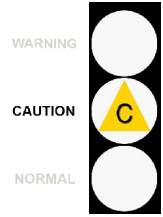


C Code : 2503
 U Name :
 T Address : Vibhavadi Rangsit Road, Chatuchak, Bangkok 10900
 O
 M Site :
 E Location : Kamphaengphet
 R Test code : T814

Unit ID : **KX 3150 AFT Brg Port**
 Unit Type : Engine Turbine Gas
 Unit Make : Solar Turbines
 Unit Model : CENTAUR 50
 Oil type / Viscosity : PTT TERBIN ISO 46
 Oil System Capacity : 1200 Liters



Notes (Finding, Evaluation, Interpretation, Suggestion and Recommendation)

Minor amount of dirt and abrasive wear noted.
 All oil conditions and oil tests appear in normal working range.
 The Anti-Oxidant Additive Tests that have been performed indicate that the AO additive strength is still within ASTM D4378 guidelines.
 Varnish & Sludge Potential Index (VSPi) is in the Warning range and indicates the abnormal presence of sludge, varnish and other insoluble matter in the oil system.
 Suggest using an off-line filtration system, that is capable of varnish and sludge removal, to clean up the oil system. A variety of different suppliers of such machines can be supplied upon request.
 Recommend resample in 500 hours from the time this sample was taken, to monitor.

Wasan C.

			Current Sample			Previous Sample			Baseline and Alarm Limit								
Condition History			Wear	Oil	Cont.	Wear	Oil	Cont.	Wear	Oil	Cont.	Alarm Limit					
			▲	●	■	●	●	■	●	●	▲	Engine Turbine Gas Solar PTT Terbin46(PTTEP Siam)					
Lab ID	Test Method	Result	246483			242400			236756			The New Oil (TNO)	Fine wear				Coarse wear
Bottle ID			1028502			1028492			1023982				U-Caution	U-Warning	U-Caution	U-Warning	
Date Sampled			06-Feb-14			08-Jan-14			20-Nov-13								
Oil Hours (Kms)			Not Given			Not Given			Not Given								
Unit Hours (Kms)			Not Given			Not Given			Not Given								
Oil Change																	
Filters Hours (Kms)																	
Wear Condition																	
Wear Element	Method	Unit	Fine(small) Wear	Coarse(large) Wear		Fine(small) Wear	Coarse(large) Wear		Fine(small) Wear	Coarse(large) Wear							
Iron	D-6595	PPM	0.2	3.1 C		0.0	0.4		0.0	3.2 C		0	>1	>2	>2	>4	
Chromium	D-6595	PPM	0.0	0.1		0.0	0.0		0.0	0.0		0	>1	>2	>1	>2	
Lead	D-6595	PPM	0.0	0.0		0.2	0.0		0.0	0.0		0	>1	>2	>3	>5	
Copper	D-6595	PPM	0.1	0.1		0.0	0.0		0.0	0.1		0	>1	>2	>1	>2	
Tin	D-6595	PPM	0.0	2.2 W		0.1	0.0		0.0	0.0		0	>2	>3	>1	>2	
Aluminum	D-6595	PPM	0.0	0.9		0.2	0.0		0.3	0.0		0	>1	>2	>1	>2	
Nickel	D-6595	PPM	0.0	0.0		0.0	0.0		0.0	0.3		0	>1	>2	>1	>2	
Silver	D-6595	PPM	0.0	0.0		0.0	0.0		0.0	0.0		0					
Molybdenum	D-6595	PPM	0.0	0.2		0.0	1.5		0.0	0.0		0					
Titanium	D-6595	PPM	0.0	0.0		0.0	0.5		0.0	1.6		0					
Oil Condition												TNO	L-Warning	L-Caution	U-Caution	U-Warning	
Viscosity @ 40°C	D-445	cSt	45.8			45.8			46.2			45.7	<41.13	<43.4	>50.27	>50.27	
Viscosity @ 100°C	D-445	cSt															
Oxidation	FTIR	Abs	14.0			13.6			14.3			11.1			>16.7	>19.4	
Nitration	FTIR	Abs	14.4			14.3			15.5			11.0			>16.5	>19.3	
TAN	D-974	mg KOH/g.	0.11			0.11			0.10			0.05			>0.15	>0.35	
TBN	D-4739	mg KOH/g.															
Contamination												TNO			U-Caution	U-Warning	
Water	T-H2O CheckTM	% (Wt.)	0.020			0.014			0.023			0.010			>0.03	>0.05	
Sodium	D-6595	PPM	0			0			0			0					
Silicon	D-6595	PPM	7.9 W	2.1		7.0 W	0.0		1.8	1.9		0	>3	>5	>3	>6	
Additive Element												TNO					
Boron	D-6595	PPM	0			0			0			0					
Magnesium	D-6595	PPM	0			0			0			1					
Calcium	D-6595	PPM	1			0			0			1					
Barium	D-6595	PPM	0			0			0			0					
Phosphorus	D-6595	PPM	31			14			44			0					
Zinc	D-6595	PPM	1	2		0	0		0	1		0					
Additional Test												TNO	L-Caution	L-Warning	U-Caution	U-Warning	
Flash Point	D-3828	°C															
Viscosity Index	D-2270																

