

C Code : 29134002
U Name : Thai Aviation Services Limited
S
T
M Address : Nakhon SI Thammarat Base, Thailand
E
R
Site :
Location :
Test code : 874

EQUIMENT
P Unit ID : HS HVF A231 00624 Main Gearbox
M Unit Type : Gearbox Reduction
N Unit Make : SIKORSKY
L Unit Model : S76D
O Oil type / Viscosity : MOBIL 1 ATF
L Oil System Capacity : 11.51 Liters



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

Note elemental analysis is showing dirt and abrasive wear.

Note large fatigue particles starting to appear.

Recommend check for other abnormal operating parameters, i.e., vibration, noise, heat etc. If abnormal condition exists, please inform laboratory with next sample.

Recommend RESAMPLE this component again, immediately upon receipt of this report, to monitor the abnormalities closely.

Andy Sitton

Condition History			Current Sample			Previous Sample			Baseline and Alarm Limit		
Lab ID	Test Method	Result	Wear	Oil	Cont.	Wear	Oil	Cont.	Wear	Oil	Cont.
			W	W	C	W	C	C	N	C	C
Bottle ID			406529			395822			392637		
Date Sampled			1185644			1085619			1085602		
Oil Hours (Kms)			16-Feb-18			11-Nov-17			17-Oct-17		
Unit Hours (Kms)			582.5			215.28			117.31		
Oil Change			1739.63			1372.38			1274.41		
Oil Added (Liters)						215.28			117.31		
Filters Hours (Kms)											
Wear Condition											
Wear Element	Method	Unit	Fine Wear (RDE)	Coarse Wear (RFS)		Fine Wear (RDE)	Coarse Wear (RFS)		Fine Wear (RDE)	Coarse Wear (RFS)	
Iron	D-6595	PPM	25.9 C	0.0		14.2	0.1		10.7	0.1	
Chromium	D-6595	PPM	2.1	0.0		1.3	0.1		0.9	0.3	
Lead	D-6595	PPM	0.7	0.0		0.5	0.1		0.9	0.1	
Copper	D-6595	PPM	6.2	0.1		2.2	0.4		1.7	0.3	
Tin	D-6595	PPM	0.7	0.0		2.3	0.1		2.5	0.1	
Aluminum	D-6595	PPM	1.1	0.0		1.2	0.1		0.3	0.1	
Nickel	D-6595	PPM	1.2 C	0.0		2.1 W	0.1		0.3	0.1	
Silver	D-6595	PPM	6.3 W	0.1		3.3	0.7		3.4	0.4	
Molybdenum	D-6595	PPM	0.0	0.0		26.4 W	0.1		1.5	0.1	
Titanium	D-6595	PPM	0.1	0.0		0.6	0.1		0.0	0.1	
Oil Condition											
Viscosity @ 40°C	D-445	cSt				6.0 W			6.3 C		
Viscosity @ 100°C	D-445	cSt				6.2 W			6.3 C		
Oxidation	E-2412M	Abs									
Nitration	E-2412M	Abs									
TAN	D-974	mg KOH/g.	2.17			1.78			1.98		
TBN	D-4739	mg KOH/g.									
Contamination											
Water	T-H2O	% (Wt.)	0.033			0.038			0.083		
Sodium	D-6595	PPM	6			4			6		
Silicon	D-6595	PPM	16.4 *	0.1		26.1 C	5.2		9.0	2.6	
Additive Element											
Boron	D-6595	PPM	260			282			271		
Magnesium	D-6595	PPM	13			6			4		
Calcium	D-6595	PPM	161			94			117		
Barium	D-6595	PPM	0			0			0		
Phosphorus	D-6595	PPM	497			655			557		
Zinc	D-6595	PPM	3	0		2	0		0	0	
Additional Test											
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 N : NORMAL , C or W : CAUTION (first level warning limit) , W or W : Warning (second level warning limit)

Accuracy of interpretation and recommendation are based on representatives sample and information supplied.

