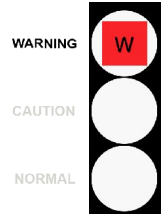


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Test code : T814 T817

Unit ID : **GT1 Before Purifier**  
Unit Type : Engine Turbine Gas  
Unit Make : GE  
Unit Model : Frame 9171 E  
Oil type / Viscosity : MOBIL DTE 732 ISO 32  
Oil System Capacity : 14000 Liters



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

Note abnormal wear metals.  
Note increase in VsPI.  
Abnormal wear may be from poor lubrication due to the varnish build-up and other insoluble matter in the oil.  
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.  
Note additive depletion is reaching critical limits.

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Current Oil Sample Cont.			Wear Oil Previous Sample Oil Cont.				Baseline and Alarm Limit				
<b>Condition History</b>											
<b>Lab ID</b>	Test Method	Result	22	54	20	31	19	73	<b>Alarm Limit</b>		
<b>Bottle ID</b>			GT1	GT1	GT 1	Alarm Limit Matrix - Set Name					
<b>Date Sampled</b>			10-Jun-13	05-Feb-13	09-Oct-12	(Equipment type / oil type)					
<b>Oil Hours (Kms)</b>			Not Given	Not Given	Not Given	ETC GE DTE 732 01/2010					
<b>Unit Hours (Kms)</b>	Not Given	Not Given	Not Given								
<b>Oil Added (Liters)</b>											
<b>Filters Hours (Kms)</b>											
<b>Wear Condition</b>			RDE fine	RFS coarse	RDE fine	RFS coarse	RDE fine	RFS coarse	The New Oil (TNO)		
<b>Wear Element</b>	<b>Method</b>	<b>Unit</b>	0.2	4.0	2.2	3.0	0.6	0.7	0	RDE fine	RFS coarse
Iron	D-6595	PPM	0.0	0.5	0.1	0.3	0.2	0.0	0	U-Caution	U-Warning
Chromium	D-6595	PPM	0.0	0.0	1.3	0.0	0.0	0.0	0	>1	>2
Lead	D-6595	PPM	0.1	0.2	0.6	0.2	1.2	0.2	0	>4	>7
Copper	D-6595	PPM	0.0	0.0	0.4	0.0	1.2	1.2	0	>2	>4
Tin	D-6595	PPM	0.1	0.0	0.0	0.0	1.5	0.3	0	>1	>2
Aluminum	D-6595	PPM	2.2	0.0	0.0	0.0	0.0	0.0	0	>1	>2
Nickel	D-6595	PPM	0.0	0.0	0.0	0.0	0.0	0.0	0		
Silver	D-6595	PPM	0.0	0.9	0.0	1.7	0.0	0.0	0		
Molybdenum	D-6595	PPM	0.1	1.8	0.1	0.5	0.0	0.0	0		
Titanium	D-6595	PPM							0		
<b>Oil Condition</b>			31.5		31.2		31.1		30.0	L-Warning	L-Caution
Viscosity @ 40 °C	D-445	cSt	8.0		8.0		7.6		7.1		>8.1
Viscosity @ 100 °C	D-445	cSt	7.0		7.1		6.9		7.2		>8.2
Oxidation	FTIR	Abs	0.03		0.02		0.03		0.09		>0.15
Nitration	FTIR	Abs									>0.2
TAN	D-974	mg KOH/g.									
TBN	D-4739	mg KOH/g.									
<b>Contamination</b>			0.023		0.017		0.031		0.012		U-Caution
Water	T-H2O CheckTM	% (Wt.)	0		1		1		0		
Sodium	D-6595	PPM	0.6	0.0	0.0	0.4	1.1	0.3	0	RDE fine	RFS coarse
Silicon	D-6595	PPM							0	U-Caution	U-Warning
<b>Additive Element</b>			0		0		0		0		
Boron	D-6595	PPM	0		0		0		0		
Magnesium	D-6595	PPM	0		1		0		0		
Calcium	D-6595	PPM	0		0		0		0		
Barium	D-6595	PPM	0		0		0		0		
Phosphorus	D-6595	PPM	0	1	1	0	1	0	0		
Zinc	D-6595	PPM							0		
<b>Additional Test</b>			220		216		212		1.40	L-Caution	L-Warning
Flash Point	D-3828	°C									
Viscosity Index	D-2270		3.5		3.5		3.5				
ASTM Color	D-1500										

Note: Alarm Limits are variable and dependent upon dataset size and to be used as general guideline.

