Quenching Oil Evaluation Report for Oil Reclamation Project

Danaher Tool, Springdale, AR

CUSTOMER:	Danaher Tool Corporation			Date:	10/1/97
Address:	1609 North Old Missouri Road, Springdale, Arkansas, 72764			*Tel:*	501-751-8500 ext 212
Attention:	Gary Gidcomb	Roy Walker		*Fax:*	501-751-6914
Oil Type:	Waste Quenching Oil from Wash Tank		Equipment Type:	Quenching Oil - Wash Tank	

SAMPLE STATUS	New Quenching Oil	Oil Sample From	Purified Oil		Test Standard
	Sentry Oil Company	Furnace Reservoir	By OilPure System		Note
Test No.	91	92	93		
Lab No.	9709-01022	9709-01023	9709-01024		10 month old or
Sample Date	9/18/97	9/18/97	9/18/97		17 times oil turnovers
Sample Location	New Oil - Bulk Tank	Heat Treating Furnace Oil Reservoir	Purified Oil - Storage Tank Waste Oil - Wash Tank		reuse quenching oil evaluation
Water Content *(ppm)*	698	571	716		ASTM: D-1744
Viscosity at 100 °F *(SUS)*	61	59	62		ASTM: D-2161
Viscosity at 210 °F *(SUS)*	34.2	34.3	34.4		ASTM: D-445
Viscosity Index	118	110	109		ASTM: D-445
Pentane Insolubles (%)	0.13	0.51	0.24		ASTM: D-893
TAN *(mg of KOH /gm)*	0.56	0.84	0.56		ASTM: D-664
RBOT *(25.4 psi drop end point)*	150 °C Bath Temp.	150 °C Bath Temp.	150 °C Bath Temp.		ASTM: D-2272
Rotating Bomb Oxidation Test					
Min. to End-Run 1	34	34	34		Excellent oxidation
Min. to End-Run 2	33	37	33		stability
Min. to End (Average)	34	37	33		
GM Quenchometer in seconds					ASTM: D-3520
GM Speed (Average)	7.2	7.9	7.3		
Ni or Ni-Cr Ball Test	NI	NI	NI		
Particle Count in 1 cc					
ISO Code	26/23/19	28/27/20	22/20/18		ISO-4406
2 - 5 microns	409,203	1,330,596	24,923		
5 - 15 microns	69,216	979,840	4,463		Oil storage tank are
15 - 25 microns	2,623	6,096	973		not clean. All stored
25 - 50 microns	1,336	1,250	443		quenching oils cross
50 -100 microns	520	236	40		contaminated from
>100 microns	367	33	0		storage tanks.
Test Filter Paper Size					
Solid Particulate					Solid Particulate
5 microns					Patch Test
in 5 cc					
Test Filter Paper Size					
Solid Particulate					Solid Particulate
20 microns					Patch Test
in 5 cc					
				Tested by:	
				Engineered Lubricants, Inc.	

