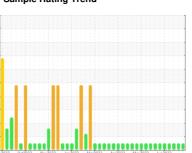


# **OIL ANALYSIS REPORT**

## Sample Rating Trend







Hancock CAT 1 (S/N 4EK00133)
Component

Biogas Engine

**CHEVRON HDAX LFG SAE 40 (--- GAL)** 

#### DIAGNOSIS

### 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

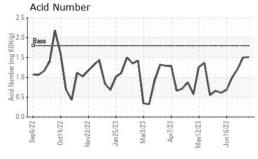
## **Fluid Condition**

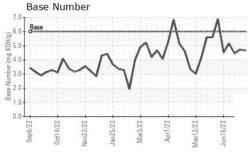
The BN result indicates that there is suitable alkalinity remaining in the oil. The AN level is acceptable for this fluid. The condition of the oil is suitable for further service.

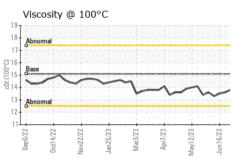
SAMPLE INFORMATION   method   limit/base   current   history1   history2								
Sample Date	SAMPLE INFORM	MATION	method	limit/base	current	history1	history2	
Sample Date	Sample Number		Client Info		WC0802668	WC0802666	WC0802699	
Oil Age         hrs         Client Info         1029         859         501           Oil Changed Sample Status         Client Info         Not Changd Not Changd Not Changd Not Changd Not Changd NoRMAL         NoRMAL			Client Info		20 Jul 2023	13 Jul 2023	28 Jun 2023	
Oil Age         hrs         Client Info         1029         859         501           Oil Changed Sample Status         Client Info         Not Changd Not Changd Not Changd Not Changd Not Changd NoRMAL         NoRMAL	Machine Age	hrs	Client Info		63962	63792	63434	
Oil Changed Sample Status         Client Info         Not Changd NORMAL         Not Changd NORMAL         Not Changd NORMAL         Not Changd NORMAL         NORMAL		hrs	Client Info		1029	859	501	
Sample Status	-		Client Info		Not Changd	Not Changd	Not Changd	
Fuel						NORMAL	NORMAL	
WEAR METALS	CONTAMINATIO	N	method	limit/base	current	history1	history2	
WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >15         3         3         3           Chromium         ppm         ASTM D5185m         >4         -1         0         -1           Nickel         ppm         ASTM D5185m         >2         0         0         0           Silver         ppm         ASTM D5185m         >5         0         0         0           Aluminum         ppm         ASTM D5185m         >6         3         2         1           Lead         ppm         ASTM D5185m         >6         3         2         1           Lead         ppm         ASTM D5185m         >9         -1         -1         0           Copper         ppm         ASTM D5185m         >4         6         6         5         5           Vanadium         ppm         ASTM D5185m         0         -1         0         0           Vanadium         ppm         ASTM D5185m         0         -1         0         0           Cadmium         ppm         ASTM D5185m         -1         -1         0 <th>Fuel</th> <th></th> <th>WC Method</th> <th>&gt;4.0</th> <th>&lt;1.0</th> <th>&lt;1.0</th> <th>&lt;1.0</th>	Fuel		WC Method	>4.0	<1.0	<1.0	<1.0	
Iron	Glycol		WC Method		NEG	NEG	NEG	
Chromium         ppm         ASTM D5185m         >4         <1	WEAR METALS		method	limit/base	current	history1	history2	
Chromium         ppm         ASTM D5185m         >4         <1	Iron	ppm	ASTM D5185m	>15	3	3	3	
Titanium         ppm         ASTM D5185m         0         0         0           Silver         ppm         ASTM D5185m         >5         0         0         0           Aluminum         ppm         ASTM D5185m         >6         3         2         1           Lead         ppm         ASTM D5185m         >9         <1         <1         0           Copper         ppm         ASTM D5185m         >4         6         6         5           Vanadium         ppm         ASTM D5185m         0         <1         0           Cadmium         ppm         ASTM D5185m         0         <1         0           Cadmium         ppm         ASTM D5185m         0         <1         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         <1         <1         0         0           Barium         ppm         ASTM D5185m         <1         <1         0         0           Molybdenum         ppm         ASTM D5185m         2         2         2         2           Magnesium         ppm	Chromium		ASTM D5185m	>4	<1	0	<1	
Silver	Nickel	ppm	ASTM D5185m	>2	0	0	0	
Aluminum	Titanium		ASTM D5185m		0	0	0	
Lead	Silver	ppm	ASTM D5185m	>5	0	0	0	
Copper         ppm         ASTM D5185m         >14         1         1         <1	Aluminum	ppm	ASTM D5185m	>6	3	2	1	
Tin         ppm         ASTM D5185m         >4         6         6         5           Vanadium         ppm         ASTM D5185m         0         <1	Lead	ppm	ASTM D5185m	>9	<1	<1	0	
Vanadium         ppm         ASTM D5185m         0         <1	Copper	ppm	ASTM D5185m	>14	1	1	<1	
Cadmium         ppm         ASTM D5185m         0         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         <1	<th>Tin</th> <th>ppm</th> <th>ASTM D5185m</th> <th>&gt;4</th> <th>6</th> <th>6</th> <th>5</th>	Tin	ppm	ASTM D5185m	>4	6	6	5
ADDITIVES	Vanadium	ppm	ASTM D5185m		0	<1	0	
Boron	Cadmium	ppm	ASTM D5185m		0	0	0	
Barium	ADDITIVES		method	limit/base	current	history1	history2	
Molybdenum         ppm         ASTM D5185m         2         2         2           Manganese         ppm         ASTM D5185m         <1	Boron	ppm	ASTM D5185m		<1	<1	0	
Manganese         ppm         ASTM D5185m         <1	Barium	ppm	ASTM D5185m		<1	0	0	
