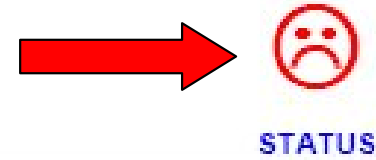




Standard Analysis Report

TECHENOMICS - CONDITION MONITORING

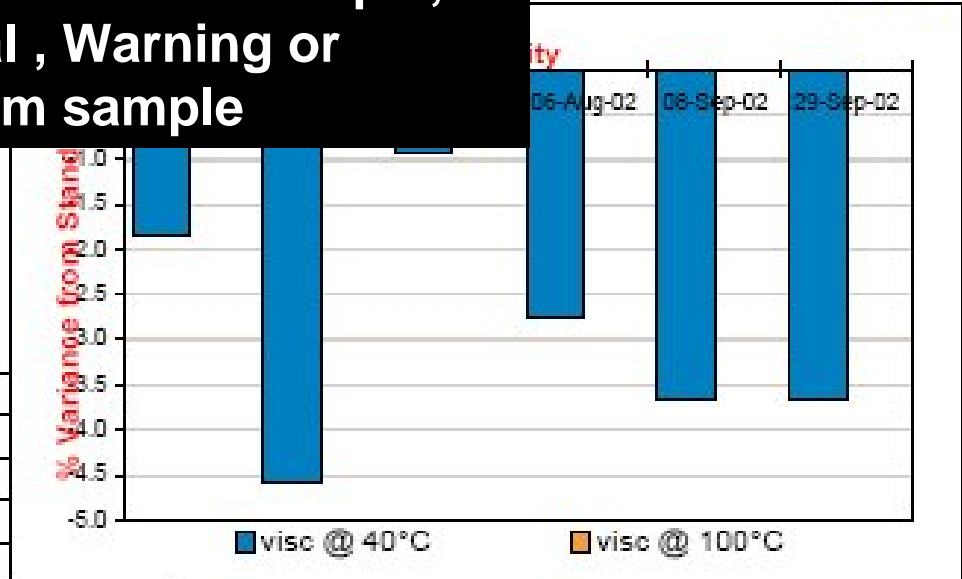
TECHNICAL ADVANCE FOR ECONOMIC GAIN



The status identifies the condition of the sample, Normal, Warning or Problem sample

Wear Metal Report: 149,153
 Client
 Attention
 Machine: CAT D11R DOZER
 ID. No. 109
 Oil Name: ENGINE OIL
 Compartment ENGINE

Date	10/06/02	7/07/02	14/07/02	6/08/02	8/09/02	29/09/02
Sample #	145470	146222	147322	147321	148863	149153
SMU	0hrs	321hrs	275hrs	634hrs	910hrs	1075hrs
Oil Hrs	260	321	275	314	278	312
Oil Changed	Yes	Yes	Yes	Yes	Yes	Yes



Wear Metals	ppm	ppm	ppm	ppm	ppm	ppm	Max
lead	6	5	4	4	3	2	15
iron	11	13	12	10	10	10	80
aluminium	6	6	3	4	6	4	20
copper	7	10	10	10	1500	236	30
chromium	2	0	1	1	1	0	15
tin	0	0	0	0	0	0	15
nickel	2	0	1	0	0	0	15
Contaminants							
silicon	12	10	9	8	10	9	30
sodium	9	10	9	9	8	7	30
Oil Additives							
magnesium	86	37	25	15	14	11	0
zinc	1558	1689	1873	1809	1628	1637	0
molybdenum	1	8	3	5	3	0	0
calcium	9200	7075	8307	7077	5584	5584	0
phosphorus	1598	2194	1929	1841	1631	1594	0
boron	474	53	51	9	5	3	0

Comments on elevated results

Copper can come from crankshaft main or big end bearings, bushing and oil coolers.

Copper trend significantly reduced although well above recommended limits.

Oxidation levels are unaffected by copper. Other wear metals within acceptable levels. Oil has been changed.

Suggest increase sampling schedule to monitor copper wear trend.

TECHENOMICS - CONDITION MONITORING

TECHNICAL ADVANCE FOR ECONOMIC GAIN



STATUS

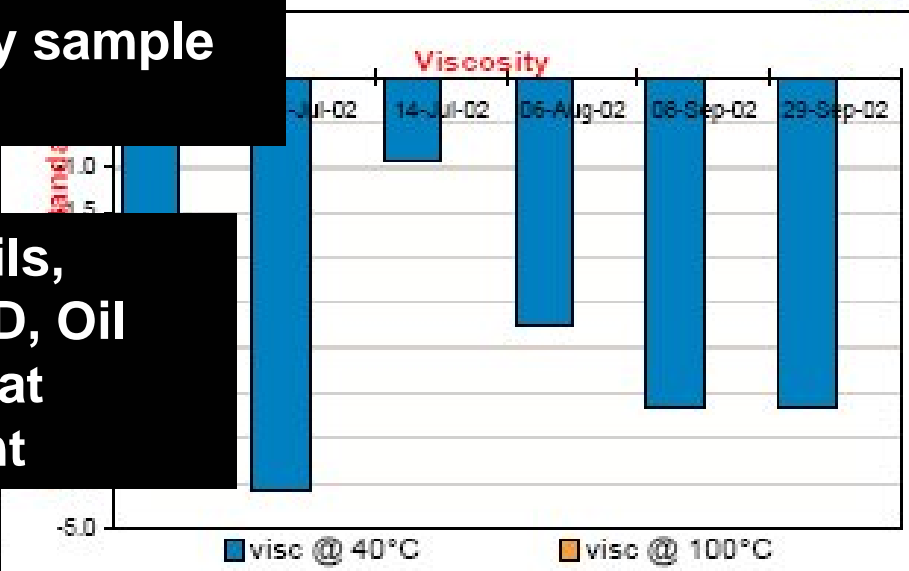
Wear Metal Report: 149,153

Client
 Attention
 Machine: CAT D11R DOZER
 ID. No. 109
 Oil Name: ENGINE OIL
 Compartment ENGINE

Laboratory sample number

Clients details, equipment ID, Oil type and what compartment

Date	10/06/02	7/07/02	14/07/02	6/08/02	5/08/02	10/08/02
Sample #	145470	146222	147322	147322		
SMU	0hrs	321hrs	275hrs	634hrs	570hrs	634hrs
Oil Hrs	260	321	275	314	278	312
Oil Changed	Yes	Yes	Yes	Yes	Yes	Yes



Wear Metals	ppm	ppm	ppm	ppm	ppm	ppm	Max
lead	6	5	4	4	3	2	15
iron	11	13	12	10	10	10	80
aluminium	6	6	3	4	6	4	20
copper	7	10	10	10	1500	236	30
chromium	2	0	1	1	1	0	15
tin	0	0	0	0	0	0	15
nickel	2	0	1	0	0	0	15
Contaminants							
silicon	12	10	9	8	10	9	30
sodium	9	10	9	9	8	7	30
Oil Additives							
magnesium	86	37	25	15	14	11	0
zinc	1556	1689	1873	1809	1628	1637	0
molybdenum	1	8	3	5	3	0	0
calcium	9200	7075	8307	7077	5584	5584	0
phosphorus	1598	2194	1929	1841	1631	1594	0
boron	474	53	51	9	5	3	0

Comments on elevated results

Copper can come from crankshaft main or big end bearings, bushing and oil coolers.

Copper trend significantly reduced although well above recommended limits.

Oxidation levels are unaffected by copper. Other wear metals within acceptable levels. Oil has been changed.

Suggest increase sampling schedule to monitor copper wear trend.

TECHENOMICS - CONDITION MONITORING

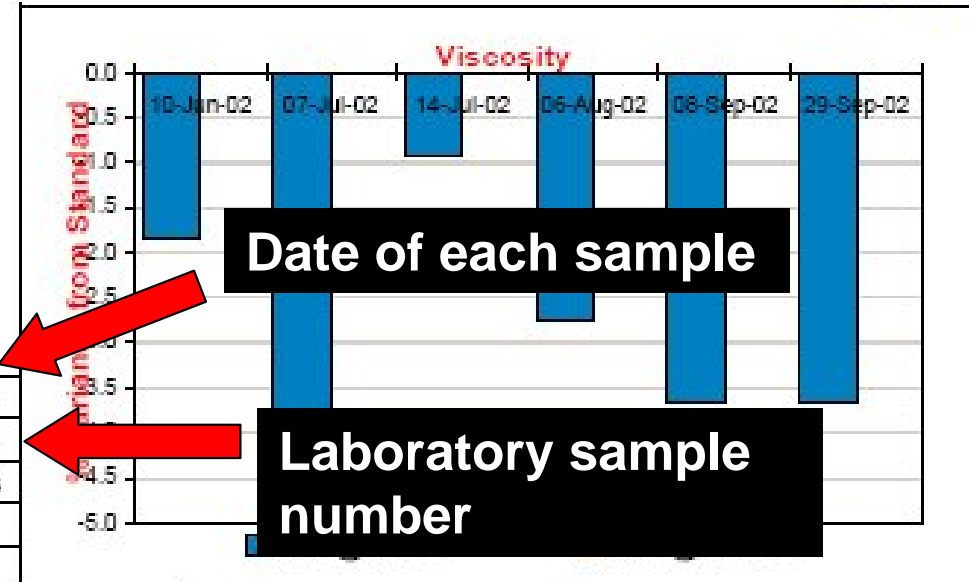
TECHNICAL ADVANCE FOR ECONOMIC GAIN



STATUS

Wear Metal Report: 149,153
Client
Attention
Machine: CAT D11R DOZER
ID. No. 109
Oil Name: ENGINE OIL
Compartment ENGINE