No Sign or : NORMAL, C or : CAUTION (first level warning limit), W 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  
 Interpretation and recommendation are based on representatives sample and information supplied. No warranty is expressed or implied for this report.

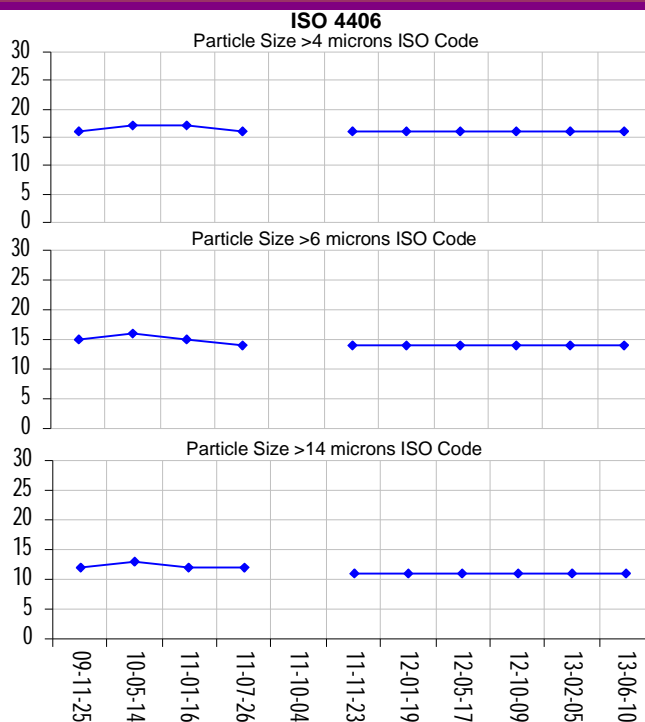
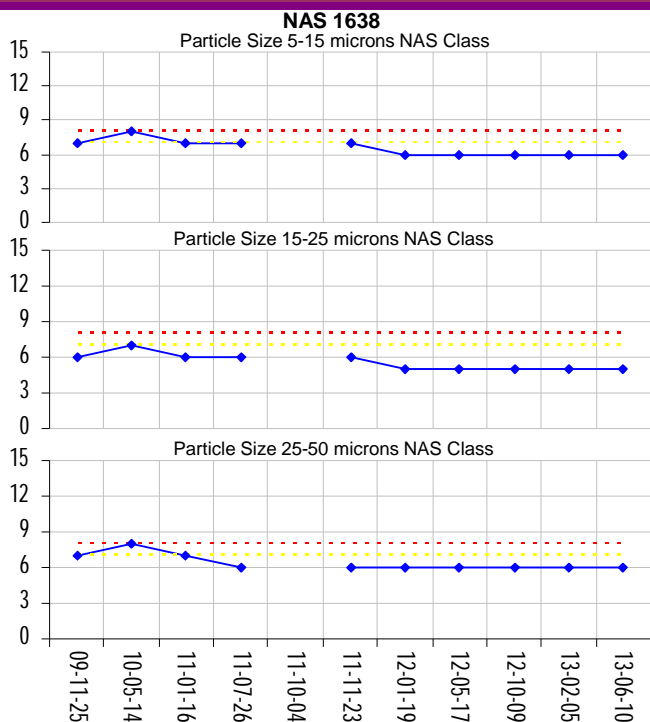
C Code  
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Test code : T814 T817

**Unit ID : GT1 Before Purifier**  
Unit Type : Engine Turbine Gas  
Unit Make : GE  
Unit Model : Frame 9171 E  
Oil type / Viscosity : MOBIL DTE 732 ISO 32  
Oil System Capacity : 14000 Liters

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

Particle count indicates oil cleanliness level is clean.

