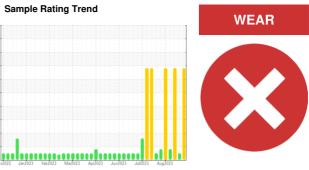


OIL ANALYSIS REPORT





DIAGNOSIS

Recommendation

We recommend that you drain the oil from the component if this has not already been done. We advise that you inspect for the source(s) of wear. We recommend an early resample to monitor this condition.

Wear

Iron ppm levels are severe. Chromium ppm levels are noted. Cylinder, crank, or cam shaft wear is indicated. Ring wear is indicated.

Contamination

There is no indication of any contamination in the oil.

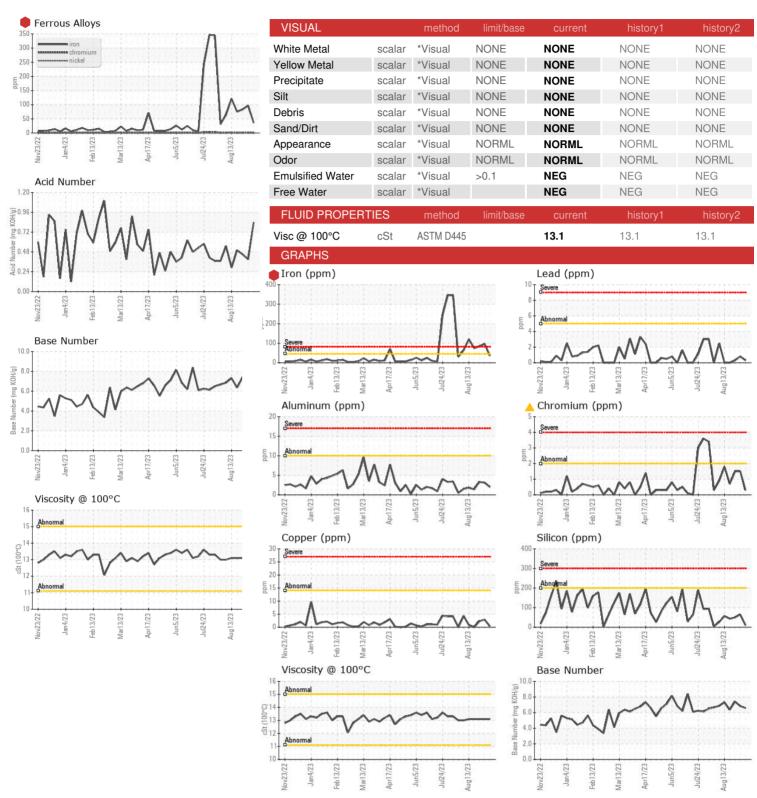
Fluid Condition

The BN result indicates that there is suitable alkalinity remaining in the oil. The AN level is acceptable for this fluid. The oil is no longer serviceable as a result of the abnormal and/or severe wear.