Date	10/06/02	7/07/02	14/07/02	6/08/02	8/09/02	29/09/02
Sample #	145470	146222	147322	147321	148863	149153
SMU	0hrs	321hrs	275hrs	634hrs	910hrs	1075hrs
Oil Hrs	260	321	275	314	278	312
Oil Changed	Yes	Yes	Yes	Yes	Yes	Yes



Wear Metals	ppm	ppm	ppm	ppm	ppm	ppm	Max	Comments on elevated results
lead	6	5	4	4	3	2	15	Copper can come from crankshaft main or big end bearings, bushing and oil coolers. Copper trend significantly reduced although well above recommended limits.
iron	11	13	12	10	10	10	80	
aluminium	6	6	3	4	6	4	20	
copper	7	10	10	10	1500	236	30	
chromium	2	0	1	1	1	0	15	
tin	0	0	0	0	0	0	15	
nickel	2	0	1	0	0	0	15	
Contaminants								Oxidation levels are unaffected by copper. Other wear metals within acceptable levels. Oil has been changed.
silicon	12	10	9	8	10	9	30	
sodium	9	10	9	9	8	7	30	Suggest increase sampling schedule to monitor copper wear trend.
Oil Additives								
magnesium	86	37	25	15	14	11	0	
zinc	1558	1689	1873	1809	1628	1637	0	
molybdenum	1	8	3	5	3	0	0	
calcium	9200	7075	8307	7077	5584	5584	0	
phosphorus	1598	2194	1929	1841	1631	1594	0	
boron	474	53	51	9	5	3	0	

TECHENOMICS - CONDITION MONITORING



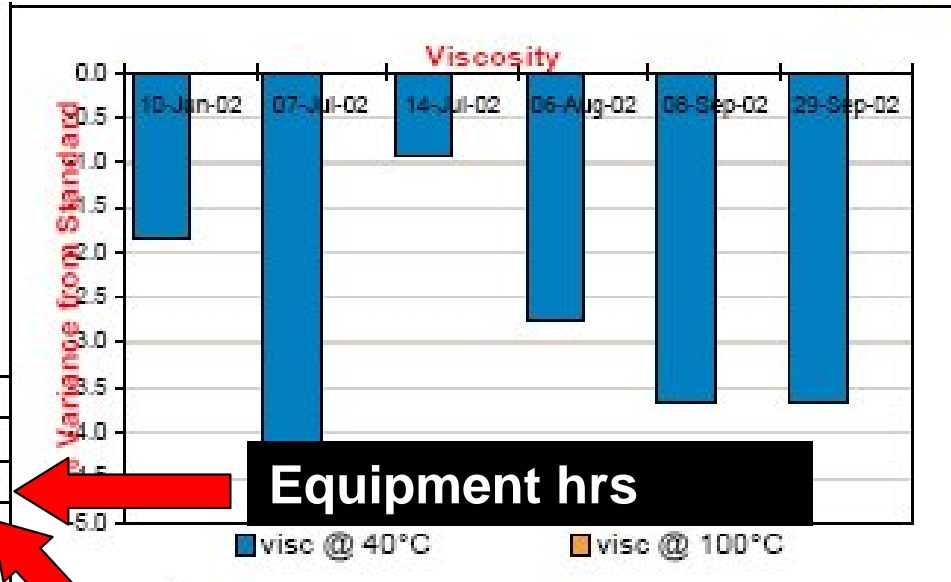
TECHNICAL ADVANCE FOR ECONOMIC GAIN

STATUS

Wear Metal Report: 149,153

Client
 Attention
 Machine: CAT D11R DOZER
 ID. No. 109
 Oil Name: ENGINE OIL
 Compartment ENGINE

Date	10/06/02	7/07/02	14/07/02	6/08/02	8/09/02	29/09/02
Sample #	145470	146222	147322	147321	148863	149153
SMU	0hrs	321hrs	275hrs	634hrs	910hrs	1075hrs
Oil Hrs	260	321	275	314	278	312
Oil Changed	Yes	Yes	Yes	Yes	Yes	Yes



Wear Metals	ppm	ppm	ppm	ppm	ppm	ppm	Limit
lead	6	5	4	4	3	2	15
iron	11	13	12	10	10	10	80
aluminium	6	6	3	4	6	4	20
copper	7	10	10	10	1500	236	30
chromium	2	0	1	1	1	0	15
tin	0	0	0	0	0	0	15
nickel	2	0	1	0	0	0	15
Contaminants							
silicon	12	10	9	8	10	9	30
sodium	9	10	9	9	8	7	30
Oil Additives							
magnesium	86	37	25	15	14	11	0
zinc	1556	1689	1873	1809	1628	1637	0
molybdenum	1	8	3	5	3	0	0
calcium	9200	7075	8307	7077	5584	5584	0
phosphorus	1598	2194	1929	1841	1631	1594	0
boron	474	53	51	9	5	3	0

Comments on elevated results

Hours on Oil if provided or big end

Copper trend significantly reduced although well above recommended limits.

Oxidation levels are unaffected by copper. Other wear metals within acceptable levels. Oil has been changed.

Suggest increase sampling schedule to monitor copper wear trend.

TECHENOMICS - CONDITION MONITORING



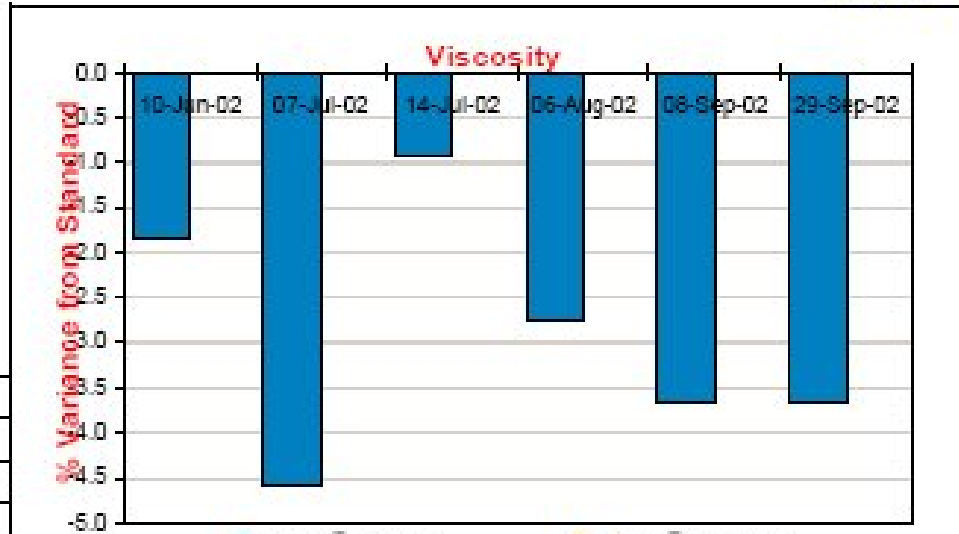
TECHNICAL ADVANCE FOR ECONOMIC GAIN

STATUS

Wear Metal Report: 149,153

Client
 Attention
 Machine: CAT D11R DOZER
 ID. No. 109
 Oil Name: ENGINE OIL
 Compartment ENGINE

Date	10/06/02	7/07/02	14/07/02	6/08/02	8/09/02	29/09/02
Sample #	145470	146222	147322	147321	148863	149153
SMU	0hrs	321hrs	275hrs	634hrs	910hrs	1075hrs
Oil Hrs	260	321	275	314	278	312
Oil Changed	Yes	Yes	Yes	Yes	Yes	Yes



Wear Metals	ppm	ppm	ppm	ppm	ppm	ppm	Max	Co
lead	6	5	4	4	3	2	15	
iron	11	13	12	10	10	10	80	
aluminium	6	6	3	4	6	4	20	
copper	7	10	10	10	1500	236	30	
chromium	2	0	1	1	1	0	15	
tin	0	0	0	0	0	0	15	
nickel	2	0	1	0	0	0	15	

Oil changed if known

Contaminants								
silicon	12	10	9	8	10	9	30	
sodium	9	10	9	9	8	7	30	

Oil Additives								
magnesium	86	37	25	15	14	11	0	
zinc	1558	1689	1873	1809	1628	1637	0	
molybdenum	1	8	3	5	3	0	0	
calcium	9200	7075	8307	7077	5584	5584	0	
phosphorus	1598	2194	1929	1841	1631	1594	0	
boron	474	53	51	9	5	3	0	

Copper can come from crankshaft main or big end bearings, bushing and oil coolers.

Copper trend significantly reduced although well above recommended limits.

Oxidation levels are unaffected by copper. Other wear metals within acceptable levels. Oil has been changed.

Suggest increase sampling schedule to monitor copper wear trend.