Magnesium         ppm         ASTM D5185m         14         12         10           Calcium         ppm         ASTM D5185m         2215         2101         2073           Phosphorus         ppm         ASTM D5185m         270         329         312         303           Zinc         ppm         ASTM D5185m         310         411         388         378           Sulfur         ppm         ASTM D5185m         2760         2617         2601           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >181         162         146         124           Sodium         ppm         ASTM D5185m         2         2         2         4           Potassium         ppm         ASTM D5185m         >20         <1         0         <1           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.1         0.1         0.1           Nitration         Abs/.1mm         *ASTM D7624         >20         7.4         7.4         6.7<	Molybdenum	ppm	ASTM D5185m		2	2	2	
Calcium         ppm         ASTM D5185m         2215         2101         2073           Phosphorus         ppm         ASTM D5185m         270         329         312         303           Zinc         ppm         ASTM D5185m         310         411         388         378           Sulfur         ppm         ASTM D5185m         2760         2617         2601           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >181         162         146         124           Sodium         ppm         ASTM D5185m         2         2         2         4           Potassium         ppm         ASTM D5185m         >20         <1         0         <1           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.1         0.1         0.1           Nitration         Abs/cm         *ASTM D7624         >20         7.4         7.4         6.7           Sulfation         Abs/.1mm         *ASTM D7414         >25         16.9         <	Manganese	nnm	ΔSTM D5185m		<1	<1	<1	
Phosphorus         ppm         ASTM D5185m         270         329         312         303           Zinc         ppm         ASTM D5185m         310         411         388         378           Sulfur         ppm         ASTM D5185m         2760         2617         2601           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >181         162         146         124           Sodium         ppm         ASTM D5185m         2         2         2         4           Potassium         ppm         ASTM D5185m         >20         <1         0         <1           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.1         0.1         0.1           Nitration         Abs/cm         *ASTM D7024         >20         7.4         7.4         6.7           Sulfation         Abs/.1mm         *ASTM D7415         >30         20.8         20.8         19.3           FLUID DEGRADATION         method         limit/base         current	9	ppiii	AO IWI DO IOOIII			<b>~</b> 1		
Zinc         ppm         ASTM D5185m         310         411         388         378           Sulfur         ppm         ASTM D5185m         2760         2617         2601           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >181         162         146         124           Sodium         ppm         ASTM D5185m         2         2         2         4           Potassium         ppm         ASTM D5185m         >20         <1         0         <1           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.1         0.1         0.1           Nitration         Abs/cm         *ASTM D7624         >20         7.4         7.4         6.7           Sulfation         Abs/.1mm         *ASTM D7415         >30         20.8         20.8         19.3           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25	-					12		
Sulfur         ppm         ASTM D5185m         2760         2617         2601           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >181         162         146         124           Sodium         ppm         ASTM D5185m         2         2         4           Potassium         ppm         ASTM D5185m         >20         <1         0         <1           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.1         0.1         0.1           Nitration         Abs/cm         *ASTM D7624         >20         7.4         7.4         6.7           Sulfation         Abs/.1mm         *ASTM D7415         >30         20.8         20.8         19.3           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         16.9         16.4         13.6           Acid Number (AN)         mg KOH/g         ASTM D8045         1.8         1	Magnesium Calcium	ppm	ASTM D5185m		14	12	10	
CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >181         162         146         124           Sodium         ppm         ASTM D5185m         2         2         4           Potassium         ppm         ASTM D5185m         >20         <1         0         <1           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.1         0.1         0.1         0.1           Nitration         Abs/cm         *ASTM D7624         >20         7.4         7.4         6.7           Sulfation         Abs/.1mm         *ASTM D7415         >30         20.8         20.8         19.3           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         16.9         16.4         13.6           Acid Number (AN)         mg KOH/g         ASTM D8045         1.8         1.51         1.50         1.21	Magnesium Calcium Phosphorus	ppm	ASTM D5185m ASTM D5185m	270	14 2215 329	12 2101 312	10 2073 303	
Silicon         ppm         ASTM D5185m         >181         162         146         124           Sodium         ppm         ASTM D5185m         2         2         4           Potassium         ppm         ASTM D5185m         >20         <1	Magnesium Calcium Phosphorus	ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m		14 2215 329	12 2101 312	10 2073 303	
Sodium         ppm         ASTM D5185m         2         2         4           Potassium         ppm         ASTM D5185m         >20         <1	Magnesium Calcium Phosphorus Zinc	ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m		14 2215 329 411	12 2101 312 388	10 2073 303 378	