No warranty is expressed or implied for this report.

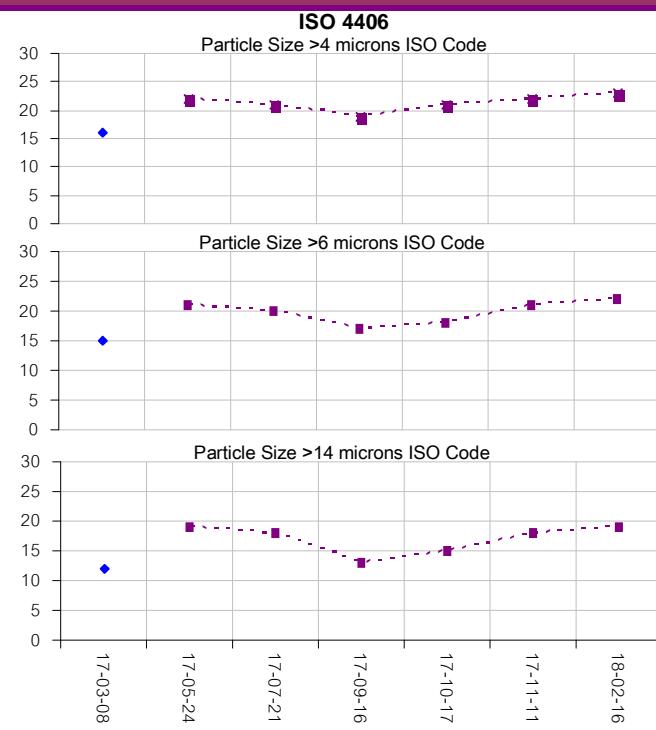
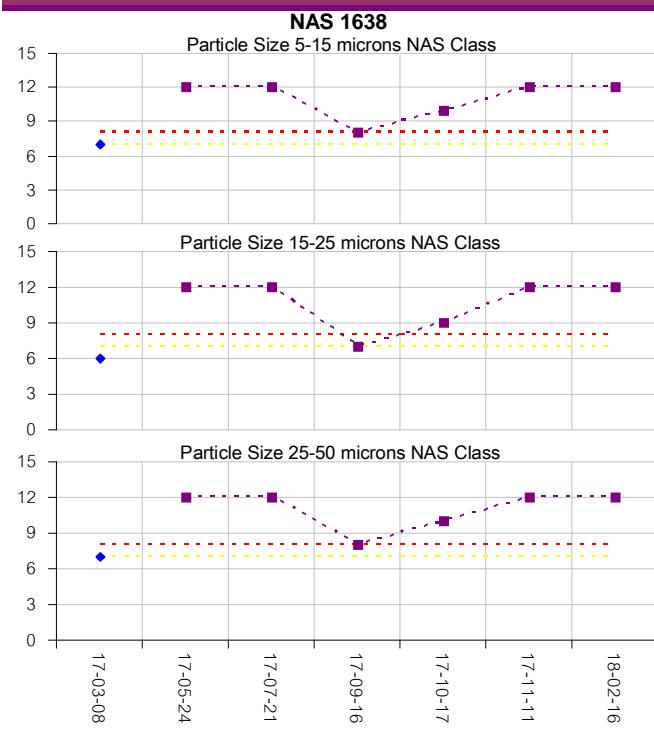
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EQUIPMENT
P Unit ID : **HS HVF A231 00624 Main Gearbox**
M Unit Type : Gearbox Reduction
E Unit Make : SIKORSKY
N Unit Model : S76D
O Oil type / Viscosity : MOBIL 1 ATF
L Oil System Capacity : 11.51 Liters

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

Particle count indicates that oil cleanliness level is above Alarm Limits range. (Cleanliness Target)
Contamination levels need to be improved to meet reliability objectives, targets and goals.