TECHENOMICS - CONDITION MONITORING

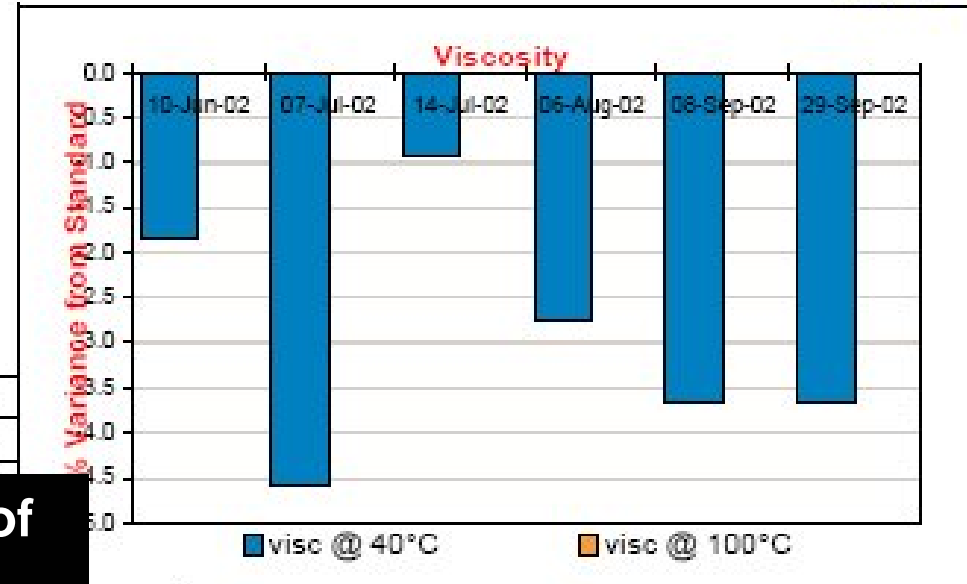


TECHNICAL ADVANCE FOR ECONOMIC GAIN

STATUS

Wear Metal Report: 149,153

Client
 Attention
 Machine: CAT D11R DOZER
 ID. No. 109
 Oil Name: ENGINE OIL
 Compartment ENGINE



Date	10/06/02	7/07/02	14/07/02	6/08/02	8/09/02	29/09/02
Sample #	145470	146222	147322	147321	148863	149153
SMU	0hrs	3				
Oil Hrs	260	3				
Oil Changed	Yes	Y				

Spectrometer readings of wear metals, these will highlight red if above the set limits

Wear Metals	10/06/02	7/07/02	14/07/02	6/08/02	8/09/02	29/09/02	Max
lead	6						5
iron	11						30
aluminium	6						20
copper	7	10	10	10	1500	236	30
chromium	2	0	1	1	1	0	15
tin	0	0	0	0	0	0	15
nickel	2	0	1	0	0	0	15
Contaminants							
silicon	12	10	9	8	10	9	30
sodium	9	10	9	9	8	7	30
Oil Additives							
magnesium	86	37	25	15	14	11	0
zinc	1558	1689	1873	1809	1628	1637	0
molybdenum	1	8	3	5	3	0	0
calcium	9200	7075	8307	7077	5584	5584	0
phosphorus	1598	2194	1929	1841	1631	1594	0
boron	474	53	51	9	5	3	0

Comments on elevated results

Copper can come from crankshaft main or big end bearings, bushing and oil coolers.

Copper trend significantly reduced although well above recommended limits.

Oxidation levels are unaffected by copper. Other wear metals within acceptable levels. Oil has been changed.

Suggest increase sampling schedule to monitor copper wear trend.

TECHENOMICS - CONDITION MONITORING



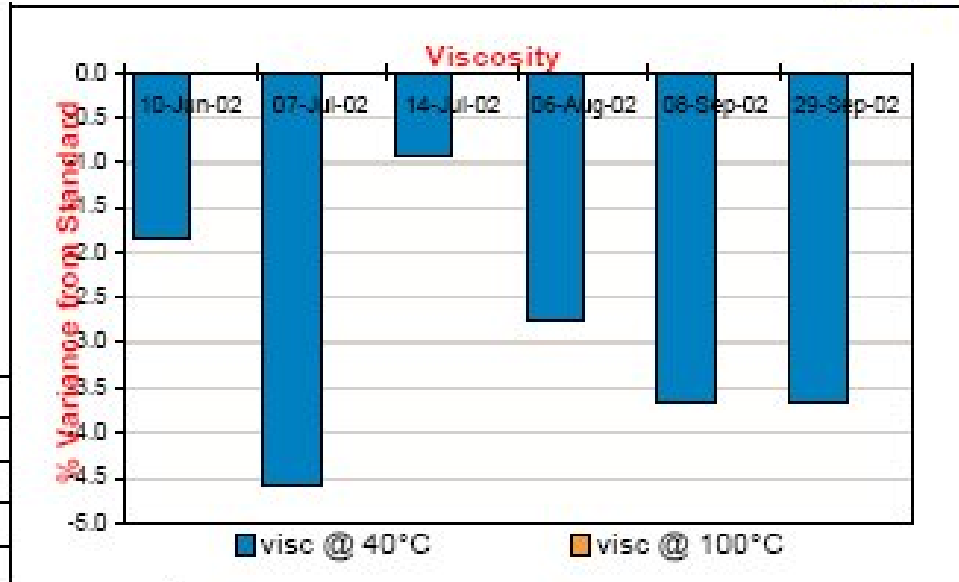
TECHNICAL ADVANCE FOR ECONOMIC GAIN

STATUS

Wear Metal Report: 149,153

Client
 Attention
 Machine: CAT D11R DOZER
 ID. No. 109
 Oil Name: ENGINE OIL
 Compartment ENGINE

Date	10/06/02	7/07/02	14/07/02	6/08/02	8/09/02	29/09/02
Sample #	145470	146222	147322	147321	148863	149153
SMU	0hrs	321hrs	275hrs	634hrs	910hrs	1075hrs
Oil Hrs	260	321	275	314	278	312
Oil Changed	Yes	Yes	Yes	Yes	Yes	Yes



Wear Metals	ppm	ppm	ppm	ppm	ppm	ppm	Max
lead	6	5	4	4	3	2	15
iron	11	13	12	10	10	10	80
aluminium	6	6	3	4	6	4	20
copper	7	10	10	10	1500	236	
chromium	2	0	1	1	1	0	15
tin	0	0	0	0	0	0	15
nickel	2	0	1	0	0	0	15
Contaminants							
silicon	12	10	9	8	10	9	30
sodium	9	10	9	9	8	7	30
Oil Additives							
magnesium	86	37	25	15	14	11	0
zinc	1558	1689	1873	1809	1628	1637	0
molybdenum	1	8	3	5	3	0	0
calcium	9200	7075	8307	7077	5584	5584	0
phosphorus	1598	2194	1929	1841	1631	1594	0
boron	474	53	51	9	5	3	0

Comments on elevated results

All wear metals are coloured to identify problems

Copper is above recommended limits.

Oxidation levels are unaffected by copper. Other wear metals within acceptable levels. Oil has been changed.

Suggest increase sampling schedule to monitor copper wear trend.

TECHENOMICS - CONDITION MONITORING



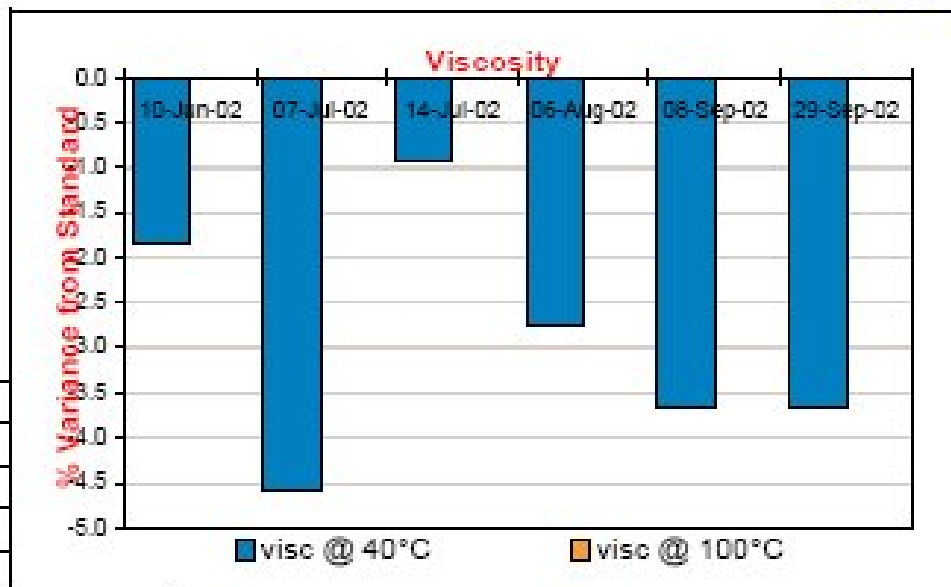
TECHNICAL ADVANCE FOR ECONOMIC GAIN

STATUS

Wear Metal Report: 149,153

Client
 Attention
 Machine: CAT D11R DOZER
 ID. No. 109
 Oil Name: ENGINE OIL
 Compartment ENGINE

Date	10/06/02	7/07/02	14/07/02	6/08/02	8/09/02	29/09/02
Sample #	145470	146222	147322	147321	148863	149153
SMU	0hrs	321hrs	275hrs	634hrs	910hrs	1075hrs
Oil Hrs	260	321	275	314	278	312
Oil Changed	Yes	Yes	Yes	Yes	Yes	Yes



All limits are displayed under the MAX, this is the recommended problem limit, if any value is higher than that set number, it will highlight a problem by colouring the values red.

ppm	ppm	Max
3	2	15
10	10	80
1500	236	30
1	0	15
0	0	15
0	0	15
10	9	30
8	7	30

Comments on elevated results

Copper can come from crankshaft main or big end bearings, bushing and oil coolers.

