Fluid Analysis Laboratory
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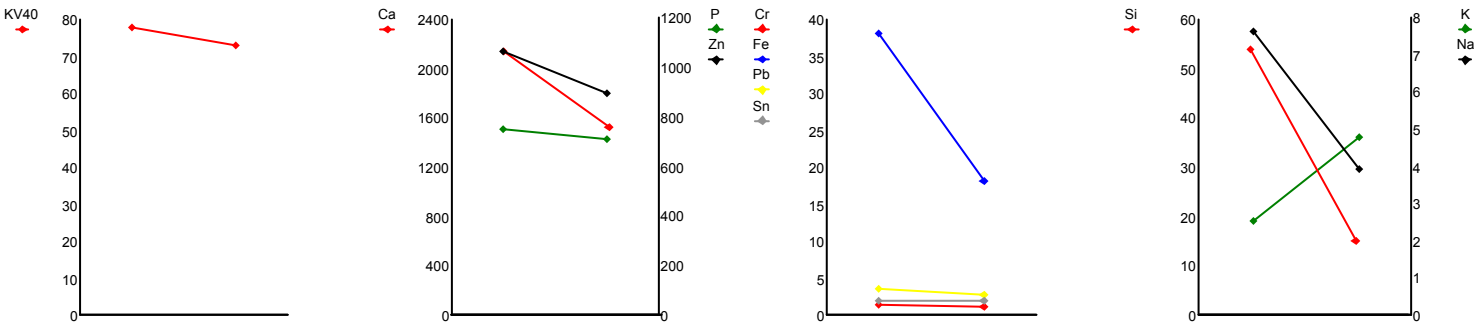
Make:	LIEBHERR	Sample No:	7142122
Model:	R922	Location:	DENBIGHSHIRE
Serial No:	1486/49965	Client:	JOHN KELLY
System:	ENGINE	Kit Ref/Bottle No:	LIE425621
Brand:	NOT GIVEN	Job No.:	12105912
Grade:	5W30	Sampled:	06/05/21
Unique No.:	5161593	Received:	10/05/21

Diagnosis Key: Normal | Caution | Serious — Diagnostician: Peter Foy

Wear appears satisfactory. No significant contamination. Advice : Monitor at the recommended sampling period.

Results		Current Sample	Historical Samples
Sample No		**7142122**	7097414
Status		✓	✓
Sampled		**06/05/21**	21/12/20
Fluid Age	HOURS		
Unit Age	HOURS	**1050**	612
Received		**10/05/21**	08/01/21
Fluid Condition			
Viscosity @ 40 °C	mm²/s	**72.9**	77.8
Ox Area	Abs/cm	**19.68**	42.81
Nit Area	Abs/cm	**10.49**	12.14
BN	mg KOH/g	**6.4**	4.5
glycol	%	**0.0**	0.0
Additives			
B (Boron)	mg/kg	**48**	86
Ba (Barium)	mg/kg	**0.7**	7.3
Ca (Calcium)	mg/kg	**1525**	2142
Mg (Magnesium)	mg/kg	**822**	728
P (Phosphorus)	mg/kg	**711**	746
Zn (Zinc)	mg/kg	**892**	1062
Contamination			
Water %	%	**<0.1**	<0.1
Fuel	-	**N**	N
Soot	wt %	**<0.1**	<0.1
Na (Sodium)	mg/kg	**3.9**	7.6
K (Potassium)	mg/kg	**4.8**	2.5
Si (Silicon)	mg/kg	**15**	54
Li (Lithium)	mg/kg	**1.9**	0.1
Wear Metals			
Al (Aluminium)	mg/kg	**2.5**	3.1
Sn (Tin)	mg/kg	**2.0**	2.0
Pb (Lead)	mg/kg	**2.6**	3.5
Cu (Copper)	mg/kg	**11**	52
Fe (Iron)	mg/kg	**18**	38
Cr (Chromium)	mg/kg	**1.1**	1.3
Mo (Molybdenum)	mg/kg	**3.7**	38
Ti (Titanium)	mg/kg	**1.4**	0.2
Cd (Cadmium)	mg/kg	**0.0**	0.0



F.A.O. NICK GIRDLESTONE, LIEBHERR GB LTD, REDGATE ROAD, SOUTH LANCS INDUSTRIAL ESTATE, ASHTON-IN-MAKERFIELD, WIGAN, UNITED KINGDOM, WN4 8D

FLUID ANALYSIS REPORT
SYMBOLS & DEFINITIONS

	Normal
	Abnormal value. Monitor as advised
	Change oil
	Action required as indicated
	Oil requires cleaning or changing

Appearance	All Systems (excl. Engines)
10	Clear & Bright
20	Dark
30	Hazy
40	Cloudy
50	Emulsified
60	Free Water
70	Solid Debris
80	Solid Debris and water

VISCOSITY - the resistance to flow in a capillary tube under gravity.
FUEL DILUTION - by flash point & viscosity to detect rich mixtures & faulty injectors etc.
OIL CONDITION (OC) - arbitrary scale to measure soot, water and metals etc.
APPEARANCE (App) - arbitrary visual assessment of non-engine oils to identify visible contamination.
SOOT - by infra red light absorption indicates poor combustion, worn upper cylinders, rings.
SOOT residues to prevent blockages.
FERROUS DEBRIS (P.Q.) - arbitrary scale to detect small and large magnetic particles.
FERROGRAPHY - a microscopic study of wear particles to establish failure mode: available on request.

WATER - essential to detect coolant leaks or contamination by sea or fresh water.
BN - a measure of reserve alkalinity to protect the crankcase from acidic combustion gases.
SULPHATION - a measure of deterioration of the oil additives by sulphuric acid contamination.
AN - a measure of corrosive acidic materials in oxidised overheated oils.
OXIDATION & NITRATION - a measure of deterioration of the oil by reaction with air.
ISO CLEANLINESS CODE - a scale to indicate amount of particles in oils >4, >6 and >14 microns.
WEAR METALS- debris in oil from worn components.
ADDITIVE METALS - elements added by manufacturer to give particular properties to the oil.
CONTAMINATION METALS - elements indicative of dirt, coal & abrasive coolant residues etc.

ABBREVIATIONS

Ag - Silver	Na - Sodium
Al - Aluminium	Ni - Nickel
B - Boron	P - Phosphorus
Ba - Barium	Pb - Lead
Ca - Calcium	S = Sulphur
Cd - Cadmium	Si = Silicon
Cl - Chlorine	Sn - Tin
Cr - Chromium	Ti - Titanium
Cu - Copper	V - Vanadium
Fe - Iron	VI - Viscosity Index
K - Potassium	Zn - Zinc
Li - Lithium	RI - Refractive Index
Mg - Manganese	FAME - Fatty Acid Methyl Ester (Biofuel)
Mo - Molybdenum	

TEST	Units
Kinematic Viscosity (KV) followed by temperature in °C	Centistoke (cSt)
Fuel	Normal Caution Serious
Oil Condition (OC)	Arbitrary scale 0-100
Appearance (App)	Arbitrary scale 0-100
Soot	%
Ferrous Debris / P.Q.	Arbitrary Scale 0-10000
Water	% or ppm. 0.1% = 1000ppm
Glycol	Normal Caution Serious, or % in mg KOH / grm
Base Number (TBN)	
Acid Number (TAN)	mg KOH / grm
Strong Acid Number (SAN)	mg KOH / grm
Particle Count (ISO Code)	No. Particles / ml >4, >6, >14 microns
Initial PH	Scale 0-14 , 7 = Neutral