Sample Date			V2022 Jan20	23 1602023 Williams	Apr2023 Jun2023 Jul2023 A	nugeoso .	
Sample Date	SAMPLE INFORM	MATION	method	limit/base	current	history1	history2
Machine Age hrs Client Info 64660 64661 64611 Oil Age hrs Client Info 156 1 107 Oil Changed Client Info N/A N/A N/A N/A Sample Status SEVERE NCR NCR NVA N/A N/A Fuel WC Method WC Method 4-0 <1.0	Sample Number		Client Info		WC0836326	WC0836332	WC0836324
Machine Age hrs Client Info 64660 64661 64611 Oil Age hirs Client Info 156 1 107 Oil Changed Client Info N/A N/A N/A N/A Sample Status SEVERE NORMAL SEVERE CONTAMINATION method Imitibase current history1 history2 Fuel WC Method 44.0 <1.0	Sample Date		Client Info		18 Aug 2023	18 Aug 2023	15 Aug 2023
Oil Changed Sample Status	Machine Age	hrs	Client Info		64660	_	_
Sevent	Oil Age	hrs	Client Info		156	1	107
CONTAMINATION	Oil Changed		Client Info		N/A	N/A	N/A
Fuel WC Method S4.0 S1.0 S	Sample Status				SEVERE	NORMAL	SEVERE
WEAR METALS	CONTAMINATIO	N	method	limit/base	current	history1	history2
WEAR METALS method limit/base current history1 history2 Iron ppm ASTM D5185m >45 97 36 83 Chromium ppm ASTM D5185m >2 <1	Fuel		WC Method	>4.0	<1.0	<1.0	<1.0
Iron	Glycol		WC Method		NEG	NEG	NEG
Chromium ppm ASTM D5185m >2 2 1 2 2 1 2 2 2 <1 2 2 <1 0	WEAR METALS		method	limit/base	current	history1	history2
Nickel	Iron	ppm	ASTM D5185m	>45	97	36	8 3
Titanium	Chromium	ppm	ASTM D5185m	>2	<u>^</u> 2	<1	<u>^</u> 2
Silver	Nickel	ppm	ASTM D5185m	>2	<1	<1	0
Aluminum ppm ASTM D5185m >10 3 2 3 Lead ppm ASTM D5185m >5 <1	Titanium	ppm	ASTM D5185m		0	0	0
Lead	Silver	ppm	ASTM D5185m	>5	0	0	0
Copper ppm ASTM D5185m >14 3 <1 2 Tin ppm ASTM D5185m >13 <1	Aluminum	ppm	ASTM D5185m	>10	3	2	3
Tin	Lead	ppm	ASTM D5185m	>5	<1	<1	<1
Vanadium ppm ASTM D5185m 0 0 0 Cadmium ppm ASTM D5185m 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185m 0 0 0 0 Barium ppm ASTM D5185m 0 0 0 0 Molybdenum ppm ASTM D5185m 0 0 0 0 Manganese ppm ASTM D5185m 1 <1 1 1 Magnesium ppm ASTM D5185m 3 3 5 Calcium ppm ASTM D5185m 1429 1374 1424 Phosphorus ppm ASTM D5185m 382 365 387 Zinc ppm ASTM D5185m 2336 2175 2388 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D51	Copper	ppm	ASTM D5185m	>14	3	<1	2
Cadmium ppm ASTM D5185m 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185m 0 0 0 Barium ppm ASTM D5185m 0 0 0 Molybdenum ppm ASTM D5185m -1 -1 0 Manganese ppm ASTM D5185m 3 3 5 Calcium ppm ASTM D5185m 382 365 387 Zinc ppm ASTM D5185m 382 365 387 Zinc ppm ASTM D5185m 2336 2175 2388 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m 200 65 10 50 Sodium ppm ASTM D5185m 20 <1	Tin	ppm	ASTM D5185m	>13	<1	<1	<1
ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185m 0 0 0 Barium ppm ASTM D5185m 0 0 0 Molybdenum ppm ASTM D5185m <1	Vanadium	ppm	ASTM D5185m		0	0	0
Boron	Cadmium	ppm	ASTM D5185m		0	0	0
Barium ppm ASTM D5185m 0 0 0 Molybdenum ppm ASTM D5185m <1 <1 0 Manganese ppm ASTM D5185m 1 <1 1 Magnesium ppm ASTM D5185m 3 3 5 Calcium ppm ASTM D5185m 1429 1374 1424 Phosphorus ppm ASTM D5185m 382 365 387 Zinc ppm ASTM D5185m 460 436 440 Sulfur ppm ASTM D5185m 2336 2175 2388 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >200 65 10 50 Sodium ppm ASTM D5185m >20 <1 <1 0 INFRA-RED method limit/base current history1 history2 Soot % % *ASTM D7624 >20	ADDITIVES		method	limit/base	current	hietory1	hietory2
Molybdenum ppm ASTM D5185m <1 <1 0 Manganese ppm ASTM D5185m 1 <1 1 Magnesium ppm ASTM D5185m 3 3 5 Calcium ppm ASTM D5185m 1429 1374 1424 Phosphorus ppm ASTM D5185m 382 365 387 Zinc ppm ASTM D5185m 460 436 440 Sulfur ppm ASTM D5185m 2336 2175 2388 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >200 65 10 50 Sodium ppm ASTM D5185m >20 <1 <1 0 INFRA-RED method limit/base current history1 history2 Soot % % *ASTM D7844 0 0 0 Nitration Abs/.1mm *ASTM D7415	ADDITIVEO		memou	IIIIII/Dase	Current	HISTORY	HISTOTYZ