Copper trend significantly reduced although well above recommended limits.

Oxidation levels are unaffected by copper. Other wear metals within acceptable levels. Oil has been changed.

Oil Additives

	10/06/02	7/07/02	14/07/02	6/08/02	8/09/02	29/09/02	0
magnesium	86	37	25	15	14	11	0
zinc	1558	1689	1873	1809	1628	1637	0
molybdenum	1	8	3	5	3	0	0
calcium	9200	7075	8307	7077	5584	5584	0
phosphorus	1598	2194	1929	1841	1631	1594	0
boron	474	53	51	9	5	3	0

Suggest increase sampling schedule to monitor copper wear trend.

TECHENOMICS - CONDITION MONITORING

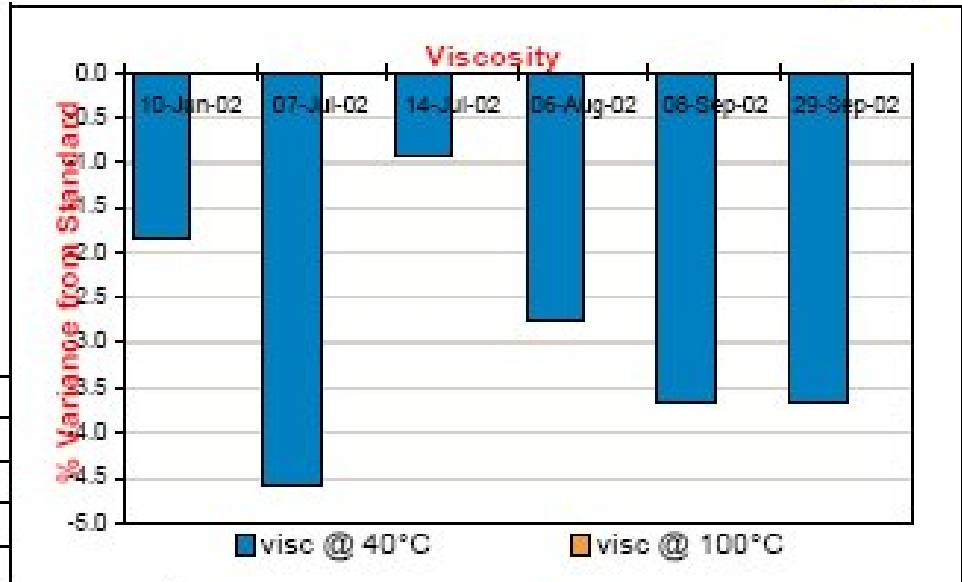
TECHNICAL ADVANCE FOR ECONOMIC GAIN



STATUS

Wear Metal Report: 149,153
 Client
 Attention
 Machine: CAT D11R DOZER
 ID. No. 109
 Oil Name: ENGINE OIL
 Compartment ENGINE

Date	10/06/02	7/07/02	14/07/02	6/08/02	8/09/02	29/09/02
Sample #	145470	146222	147322	147321	148863	149153
SMU	0hrs	321hrs	275hrs	634hrs	910hrs	1075hrs
Oil Hrs	260	321	275	314	278	312
Oil Changed	Yes	Yes	Yes	Yes	Yes	Yes



Wear Metals	ppm	ppm	ppm	ppm	ppm	ppm	Max
lead	6	5	4	4	3	2	15
iron	1	1	1	1	1	1	80
aluminium	6	6	6	6	6	6	20
copper	7	7	7	7	6	6	15
chromium	2	2	2	2	2	2	15
tin	0	0	0	0	0	0	15
nickel	2	2	2	2	2	2	15

These are the recommendations from the Lab staff for this sample

Comments on elevated results

Copper can come from crankshaft main or big end bearings, bushing and oil coolers.

Copper trend significantly reduced although well above recommended limits.

Oxidation levels are unaffected by copper. Other wear metals within acceptable levels. Oil has been changed.

Suggest increase sampling schedule to monitor copper wear trend.

Contaminants	12	10	9	8	10	9	30
silicon	12	10	9	8	10	9	30
sodium	9	10	9	9	8	7	30

Oil Additives	86	37	25	15	14	11	0
magnesium	86	37	25	15	14	11	0
zinc	1558	1689	1873	1809	1628	1637	0
molybdenum	1	8	3	5	3	0	0
calcium	9200	7075	8307	7077	5584	5584	0
phosphorus	1598	2194	1929	1841	1631	1594	0
boron	474	53	51	9	5	3	0

TECHENOMICS - CONDITION MONITORING

TECHNICAL ADVANCE FOR ECONOMIC GAIN

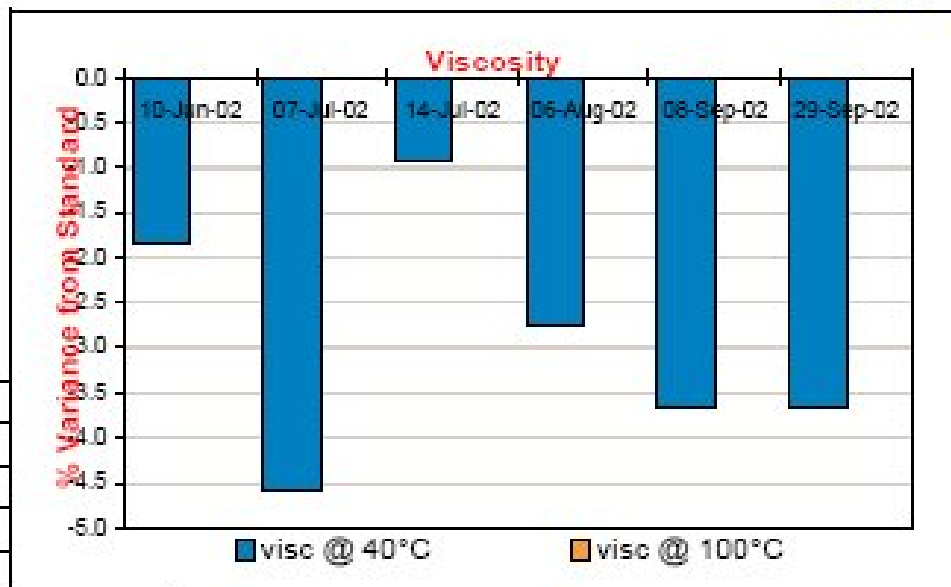


STATUS

Wear Metal Report: 149,153

Client
 Attention
 Machine: CAT D11R DOZER
 ID. No. 109
 Oil Name: ENGINE OIL
 Compartment ENGINE

Date	10/06/02	7/07/02	14/07/02	6/08/02	8/09/02	29/09/02
Sample #	145470	146222	147322	147321	148863	149153
SMU	0hrs	321hrs	275hrs	634hrs	910hrs	1075hrs
Oil Hrs	260	321	275	314	278	312
Oil Changed	Yes	Yes	Yes	Yes	Yes	Yes



Wear Metals	ppm	ppm	ppm	ppm	ppm	ppm	Max
lead	6	5	4	4	3	2	15
iron	11	13	12	10	10	10	80
aluminium	6	6	3	4	6	4	20
copper	7	10	10	10	1500	236	30
chromium	2	0	1	1	1	0	15
tin	0	0	0	0	0	0	15
nickel	2	0	1	0	0	0	15
Contaminants							
silicon	12	10	9	8	10	9	30
sodium	9	10	9	9	8	7	30
Oil Additives							
magnesium	86	37	25	15	14	11	0
zinc	1558	1689	1873	1809	1628	1637	0
molybdenum	1	8	3	5	3	0	0
calcium	9200	7075	8307	7077	5584	5584	0
phosphorus	1598	2194	1929	1841	1631	1594	0
boron	474	53	51	9	5	3	0

Comments on elevated results

Copper can come from crankshaft main or big end bearings, bushing and oil coolers.

Copper trend significantly reduced although well above recommended limits.

Oxidation levels are unaffected by copper. Other wear metals within acceptable levels. Oil has been changed.

Suggest increase sampling schedule to monitor copper.