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Sample Location	New Oil - Bulk Tank	Heat Treating Furnace	Purified Oil - Storage Tank		reuse quenching oil
		Oil Reservoir	After Furnace Wash Tank		evaluation
Quenchalyzer Part 1	**Cooling Rate**	**Cooling Rate**	**Cooling Rate**		
Condition	78 °F Static	78 °F Static	78 °F Static		
Max. Rate, °F /sec.	204.48	199.9	201.72		
Temp. @ Max. Rate °F	1059.17	1038.44	1065.78		
Rate @572 °F /sec.	59.44	55.84	60.36		
Rate @482 °F /sec.	31.33	28.8	32.14		
Rate @392 °F /sec.	12.61	12.96	7.875		
Quenchalyzer Part 2	**Time From Immersion To Specified Temperature**				
Time in sec. to 1,112 °F	7.00	8.250	7.875		
Time in sec. to 752 °F	9.125	10.375	10.00		
Time in sec. to 392 °F	18.00	12.96	18.875		
Quenchalyzer Part 3	**Boiling Phase**	**Boiling Phase**	**Boiling Phase**		
Start Temp. in °F	1351.39	1338.80	1349.59		
Start Time in seconds	4.875	6.00	5.625		
End Temp. in °F	594.02	585.18	574.88		
End Time in seconds	11.00	12.375	12.125		
Start /End Different in °F	757.37	753.62	574.88		
X-Ray Fluorescence in ppm					
Aluminum (Al)	*	*	*		
Antimony (Sb)	*	*	*		Energy Dispersive
Cadmium (Cd)	*	*	*		X-Ray Fluorescence
Chromium (Cr)	*	*	*		
Cobalt (Co)	*	*	*		
Copper (Cu)	6	*	*		
Iron (Fe)	92	21	18		High Iron Content
Lead (Pb)	*	*	*		on new oil
Manganese (Mn)	*	*	*		
Molybdenum (Mo)	*	*	*		
Nickel (Ni)	*	*	*		
Silver (Ag)	*	*	*		
Tin (Sn)	*	*	*		
Titanium (Ti)	*	*	*		
Vanadium (V)	*	*	*		
Barium (Ba)	*	*	*		
Boron (B)	*	*	*		
Calcium (Ca)	13	*	16		
Magnesium (Mg)	*	*	*		
Phosphorus (P)	*	*	*		
Silicon (Si)	293	*	*		High Silicon Content
Zinc (Zn)	*	*	*		from additive resin
Chlorine (Cl)	36	36	48		
Sulfur (S)	676	569	552		
Remark	* = Below Minimum Detection Limit		Tested by: Engineered Lubricants, Inc.		

Oil Analysis Report

OILPURESYSTEMS
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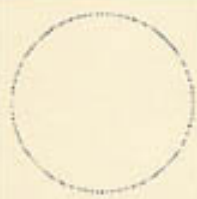
Company: Danaher Tool Corporation
Address: 1609 North Old Missouri Road
City: Springdale State: AR Zip: 72764
Telephone: 501-751-8500 ext 212 Fax: 501-751-6914
Contact: Gary Gidcomb Title:

Date: August 22, 1997
Oil Type: Quenching oil
Equip. Type: Furnace wash tank
Note: Test result evaluation from AST-500 oil purification system after 9 months.

OIL ANALYSIS METHOD		Sample No. 1 (1A)	Sample No. 6 (2B)	Sample No. 7 (4B)	Sample No. 8	Sample No. 9
Oil Sampling Date		11-22-96	11-22-96	11-22-96	8-1-97	8-2-97
Oil Type or Equipment I.D.		AST-500	VJ-150	FC-4	MB-50	MB-50
Oil Sample Status		Dirty oil from wash tank	21 hrs after vac. jet dehydration	40 hrs after filter cart pre-treated	6 hrs after PurePack Chem.	24 hrs after PurePack Chem.
PurePack Formula					M3MS3/M3/MQ3	M3MS3/M3/MQ3
Oil Reservoir Size						
Sample Location		Upper settled oil from AST-500	Discharge from VJ-150	Discharge from FC-4 filter cart	Discharge from MB-50	Discharge from MB-50
Specific Gravity at 70°F						
Viscosity in SUS *(ASTM: D-2161-74)*		67	65	65	64	64
Water Content in ppm *(Karl Fisher Method)*		over 30,000	9,746	53	75	71
TAN in mg of KOH /gm *(ASTM: 664)*		1.12	0.56	0.56	0.56	0.56
Particle Count in One cc *(ISO: D-4406)*	*5 microns*	6,364	2,060	3,348	65	20
	10 microns	3,298	2,007	126	11	8
	15 microns	1,956	1,938	37	4	3
	25 microns	784	1,794	12	0	0
	50 microns	13	1,387	2	0	0
	75 microns	0	166	0	0	0
ISO Code:		20/18	18/18	19/12	13/9	12/9
Gravimetric Analysis per 5 cc sample *(see OilPure solid contamination color chart for color reference)*						
Filter Paper Dot Test Size: 0.8 micron						
OilPure Color Code:						

Note:

The sample no. 8 and 9 are the latest sampling which show excellent oil cleanliness. Particle count shows super low number, Total Acid Number (TAN) shows no chemical changes in the oil and water content is 71 ppm.