Lab ID Bottle ID Date Sampled Oil Hours (Kms) Unit Hours (Kms) Oil Added (Liters) Filters Hours (Kms)	Current Sample			Previous Sample			Particle Count						
	220964 GT1 10-Jun-13 Not Given Not Given	207231 GT1 05-Feb-13 Not Given Not Given	198073 GT 1 09-Oct-12 Not Given Not Given	NAS 1638 ISO 4406		Alarm Limit			U-Caution		U-Warning		
				BASELINE		ETG GE DTE 732 01/2010							
<b>Contamination</b>							<b>Particle Count NAS 1638 System Standard</b>						
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	1,000	5	1,000	5	1,200	5		>16000	7	>32000	8		
Particle Size 15-25 microns	300	6	300	6	300	6		>2850	7	>5700	8		
Particle Size 25-50 microns	<100	5	<100	5	<100	5		>506	7	>1012	8		
Particle Size 50-100 microns	<100	2	<100	2	<100	3							
Particle Size >100 microns													
<b>Particle Count ISO 4406:1999 System Standard</b>													
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	94	14	97	14	107	14							
Particle Size > 6 microns	13	11	13	11	15	11							
Particle Size > 14 microns	16 / 14 / 11		16 / 14 / 11		16 / 14 / 11								
<b>ISO 4406 Class Rating</b>													



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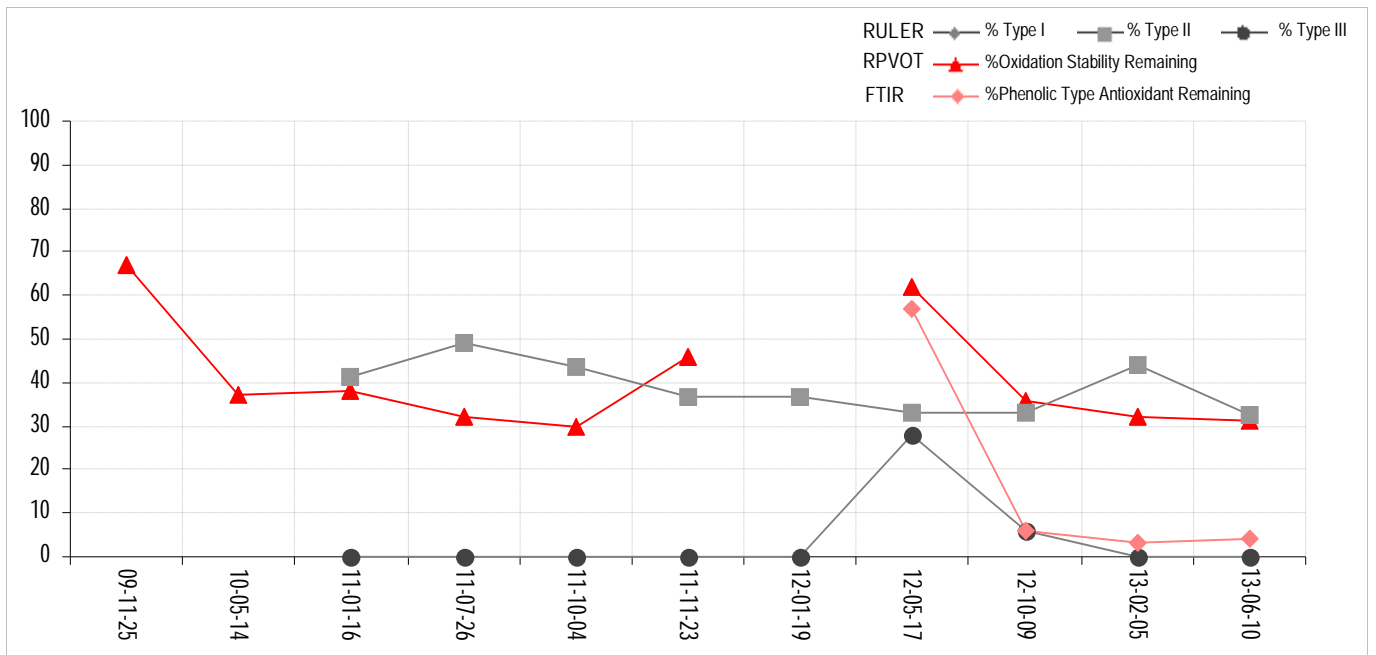
E Unit ID : **GT1 Before Purifier**  
O Unit Type : Engine Turbine Gas  
I Unit Make : GE  
M Unit Model : Frame 9171 E  
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O Oil type / : MOBIL DTE 732 ISO 32  
I Viscosity :  
L  
Oil System Capacity : 14000 Liters

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

FTIR scan AND Ruler (Voltammetry) shows phenolic-type anti-oxidant additive to be depleted.