These are the additive package details of the used oil



boron	474	53	51	0	5	3	0
TBN	0						
soot	10						0
glycol%	0						
water (ppm)	0						
fuel dilution%	0	0	0	0	0	0	5
oxidation	9	11	13	11	9	6	40
nitration	16	11	12	11	9	6	40
sulphation	15	14	15	13	8	6	40

Infra red is only used on engine oils or when asked by a client

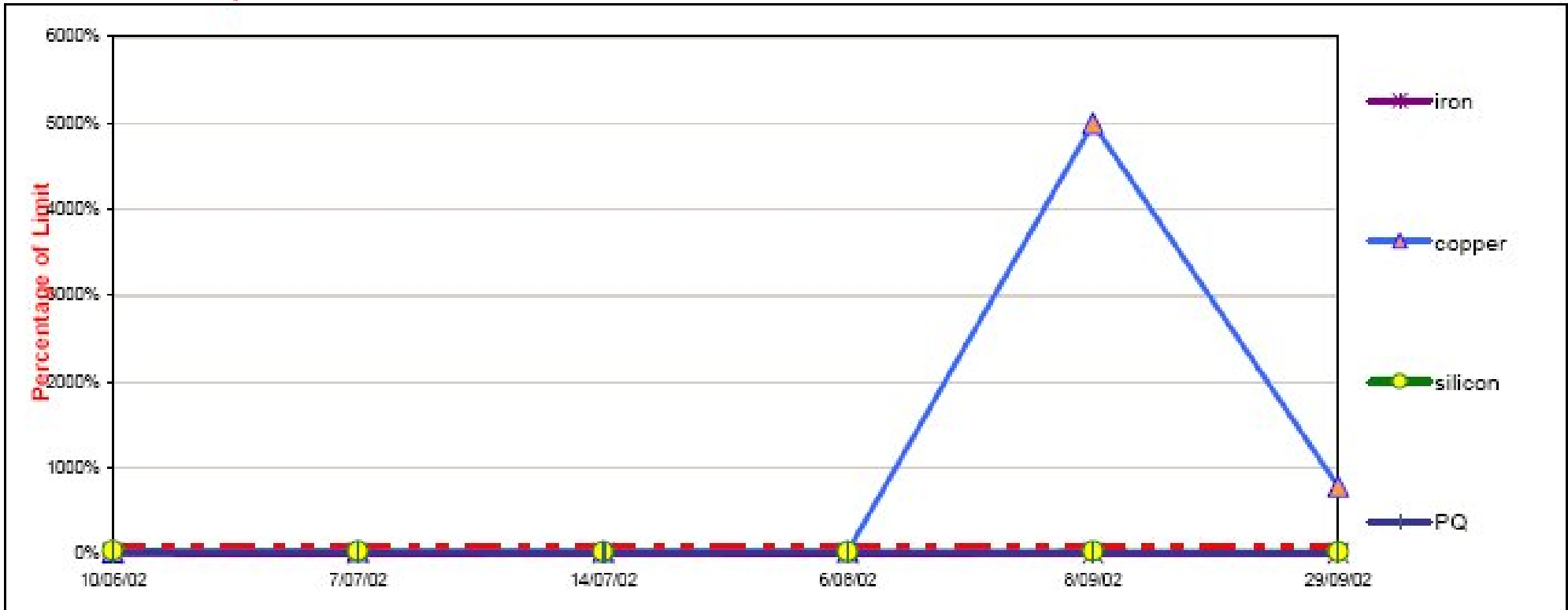
Physical Tests

water %	0	0	0	0	0	0	2
PQ	7	7	5	7	6	4	28
visc @ 100°C	0	0	0	0	0	0	0
visc @ 40°C	107	104	108	106	105	105	109

Particle Cleanliness Analysis

ISO 4406 - 02	0
ISO 4406 - 05	0
ISO 4406 - 15	0
Count 1ml	0

Element Trends Graph



Infra Red

TBN	0	0	0	0	0	0	0
soot	0	0	0	0	0	0	0
glycol%	0	0	0	0	0	0	0
water (ppm)	0	0	0	0	0	0	0
fuel dilution%	0	0	0	0	0	0	0
oxidation	0	0	0	0	0	0	0
nitration	0	0	0	0	0	0	0
sulphation	0	0	0	0	0	0	0

Physical Tests

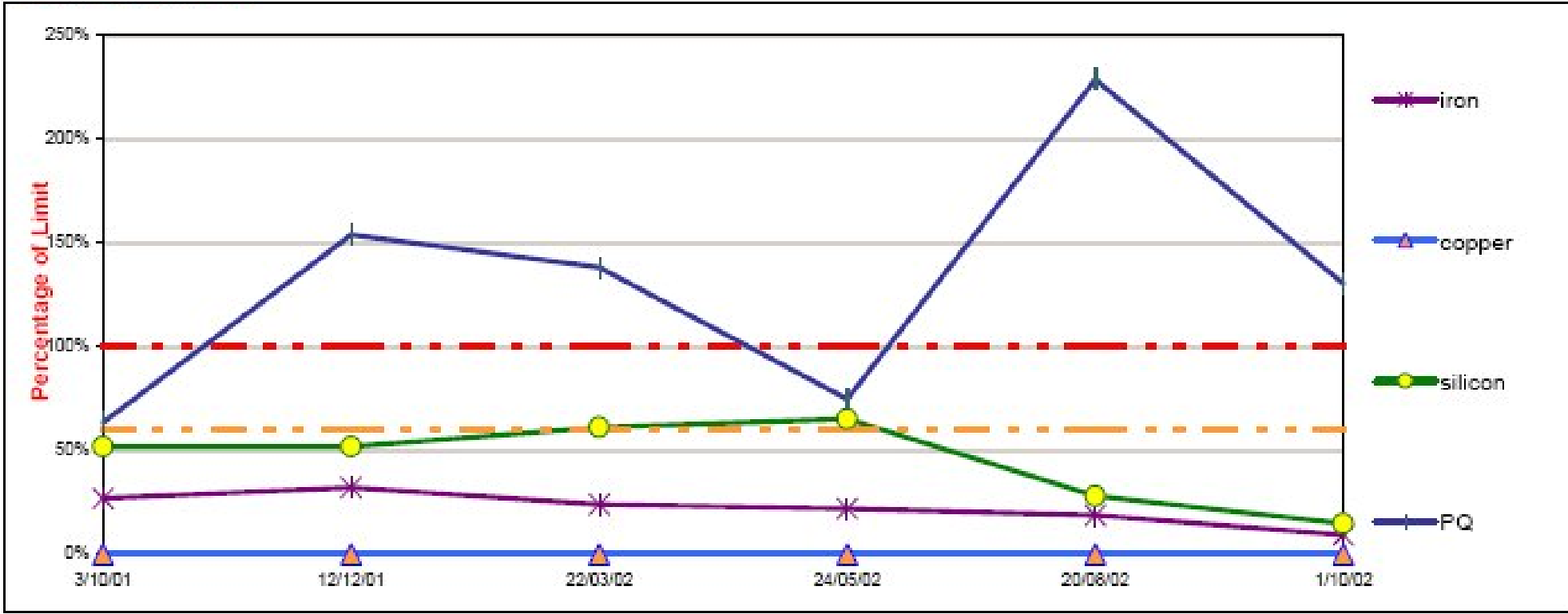
water %	0	0
PQ	106	257
visc @ 100°C	0	0
visc @ 40°C	386	359

Physical tests display water ingress, high iron and viscosity readings

Particle Cleanliness Analysis

ISO 4406 - 02	0
ISO 4406 - 05	0
ISO 4406 - 15	22
Count 1ml	81070

Element Trends Graph



For enquiries, contact: SINGLETON LABORATORY phone: 02 65712699 fax: 02 65712044 mobile: 0419604431

This wear analysis and oil condition report should be used in conjunction with normal maintenance and evaluated from sample to sample. Every care will be taken in processing samples but no express or implied guarantee is furnished in regard to the continuing operation or condition of this machinery or any part thereof.

TECHENOMICS - CONDITION MONITORING



TECHNICAL ADVANCE FOR ECONOMIC GAIN

STATUS

Wear Metal Report: 149,153

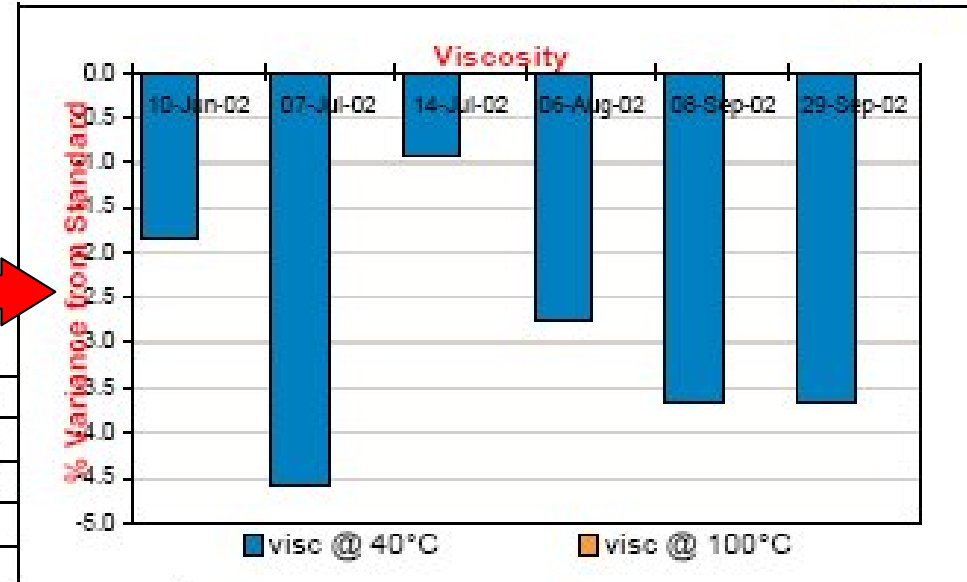
Client
Attention
Machine: CAT D11R DOZER

Oil Name:
Compartment

Date: 02 29/09/02
Sample #: 33 149153

SMU
Oil Hrs: 260 321 275 314 278 312
Oil Changed: Yes Yes Yes Yes Yes Yes

This is the viscosity graph which will demonstrate how the oils resistance is performing



Wear Metals	ppm	ppm	ppm	ppm	ppm	ppm	Max
lead	6	5	4	4	3	2	15
iron	11	13	12	10	10	10	80
aluminium	6	6	3	4	6	4	20
copper	7	10	10	10	1500	236	30
chromium	2	0	1	1	1	0	15
tin	0	0	0	0	0	0	15
nickel	2	0	1	0	0	0	15
Contaminants							
silicon	12	10	9	8	10	9	30
sodium	9	10	9	9	8	7	30
Oil Additives							
magnesium	86	37	25	15	14	11	0
zinc	1558	1689	1873	1809	1628	1637	0
molybdenum	1	8	3	5	3	0	0
calcium	9200	7075	8307	7077	5584	5584	0
phosphorus	1598	2194	1929	1841	1631	1594	0
boron	474	53	51	9	5	3	0

Comments on elevated results

Copper can come from crankshaft main or big end bearings, bushing and oil coolers.