Lab ID	Current Sample		Previous Sample		Particle Count		NAS 1638 ISO 4406	
					BASELINE		Alarm Limit	
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Oil Change	1739.63		1372.38		1274.41			
Oil Added (Liters)								
Filters Hours (Kms)								
PC Method	ISO 11500		ISO 11500		ISO 11500			
Contamination								
Particle Count NAS 1638 System Standard								
Particle Size Range	No. of Particles / 100ml.	Class						
Particle Size 5-15 microns	1,711,700	12 W	1,220,700	12 W	161,300	10 W	>16000	7 >32000
Particle Size 15-25 microns	269,680	12 W	135,400	12 W	18,300	9 W	>2850	7 >5700
Particle Size 25-50 microns	41,090	12 W	33,600	12 W	6,200	10 W	>506	7 >1012
Particle Size 50-100 microns	1,390	10	2,300	11	800	10		
Particle Size >100 microns	40	8	200	10	100	9		
Particle Count ISO 4406:1999 System Standard								
Particle Size Range	No. of Particles / ml.	Class						
Particle Size > 4 microns	42,478	23	25,840	22	11,711	21		
Particle Size > 6 microns	20,239	22	13,922	21	1,867	18		
Particle Size > 14 microns	3,122	19	1,715	18	254	15		
ISO 4406 Class Rating	23/22/19		22/21/18		21/18/15			



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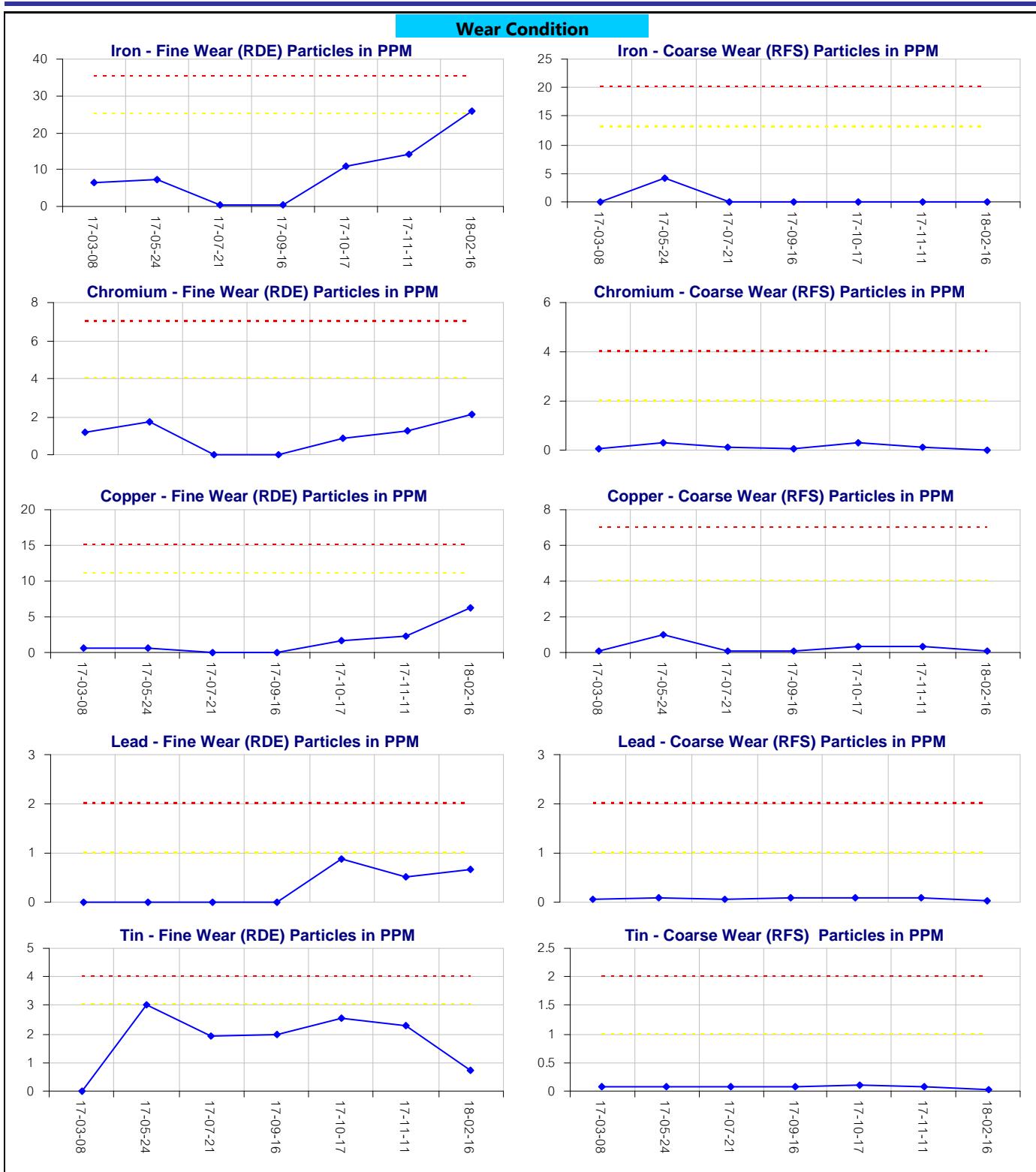
Amount of visible ferrous particles, is cautionary, compared to the other similar samples.
Fatigue particles found in the ferrogram may be an indication of the dirt related fatigue wear.
Recommend check for other abnormal operating parameters to monitor and confirm the abnormalities closely.