Andy Sitton

Lab ID Bottle ID Date Sampled Oil Hours (Kms) Unit Hours (Kms) Oil Added (Liters) Filters Hours (Kms)	Test Method	Result	Current Sample			Previous Sample			RULER <sup>TM</sup> RPVOT (RBOT) FTIR		
			220964 GT1 10-Jun-13 Not Given Not Given	207231 GT1 05-Feb-13 Not Given Not Given	198073 GT 1 09-Oct-12 Not Given Not Given	Based on and referred to ASTM D-4378-0 Alarm Limit based on ASTM D-4378-08					
<b>Oil Condition</b>									The New Oil		
<b>RULER<sup>TM</sup> (Remaining Useful Life Evaluation Routine)</b>			n/p	n/p	n/p	100	Caution	Warning			
% Type I Antioxidant Remaining	D-9704	%	32.7 C	44 C	33.1 C	100	<50	<25			
% Type II Antioxidant Remaining	D-6602	%	0 W	0 W	5.8 W	100	<50	<25			
% Type III Antioxidant Remaining		%	Green	G & Y	G&Y						
RULER Test Solution		Color									
<b>RPVOT (Rotating Pressure Vessel Oxidation Test) or previously known as RBOT</b>			322 C	322 C	358 C	100	Caution	Warning			
Oxidation Stability	D-2272	Minutes	31 C	32 C	36 C	100	<50	<25			
%Oxidation Stability Remaining		%									
<b>FTIR (Fourier Transform Infrared)</b>			4 W	3 W	6	100	Caution	Warning			
%Phenolic Type Antioxidant Remaining	D-2668	%									




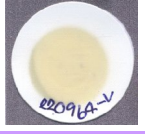
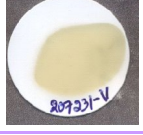


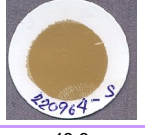



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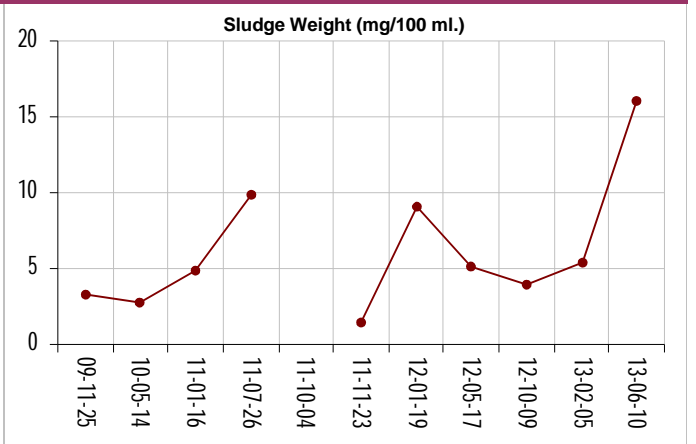
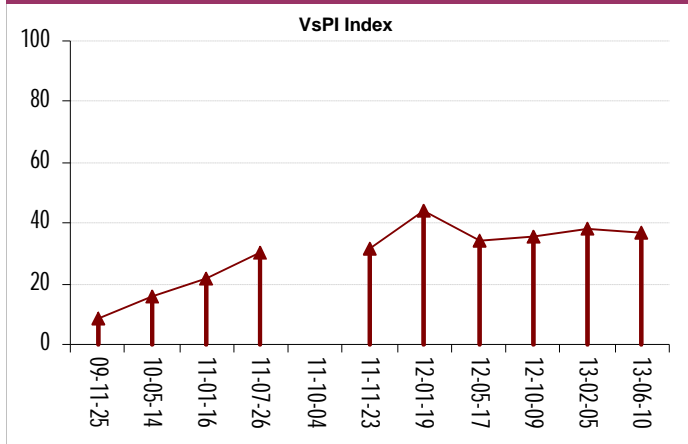
**Unit ID : GT1 Before Purifier**  
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P Unit Type : Engine Turbine Gas  
M Unit Make : GE  
E Unit Model : Frame 9171 E  
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O Oil type /  
I Viscosity : MOBIL DTE 732 ISO 32  
L  
Oil System Capacity : 14000 Liters

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

Note increase in VsPI.

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.

