS OR	IMPLIE	ed, is i	MADE A	GAINS	t failu	JRE OF	this p	ECE OF		
AL — AI CR — CI FE — IRI	lumin Hrom On	NUM NUM			CU - PB - M0 -	- Copp - Lead - Moly	er ′Bdenu	JM		SI - NA	Wear - Silico - Sod	metal a DN IUM	BBREVIA	TIONS W – W F – FU A – AN	ater El Itifrei	EZE		0, 0,	ST — S(SU — SI)ot Jlphur			0X - NI -	OXIDATIO NITRATION
										41	3													*
										- 4	2)								
271092	9	7 1	3	Ø	5	3.	8	-	533	- #	t	ч <u>.</u>	N	N	-	5	35	-	59	_	-	-	-	; _
271092	10	4 3	6	2	9	6	9	-	540	C(iP.		N	N	-	17	79	-	150	-	-	-	-	-
ATE	CI	U F	C	CONCE CR	ELE ENTRA PB	Ment Tions Al	in ppi Si	M Mo	NA	MG	SN		ы	F	A	ST	OIL (CONDI % C NIT	tion/c F all Sul	ONTAN OWABL ¥¥¥	IINANT E ¥¥¥	'S Tan	TBN	VIS
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ATE AKEN						DI	DEVI	0110	2															, 14 2
EC'D							#2	2																
ATE AKEN			-			pp	SE MI	2110			Ξ.													
EC'D 271092	I	N				Pł	₩EVII #1	ous I		THI To	S COUI ESTABI	LD BE CA LISH A T	NUSED E REND.	Y THE	DIL	ADDI	TIVE	PACK	16E. M	IORE S	AMPLE	s are	NEED	ED
DATE TAKEN										UNK	NOWN I	HOURS ON	I OIL S	AMPLE	. COF	PPER	IS HI	GH. 5	SODIUM	IS H	IGH.			
EC'D 271092			382	2 3	82	Cl	JRRE	ENT		CHE	CK FOI	r the CC	IRRECT	COOLA	NT PI	RESSU	IRE/TE	MP. F	OSSIE	LE GE	AR TR	AIN W	EAR.	4
ATE AKEN OIL)FD	TOTAL HOUR	s	HOURS ON OIL						IRO	N IS S	SLIGHTLY	HIGH.		ATIO	n and	SULP	HUR A	ARE HI	6H				
								2							EVALU	ordi Lai Lab Iation	ER No. BEL # I.D. # CODE		4 9 E	-29 2J784	27			
		FREM WA	ANTL 616	E 1271 1271										. (DIL BRA	and & Oil (TYPE CHGD?		L	NUINC	OCH) (
		FUEL ATT	MR E	CHNOL Bob P	.06y 'Latt										C01	N SERI/	MODEL AL No.		6	EN NO	2 -65N	CCT		
																JC	MAKE		F	ERDAN	A			

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128-134 Great Eastern Highway, South Guildford, Western Australia, 6055 Telephone: (09) 377 9549, 377 9571 Facsimile: (09) 377 2405

					Equip. #	GEN2
					JOBSITE	PERDANA
					МАКЕ	
	FUE	L TECH	NOLOSY		MODEL	
	ATT	MR BO	B PLATT		SERIAL No.	GEN NO2
	PO	ROX 12	71		COMPARTMENT	ENGINE-GEN SET
	FRE	MANTLE			OIL BRAND & TYPE	1
	WA	6160			OIL CHGD?	
					ORDER No.	
					LABEL #	4-27
					LAB I.D. #	92378429
					EVALUATION CODE	B
DATE TAKEN 79-09-912	TOTA	AL HO	URS		IRON IS SLIGHTLY HIGH. OXIDATION AND SULPHUR	ARE HIGH
REC'D	Hou	rs on	OIL	CURRENT	CHECK FOR THE CORRECT COOLANT PRESSURE/TEMP. (PROCEDURE.	CHECK FOR CORRECT SHUT DOWN
271092	N	294	294			
DATE TAKEN					COPPER IS HIGH. SODIUM IS HIGH. OXIDATION AND	SULPHUR ARE HIGH
				PREVIOUS		
				44.1	LHELK FUK THE LUKKELT LUULANT PRESSURE/TEMP. T	CHELK FOR RESIDUAL UIL
REC'D		780	740	// •	FULLDWING DIL DKAIN	
2/1892	N	382	967			
date Taken			£j		IRON IS SLIGHTLY HIGH. DXIDATION AND SULPHUR 4	ARE HIGH
				PREVIOUS	CHECK FOR THE CORRECT CODI ANT PRESSURE/TEMP.	POSSIBLE GEAR TRAIN NEAR
REC'D				#2	uneok fen me bennebt boernit mebberi fen fi	bollee beim minin weime
771007	N	382	387	// L		
2/10/2	н	502	002			
DATE TAKEN			R		UNKNOWN HOURS ON DIL SAMPLE, COPPER IS HIGH, S	GODIUM IS HIGH.
				PREVIOUS	THIS COULD BE CAUGED BY THE DIL ADDITIVE DARW	AGE MORE CAMPLES ADE MEENEN
				343		TUE, HUNE DHOFLED HAVE MEEDED
	hi			77" Q	TO LOTHOLION & TREMU.	
2/1072	N					