Note: Alarm Limits are variable and dependent upon dataset size and to be used as general guideline.
 No Sign or ● : NORMAL , ▲ or ■ : CAUTION (first level warning limit) , ■ or ■ : Warning (second level warning limit)
 U-Caution : Upper CAUTION Level L-Caution : Lower CAUTION Level First Level Alarm Alert Limit in Upper Level and/or Lower Level
 U-Warning : Upper WARNING Level L-Warning : Lower WARNING required Level Second Level Alarm Alert Limit in Upper Level and/or Lower Level
 Baseline will be data of either "The new oil" or "Reference oil" or "Oil specification". TNO = The new oil , RO = Reference oil , OS = Oil Specification
 Accuracy of interpretation and recommendation are based on representatives sample and information supplied. No warranty is expressed or implied for this report.

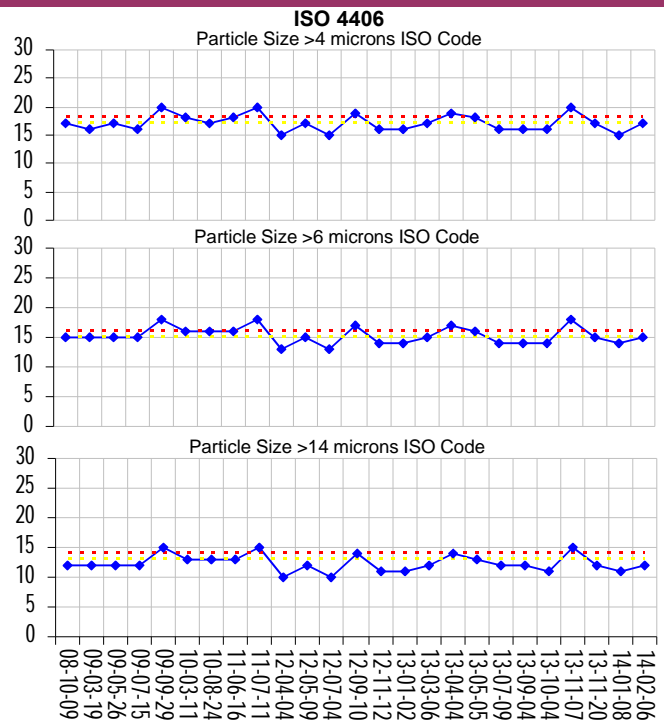
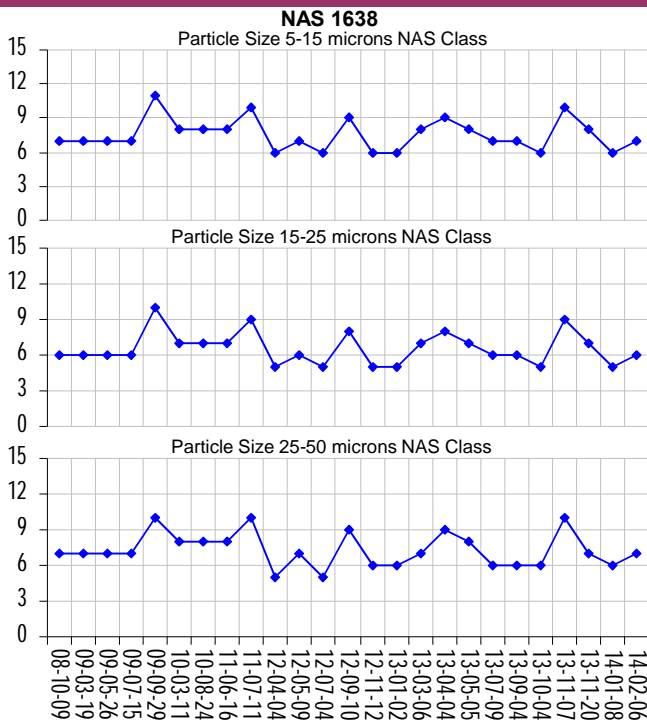
C Code : 2503
 U Name :
 S Address : Vibhavadi Rangsit Road, Chatuchak, Bangkok 10900
 T
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 E
 R Site :
 Location : Kamphaengphet
 Test code : T814