	Current Sample	Previous Sample		
<b>Lab ID</b>	220964	207231	198073	
<b>Bottle ID</b>	GT1	GT1	GT 1	
<b>Date Sampled</b>	10-Jun-13	05-Feb-13	09-Oct-12	
<b>Oil Hours (Kms)</b>	Not Given	Not Given	Not Given	
<b>Unit Hours (Kms)</b>	Not Given	Not Given	Not Given	
<b>Oil Added (Liters)</b>				
<b>Filters Hours (Kms)</b>				
<b>Contamination</b>				
<b>Varnish and Sludge Potential Index™ ( VsPI™ )</b>				
VPI (Varnish Potential Index) : Soluble Varnish Type Contamination in Oil				
	VPI View	VPI View	VPI View	VPI View
VPI™ Varnish Potential Index Soluble Varnish Contaminant				
VPI Rating	24.8	31.4	29.7	
SPI (Sludge Potential Index) : or MPC test (Membrane Patch Colorimetry) ASTM D02.C0.01 WK 13070 : Insoluble Varnish Type Contamination in Oil				
	SPI View	SPI View	SPI View	SPI View
SPI™ Sludge Potential Index (MPC Membrane Patch Colorimetry) Insoluble Varnish Contaminant				
SPI Rating	48.8	44.3	40.8	
Sludge Weight	16.1 mg/100 ml	5.4 mg/100 ml	3.9 mg/100 ml	
ETG GE DTE 732.01/2010 <b>Alarm Limit Name</b>				
TNO				
0 Caution Warnjgg				
<b>VsPI™</b> VsPI = (VPI + SPI) / 2	36.8 W	37.9 W	35.2 W	



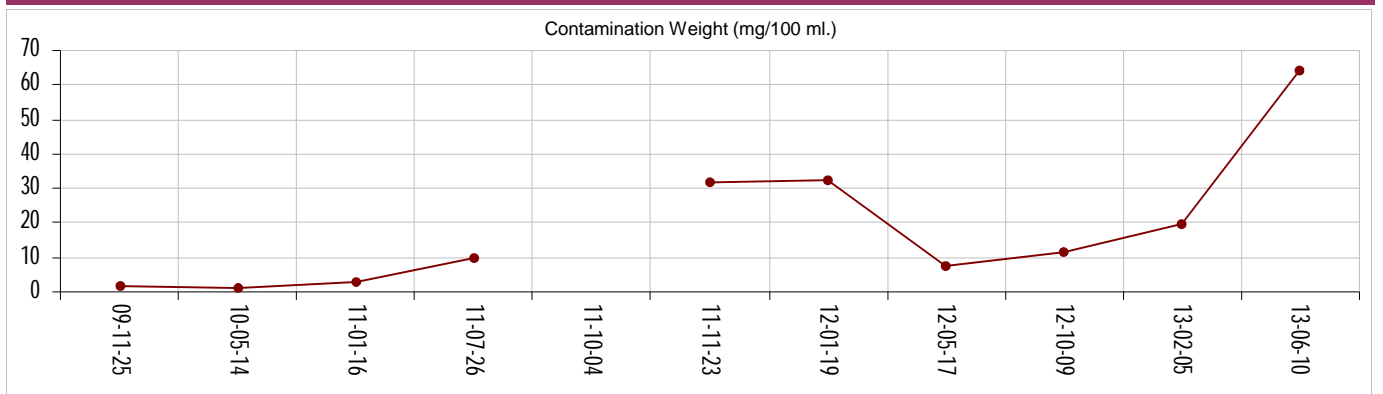
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Test code : T814 T817

Unit ID : **GT1 Before Purifier**  
Unit Type : Engine Turbine Gas  
Unit Make : GE  
Unit Model : Frame 9171 E  
Oil type / Viscosity : MOBIL DTE 732 ISO 32  
Oil System Capacity : 14000 Liters

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

Gravimetric analysis (photos shown) indicate the oil is highly contaminated with sludge-like materials.