	Current Sample			Previous Sample														
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Oil Change				Oil Added (Liters)			Filters Hours (Kms)		215.28	117.31 <th>ASTM D 7690 M</th> <td></td> <td></td> <td></td>	ASTM D 7690 M							
Wear Condition				Ferrographic Analysis							Typical Normal Condition							
Volume of Sample Used	3.00	ml	3.00	ml	3.00	ml	3	ml										
Image of Wear & Contaminant (Ferrogram) Magnification 50X		1000 µm		1000 µm		1000 µm		1000 µm										
Image of Wear & Contaminant (Ferrogram) Magnification 500X		100 µm		100 µm		100 µm		100 µm										
Image of Wear & Contaminant (Filtergram) Magnification 500X		100 µm		100 µm		100 µm		100 µm										
Wear & Contaminants Particles	%Rating	Size (Micron)	Particle Type	%Rating	Size (Micron)	Particle Type	%Rating	Size (Micron)	Particle Type	%Rating	Size (Micron)	Particle Type						
Normal Rubbing Wear	60	2-3	1	70	2-3	1	80	2-3	1	95	2-3	1						
Fatigue Gear Wear	25	5-40	1	10	5-15	1	10	5-10	1									
Fatigue Bearing Wear																		
Fatigue Sphere																		
Severe Sliding Wear																		
Cutting Wear																		
Black Oxides	5	5-20	1	5	5-15	1	5	5-10	1									
Red Oxides																		
Corrosive Wear																		
Dirt and Dust	10	10-60	3	15	10-60	3	5	10-40	3	5	3-5	3						
Copper																		
White Metal																		
Ferrographic Analysis Rating (FAR) rating in grade	ABCD F ☹			ABCDF ☺			ABCDF ☺											

%Rating :	Percent area covered by wear debris particles or contaminant particles.	Ferrographic Analysis Rating (FAR) , rating in grade
Size :	Size in micron unit (0.001 mm)	A : Excellent - normal rubbing wear condition
Particle Type :	1: Ferrous Wear Particles 1.1: Low Alloy 1.2: Medium Alloy 1.3: High Alloy 1.4: Case Hardened 2: Non-ferrous Wear Particles 2.1: Copper 2.2: White Metal 2.3: Babbitting 3: Contamination Particles 3.1: Fibers	B : Good - normal rubbing wear condition
		C : Fair or moderate - normal rubbing wear condition
		D : Severe and/or critical - wear condition
		F : Extreme severe and/or extreme critical - wear condition