E Unit ID : **KX 3150 AFT Brg Port**
 O Unit Type : Engine Turbine Gas
 U Unit Make : Solar Turbines
 I Unit Model : CENTAUR 50
 P
 M
 E
 N
 T Oil type / Viscosity : PTT TERBIN ISO 46
 L
 Oil System Capacity : 1200 Liters

Notes (Finding, Evaluation, Interpretation, Suggestion and Recommendation)

Particle count indicates that oil cleanliness level is near to unacceptable range.

		Current Sample		Previous Sample		Particle Count		NAS 1638		ISO 4406	
Lab ID		246483		242400		236756					
Bottle ID		1028502		1028492		1023982					
Date Sampled		06-Feb-14		08-Jan-14		20-Nov-13					
Oil Hours (Kms)		Not Given		Not Given		Not Given					
Unit Hours (Kms)		Not Given		Not Given		Not Given					
Oil Change											
Oil Added (Liters)											
Filters Hours (Kms)											
Contamination											
Particle Count NAS 1638 System Standard											
Particle Size Range	No. of Particles / 100ml.	Class	No. of Particles / 100ml.	Class	No. of Particles / 100ml.	Class	Class	No. of Particles / 100ml.	Class	No. of Particles / 100ml.	Class
Particle Size 5-15 microns	23,700	7	10,600	6	33,600	8					
Particle Size 15-25 microns	2,200	6	900	5	3,100	7					
Particle Size 25-50 microns	600	7	300	6	900	7					
Particle Size 50-100 microns	<100	6	<100	5	<100	6					
Particle Size >100 microns	<100	4	<100	2	<100	5					
Particle Count ISO 4406:1999 System Standard											
Particle Size Range	No. of Particles / ml.	Class	No. of Particles / ml.	Class	No. of Particles / ml.	Class	Class	No. of Particles / ml.	Class	No. of Particles / ml.	Class
Particle Size > 4 microns	712	17 C	317	15	1,010	17 C		>640	17	>1300	18
Particle Size > 6 microns	199	15 C	89	14	282	15 C		>160	15	>320	16
Particle Size > 14 microns	28	12	12	11	39	12		>40	13	>80	14
ISO 4406 Class Rating	17 / 15 / 12		15 / 14 / 11		17 / 15 / 12			17/15/13		18/16/14	