Manganese ppm ASTM D5185m 1 <1 1 Magnesium ppm ASTM D5185m 3 3 5 Calcium ppm ASTM D5185m 1429 1374 1424 Phosphorus ppm ASTM D5185m 382 365 387 Zinc ppm ASTM D5185m 460 436 440 Sulfur ppm ASTM D5185m 2336 2175 2388 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >200 65 10 50 Sodium ppm ASTM D5185m >20 <1 <1 0 Potassium ppm ASTM D5185m >20 <1 <1 0 INFRA-RED method limit/base current history1 history2 Soot % *ASTM D7844 0 0 0 Nitration Abs/:mm *ASTM D7415	Boron	ppm		IIIIIIIIIII			
Magnesium ppm ASTM D5185m 3 3 5 Calcium ppm ASTM D5185m 1429 1374 1424 Phosphorus ppm ASTM D5185m 382 365 387 Zinc ppm ASTM D5185m 460 436 440 Sulfur ppm ASTM D5185m 2336 2175 2388 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >200 65 10 50 Sodium ppm ASTM D5185m >20 <1	Boron		ASTM D5185m	IIIIIVDASE	0	0	0
Calcium ppm ASTM D5185m 1429 1374 1424 Phosphorus ppm ASTM D5185m 382 365 387 Zinc ppm ASTM D5185m 460 436 440 Sulfur ppm ASTM D5185m 2336 2175 2388 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >200 65 10 50 Sodium ppm ASTM D5185m >20 <1	Boron Barium	ppm	ASTM D5185m ASTM D5185m	IIIIIIIIIII	0 0	0	0
Phosphorus ppm ASTM D5185m 382 365 387 Zinc ppm ASTM D5185m 460 436 440 Sulfur ppm ASTM D5185m 2336 2175 2388 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >200 65 10 50 Sodium ppm ASTM D5185m >20 <1	Boron Barium Molybdenum	ppm	ASTM D5185m ASTM D5185m ASTM D5185m	IIIIIUDASE	0 0 <1	0 0 <1	0 0 0
Zinc ppm ASTM D5185m 460 436 440 Sulfur ppm ASTM D5185m 2336 2175 2388 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >200 65 10 50 Sodium ppm ASTM D5185m 0 0 0 0 Potassium ppm ASTM D5185m >20 <1	Boron Barium Molybdenum Manganese	ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	iiiiii/base	0 0 <1 1	0 0 <1 <1	0 0 0
Sulfur ppm ASTM D5185m 2336 2175 2388 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >200 65 10 50 Sodium ppm ASTM D5185m 0 0 0 0 Potassium ppm ASTM D5185m >20 <1	Boron Barium Molybdenum Manganese	ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m		0 0 <1 1 3	0 0 <1 <1 3	0 0 0 1 5
CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >200 65 10 50 Sodium ppm ASTM D5185m 0 0 0 0 Potassium ppm ASTM D5185m >20 <1	Boron Barium Molybdenum Manganese Magnesium Calcium	ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	iiiiii base	0 0 <1 1 3 1429	0 0 <1 <1 3 1374	0 0 0 1 5
Silicon ppm ASTM D5185m >200 65 10 50 Sodium ppm ASTM D5185m 0 0 0 0 Potassium ppm ASTM D5185m >20 <1 <1 0 INFRA-RED method limit/base current history1 history2 Soot % % *ASTM D7844 0 0 0 Nitration Abs/cm *ASTM D7624 >20 5.2 4.2 4.8 Sulfation Abs/.1mm *ASTM D7415 >30 15.7 14.8 15.0 FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 9.9 8.7 9.3 Acid Number (AN) mg KOH/g ASTM D8045 0.835 0.39 0.45	Boron Barium Molybdenum Manganese Magnesium	ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	IIIIII VASE	0 0 <1 1 3 1429 382	0 0 <1 <1 3 1374 365	0 0 0 1 5 1424 387
Sodium ppm ASTM D5185m 0 0 0 Potassium ppm ASTM D5185m >20 <1	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus	ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	IIIIII VASE	0 0 <1 1 3 1429 382 460	0 0 <1 <1 3 1374 365 436	0 0 0 1 5 1424 387 440
Potassium ppm ASTM D5185m >20 <1 <1 0 INFRA-RED method limit/base current history1 history2 Soot % % *ASTM D7844 0 0 0 Nitration Abs/cm *ASTM D7624 >20 5.2 4.2 4.8 Sulfation Abs/.1mm *ASTM D7415 >30 15.7 14.8 15.0 FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 9.9 8.7 9.3 Acid Number (AN) mg KOH/g ASTM D8045 0.835 0.39 0.45	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur	ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m		0 0 <1 1 3 1429 382 460 2336	0 0 <1 <1 3 1374 365 436 2175	0 0 0 1 5 1424 387 440 2388
INFRA-RED	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur	ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m	limit/base	0 0 <1 1 3 1429 382 460 2336	0 0 <1 <1 3 1374 365 436 2175 history1	0 0 0 1 5 1424 387 440 2388
Soot % % *ASTM D7844 0 0 0 Nitration Abs/cm *ASTM D7624 >20 5.2 4.2 4.8 Sulfation Abs/.1mm *ASTM D7415 >30 15.7 14.8 15.0 FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 9.9 8.7 9.3 Acid Number (AN) mg KOH/g ASTM D8045 0.835 0.39 0.45	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS	ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m	limit/base	0 0 <1 1 3 1429 382 460 2336 current	0 0 <1 <1 3 1374 365 436 2175 history1	0 0 0 1 5 1424 387 440 2388 history2