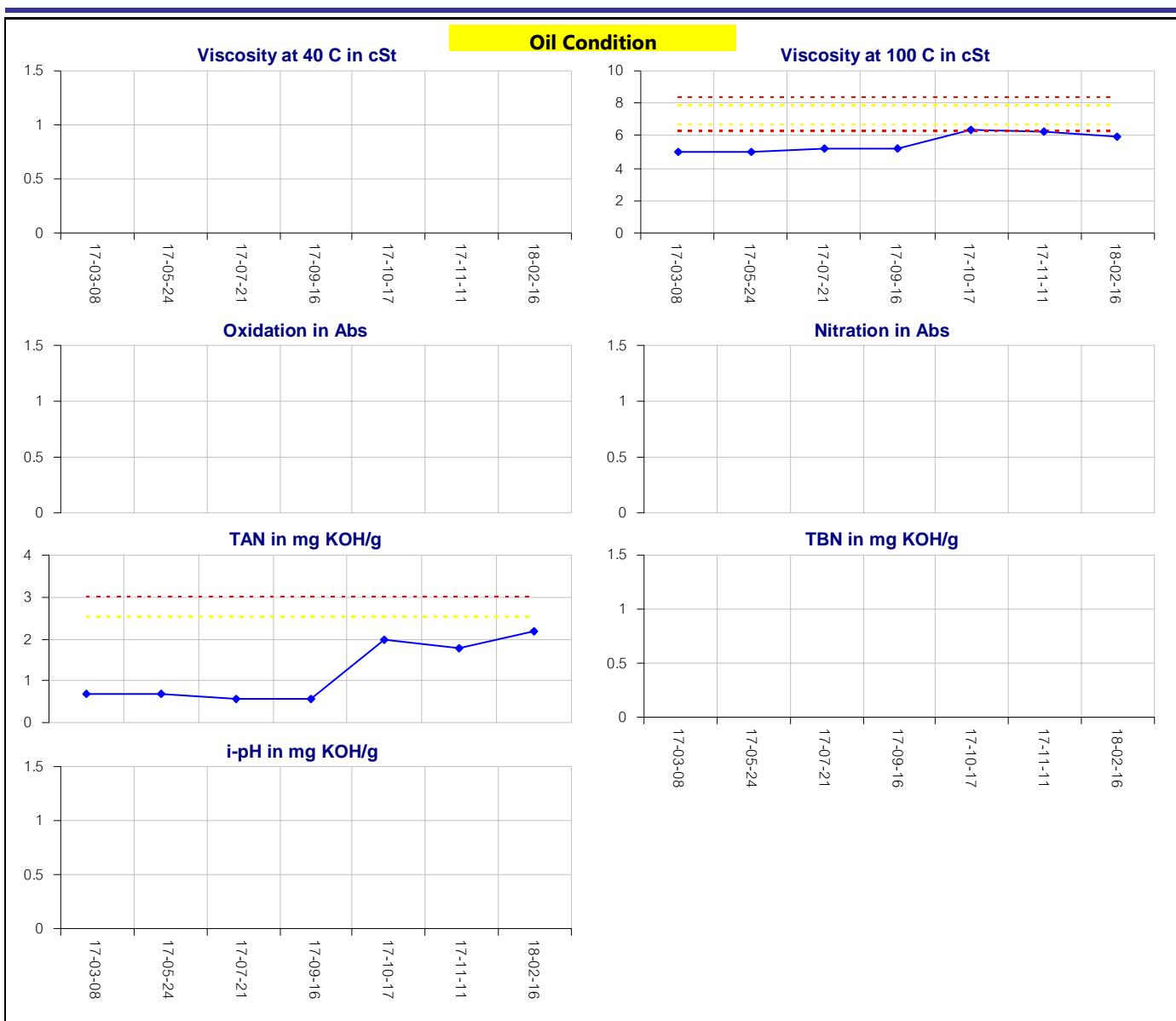
CUSTOMER
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