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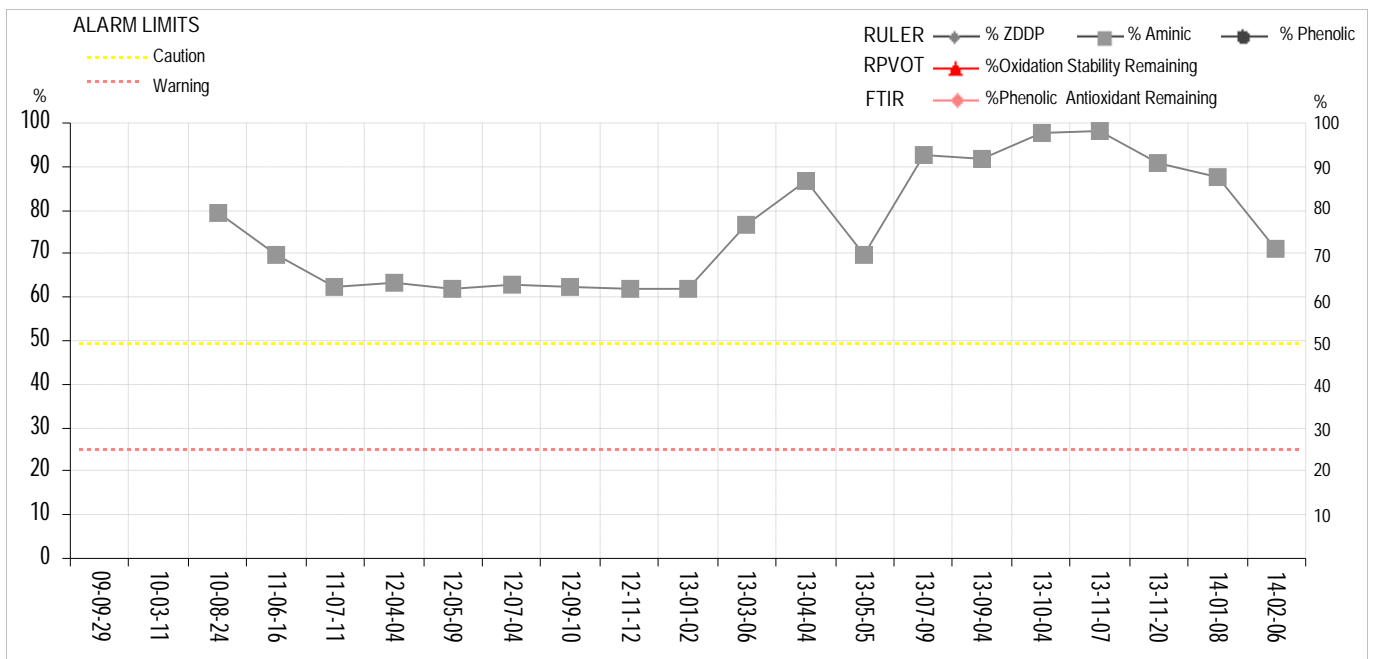
Unit ID : **KX 3150 AFT Brg Port**
 Unit Type : Engine Turbine Gas
 Unit Make : Solar Turbines
 Unit Model : CENTAUR 50
 Oil type / Viscosity : PTT TERBIN ISO 46
 Oil System Capacity : 1200 Liters

Notes (Finding, Evaluation, Interpretation, Suggestion and Recommendation)

The Anti-Oxidant Additive Tests that have been performed indicate that the AO additive strength is still within ASTM D4378 guidelines.

Wasan C.