	Current Sample	207231	Previous Sample	198073							
<b>Lab ID</b>	220964	GT1	GT1	GT 1	 (Mod. ASTM D-4898)						
<b>Bottle ID</b>	GT1	GT1	GT1	GT 1							
<b>Date Sampled</b>	10-Jun-13	05-Feb-13	Not Given	09-Oct-12							
<b>Oil Hours (Kms)</b>	Not Given	Not Given	Not Given	Not Given							
<b>Unit Hours (Kms)</b>	Not Given	Not Given	Not Given	Not Given							
<b>Oil Added (Liters)</b>											
<b>Filters Hours (Kms)</b>											
<b>Contamination</b>											
<b>Gravimetric Analysis : Test Method for Insoluble Contamination of Fluid</b>					<b>The New Oil (TNO)</b>						
Fluid Volume	10 ml	10 ml	10 ml	10 ml	10 ml						
Filter Type	0.8 micron	0.8 micron	0.8 micron	0.8 micron	0.8 micron						
Photo of Insoluble Contamination Retained on Filter Membrane Disc											
Photo of Insoluble Contamination Retained on Filter Membrane Disc											
Photo of Insoluble Contamination Retained on Filter Membrane Disc - Magnification 100x											
Photo of Insoluble Contamination Retained on Filter Membrane Disc Magnification 100x											
Contaminant Retain on Filter Disk	% Visual Rating	% Visual Rating	% Visual Rating	% Visual Rating	% Visual Rating						
Grey & Black Metal		10	10								
Copper Base Metal											
Bright & White Metal											
Rust & Corrosion											
Dirt & Dust		70	70		100						
Fibers / Filters / Seals											
Sludge & Varnish	100	20	20								
Contamination Weight (mg/100 ml)	64.5 mg/100 ml <b>W</b>	19.9 mg/100 ml <b>C</b>	11.5 mg/100 ml		<table border="1"> <tr> <td>TNO</td> <td>Caution</td> <td>Warning</td> </tr> <tr> <td>2</td> <td>&gt;15</td> <td>&gt;30</td> </tr> </table>	TNO	Caution	Warning	2	>15	>30
TNO	Caution	Warning									
2	>15	>30									



**Gravimetric Analysis:**  
 - determines total solid and soft compound contamination level by weight  
 - identifies particle contamination in oils by microscopic analysis  
 - determines oil contamination level by colorimetric (color density)  
 In brief, will analyze oil cleanliness and source(s) of contamination.

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Unit ID : **GT1 Before Purifier**  
Unit Type : Engine Turbine Gas  
Unit Make : GE  
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Oil type /  
I Viscosity : MOBIL DTE 732 ISO 32  
L  
Oil System Capacity : 14000 Liters

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

Foaming Tendency is slightly outside of normal limits.  
Air Release characteristic ASTM D-3427 is slightly outside of the normal limits.

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Lab ID Bottle ID Date Sampled Oil Hours (Kms) Unit Hours (Kms) Oil Added (Liters) Filters Hours (Kms)	Unit	Current Sample	Previous Sample		Foaming Characteristic	
		220964 GT1 10-Jun-13 Not Given Not Given	207231 GT1 05-Feb-13 Not Given Not Given	198073 GT 1 09-Oct-12 Not Given Not Given	New Oil	Alarm Limit Range

Foaming Characteristics				Test Method : D-892		
Test	Unit	Current Sample	Previous Sample	New Oil	Caution Limit	Warning Limit
<b>Foam Sequence I , 24 °c</b>						
<b>Foaming Tendency</b>	Foaming volume in ml.	390 <b>C</b>	450 <b>W</b>	420 <b>C</b>	Max 350	Max 450
<b>Foam Stability</b>	Remaining Foam in ml.	0	0	0	Max 5	Max 10
<b>Foam Sequence II, 94 °c</b>						
<b>Foaming Tendency</b>	Foaming volume in ml.	40 <b>C</b>	50 <b>W</b>	40 <b>C</b>	Max 30	Max 50
<b>Foam Stability</b>	Remaining Foam in ml.	0	0	0	Max 1	Max 5
<b>Foam Sequence III, 94 to 24 °c</b>						
<b>Foaming Tendency</b>	Foaming volume in ml.	370 <b>C</b>	510 <b>W</b>	530 <b>W</b>	Max 350	Max 450
<b>Foam Stability</b>	Remaining Foam in ml.	0	0	10 <b>W</b>	Max 1	Max 5

**Explanation:** Foaming Tendency : Volume of foam generated after blowing for 5 minutes period.  
Foam Stability : Volume of residual foam left after a 10 minutes setting period.