Potassium         ppm         ASTM D5185m         >20         <1	Magnesium Calcium Phosphorus Zinc Sulfur	ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	310	14 2215 329 411 2760	12 2101 312 388 2617	10 2073 303 378 2601	
INFRA-RED	Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS	ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m method	310 limit/base	14 2215 329 411 2760	12 2101 312 388 2617 history1	10 2073 303 378 2601 history2	
Soot %         %         *ASTM D7844         0.1         0.1         0.1           Nitration         Abs/cm         *ASTM D7624         >20         7.4         7.4         6.7           Sulfation         Abs/.1mm         *ASTM D7415         >30         20.8         20.8         19.3           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         16.9         16.4         13.6           Acid Number (AN)         mg KOH/g         ASTM D8045         1.8         1.51         1.50         1.21	Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS	ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m method ASTM D5185m	310 limit/base	14 2215 329 411 2760 current	12 2101 312 388 2617 history1	10 2073 303 378 2601 history2	
Nitration         Abs/cm         *ASTM D7624         >20         7.4         7.4         6.7           Sulfation         Abs/.1mm         *ASTM D7415         >30         20.8         20.8         19.3           FLUID DEGRADATION method limit/base current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         16.9         16.4         13.6           Acid Number (AN)         mg KOH/g         ASTM D8045         1.8         1.51         1.50         1.21	Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium	ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m method ASTM D5185m ASTM D5185m	310 limit/base >181	14 2215 329 411 2760 current 162 2	12 2101 312 388 2617 history1 146 2	10 2073 303 378 2601 history2 124 4	
Sulfation         Abs/.1mm         *ASTM D7415         >30         20.8         20.8         19.3           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         16.9         16.4         13.6           Acid Number (AN)         mg KOH/g         ASTM D8045         1.8         1.51         1.50         1.21	Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium	ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m  method ASTM D5185m ASTM D5185m ASTM D5185m	310 limit/base >181 >20	14 2215 329 411 2760 current 162 2 <1	12 2101 312 388 2617 history1 146 2	10 2073 303 378 2601 history2 124 4 <1	
FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         16.9         16.4         13.6           Acid Number (AN)         mg KOH/g         ASTM D8045         1.8         1.51         1.50         1.21	Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED	ppm ppm ppm ppm ppm ppm	ASTM D5185m	limit/base >181 >20 limit/base	14 2215 329 411 2760 current 162 2 <1	12 2101 312 388 2617 history1 146 2 0	10 2073 303 378 2601 history2 124 4 <1	
Oxidation         Abs/.1mm         *ASTM D7414         >25         16.9         16.4         13.6           Acid Number (AN)         mg KOH/g         ASTM D8045         1.8         1.51         1.50         1.21	Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot %	ppm ppm ppm ppm ppm ppm	ASTM D5185m	limit/base >181 >20 limit/base	14 2215 329 411 2760 current 162 2 <1 current 0.1	12 2101 312 388 2617 history1 146 2 0 history1 0.1	10 2073 303 378 2601 history2 124 4 <1 history2	
Acid Number (AN)         mg KOH/g         ASTM D8045         1.8         1.51         1.50         1.21	Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot % Nitration	ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m  Method ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m  Method *ASTM D7844 *ASTM D7624	310  limit/base >181 >20  limit/base >20	14 2215 329 411 2760 current 162 2 <1 current 0.1 7.4	12 2101 312 388 2617 history1 146 2 0 history1 0.1 7.4	10 2073 303 378 2601 history2 124 4 <1 history2 0.1 6.7	
	Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot % Nitration Sulfation	ppm ppm ppm ppm ppm ppm ppm ppm Abs/cm	ASTM D5185m ASTM D7844 *ASTM D7624 *ASTM D7415	310  limit/base >181  >20  limit/base  >20  >30	14 2215 329 411 2760	12 2101 312 388 2617 history1 146 2 0 history1 0.1 7.4 20.8	10 2073 303 378 2601 history2 124 4 <1 history2 0.1 6.7 19.3	
	Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot % Nitration Sulfation FLUID DEGRADA	ppm ppm ppm ppm ppm ppm ppm ppm ppm Abs/cm Ation	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m  METHOD  ASTM D5185m  METHOD  ASTM D5185m  ASTM D5185m  ASTM D5185m  ASTM D5185m  ASTM D5185m  METHOD  *ASTM D7844  *ASTM D7624  *ASTM D7415  METHOD	limit/base >181 >20 limit/base >20 >30 limit/base	14 2215 329 411 2760 current 162 2 <1 current 0.1 7.4 20.8 current	12 2101 312 388 2617 history1 146 2 0 history1 0.1 7.4 20.8 history1	10 2073 303 378 2601 history2 124 4 <1 history2 0.1 6.7 19.3 history2	
	Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot % Nitration Sulfation FLUID DEGRADA Oxidation	ppm ppm ppm ppm ppm ppm ppm ppm ppm Abs/.1mm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m  Method ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m  Method *ASTM D7844 *ASTM D7624 *ASTM D76145  Method *ASTM D7414	limit/base >181 >20 limit/base >20 >30 limit/base >25	14 2215 329 411 2760  current 162 2 <1  current 0.1 7.4 20.8  current	12 2101 312 388 2617 history1 146 2 0 history1 0.1 7.4 20.8 history1	10 2073 303 378 2601 history2 124 4 <1 history2 0.1 6.7 19.3 history2 13.6	