Lab ID Bottle ID Date Sampled Oil Hours (Kms) Unit Hours (Kms) Oil Added (Liters) Oilchange Filters Hours (Kms)	Test Method	Result	Current Sample	Previous Sample		RULER™ RPVOT (RBOT) FTIR Based on and referred to ASTM D-4378-0 Alarm Limit based on ASTM D-4378-08						
			246483 1028502 06-Feb-14 Not Given Not Given	242400 1028492 08-Jan-14 Not Given Not Given	236756 1023982 20-Nov-13 Not Given Not Given							
Oil Condition												
RULER™(Remaining Useful Life Evaluation Routine)						<table border="1"> <tr> <td>The New Oil</td> <td>Caution</td> <td>Warning</td> </tr> <tr> <td>100</td> <td><50</td> <td><25</td> </tr> </table>	The New Oil	Caution	Warning	100	<50	<25
The New Oil	Caution	Warning										
100	<50	<25										
% ZDDP Antioxidant Remaining	D-6971-04	%	n/p	n/p	n/p							
%Aminic Antioxidant Remaining	D-6810-02	%	71.3	87.8	90.9							
%Phenolic Antioxidant Remaining		%	n/p	n/p	n/p							
RULER Test Solution		Color	Green	Green	Green							
FTIR (Fourier Transform Infrared)						<table border="1"> <tr> <td></td> <td>Caution</td> <td>Warning</td> </tr> </table>		Caution	Warning			
	Caution	Warning										
%Phenolic Antioxidant Remaining	D-2668	%	n/p	n/p	n/p							
RPVOT (Rotating Pressure Vessel Oxidation Test) or previously known as RBOT						<table border="1"> <tr> <td></td> <td>Caution</td> <td>Warning</td> </tr> </table>		Caution	Warning			
	Caution	Warning										
Oxidation Stability	D-2272	Minutes										
%Oxidation Stability Remaining		%										



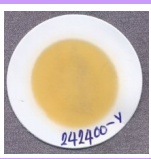








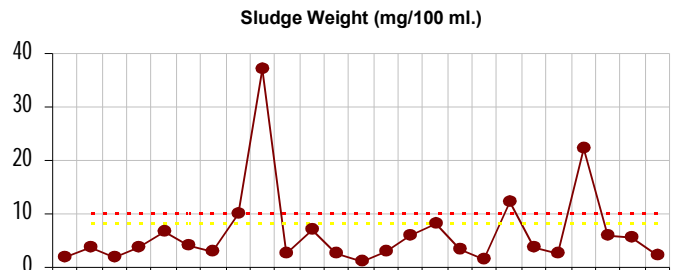
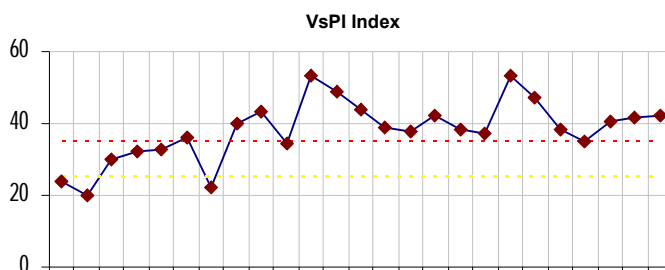
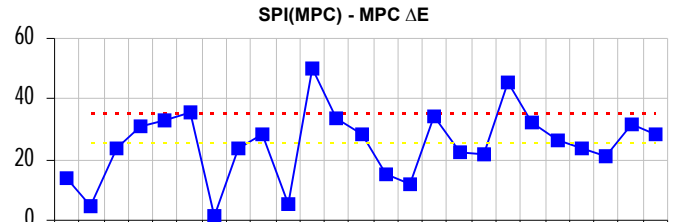
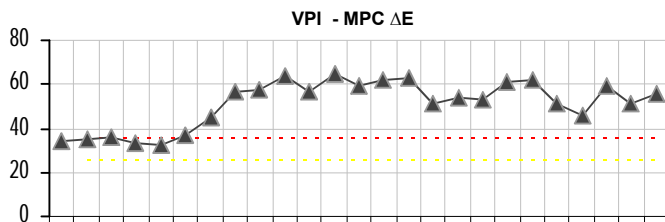
C Code : 2503
 U Name :
 S Address : Vibhavadi Rangsit Road, Chatuchak, Bangkok 10900
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 Location : Kamphaengphet
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Unit ID : **KX 3150 AFT Brg Port**
 Unit Type : Engine Turbine Gas
 Unit Make : Solar Turbines
 Unit Model : CENTAUR 50
 Oil type / Viscosity : PTT TERBIN ISO 46
 Oil System Capacity : 1200 Liters

