

# WEAR ABNORMAL CONTAMINATION ABNORMAL FLUID CONDITION ABNORMAL

Current

LH0288228

29 Apr 2024

23144

0

0

History1

21976

0

0

LH0278580 LH

05 Jan 2024 23 Aug 2023

0

0

0

History2



### LIEBHERR LH60C 106512-1528

Left Final Drive

## LIEBHERR GEAR BASIC 90 LS (--- GAL)

Test

Sample Number

Sample Date

Machine Age

Oil Age

Filter Age

UOM

hrs

hrs

hrs

Method

Client Info

**Client Info** 

Client Info

Client Info

Client Info

Limit/Abn

RECOMMENDATION

We advise that you check all areas where dirt can enter the system. The oil change at the time of sampling has been noted. Confirm the source of the lubricant being utilized for top-up/fill. We recommend an early resample to monitor this condition.

#### **WEAR**

Iron and chromium ppm levels are abnormal. Aluminum ppm levels are noted. Gear wear is indicated.

### CONTAMINATION

Elemental levels of silicon (Si) and aluminum (Al) indicate aluminasilicate (coarse dirt) ingress. High amount of ingressed dirt has caused abrasive wear to the component.

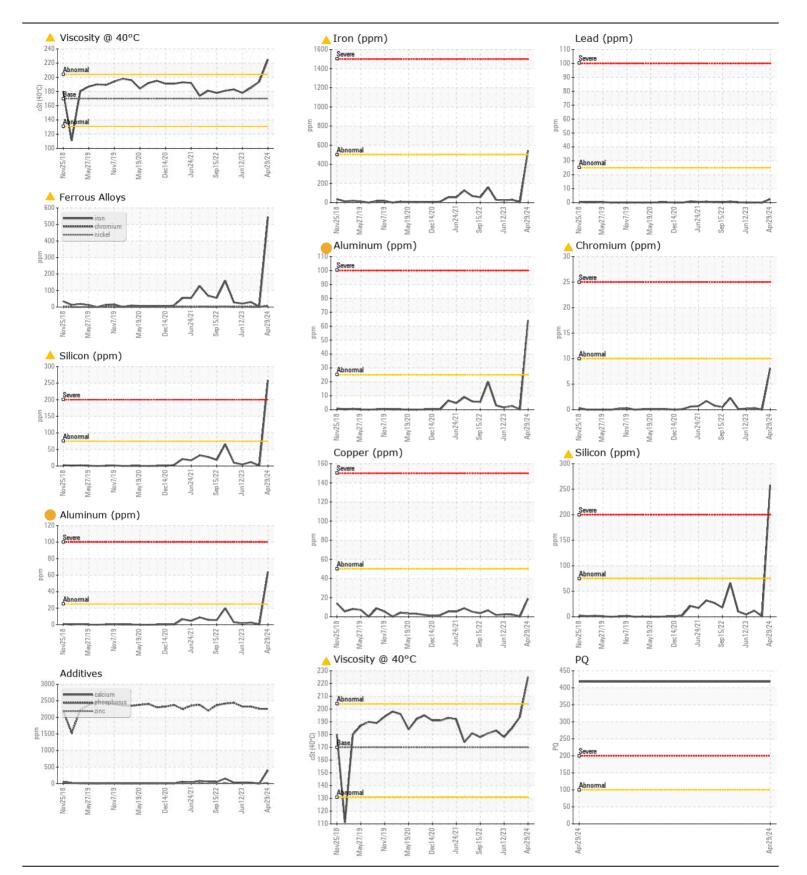
Oil Changed   Client Info   None   None   None     Filter Changed   Client Info   None   None   None     Sample Status   ASTM D8184/   ABNORMAL   NORMAL   NORMAL     PQ   ASTM D8185//   500   A 544   2   30     Chromium   ppm   ASTM D5185//   >10   3   <1   <1     Nickel   ppm   ASTM D5185//   >10   3   <1   <1     Silver   ppm   ASTM D5185///   0   <1   3   <1     Aluminum   ppm   ASTM D5185///   0   0   0   0     Aluminum   ppm   ASTM D5185///   5   0   3   <1   3     Lead   ppm   ASTM D5185///   >1   0   0   0     Vanadium   ppm   ASTM D5185///   <1   0   0   0     Vanadium   ppm   ASTM D5185///   <1   1   1   1   1     Van	T IIICE Age	1113			v	0	0
Sample StatusABNORMALNORMALNORMALNORMALPQASTM D8184*418IronppmASTM D5185(m) >10544230ChromiumppmASTM D5185(m) >1050<1NickelppmASTM D5185(m) >1050<1SilverppmASTM D5185(m) >25000AluminumppmASTM D5185(m) >25000AluminumppmASTM D5185(m) >25200CopperppmASTM D5185(m) >2519<12TinppmASTM D5185(m) >10<100VanadiumppmASTM D5185(m) >10<100VanadiumppmASTM D5185(m) >10<100VanadiumppmASTM D5185(m) >10<100VanadiumppmASTM D5185(m) >5019<112Yellow MetalscalarVisual*NONENONENONEYellow MetalscalarVisual*NONENONENONESiliconppmASTM D5185(m) >2012<1<1DebrisscalarVisual*NONENONENONESand/DirtscalarVisual*NORENORMNORMAppearancescalarVisual*NORENORMNORMAppearancescalarVisual*NORNORMNORMAppearancescalarVisual*0	Oil Changed		Client Info		Changed	Changed	Changed
PQ   ASTM D8184*   418      Iron   ppm   ASTM D5185(m)   >500   ▲ 544   2   30     Chromium   ppm   ASTM D5185(m)   >10   ▲ 8   0   <1     Nickel   ppm   ASTM D5185(m)   >10   3   <1   <1     Titanium   ppm   ASTM D5185(m)   >10   3   <1   <1     Silver   ppm   ASTM D5185(m)   >25   0   0   0     Aluminum   ppm   ASTM D5185(m)   >25   2   0   0     Copper   ppm   ASTM D5185(m)   >25   19   <1   2     Tin   ppm   ASTM D5185(m)   >50   19   <1   0   0     Vanadium   ppm   ASTM D5185(m)   >50   19   <1   0   0     Vanadium   ppm   ASTM D5185(m)   >50   12   <1   2     Silicon   ppm   ASTM D5185(m)   >20   NONE   <	Filter Changed		Client Info		None	None	None