Copper trend significantly reduced although well above recommended limits.

Oxidation levels are unaffected by copper. Other wear metals within acceptable levels. Oil has been changed.

Suggest increase sampling schedule to monitor copper wear trend.

Infra Red

TBN	0	0	0	0	0	0	0
soot	0	0	0	0	0	0	0
glycol%	0	0	0	0	0	0	0
water (ppm)	0	0	0	0	0	0	0
fuel dilution%	0	0	0	0	0	0	0
oxidation	0	0	0	0	0	0	0
nitration	0	0	0	0	0	0	0
sulphation	0	0	0	0	0	0	0

Physical Tests

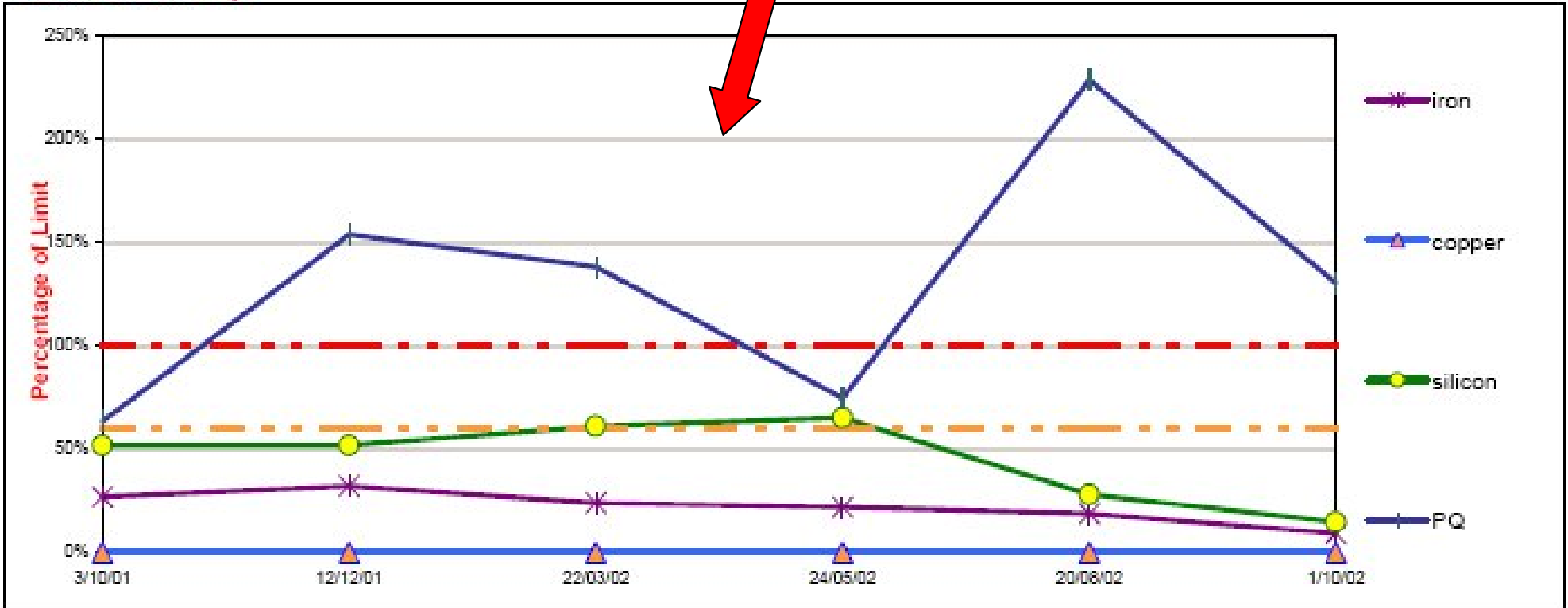
water %	0	0	0
PQ	106	257	231
visc @ 100°C	0	0	0
visc @ 40°C	386	359	366

cleanliness Analysis

- 02	0
- 05	0
- 15	22
Count 1ml	81070

This is the wear metal graph that will help identify problem elements

Element Trends Graph



For enquiries, contact: SINGLETON LABORATORY phone: 02 65712699 fax: 02 65712044 mobile: 0419604431

This wear analysis and oil condition report should be used in conjunction with normal maintenance and evaluated from sample to sample. Every care will be taken in processing samples but no express or implied guarantee is furnished in regard to the continuing operation or condition of this machinery or any part thereof.



Micro Analysis Report

TECHENOMICS - CONDITION MONITORING



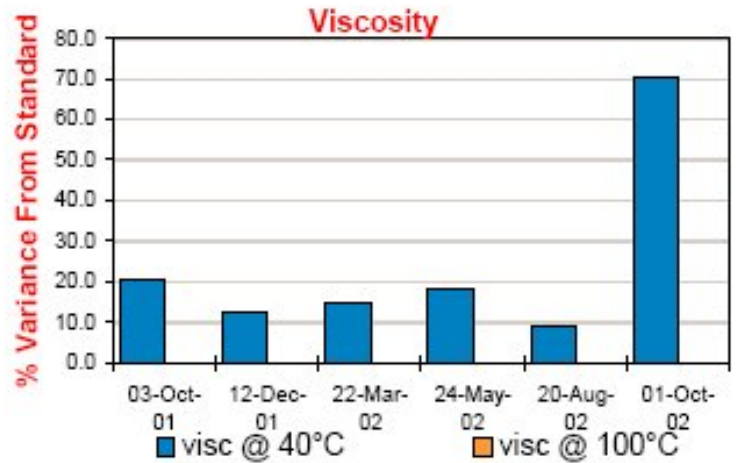
STATUS

TECHNICAL ADVANCE FOR ECONOMIC GAIN

Microanalysis Report: 148,994

Client
 Address
 Machine: P & H 2300 XP Shovel HST.GBX
 ID. No. 310
 Oil Name: MOLYBOND G1700 300
 Compartment Hoist Gearcase

Sample date	3/10/01	12/12/01	22/03/02	24/05/02	20/08/02	1/10/02
Oil hours	8,297	8,874	9,430	9,906	10,343	0
Sample no.	135,352					
SMU	54355hrs	54932				



Particle Analysis displays the size and quantity of particles found in the sample

Physical Tests

water %	0	0	0	0	0	0	2
fuel %	0	0	0	0	0	0	2
visc @ 100°C	0	0	0	0	0	0	0
visc @ 40°C	359	366	378	348	345	+/-30%	320

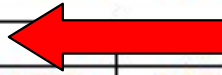
Particle Analysis

Particle Count	0	0	82500	0	86620	81070	1 ml Sample % of Total % of Total % of Total % of Total 02\05\15 µm 167
>100µm	0	0	0	0	0	0	
50-100µm	0	0	0	0	0	0	
10-50µm	0	0	4	0	7	6	
<10µm	0	0	96	0	93	94	
ISO 4406 Level	- -	- -	- 123	- -	- -	- 122	
PQ	106	257	231	125	382	218	