Notes (Finding, Evaluation, Interpretation, Suggestion and Recommendation)

Varnish & Sludge Potential Index (VsPI) is in the Warning range and indicates the abnormal presence of sludge, varnish and other insoluble matter in the oil system.

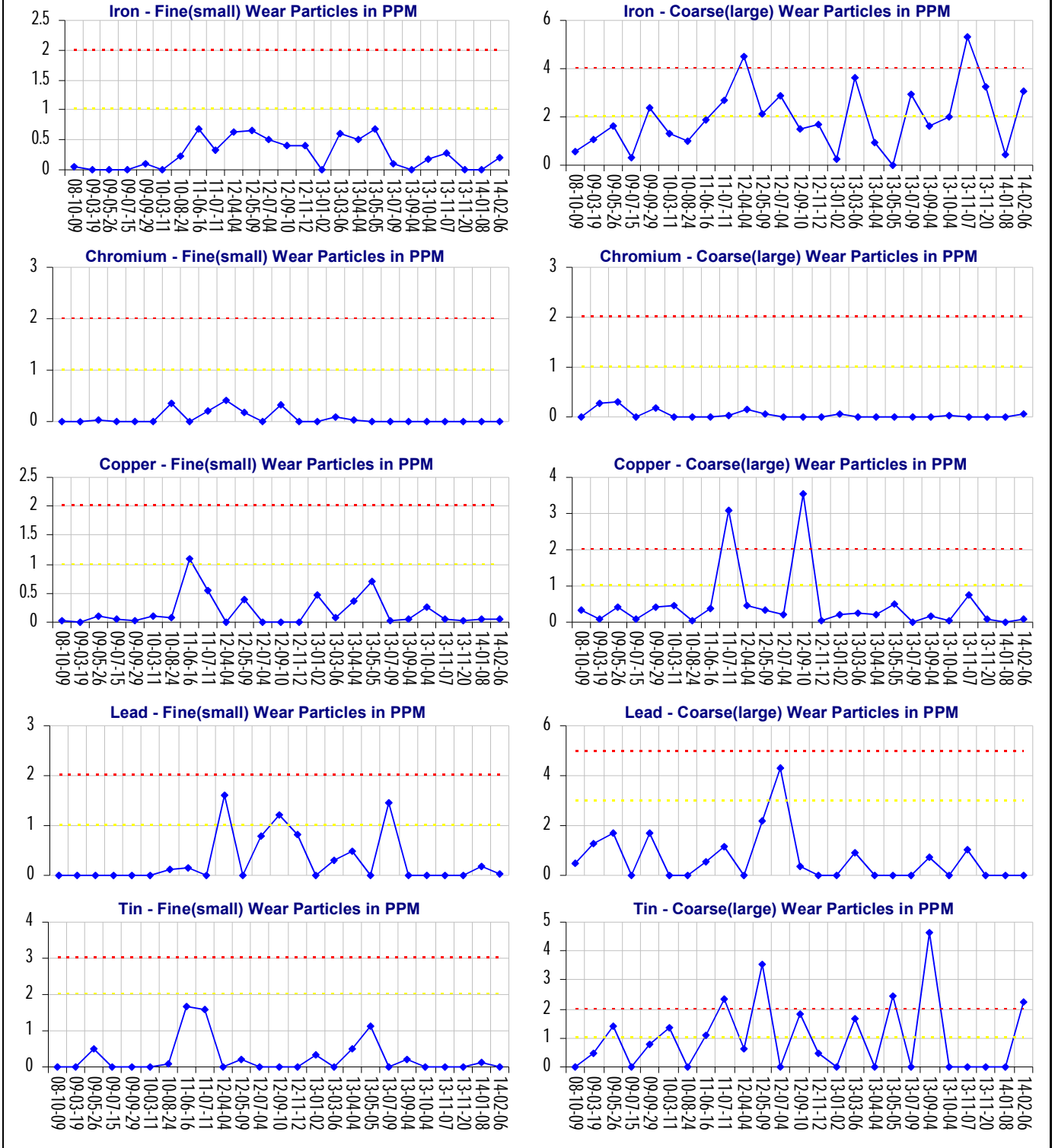
	Current Sample		Previous Sample		ASTM D7843 M VsPI™ Varnish & Sludge Potential Index  New Oil and Alarm Limit Name New Oil Limit Name Engine Turbine Gas Solar PTT Terbin46(PTTEP Siam)						
Lab ID Bottle ID Date Sampled Oil Hours (Kms) Unit Hours (Kms) Oil Change Oil Added (Liters) Filters Hours (Kms)	246483	242400	236756								
Contamination Varnish and Sludge Potential Index™ (VsPI™)											
VPI (Varnish Potential Index)	: Soluble Varnish Type Contamination in Oil										
VPI™ Varnish Potential Index Soluble Varnish Contaminant											
VPI Rating	55.5 W	51.3	59.5		<table border="1"> <tr> <td>New Oil</td> <td>Caution</td> <td>Warning</td> </tr> <tr> <td>1</td> <td>>25</td> <td>>35</td> </tr> </table>	New Oil	Caution	Warning	1	>25	>35
New Oil	Caution	Warning									