Iron   ppm   ASTM D5185(m)   >500   ▲ 544   2   30     Chromium   ppm   ASTM D5185(m)   >10   ▲ 8   0   <1     Nickel   ppm   ASTM D5185(m)   >10   3   <1   <1     Titanium   ppm   ASTM D5185(m)   >10   3   <1   <1     Silver   ppm   ASTM D5185(m)   >25   ● 64   <1   3     Lead   ppm   ASTM D5185(m)   >25   2   0   0     Copper   ppm   ASTM D5185(m)   >50   19   <1   2     Tin   ppm   ASTM D5185(m)   >10   <1   0   0     Vanadium   ppm   ASTM D5185(m)   >10   <1   0   0     Vanadium   ppm   ASTM D5185(m)   >20   12   <1   12     Tin   ppm   ASTM D5185(m)   >20   12   <1   <1     Yellow Metal   scalar   Visual*   NONE	Sample Status				ABNORMAL	NORMAL	NORMAL
Iron   ppm   ASTM D5185(m)   >500   ▲ 544   2   30     Chromium   ppm   ASTM D5185(m)   >10   ▲ 8   0   <1     Nickel   ppm   ASTM D5185(m)   >10   3   <1   <1     Titanium   ppm   ASTM D5185(m)   >10   3   <1   <1     Silver   ppm   ASTM D5185(m)   >25   ● 64   <1   3     Lead   ppm   ASTM D5185(m)   >25   2   0   0     Copper   ppm   ASTM D5185(m)   >50   19   <1   2     Tin   ppm   ASTM D5185(m)   >10   <1   0   0     Vanadium   ppm   ASTM D5185(m)   >10   <1   0   0     Vanadium   ppm   ASTM D5185(m)   >20   12   <1   12     Tin   ppm   ASTM D5185(m)   >20   12   <1   <1     Yellow Metal   scalar   Visual*   NONE	PO				440		
Chromium   ppm   ASTM D5185(m)   >10   ▲ 8   0   <11		nnm		. 500	-		
Nickel   ppm   ASTM D5185(m)   >10   3   <1			· · /				
Titanium   ppm   ASTM D5185(m)   5   0   <1					-		
Silver   ppm   ASTM D5185(m)   0   0   0   0     Aluminum   ppm   ASTM D5185(m)   >25   2   0   0     Copper   ppm   ASTM D5185(m)   >50   19   <1   2     Tin   ppm   ASTM D5185(m)   >10   <1   0   0     Vanadium   ppm   ASTM D5185(m)   <1   0   0   0     Vanadium   ppm   ASTM D5185(m)   <1   0   0   0     Vanadium   ppm   ASTM D5185(m)   >10   <1   0   0     Valite Metal   scalar   Visual*   NONE   NONE   NONE   NONE     Yellow Metal   scalar   Visual*   NONE   NONE   NONE   NONE     Silicon   ppm   ASTM D5185(m)   >20   12   <1   <1     Water   WC Method   >0.2   NEG   NORE   NONE   NONE     Debris   scalar   Visual*   NORE </th <th></th> <th></th> <th>· · /</th> <th>&gt;10</th> <th></th> <th></th> <th></th>			· · /	>10			
Aluminum   ppm   ASTM D5185(m)   >25   64   <1					-		