Air Release Properties				Test Method : D-3427		
Test	Unit	Current Sample	Previous Sample	New Oil	Caution Limit	Warning Limit
<b>Air Release at 50°c</b>	Minutes : Seconds	3 : 30 <b>C</b>	3 : 45 <b>C</b>	3 : 01 <b>C</b>	: Max 3 :	Max 4 :

**Explanation:** Determination the ability of lubricating oils to separate from entrained air or air bubble during the test procedure.  
Result of Air Release is the time for the air entrained during the test procedure to detrain to 0.2% by volume.

Note : Alarm Limits are variable and dependent upon dataset and to be used as general guideline  
Accuracy of interpretation and recommendation are based on representatives samples and information supplied.

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Test code : T814 T817

E Unit ID : **GT1 Before Purifier**  
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I Unit Type : Engine Turbine Gas  
P Unit Make : GE  
M Unit Model : Frame 9171 E  
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O Oil type /  
I Viscosity : MOBIL DTE 732 ISO 32  
L  
Oil System Capacity : 14000 Liters

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

Water Separability ASTM D-1401 is acceptable.  
Filterability times Wet (Wet In-Service versus Dry In-Service) are acceptable (00:xx vs. 00:xx or 1.5X and 2.0X the Dry In-Service value).

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Lab ID Bottle ID Date Sampled Oil Hours (Kms) Unit Hours (Kms) Oil Added (Liters) Filters Hours (Kms)	Unit	Current Sample	Previous Sample		Water Separability (Demulsibility)	
			220964 GT1 10-Jun-13 Not Given Not Given	207231 GT1 05-Feb-13 Not Given Not Given	198073 GT 1 09-Oct-12 Not Given Not Given	Filterability
					New Oil	Alarm Limit Range

**Water Separability Characteristics or Demulsibility**

Test Method : D-1401

Test	Unit	Current Sample	Previous Sample		New Oil	Caution Limit	Warning Limit
<b>Water Separability At 54°C</b>	Oil / Water / Emulsion (Mins)	40 / 40 / 0 / (8.30) See below details	40 / 40 / 0 / (4.82) See below details	10 / 12 / 58 / (>30) See below details			
	Volume OIL Layer in ml.	40	40	10			
	Volume WATER Layer in ml.	40	40	12			
	Volume EMULSION Layer in ml	0	0	58			
	Separation in minutes	8.30	4.82	>30 W		Max 25	Max 30
<b>Volume Emulsion Layer in ml. after</b>							
	<b>5 Minutes</b>	Volume emulsion in ml.	10	67			
	<b>20 Minutes</b>	Volume emulsion in ml.	0	61			
<b>30 Minutes</b>	Volume emulsion in ml.	0	58				

Abbreviation : ml = milliliters, mins = minutes

Oil / Water / Emulsion (Mins) = Volume of oil layer in ml. / Volume of water layer in ml. / Volume of emulsion layer (separation in minutes)

**Filterability**

In House Method

Test	Unit	Current Sample	Previous Sample		New Oil	Caution Limit	Warning Limit
------	------	----------------	-----------------	--	---------	---------------	---------------

**Stage I : Dry Phase** , Determination of the filterability for Dry Oils (no water mix)

<b>Porosity Size</b>	Micron	1.2	1.2	1.2			
% Water mix to sample	%	0	0	0			
<b>Filterability Stage I: Dry Phase</b>	Minutes	1 : 00	: 54	0 : 53	:	Max :	Max :

**Stage II : Wet Phase** , Determination of the filterability for Oils in presence of water

<b>Porosity Size</b>	Micron	1.2	1.2	1.2			
% Water mix to sample	%	2	2	2			
<b>Filterability Stage II: Wet Phase</b>	Minutes	1 : 38	1 : 44 C	1 : 04	:	Max :	Max :

Note : Alarm Limits are variable and dependent upon dataset and to be used as general guideline  
Accuracy of interpretation and recommendation are based on representatives samples and information supplied.