1	>25	>35									
SPI (Sludge Potential Index) : Conform to ASTM D7843 - MPC (Membrane Patch Colorimetry)	: Insoluble Varnish Type Contamination in Oil										
SPI™ Sludge Potential Index (MPC Membrane Patch Colorimetry) Insoluble Varnish Contaminant											
SPI(MPC) Rating	28.5 C	31.8	21.0		<table border="1"> <tr> <td>New Oil</td> <td>Caution</td> <td>Warning</td> </tr> <tr> <td>1</td> <td>>25</td> <td>>35</td> </tr> </table>	New Oil	Caution	Warning	1	>25	>35
New Oil	Caution	Warning									
1	>25	>35									
VsPI™	42.0 W	41.6 W	40.3 W		<table border="1"> <tr> <td>New Oil</td> <td>Caution</td> <td>Warning</td> </tr> <tr> <td>1</td> <td>>25</td> <td>>35</td> </tr> </table>	New Oil	Caution	Warning	1	>25	>35
New Oil	Caution	Warning									
1	>25	>35									
Sludge Weight	2.1 mg/100 ml	5.6 mg/100 ml	5.8 mg/100 ml		<table border="1"> <tr> <td>New Oil</td> <td>Caution</td> <td>Warning</td> </tr> <tr> <td>2</td> <td>>8</td> <td>>10</td> </tr> </table>	New Oil	Caution	Warning	2	>8	>10
New Oil	Caution	Warning									
2	>8	>10									



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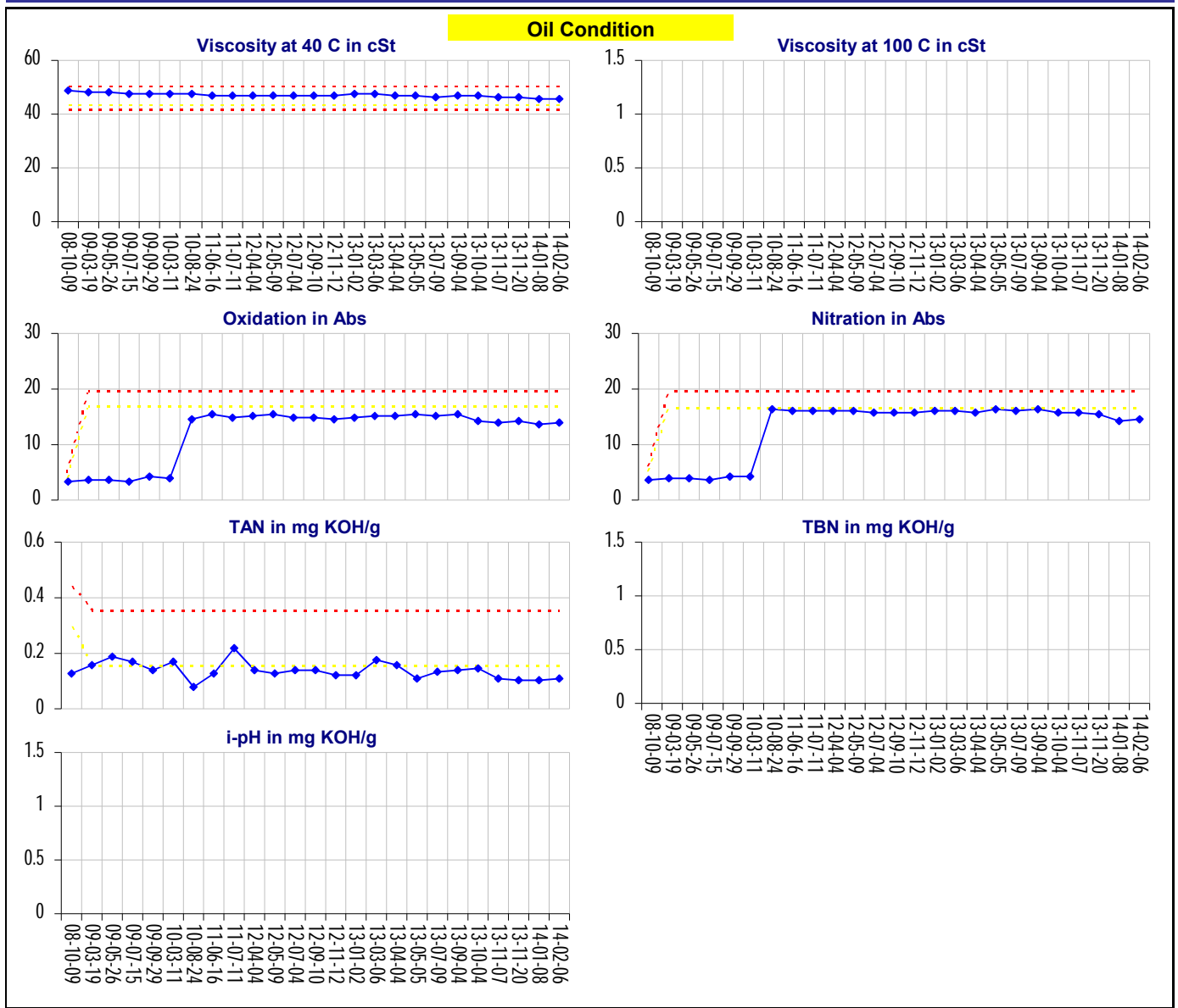
E Unit ID : **KX 3150 AFT Brg Port**
 O U I P Unit Type : Engine Turbine Gas
 M E Unit Make : Solar Turbines
 N T Unit Model : CENTAUR 50
 o Oil type / Viscosity : PTT TERBIN ISO 46
 L
 Oil System Capacity : 1200 Liters

Wear Condition



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 Oil type / Viscosity : PTT TERBIN ISO 46
 Oil System Capacity : 1200 Liters