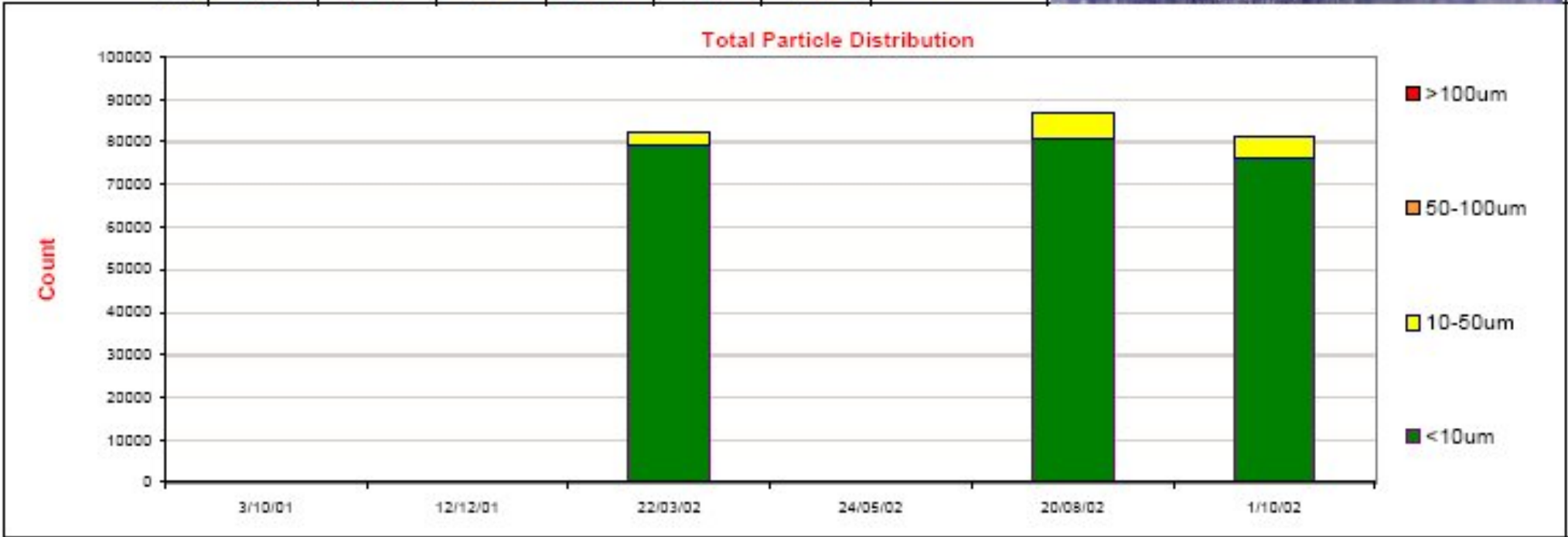
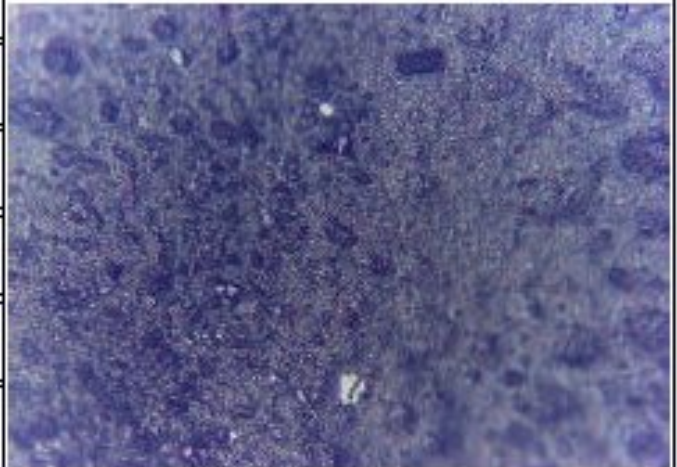
Comments:

Moderate levels of contamination evident -- trend declining. Wear debris levels are within acceptable limits. See wear metal report for recommendations.

Particle Class - Max Size Observed in μm & Ratio	100	207	201	120	302	210	107
rubbing wear ratio	10 MED	10 HIGH	5 MED	5 HIGH	5 MED	5 MED	5 MED
cutting wear ratio	0	0	0	0	0	0	0
scuffing wear ratio	0	0	0	0	0	50 LOW	0
fatigue wear ratio	220 MED	180 HIGH	45 MED	20 HIGH	90 MED	105 LOW	Abnormal Wear Type
fatigue laminar ratio	70 LOW	0	0	0	0	0	Abnormal Wear Type
spheres ratio	0	0	0	0	0	0	Abnormal Wear Type
red oxides ratio	0	0	0	0	0	0	Abnormal Wear Type
non-ferrous ratio	0	0	0	0	60 LOW	0	Abnormal Wear Type
misc-dust ratio	20 HIGH	100 HIGH	45 MED	110 HIGH	120 HIGH	90 MED	Contam'

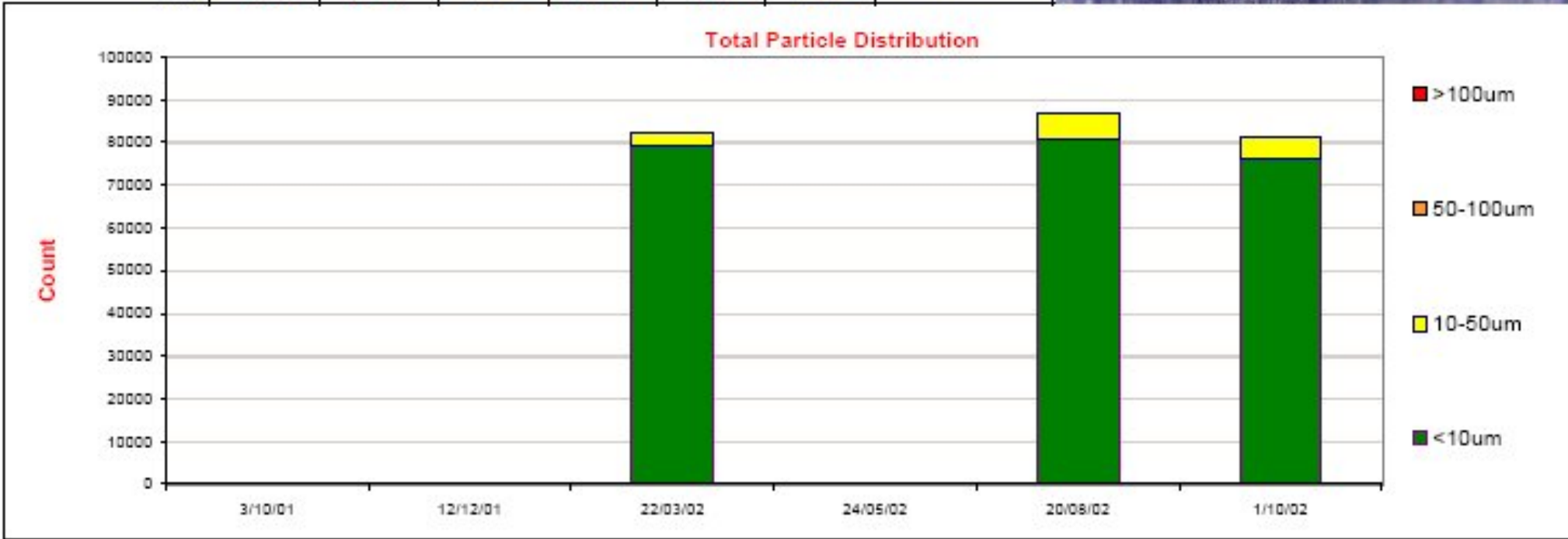
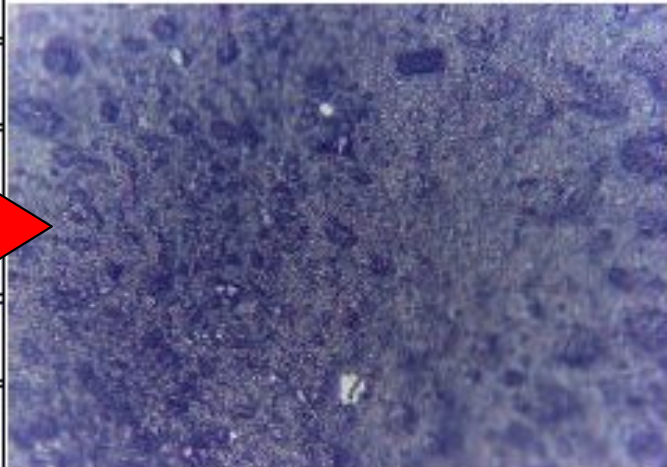
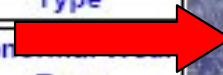


Particle Class displays the wear type and size found by readings under a microscope



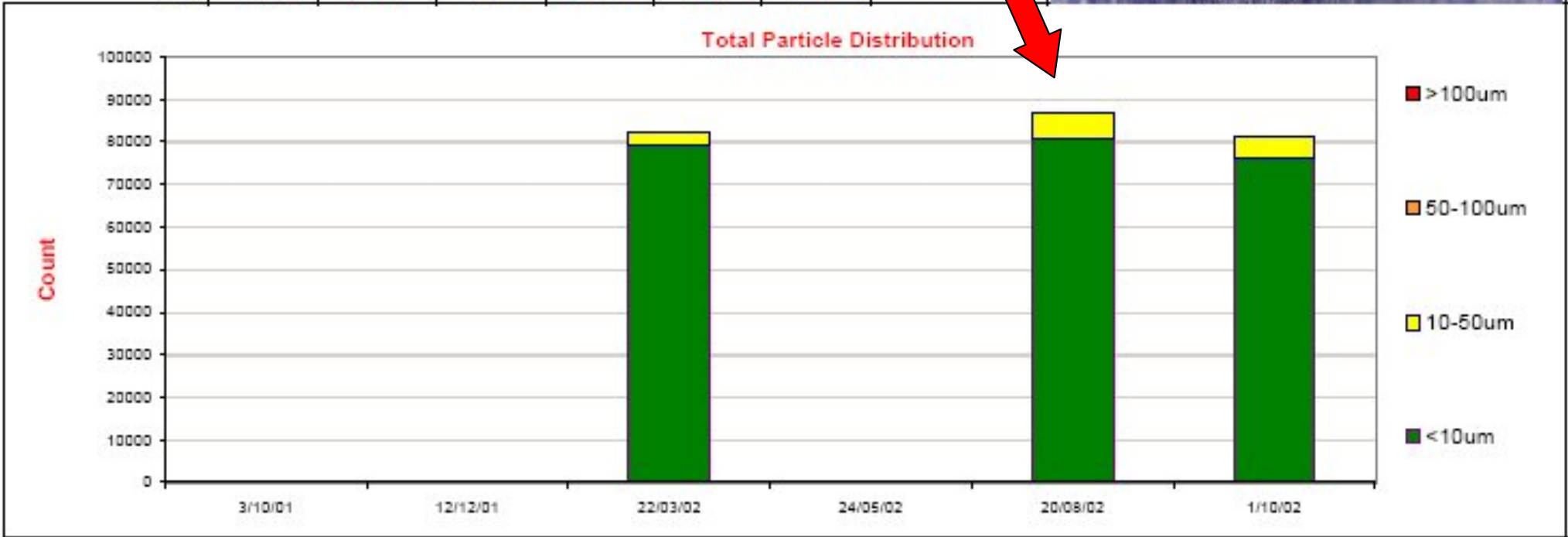
	100	207	201	120	302	210	107
Particle Class - Max Size Observed in μm & Ratio							
rubbing wear ratio	10 MED	10 HIGH	5 MED	5 HIGH	10 MED	5 LOW	Normal Wear Type
cutting wear ratio	0	0	0	0	0	0	Abnormal Wear Type
scuffing wear ratio	0	0	0	0	50 LOW	45 LOW	Abnormal Wear Type
fatigue wear ratio	220 MED	180 HIGH	45 MED	20 HIGH	90 MED	105 LOW	Abnormal Wear Type
fatigue laminar ratio	70 LOW	0	0	0	0	0	Abnormal Wear Type
spheres ratio	0						normal Wear Type
red oxides ratio	0						Type
non-ferrous ratio	0				LOW		normal Wear Type
misc-dust ratio	20 HIGH	100 HIGH	45 MED	110 HIGH	120 HIGH	90 MED	Contam'