## **OIL ANALYSIS REPORT**





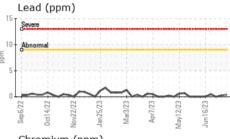


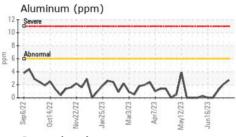
VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Yellow Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Precipitate	scalar	*Visual	NONE	NONE	NONE	NONE
Silt	scalar	*Visual	NONE	NONE	NONE	NONE
Debris	scalar	*Visual	NONE	NONE	NONE	NONE
Sand/Dirt	scalar	*Visual	NONE	NONE	NONE	NONE
Appearance	scalar	*Visual	NORML	NORML	NORML	NORML
Odor	scalar	*Visual	NORML	NORML	NORML	NORML
<b>Emulsified Water</b>	scalar	*Visual	>0.1	NEG	NEG	NEG
Free Water	scalar	*Visual		NEG	NEG	NEG

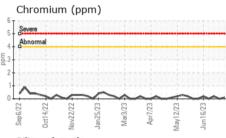
FLUID PHOPEN	IIIEO	memod			riistory i	History∠
Visc @ 100°C	cSt	ASTM D445	15.1	14.2	14.0	13.8

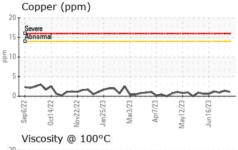
Seve	ere		4 4 4 4 4		4 4 4 4 4		
Ab	ormal						
Abh	h						
		4					
	-1	~	1	7		-	
	1	~	~	7	$\sim$	~	
Sep 6/22	Oct14/22	Vov22/22 >	Jan25/23	Mar3/23	Apr7/23	May12/23	Jun16/23

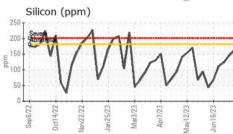
**GRAPHS** 

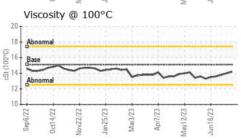


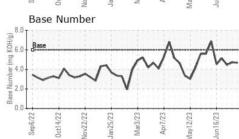
















Certificate L2367

Laboratory Sample No. Lab Number **Unique Number** Test Package : MOB 2

: WC0802668 : 05905653 : 10567009

: WearCheck USA - 501 Madison Ave., Cary, NC 27513 Received Diagnosed

: 24 Jul 2023 : 25 Jul 2023 Diagnostician : Sean Felton

**EDL NA Recips-Hancock County** HANCOCK COUNTY POWER STATION, 3574 TOWNSHIP ROAD 142

FINDLAY, OH US 45840

Contact: TIM CUSICK

tim.cusick@energydevelopments.com

To discuss this sample report, contact Customer Service at 1-800-237-1369. \* - Denotes test methods that are outside of the ISO 17025 scope of accreditation.

Statements of conformity to specifications are based on the simple acceptance decision rule (JCGM 106:2012)

T:

F: