

#### Machine Id **141701-WHEEL SET 51** Component Gearbox

# LIEBHERR GEAR HYPOID 90 EP (--- GAL)

### RECOMMENDATION

Resample at the next service interval to monitor.

#### WEAR

All component wear rates are normal.

## CONTAMINATION

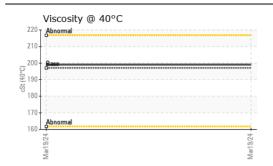
There is no indication of any contamination in the oil.

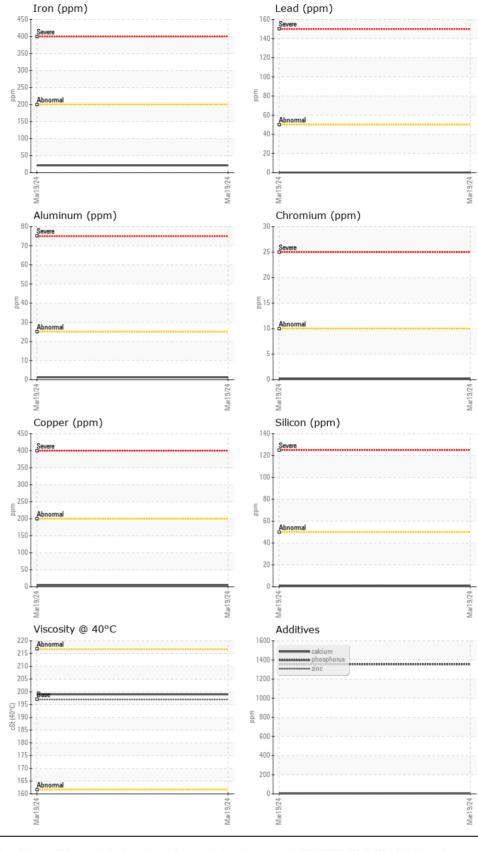
# FLUID CONDITION

The condition of the oil is acceptable for the time in service.

TestUOMMethodLimit/AnCurrentHistory1History2Sample NumberClient Info19 Mar 2024Machine AgehrsClient Info12015Machine AgehrsClient Info2000Filter AgehrsClient Info0Oil AgehrsClient InfoChangedFilter AgehrsClient InfoChangedFilter ChangedClient InfoN/ASample StatusNORMALIronppmASTM D5185m>10C1NickelppmASTM D5185m>100NickelppmASTM D5185m>100SilverppmASTM D5185m>200AluminumppmASTM D5185m>200VanadiumppmASTM D5185m>100VanaduumppmASTM D5185m>100ValdoumppmASTM D5185m>202VanaduumppmASTM D5185m>202VanaduumppmASTM D5185m>202VanaduumppmASTM D5185m>202Vanaduumppm <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>							
Sample DateClient Info19 Mar 2024Machine AgehrsClient Info2000Filter AgehrsClient Info0Gli ChangedClient InfoChangedOil ChangedClient InfoN/AFilter ChangedClient InfoN/AFilter ChangedClient InfoN/ASample StatusVNORMALIronppmASTM D5185m>20021NickelppmASTM D5185m>100NickelppmASTM D5185m>100SilverppmASTM D5185m>500LeadppmASTM D5185m>500VanadiumppmASTM D5185m>500VanadiumppmASTM D5185m>500VanadiumppmASTM D5185m>50C1VanadiumppmASTM D5185m>50C1VanadiumppmASTM D5185m>50C1VanadiumppmASTM D5185m>50C1VanadiumppmASTM D5185m>50C1VanadiumppmASTM D5185m>50C1	Test	UOM	Method	Limit/Abn	Current	History1	History2
Machine Age  hrs  Client Info  12015      Oil Age  hrs  Client Info  2000      Filter Age  hrs  Client Info  0      Oil Changed  Client Info  N/A      Filter Changed  Client Info  N/A      Sample Status  Client Info  N/A      Iron  ppm  ASTM D5185m  >200  21      Nickel  ppm  ASTM D5185m  >10  <1      Silver  ppm  ASTM D5185m  >10  0      Qopper  ppm  ASTM D5185m  >50  0      Vanadum  ppm  ASTM D5185m  >50  0      Yanadum  ppm  ASTM D5185m  >50  0      Yanadum  ppm  ASTM D5185m<	Sample Number		Client Info		LM0000122		
Oil Age  hrs  Client Info  2000      Filter Age  hrs  Client Info  0      Oil Changed  Client Info  N/A      Filter Changed  O  Client Info  N/A      Sample Status  NORMAL       Iron  ppm  ASTM D5185m  >200  21      Chromium  ppm  ASTM D5185m  10  0      Nickel  ppm  ASTM D5185m  10  0      Aluminum  ppm  ASTM D5185m  50  0      Lead  ppm  ASTM D5185m  50  0      Vanaduiu  ppm  ASTM D5185m  50  4      Yellow Metal  scalar  'Visual  NONE  NONE      Yellow Metal	Sample Date		Client Info		19 Mar 2024		
Filter Age  hrs  Client Info  0     Oil Changed  Client Info  KA      Filter Changed  Client Info  N/A      Sample Status  NORMAL      Iron  ppm  ASTM D5185m  >200  21      Chromium  ppm  ASTM D5185m  >10  0      Nickel  ppm  ASTM D5185m  >10  0      Silver  ppm  ASTM D5185m  >25  1      Aluminum  ppm  ASTM D5185m  >200  4      Agad  ppm  ASTM D5185m  >50  0      Vanadum  ppm  ASTM D5185m  >10  0      Vanadum  ppm  ASTM D5185m  >20  4      Vanadum  ppm  ASTM D5185m  >20	Machine Age	hrs	Client Info		12015		
Oil Changed  Client Info  Khanged	Oil Age	hrs	Client Info		2000		