Lead   ppm   ASTM D5185(m)   >25   2   0   0     Copper   ppm   ASTM D5185(m)   >50   19   <1   2     Tin   ppm   ASTM D5185(m)   >10   <1   0   0     Vanadium   ppm   ASTM D5185(m)   >10   <1   0   0     White Metal   scalar   Visual*   NONE   NONE   NONE   NONE     Yellow Metal   scalar   Visual*   NONE   NONE   NONE   NONE     Silicon   ppm   ASTM D5185(m)   >75   ▲ 258   <1   12     Potassium   ppm   ASTM D5185(m)   >20   12   <1   <1     Water   WC Method   >0.2   NEG   NONE   NONE   NONE     Debris   scalar   Visual*   NONE   NONE   NONE   NONE     Appearance   scalar   Visual*   NORML   NORML   NORML   NORML     Emulsified Water   scalar			· · /	0.5			
Copper   ppm   ASTM D5185(m)   >50   19   <1			( )		-		
Tin   ppm   ASTM D5185(m)   >10   <1		ppm	· · ·				
Vanadium   ppm   ASTM D5185(m)   <1		ppm	ASTM D5185(m)	>50	19		
White MetalscalarVisual*NONENONENONENONENONEYellow MetalscalarVisual*NONENONENONENONENONESiliconppmASTM D5185(m)>75▲ 258<112PotassiumppmASTM D5185(m)>2012<1<1WaterWC Method>0.2NEGNEGNEGSiltscalarVisual*NONENONENONENONEDebrisscalarVisual*NONENONENONENONESand/DirtscalarVisual*NORNONENONENONEAppearancescalarVisual*NORMLNORMLNORMLNORMLAppearancescalarVisual*NORMLNORMLNORMLNORMLEmulsified WaterscalarVisual*NOR1113BoronppmASTM D5185(m)0200MolybdenumppmASTM D5185(m)02801MagnesiumppmASTM D5185(m)<1136<16CalciumppmASTM D5185(m)<11829SulfurppmASTM D5185(m)<11829SulfurppmASTM D5185(m)<1182404525833Visc @ 40°CcStASTM D5185(m)170194185	Tin	ppm	ASTM D5185(m)	>10	<1	0	
Yellow MetalscalarVisual*NONENONENONENONENONESiliconppmASTM D5185(m)>75▲ 258<112PotassiumppmASTM D5185(m)>2012<1<1WaterWC Method>0.2NEGNEGNEGSiltscalarVisual*NONENONENONENONEDebrisscalarVisual*NONENONENONENONESand/DirtscalarVisual*NONENONENONENONEAppearancescalarVisual*NORMNORMLNORMLHAZYOdorscalarVisual*NORNORMLNORMLNORMLEmulsified WaterscalarVisual*NORNORMLNORMLNORMLBoronppmASTM D5185(m)03<12BariumppmASTM D5185(m)0000MagnesiumppmASTM D5185(m)02801MagnesiumppmASTM D5185(m)<1136<16CalciumppmASTM D5185(m)<1136235PhosphorusppmASTM D5185(m)<11829SulfurppmASTM D5185(m)<11829SulfurppmASTM D5185(m)<1182404525833Visc @ 40°CcStASTM D5185(m)170245194185	Vanadium	ppm	ASTM D5185(m)		<1	0	0
Silicon ppm ASTM D5185(m) >75 $\checkmark$ 258 <1	White Metal	scalar	Visual*	NONE	NONE	NONE	NONE
PotassiumppmASTM D5185(m)>2012<1	Yellow Metal	scalar	Visual*	NONE	NONE	NONE	NONE
PotassiumppmASTM D5185(m)>2012<1	Silicon	ppm	ASTM D5185(m)	>75	<b>4</b> 258	<1	12
WaterWC Method>0.2NEGNEGNEGSiltscalarVisual*NONENONENONENONEDebrisscalarVisual*NONENONENONENONESand/DirtscalarVisual*NONENONENONENONEAppearancescalarVisual*NORMNORMLNORMLHAZYOdorscalarVisual*NORMNORMLNORMLNORMLNORMLEmulsified WaterscalarVisual*>0.2NEGNEGNEGSodiumppmASTM D5185(m)03<12BariumppmASTM D5185(m)0200MagnesiumppmASTM D5185(m)02801MagnesiumppmASTM D5185(m)<1136<16CalciumppmASTM D5185(m)2143225122602327ZincppmASTM D5185(m)<11829SulfurppmASTM D5185(m)<11829SulfurppmASTM D5185(m)23468242012404525833Visc @ 40°CcStASTM D7279(m)17025194185	Potassium		ASTM D5185(m)	>20	12	<1	<1