This is a picture of the microscopic image of that sample



Particle Class - Max Size Observed in μm & Ratio	100	207	231	123	302	210	107
rubbing wear ratio	10 MED	10 HIGH	5 MED	5 HIGH	10 MED	5 LOW	Normal Wear Type
cutting wear ratio	0	0	0	0	0	0	Abnormal Wear Type
scuffing wear ratio	0	0	0	0	50 LOW	45 LOW	Abnormal Wear Type
fatigue wear ratio	220 MED	180 HIGH	45 MED	20 HIGH	90 MED	105 LOW	Abnormal Wear Type
fatigue laminar ratio	70 LOW	0	0	0	0	0	Abnormal Wear Type
spheres ratio	0	0	0	0			
red oxides ratio	0	0	0	0			
non-ferrous ratio	0	0	0	0		LOW	Type
misc-dust ratio	20 HIGH	100 HIGH	45 MED	110 HIGH	120 HIGH	90 MED	Contam

This graph is the particle distribution, it highlights particle quantity



TECHENOMICS - CONDITION MONITORING



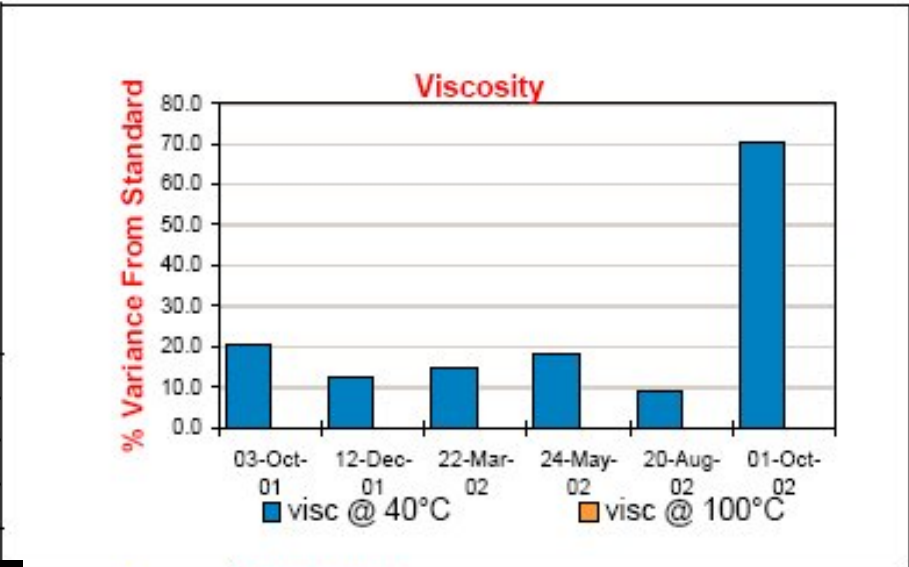
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Microanalysis Report: 148,994

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 Oil Name: MOLYBOND G1700 300
 Compartment Hoist Gearcase

Sample date	3/10/01	12/12/01	22/03/02	24/05/02	20/08/02	1/10/02
Oil hours	8,297	8,874	9,430	9,906	10,343	0
Sample no.	135,352	138,868	142,701	144,740	147,726	148,994
SMU	54355hrs	54932hrs	55488hrs	55964hrs	56401hrs	0hrs



Physical Tests

water %	0
fuel %	0
visc @ 100°C	0
visc @ 40°C	386

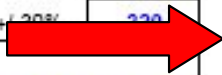
These are the recommendations of the micro analysis

	2
	2
+/-30%	0
+/-20%	228

Comments:
 Moderate levels of contamination evident -- trend declining. Wear debris levels are within acceptable limits. See wear metal report for recommendations.

Particle Analysis

Particle Count	0	0	82500	0	86620	81070	1 ml Sample
>100µm	0	0	0	0	0	0	% of Total
50-100µm	0	0	0	0	0	0	% of Total
10-50µm	0	0	4	0	7	6	% of Total
<10µm	0	0	96	0	93	94	% of Total
ISO 4406 Level	- - -	- - -	- - 23	- - -	- - -	- - 22	02\05\15 µm
PQ	106	257	231	125	382	218	167



Basic Wear Metal Interpretation

IRON (FE)	ENGINE	TRANSMISSION	DIFFERENTIAL	PLANETARY	TORQUE CONVERTER	HYDRAULIC SYSTEM	FINAL DRIVE	GEAR BOX	AIR COMPRESSOR
	Cylinder liners	Gears	Gears	Gears	Housing	Pump/motor	Gears	Gears	Crankshaft Block
	Blocks	Discs	Shafts	Shafts	Bearings	Vanes	Bearings	Shaft	Housing
	Gears	Housing	Bearings	Bearings	Shafts	Gears	Shafts	Bearings	Screws
	Crankshaft	Bearings	Housings	Housing		Pistons	Housing		Bearings
	Wrist Pins	Brake bands				Cylinder bores & rods			Shaft
	Rings (cast)	Shift spools				Bearings			Oil Pump
	Camshaft	Pumps				Valves			Piston rings
	Valve train					Pump housing			Cylinders
	Oil pump								
COPPER (CU)	Wrist pin bushings	Clutches	Bushings	Bushings	Bushings	Pump thrust plates	Bushings	Bushings	Wear plates
	Bearings	Steering discs	Thrust washers	Thrust washers	Thrust washers	Pump pistons	Thrust washers	Thrust washers	Bushings
	Cam bushings	Bushing/thrust washers	Oil pumps (where used)			Cylinder gland guides			Wrist pin bushings
	Oil Cooler	Oil cooler				Bushings			Bearings
	Valve train bushings					Oil Coolers (some)			Thrust washers
	Trust washers								
	Governor & oil pump								
	Oil additive (Some)								
ALUMINUM (AL)	Pistons	Pumps	Thrust washers		Impeller	Pump/motor housing	Oil pump	Thrust washers	Rotors
	Bearings	Clutches	Pump bushings		Turbine	Cylinder gland	Thrust washers	Oil pump	Pistons
	Bushings	Thrust washers			Pump	Thrust plates		Bushings	Bearings
	Blocks (some)	Bushings							Thrust washers
	Poil pump bushings								Block housing
	Blower								
	Thrust bearings								
CHROME (CR)	Rings	Roller/taper bearings	Roller/taper bearings	Roller/taper bearings	Roller/taper bearings	Roller/taper bearings	Roller/taper bearings	Roller/taper bearings	Roller/taper bearings
	Roller/taper bearings	Water treatment				Rods			Rings
	Liners					Spools			Water treatment (cooler)
	Exhaust valves								
	Water treatment								
	Chemical								
TIN (SN)	Pistons (Overlay)								Pistons (Overlay)
	Bearings (Overlay)								Bearings (Overlay)
	Bushings								Bushings
LEAD (PB)	Bearings	Oil additive (limited)	Oil additive (limited)	Oil additive (limited)			Oil additive (limited)	Oil additive (limited)	Bearings
	Gasoline								
	Ocatne improver								
	Oil additive (Some)								
SILICON (SI)	Anti-foam additive	Disc Lining	Ingested dirt	Ingested dirt	Ingested dirt	Ingested dirt	Ingested dirt	Ingested dirt	Ingested dirt
	Ingested dirt					Elastomeric seals			
	Coolant leak								
SODIUM (NA)	Oil additives	Oil additives	Ingested dirt	Ingested dirt	Oil additives	Oil additives	Oil additives	Oil additives	Oil additives
	Anti-freeze	Anti-freeze			Ingested dirt	Anti-freeze	Road salt	Ingested dirt	Ingested dirt
	Road salt/dirt	Road salt/dirt				Ingested dirt	Ingested dirt		Anti-freeze