Filter Changed  Client Info  N/A      Sample Status  Client Info  N/A      Iron  ppm  ASTM D5185m  >200  21      Chromium  ppm  ASTM D5185m  >10  0      Nickel  ppm  ASTM D5185m  >10  0      Silver  ppm  ASTM D5185m  >10  0      Aluminum  ppm  ASTM D5185m  >20  1      Aluminum  ppm  ASTM D5185m  >20  4      Vanadium  ppm  ASTM D5185m  >20  4	Filter Age	hrs	Client Info		0		
Sample Status  NORMAL      Iron  ppm  ASTM D5185m  >200  21      Chromium  ppm  ASTM D5185m  >10  C1      Nickel  ppm  ASTM D5185m  >10  0      Titanium  ppm  ASTM D5185m  >10  0      Aluminum  ppm  ASTM D5185m  >10  0      Aluminum  ppm  ASTM D5185m  >50  0	Oil Changed		Client Info		Changed		
Iron  ppm  ASTM D5185m  >200  21      Chromium  ppm  ASTM D5185m  >10  <1      Nickel  ppm  ASTM D5185m  >10  0      Titanium  ppm  ASTM D5185m  0  0      Aluminum  ppm  ASTM D5185m  >25  1      Aluminum  ppm  ASTM D5185m  >20  4      Lead  ppm  ASTM D5185m  >50  0      Vanadium  ppm  ASTM D5185m  >10  0      Vanadium  ppm  ASTM D5185m  >10  0      Vanadium  ppm  ASTM D5185m  >10  0      Vanadium  ppm  ASTM D5185m  >20  2      Vanadium  ppm  ASTM D5185m	Filter Changed		Client Info		N/A		
Chromium  ppm  ASTM D5185m  >10  <1	Sample Status				NORMAL		
Chromium  ppm  ASTM D5185m  >10  <1	Iron	nnm	ASTM D5185m	>200	21		
Nickel  ppm  ASTM D5185m  >10  0      Titanium  ppm  ASTM D5185m  0      Silver  ppm  ASTM D5185m  >25  1      Aluminum  ppm  ASTM D5185m  >20  4      Lead  ppm  ASTM D5185m  >200  4      Copper  ppm  ASTM D5185m  >10  0      Vanadium  ppm  ASTM D5185m  >10  0      Vanadium  ppm  ASTM D5185m  >10  0      Vanadium  ppm  ASTM D5185m  >20  2      Vanadium  ppm  ASTM D5185m  >20  2      Yellow Metal  scalar  *Visual  NONE       Silicon  ppm  ASTM D5185m  >2							
Titanium  ppm  ASTM D5185m  1     Silver  ppm  ASTM D5185m  0     Aluminum  ppm  ASTM D5185m  >25  1     Lead  ppm  ASTM D5185m  >200  4     Copper  ppm  ASTM D5185m  >200  4     Tin  ppm  ASTM D5185m  >10  0     Vanadium  ppm  ASTM D5185m  >10  0     Vanadium  ppm  ASTM D5185m  >10  0     Vanadium  ppm  ASTM D5185m  >50  <1     Vanadium  ppm  ASTM D5185m  >50  <1     Yellow Metal  scalar  *Visual  NONE  NONE     Silicon  ppm  ASTM D5185m  >20  2     Silit  scalar  *Visual  NONE  NONE     Sand/Dirt <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>							
Silver  ppm  ASTM D5185m  0      Aluminum  ppm  ASTM D5185m  >25  1      Lead  ppm  ASTM D5185m  >50  0      Copper  ppm  ASTM D5185m  >200  4      Tin  ppm  ASTM D5185m  >10  0      Vanadium  ppm  ASTM D5185m  >10  0      White Metal  scalar  *Visual  NONE  NONE      Yellow Metal  scalar  *Visual  NONE  NONE      Silicon  ppm  ASTM D5185m  >20  2      Water  WC Method  >0.2  NEG      Silit  scalar  *Visual  NONE  NONE      Sand/Dirt  scalar  *Visual  NORE  <				210	-		
Aluminum  ppm  ASTM D5185m  >25  1     Lead  ppm  ASTM D5185m  >500      Copper  ppm  ASTM D5185m  >200  4      Tin  ppm  ASTM D5185m  >10  0      Vanadium  ppm  ASTM D5185m  >10  0      White Metal  scalar  *Visual  NONE  NONE      Yellow Metal  scalar  *Visual  NONE  NONE      Silicon  ppm  ASTM D5185m  >50  <1      Yellow Metal  scalar  *Visual  NONE  NONE      Silicon  ppm  ASTM D5185m  >20  2      Silit  scalar  *Visual  NONE  NORE      Debris  scalar  *Visual  NORML					-		