DebrisscalarVisual*NONENONENONENONENONESand/DirtscalarVisual*NONENONENONENONENONENONEAppearancescalarVisual*NORMLNORMLNORMLNORMLHAZYOdorscalarVisual*NORMLNORMLNORMLNORMLNORMLEmulsified WaterscalarVisual*>0.2NEGNEGNEGSodiumppmASTM D5185(m)03<12BariumppmASTM D5185(m)0200MolybdenumppmASTM D5185(m)02801MagnesiumppmASTM D5185(m)<1136<16CalciumppmASTM D5185(m)<1405235PhosphorusppmASTM D5185(m)<11829SulfurppmASTM D5185(m)<11829SulfurppmASTM D5185(m)<1182404525833Visc @ 40°CcStASTM D5185(m)170225194185	Water		WC Method	>0.2	NEG	NEG	NEG
Sand/DirtscalarVisual*NONENONENONENONENONEAppearancescalarVisual*NORMLNORMLNORMLNORMLHAZYOdorscalarVisual*NORMLNORMLNORMLNORMLNORMLNORMLEmulsified WaterscalarVisual*>0.2NEGNEGNEGSodiumppmASTM D5185(m)03<12BoronppmASTM D5185(m)03<12BariumppmASTM D5185(m)0000MolybdenumppmASTM D5185(m)02801MagnesiumppmASTM D5185(m)<1136<16CalciumppmASTM D5185(m)<1405235PhosphorusppmASTM D5185(m)<11829SulfurppmASTM D5185(m)<11829Visc @ 40°CcStASTM D5185(m)170225194185	Silt	scalar	Visual*	NONE	NONE	NONE	NONE
AppearancescalarVisual*NORMLNORMLNORMLNORMLNACRMLNACRMLOdorscalarVisual*NORMLNORMLNORMLNORMLNORMLNORMLEmulsified WaterscalarVisual*>0.2NEGNEGNEGSodiumppmASTM D5185(m)03<12BoronppmASTM D5185(m)0200MolybdenumppmASTM D5185(m)02801MagnesiumppmASTM D5185(m)02801MagnesiumppmASTM D5185(m)<1136<16CalciumppmASTM D5185(m)<1405235PhosphorusppmASTM D5185(m)<11829SulfurppmASTM D5185(m)<1182404525833Visc @ 40°CcStASTM D7279(m)170225194185	Debris	scalar	Visual*	NONE	NONE	NONE	NONE
OdorscalarVisual*NORMLNORMLNORMLNORMLNORMLEmulsified WaterscalarVisual*>0.2NEGNEGNEGSodiumppmASTM D5185(m)01113BoronppmASTM D5185(m)03<12BariumppmASTM D5185(m)0200MolybdenumppmASTM D5185(m)02801MagnesiumppmASTM D5185(m)02801MagnesiumppmASTM D5185(m)<1136<16CalciumppmASTM D5185(m)<1405235PhosphorusppmASTM D5185(m)<143225122602327ZincppmASTM D5185(m)<11829SulfurppmASTM D5185(m)<1482404525833Visc @ 40°CcStASTM D7279(m)170225194185	Sand/Dirt	scalar	Visual*	NONE	NONE	NONE	NONE
Emulsified Water   scalar   Visual*   >0.2   NEG   NEG   NEG     Sodium   ppm   ASTM D5185(m)   11   1   3     Boron   ppm   ASTM D5185(m)   0   3   <1   2     Barium   ppm   ASTM D5185(m)   0   2   0   0     Molybdenum   ppm   ASTM D5185(m)   0   0   0   0     Manganese   ppm   ASTM D5185(m)   0   28   0   1     Magnesium   ppm   ASTM D5185(m)   0   28   0   1     Calcium   ppm   ASTM D5185(m)   <1   136   <1   6     Calcium   ppm   ASTM D5185(m)   <1   405   2   35     Phosphorus   ppm   ASTM D5185(m)   2143   2251   2260   2327     Zinc   ppm   ASTM D5185(m)   <1   18   2   9     Sulfur   ppm   ASTM D5185(m)   23468   24201<	Appearance	scalar	Visual*	NORML	NORML	NORML	HAZY
Sodium   ppm   ASTM D5185(m)   11   1   3     Boron   ppm   ASTM D5185(m)   0   3   <1	Odor	scalar	Visual*	NORML	NORML	NORML	NORML
Boron   ppm   ASTM D5185(m)   0   3   <1	Emulsified Water	scalar	Visual*	>0.2	NEG	NEG	NEG