C Code

U Name :

S Address :

O Site :

L Location :

Test code : T814 T817

E Unit ID : **GT1 Before Purifier**

P Unit Type : Engine Turbine Gas

M Unit Make : GE

E Unit Model : Frame 9171 E

L Oil type / Viscosity : MOBIL DTE 732 ISO 32

Oil System Capacity : 14000 Liters

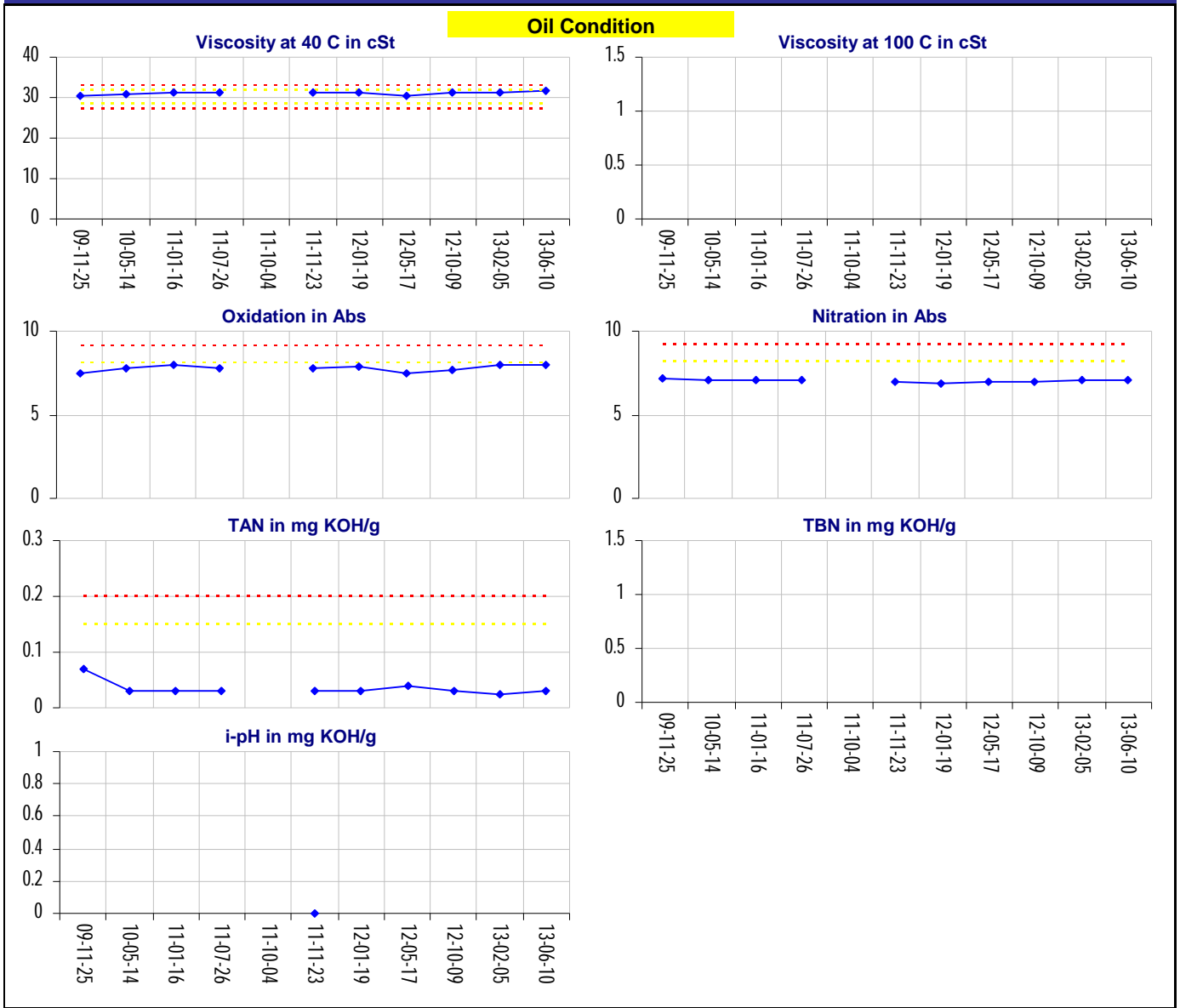
**Wear Condition**





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O Unit Type : Engine Turbine Gas  
U Unit Make : GE  
N Unit Model : Frame 9171 E  
I Oil type /  
V Viscosity : MOBIL DTE 732 ISO 32  
L  
Oil System Capacity : 14000 Liters



C Code

Name :

Address :

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Location :

Test code : T814 T817

Unit ID : **GT1 Before Purifier**

Unit Type : Engine Turbine Gas

Unit Make : GE

Unit Model : Frame 9171 E

Oil type / Viscosity : MOBIL DTE 732 ISO 32

Oil System Capacity : 14000 Liters