Lead  ppm  ASTM D5185m  >50  0     Copper  ppm  ASTM D5185m  >200  4      Tin  ppm  ASTM D5185m  >10  0      Vanadium  ppm  ASTM D5185m  >10  0      White Metal  scalar  *Visual  NONE  NONE      Yellow Metal  scalar  *Visual  NONE  NONE      Silicon  ppm  ASTM D5185m  >50  <1				>25	-		
Copper  ppm  ASTM D5185m  >200  4      Tin  ppm  ASTM D5185m  >10  0      Vanadium  ppm  ASTM D5185m  >10  0      White Metal  scalar  *Visual  NONE  NONE      Yellow Metal  scalar  *Visual  NONE  NONE      Silicon  ppm  ASTM D5185m  >50  <1      Potassium  ppm  ASTM D5185m  >20  2      Water  WC Method  >0.2  NEG       Sad/Dirt  scalar  *Visual  NONE  NONE      Appearance  scalar  *Visual  NORML  NORML      Godr  scalar  *Visual  NORML  NORML      Molybfenum  ppm <th></th> <th></th> <th></th> <th></th> <th>-</th> <th></th> <th></th>					-		
Tin  ppm  ASTM D5185m  >10  0     Vanadium  ppm  ASTM D5185m  0  0     White Metal  scalar  *Visual  NONE  NONE  NONE     Yellow Metal  scalar  *Visual  NONE  NONE      Silicon  ppm  ASTM D5185m  >50  <1					-		
Vanadium  ppm  ASTM D5185m  0     White Metal  scalar  *Visual  NONE  NONE     Yellow Metal  scalar  *Visual  NONE  NONE     Silicon  ppm  ASTM D5185m  >50  <1      Silicon  ppm  ASTM D5185m  >20  2      Water  WC Method  >0.2  NEG      Silt  scalar  *Visual  NONE  NONE      Sand/Dirt  scalar  *Visual  NONE  NONE      Appearance  scalar  *Visual  NORML  NORML      Odor  scalar  *Visual  NORML  NORML      Sodium  ppm  ASTM D5185m   <1      Boron  ppm  ASTM D5185m   0 <th></th> <th></th> <th></th> <th></th> <th>-</th> <th></th> <th></th>					-		
White Metal  scalar  *Visual  NONE  NONE     Yellow Metal  scalar  *Visual  NONE  NONE      Silicon  ppm  ASTM D5185m  >50  <1      Potassium  ppm  ASTM D5185m  >20  2      Water  WC Method  >0.2  NEG      Silt  scalar  *Visual  NONE  NONE      Debris  scalar  *Visual  NONE  ILIGHT      Appearance  scalar  *Visual  NORM  NORML      Odor  scalar  *Visual  NORML  NORML      Sodium  ppm  ASTM D5185m   1      Boron  ppm  ASTM D5185m   3      Molybdenum  ppm  ASTM D5185m  0 <t< th=""><th></th><th></th><th></th><th>210</th><th>-</th><th></th><th></th></t<>				210	-		
Yellow Metal  scalar  *Visual  NONE  ····  ····    Silicon  ppm  ASTM D5185m  >50  <1  ····  ····    Potassium  ppm  ASTM D5185m  >20  2  ····  ····    Water  WC Method  >0.2  NEG  ····  ····    Silt  scalar  *Visual  NONE  NONE  ····  ····    Debris  scalar  *Visual  NONE  LIGHT  ····  ····    Sand/Dirt  scalar  *Visual  NONE  NORE  ····  ····    Appearance  scalar  *Visual  NORML  NORML  ····  ····    Odor  scalar  *Visual  NORML  NORML  ····  ····    Boron  ppm  ASTM D5185m  <1  ····  ····  ····    Barium  ppm  ASTM D5185m  0  ····  ····  ····    Molybdenum  ppm  ASTM D5185m  6<				NONE	-		
SiliconppmASTM D5185m>50<1							