Nitration Abs/cm *ASTM D7624 >20 5.2 4.2 4.8 Sulfation Abs/.1mm *ASTM D7415 >30 15.7 14.8 15.0 FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 9.9 8.7 9.3 Acid Number (AN) mg KOH/g ASTM D8045 0.835 0.39 0.45	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS	ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m	limit/base	0 0 <1 1 3 1429 382 460 2336 current 65	0 0 <1 <1 3 1374 365 436 2175 history1	0 0 0 1 5 1424 387 440 2388 history2 50
Sulfation Abs/.1mm *ASTM D7415 >30 15.7 14.8 15.0 FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 9.9 8.7 9.3 Acid Number (AN) mg KOH/g ASTM D8045 0.835 0.39 0.45	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium	ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m	limit/base >200 >20	0 0 <1 1 3 1429 382 460 2336 current 65 0 <1	0 0 <1 <1 3 1374 365 436 2175 history1 10 0 <1	0 0 0 1 5 1424 387 440 2388 history2 50 0
FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 9.9 8.7 9.3 Acid Number (AN) mg KOH/g ASTM D8045 0.835 0.39 0.45	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED	ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m	limit/base >200 >20	0 0 <1 1 3 1429 382 460 2336 current 65 0 <1	0 0 <1 <1 3 1374 365 436 2175 history1 10 0 <1	0 0 0 1 5 1424 387 440 2388 history2 50 0
Oxidation Abs/.1mm *ASTM D7414 >25 9.9 8.7 9.3 Acid Number (AN) mg KOH/g ASTM D8045 0.835 0.39 0.45	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m Method *ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	limit/base >200 >20 limit/base	0 0 <1 1 1 3 1429 382 460 2336 current 65 0 <1 current	0 0 <1 <1 3 1374 365 436 2175 history1 10 0 <1 history1 0	0 0 0 1 5 1424 387 440 2388 history2 50 0
Acid Number (AN) mg KOH/g ASTM D8045 0.835 0.39 0.45	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot % Nitration	ppm	ASTM D5185m method *ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	limit/base >200 >20 limit/base >20	0 0 <1 1 1 3 1429 382 460 2336 current 65 0 <1 current 0 5.2	0 0 <1 <1 3 1374 365 436 2175 history1 10 0 <1 history1 0 4.2	0 0 0 1 5 1424 387 440 2388 history2 50 0 history2
	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot % Nitration Sulfation	ppm	ASTM D5185m Method ASTM D5185m ASTM D7844 *ASTM D7624 *ASTM D76145	limit/base >200 limit/base >20 >20 >30	0 0 <1 1 1 3 1429 382 460 2336 current 65 0 <1 current 0 5.2 15.7	0 0 <1 <1 3 1374 365 436 2175 history1 10 0 <1 history1 0 4.2 14.8	0 0 0 1 5 1424 387 440 2388 history2 50 0 history2 0 4.8 15.0
Base Number (BN) mg KOH/g ASTM D2896 6.57 6.83 7.40	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot % Nitration Sulfation FLUID DEGRADA	ppm	ASTM D5185m method *ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m method *ASTM D7844 *ASTM D7624 *ASTM D7415 method	limit/base >200 >20 limit/base >20 >30 limit/base	0 0	0 0 <1 <1 3 1374 365 436 2175 history1 10 0 <1 history1 0 4.2 14.8 history1	0 0 0 1 5 1424 387 440 2388 history2 50 0 history2 0 4.8 15.0
	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot % Nitration Sulfation FLUID DEGRADA	ppm	ASTM D5185m METHOD ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m METHOD *ASTM D7844 *ASTM D7624 *ASTM D7415 METHOD *ASTM D7414	limit/base >200 >20 limit/base >20 >30 limit/base	0 0	0 0 <1 <1 3 1374 365 436 2175 history1 10 0 <1 history1 0 4.2 14.8 history1 8.7	0 0 0 1 5 1424 387 440 2388 history2 50 0 0 history2 0 4.8 15.0 history2



OIL ANALYSIS REPORT







Laboratory Sample No. Lab Number Test Package

Unique Number

: WC0836326 . 05929863 : 10615134 : MOB 2

: WearCheck USA - 501 Madison Ave., Cary, NC 27513 : 21 Aug 2023 Received Diagnosed : 22 Aug 2023

: Sean Felton Diagnostician

OAK GROVE KS 1150 E 700TH AVE ARCADIA, KS US 66711 Contact: KALEB WEAVER

kaleb.weaver@cubedistrictenergy.com T:

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)

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