			CONC	ELE ENTRA	MENT	in pp	M	3				e F	-	90 ¹	OIL (Condi % 0	fion/c F allo	ontan Owabl	1INANT .E	ſS		
DATE	CU	FE	CR	PB	AL	SI	MO	NA	MG SN		Ħ	F	A	ST	DXI	NIT	SUL	***	ŧŧŧ	TAN	TBN	VIS
271092	100	33	1	6	6	10	-	537	- CUR		N	N	-	20	83	-	153	-	-	-	-	-
271092	96	28	1	11	6.	10	-	535	-#1		N	N		13	65	-	129	-	-	-		-
271092	184	36	2	9	. 6	9	-	548	-#2		N	N	-	17	79	2 2 2	158	-		-	, -	
271092	97	13	0	5	3	8	-	533	- #3	а. Э. ^э	N	N	-	5	35	-	59	-	-	-	-	-
AL — A CR — C FE — IF		M		CU - PB - MO	- Copp - Lead - Moly	ER (BDENL	IM		WE SI — S NA — S	Ar Metal Ilicon Sodium	ABBREVIA	Ations W – W F – Fu A – AM	ater El Itifree	ZE		S	ST — SC SU — SL)ot Jlphur	53		0X — NI —	Oxidation Nitration

EVALUATION CODES: A - ACCEPTABLE B - REPORTABLE C - UNACCEPTABLE X - URGENT

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	FI	151 T	ELANU	(06V											EQ J(UIP. # DBSITE MAKE			GEN3 Perdai	NA			
	AT PO FR WA	T MR BOX Eman 61	BOB 1271 TLE 60	PLATT									(co Dil Br.	SERI MPART AND & OIL (AL No. IMENT TYPE CHGD?			GEN N Engin)3 E-6en	SET		
				æ										EVALI	LA LAB JATION	BEL # I.D. # CODE			4-35 92J78 B	431			
ATE AKEN 28-08-99	TO	OTAL	HOURS	3					U	VKNOWN I	HOURS ON	OIL S	AMPLE	. CO	PPER	IS H	IGH.	SODIU	MISI	HIGH.			7
EC'D 271892	N N	UUKS	UN UIL		Cl	JRRI	ENT		TI	HIS COUN NDICATE	LD BE CAL D, CHECK	ised B For T	iy the The Co	OIL RREC	ADDI T COU	TIVE	PACK PRES	AGE. SURE/	SLIGH TEMP.	F OXII	ATION		
ATE AKEN											15												
EC'D					P	HEVI	ous 1																
ATE	•																	7.					
					PF	REVI	ous																
C'D						#	2																
TE KEN					PI	REVI	ous								20								
:C'D						#:	3																
				ELE	MENT		->									OIL	COND	ITION/C	ONTA	MINAN	rs		
TE	:0	FE	CONC	PB	ATIONS	SI	M MQ	NA	MG	SN		H	F	A	ST	OXI	% (NIT	of All Sul	OWAB	LE ###	TAN	TBN	VIS
?71092	99	10	Ø	6	3	10	-	536	-0	- CE	, *)	N	N	-	9	44	-	46	-	-	-	-	-
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									Ŧ	#2						e 2							
		2							Ŧ	#3													
AL — ALUM CR — CHROI FE — IRON				CU - PB - MO -	- Copp - Lead - Moly	ER (BDENU	IM	F A	SN	WEAR I - SILICO A - SODI	METAL AB	BREVIA F	Tions W — W = — Fu A — AN	ater El Itifre	EZE			ST — S SU — S	oot Ulphuf	1		0X NI	· Oxidation Nitration

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					Equip. # Gen3 Jobsite Perdana
					MAKE
	FUE	L TECH	NOLOGY		MODEL
	ATT	MR BO	B PLATT		SERIAL NO. GEN NO3
	PO	BOX 12	71		COMPARTMENT ENGINE-GEN SET
	FRE	MANTLE			OIL BRAND & TYPE
	¥A	6160			OIL CHGD?
					ORDER NO. UNTREATED
					LABEL # 4-33
					LAB I.D. # 92J78433
					EVALUATION CODE
DATE TAKEN OIL	TOT	AL HO	URS		COPPER IS HIGH. SODIUM IS HIGH. SLIGHT OXIDATION INDICATED,
REC'D	huu		UIL	CURRENT	THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE. CHECK FOR THE CORRECT COOLANT PRESSURE/TEMP.
271092	N	180	180		
DATE TAKEN				N N	COPPER IS HIGH. SODIUM IS HIGH. OXIDATION IS HIGH.
REC'D				PREVIOUS #1	THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE. CHECK FOR THE CORRECT CODLANT PRESSURE/TEMP.
271092	N	250	250		
DATE TAKEN					UNKNOWN HOURS ON OIL SAMPLE. COPPER IS HIGH. SODIUM IS HIGH.
20-00-72				PREVIOUS	THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE. SLIGHT DYIDATION
REC'D				#2	INDICATED, CHECK FOR THE CORRECT COOLANT PRESSURE/TEMP.
271092	N				
DATE TAKEN					
				PREVIOUS	
REC'D				#3	
			51 51		