PotassiumppmASTM D5185m>202WaterWC Method>0.2NEGSiltscalar*VisualNONENONEDebrisscalar*VisualNONELIGHTSand/Dirtscalar*VisualNONENONEAppearancescalar*VisualNORMLNORMLOdorscalar*VisualNORMLNORMLEmulsified Waterscalar*VisualNORMLNORMLSodiumppmASTM D5185m<1BoronppmASTM D5185m0MolybdenumppmASTM D5185m0MagnesiumppmASTM D5185m<11MagnesiumppmASTM D5185m4PhosphorusppmASTM D5185m2ZincppmASTM D5185m2SulfurppmASTM D5185m2							
WaterWC Method>0.2NEGSiltscalar*VisualNONENONEDebrisscalar*VisualNONELIGHTSand/Dirtscalar*VisualNONENONEAppearancescalar*VisualNORMLNORMLOdorscalar*VisualNORMLNORMLEmulsified Waterscalar*VisualNORMLNORMLSodiumppmASTM D5185m3BoronppmASTM D5185m0MolybdenumppmASTM D5185m0ManganeseppmASTM D5185m4MagnesiumppmASTM D5185m4PhosphorusppmASTM D5185m2ZincppmASTM D5185m2SulfurppmASTM D5185mMargesiumppmASTM D5185mSulfurppmASTM D5185mMargesiumppmASTM D5185mSulfurppmASTM D5185mMargesiumppmASTM D5185m	Silicon	ppm	ASTM D5185m	>50	<1		
Siltscalar*VisualNONENONEDebrisscalar*VisualNONELIGHTSand/Dirtscalar*VisualNONENONEAppearancescalar*VisualNORMLNORMLOdorscalar*VisualNORMLNORMLOdorscalar*VisualNORMLNORMLEmulsified Waterscalar*Visual>0.2NEGSodiumppmASTM D5185m3BoronppmASTM D5185m0BariumppmASTM D5185m0MolybdenumppmASTM D5185m6MagnesiumppmASTM D5185m4PhosphorusppmASTM D5185m1355ZincppmASTM D5185m2SulfurppmASTM D5185m1355	Potassium	ppm	ASTM D5185m	>20	2		
International DebrisScalar*VisualNONELIGHTSand/Dirtscalar*VisualNONENONEAppearancescalar*VisualNORMLNORMLOdorscalar*VisualNORMLNORMLOdorscalar*VisualNORMLNORMLEmulsified Waterscalar*Visual>0.2NEGSodiumppmASTM D5185m<1BoronppmASTM D5185m3BariumppmASTM D5185m0MolybdenumppmASTM D5185m<1MagnesiumppmASTM D5185m<16MagnesiumppmASTM D5185m4PhosphorusppmASTM D5185m22ZincppmASTM D5185m2SulfurppmASTM D5185m2SulfurppmASTM D5185mSulfurppmASTM D5185mSulfurppmASTM D5185mSulfurppmASTM D5185mSulfurppmASTM D5185m	Water		WC Method	>0.2	NEG		
Sand/Dirtscalar*VisualNONENONEAppearancescalar*VisualNORMLNORMLOdorscalar*VisualNORMLNORMLEmulsified Waterscalar*Visual>0.2NEGSodiumppmASTM D5185m<1BoronppmASTM D5185m3BariumppmASTM D5185m0MolybdenumppmASTM D5185m0ManganeseppmASTM D5185m<6MagnesiumppmASTM D5185m4PhosphorusppmASTM D5185m2ZincppmASTM D5185m2SulfurppmASTM D5185mSulfurppmASTM D5185mSulfurppmASTM D5185mSulfurppmASTM D5185mSulfurppmASTM D5185mSulfurppmASTM D5185mSulfurppmASTM D5185mSulfurppmASTM D5185mSulfurppmASTM D5185m<	Silt	scalar	*Visual	NONE	NONE		
Appearancescalar*VisualNORMLNORMLOdorscalar*VisualNORMLNORMLEmulsified Waterscalar*Visual>0.2NEGSodiumppmASTM D5185m<1BoronppmASTM D5185m0BariumppmASTM D5185m0MolybdenumppmASTM D5185m0ManganeseppmASTM D5185m6MagnesiumppmASTM D5185m6PhosphorusppmASTM D5185m1355ZincppmASTM D5185m2SulfurppmASTM D5185mSulfurppmASTM D5185m	Debris	scalar	*Visual	NONE	LIGHT		
Odorscalar*VisualNORMLNORMLEmulsified Waterscalar*Visual>0.2NEGSodiumppmASTM D5185m<1BoronppmASTM D5185m3BariumppmASTM D5185m0MolybdenumppmASTM D5185m0ManganeseppmASTM D5185m<1MagnesiumppmASTM D5185m6CalciumppmASTM D5185m4PhosphorusppmASTM D5185m2ZincppmASTM D5185m2SulfurppmASTM D5185mSulfurppmASTM D5185m	Sand/Dirt	scalar	*Visual	NONE	NONE		