Barium   ppm   ASTM D5185(m)   0   2   0   0     Molybdenum   ppm   ASTM D5185(m)   0   0   0   0   0     Manganese   ppm   ASTM D5185(m)   0   28   0   1     Magnesium   ppm   ASTM D5185(m)   <1   136   <1   6     Calcium   ppm   ASTM D5185(m)   <1   405   2   35     Phosphorus   ppm   ASTM D5185(m)   2143   2251   2260   2327     Zinc   ppm   ASTM D5185(m)   <1   18   2   9     Sulfur   ppm   ASTM D5185(m)   23468   24201   24045   25833     Visc @ 40°C   cSt   ASTM D7279(m)   170   225   194   185	Sodium	ppm	ASTM D5185(m)		11	1	3
Barium   ppm   ASTM D5185(m)   0   2   0   0     Molybdenum   ppm   ASTM D5185(m)   0   0   0   0   0     Manganese   ppm   ASTM D5185(m)   0   28   0   1     Magnesium   ppm   ASTM D5185(m)   <1	Boron	ppm	ASTM D5185(m)	0	3	<1	2
Manganese   ppm   ASTM D5185(m)   0   28   0   1     Magnesium   ppm   ASTM D5185(m)   <1	Barium		ASTM D5185(m)	0	2	0	0
Manganese   ppm   ASTM D5185(m)   0   28   0   1     Magnesium   ppm   ASTM D5185(m)   <1	Molybdenum	ppm	ASTM D5185(m)	0	0	0	0
Magnesium   ppm   ASTM D5185(m)   <1	Manganese		ASTM D5185(m)	0	28	0	1
Phosphorus   ppm   ASTM D5185(m)   2143   2251   2260   2327     Zinc   ppm   ASTM D5185(m)   <1		ppm	ASTM D5185(m)	<1	136	<1	6
Phosphorus   ppm   ASTM D5185(m)   2143   2251   2260   2327     Zinc   ppm   ASTM D5185(m)   <1	0		· · ·		405		35
Zinc   ppm   ASTM D5185(m)   <1	Phosphorus		ASTM D5185(m)	2143	2251	2260	2327
Sulfur   ppm   ASTM D5185(m)   23468   24201   24045   25833     Visc @ 40°C   cSt   ASTM D7279(m)   170   ▲   225   194   185	•		· · /	<1	18	2	9
Visc @ 40°C cSt ASTM D7279(m) 170 (225) 194 185	Sulfur			23468	24201	24045	25833
	Visc @ 40°C		· · /	170		194	185
			- ()			-	

#### FLUID CONDITION

Viscosity of sample indicates oil is within SAE 80W140 range, advise investigate. This plus the additive levels indicates that this is not the same brand, or type of oil as reported. The oil is no longer serviceable as a result of the abnormal and/or severe wear.

Report Id: MANSEL [WCAMIS] 02633286 (Generated: 05/05/2024 12:02:05) Rev: 1

Page 1 of 2



Laboratory : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9 Gerdau - Mandak Metal Processors Ltd., CALA Sample No. 1 Railway St., P.O. Box 334 : LH0288228 Received :03 May 2024 Selkirk, MB Lab Number : 02633286 Tested :03 May 2024 ISO 17025:2017 Accredited : 05 May 2024 - Kevin Marson CA R1A 2B3 Unique Number : 5774439 Diagnosed Laboratory Test Package : MOB 1 (Additional Tests: PQ) Contact: Santiago Giraldo To discuss this sample report, contact Customer Service at 1-800-268-2131. santiago.giraldo@gerdau.com Test denoted (\*) outside scope of accreditation, (m) method modified, (e) tested at external lab. T: F: (204)482-8241 Validity of results and interpretation are based on the sample and information as supplied.

Submitted By: Bastian Firmbach Page 2 of 2