			CONC	ELE ENTRA	Ment Tions	in pp	М								OIL	Condit % 0	tion/c F all	ontan Owabi	Minan ⁻ Le	TS		
DATE	CU	FE	CR	PB	AL	SI	MD	NA	MG SN		¥	F	A	ST	OXI	NIT	SUL	***	ŧŧŧ	TAN	TBN	VIS
271092	98	22	1	9	4	14	-	534	- CUR	54 25	N	N	-	12	47	-	55	-	-		-	-
271092	99	17	8	7	3.	12	-	538	-#t		N	N	Ę	10	54	-	61	-	-	-	-	
271892	99	10	Ø	6	3	10	-	536	-#2	Å.	N	N	-	9	44	-	46	-	-	-		_
						-			#3											-		
AL - 7 CR - 0 FE - 11 EVALU	aluminiu Chromiun Ron Ation Coi	M M DES:	A — AC	CU - PB - MO · CEPTAF	- Copp - Lead - Moly	er 'Bdenl - Rep(IM	F C -	WEAR SI — SILICO NA — SOD	METAL A ON IUM X — URI	ABBREVIA	Ations W — W F — Fu A — Af	/Ater el Ntifre	EZE		S	ST — S(SU — SL)ot Jlphur	1	jan S	OX — NI —	OXIDATION NITRATION





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					EQUIP. # GEN3
					JOBSITE PERDANA
					MAKE
	FUE	L TECH	NOLOGY		MODEL
	ATT	MR BO	B PLATT		SERIAL NO. GEN NO3
	P0 I	BOX 12	71		COMPARTMENT ENGINE-GEN SET
	FRE	MANTLE			OIL BRAND & TYPE
	WA	6160			OIL CHGD?
					ORDER No.
					LABEL # 4~31
					LAB I.D. # 92378435
					EVALUATION CODE
DATE					COPPER IS HIGH. SODIUM IS HIGH. SLIGHT OXIDATION INDICATED,
OIL	TOTA	AL HO	URS		
REC'D	11001			CURRENT	THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE. CHECK FOR THE CORRECT COOLANT PRESSURE/TEMP.
271892	N	28	20		
				5	
DATE					COPPER IS HIGH. SODIUM IS HIGH. DXIDATION AND SULPHUR ARE HIGH
29-09-92				DEFINITION	
				PHEVIOUS	CHECK FOR THE CORRECT COOLANT PRESSURE/TEMP. CHECK FOR RESIDUAL OIL
REC'D				#1	FOLLOWING OIL DRAIN
271092	N	67	67		
DATE					COPPER IS HIGH. SODIUM IS HIGH. SLIGHT OXIDATION INDICATED,
				normone	
				FREVIOUS	THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE. CHECK FOR THE CORRECT
REC'D				#2	CODLANT PRESSURE/TEMP.
271092	N	180	180		
DATE TAKEN		2			COPPER IS HIGH. SODIUM IS HIGH. OXIDATION IS HIGH.
				PREVINIC	
				I NE VIUUU	THIS COULD BE CAUSED BY THE OIL ADDITIVE PACKAGE. CHECK FOR THE CORRECT
REC'D				#3	COOLANT PRESSURE/TEMP.
271092	N	250	250		

ELEMENT CONCENTRATIONS IN PPM												OIL CONDITION/CONTAMINANTS % OF ALLOWABLE												
DATE	CU	FE	CR	PB	AL	SI	MD	NA	MG	SN	Į		F	A	ST	OXI	NIT	SUL	***	ŧŧŧ	TAN	TBN	VIS	
271892	98	22	1	9	4	14	-	532	- [JUR		N	N	-	8	45	-	55	-	-	-	-	-	
271092	186	20	0	9	5.	13	-	548	-	4 t	;	N	N	-	18	75	-	94	-			-	-	
271092	98	22	1	9	4	14	-	534	-	#2		N	N	-	12	47	-	55	-		-	-	-	
271892	99	17	0	7	3	12	-	538	- ,	#3		N	N	-	10	54	-	61	-	-	-	-	-	
AL – A CR – C FE – IF	CU — COPPER PB — LEAD MO — MOLYBDENUM						S	WEAF SI — SILIO VA — SOI	R Metal Abbre Con Dium		st — soot su — sulphur					ox — Oxidation NI — Nitration								

EVALUATION CODES: A - ACCEPTABLE B - REPORTABLE C - UNACCEPTABLE X - URGENT

THIS ANALYSIS IS INTENDED AS AN AID IN PREDICTING MECHANICAL WEAR. NO GUARANTEE, EXPRESS OR IMPLIED, IS MADE AGAINST FAILURE OF THIS PIECE OF EQUIPMENT OR A COMPONENT PART THEREOF.

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