Emulsified Water  scalar  *Visual  >0.2  NEG      Sodium  ppm  ASTM D5185m  <1      Boron  ppm  ASTM D5185m  3      Barium  ppm  ASTM D5185m  0      Molybdenum  ppm  ASTM D5185m  0      Manganese  ppm  ASTM D5185m  <1      Magnesium  ppm  ASTM D5185m  <6      Calcium  ppm  ASTM D5185m  4      Phosphorus  ppm  ASTM D5185m  2      Zinc  ppm  ASTM D5185m  29417	Appearance	scalar	*Visual	NORML	NORML		
Sodium  ppm  ASTM D5185m  <1	Odor	scalar	*Visual	NORML	NORML		
Boron  ppm  ASTM D5185m  3     Barium  ppm  ASTM D5185m  0     Molybdenum  ppm  ASTM D5185m  0     Molybdenum  ppm  ASTM D5185m  0     Manganese  ppm  ASTM D5185m      Magnesium  ppm  ASTM D5185m  6     Calcium  ppm  ASTM D5185m  4     Phosphorus  ppm  ASTM D5185m  1355     Zinc  ppm  ASTM D5185m  2     Sulfur  ppm  ASTM D5185m  29417	Emulsified Water	scalar	*Visual	>0.2	NEG		
Boron  ppm  ASTM D5185m  3     Barium  ppm  ASTM D5185m  0     Molybdenum  ppm  ASTM D5185m  0     Molybdenum  ppm  ASTM D5185m  0     Manganese  ppm  ASTM D5185m      Magnesium  ppm  ASTM D5185m  6     Calcium  ppm  ASTM D5185m  4     Phosphorus  ppm  ASTM D5185m  1355     Zinc  ppm  ASTM D5185m  2     Sulfur  ppm  ASTM D5185m  29417	Sodium	maa	ASTM D5185m		<1		
Barium  ppm  ASTM D5185m  0     Molybdenum  ppm  ASTM D5185m  0     Manganese  ppm  ASTM D5185m  c1     Magnesium  ppm  ASTM D5185m  6     Calcium  ppm  ASTM D5185m  4     Phosphorus  ppm  ASTM D5185m  1355     Zinc  ppm  ASTM D5185m  2     Sulfur  ppm  ASTM D5185m  29417	Boron						
Manganese  ppm  ASTM D5185m  <1	Barium		ASTM D5185m		0		
Manganese  ppm  ASTM D5185m  <1	Molybdenum	ppm	ASTM D5185m		0		
Calcium  ppm  ASTM D5185m  4      Phosphorus  ppm  ASTM D5185m  1355      Zinc  ppm  ASTM D5185m  2      Sulfur  ppm  ASTM D5185m  29417	Manganese		ASTM D5185m		<1		
Phosphorus  ppm  ASTM D5185m  1355     Zinc  ppm  ASTM D5185m  2     Sulfur  ppm  ASTM D5185m  29417	Magnesium	ppm	ASTM D5185m		6		
Zinc  ppm  ASTM D5185m  2     Sulfur  ppm  ASTM D5185m  29417	Calcium	ppm	ASTM D5185m		4		
Sulfur  ppm  ASTM D5185m  29417	Phosphorus	ppm	ASTM D5185m		1355		
	Zinc	ppm	ASTM D5185m		2		
Visc @ 40°C cSt ASTM D445 197 199	Sulfur	ppm	ASTM D5185m		29417		
	Visc @ 40°C	cSt	ASTM D445	197	199		

Contact/Location: ANDREAS WILFLING - LIEHIA





Laboratory : WearCheck USA - 501 Madison Ave., Cary, NC 27513 LIEBHERR USA CO - Maritime Cranes Sample No. Received 15101 NW 112TH AVE : LM0000122 : 16 Apr 2024 Lab Number : 06151368 HIALEAH GARDENS, FL Tested : 18 Apr 2024 Unique Number : 10981446 : 19 Apr 2024 - Sean Felton US 33018 Diagnosed Test Package : MOBCE Contact: ANDREAS WILFLING Certificate L2367 To discuss this sample report, contact Customer Service at 1-800-237-1369. andreas.wilfling@liebherr.com \* - Denotes test methods that are outside of the ISO 17025 scope of accreditation. T: (305)817-7566 Statements of conformity to specifications are based on the simple acceptance decision rule (JCGM 106:2012) F:

Contact/Location: ANDREAS WILFLING - LIEHIA Page 2 of 2