

OIL ANALYSIS REPORT

Base Number (BN) mg KOH/g ASTM D2896

Area Catlettsburg [Catlettsburg] Oil - Starboard Genset

Starboard Genset

Fluid MARATHON 15W40 (--- 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 BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.



Sample Rating Trend

Sample Number Client Info WC0769549 WC0769473 WC0731847 Sample Date Client Info 28 Mar 2024 08 Aug 2023 01 Oct 2022 Machine Age hrs Client Info 364 0 0 Oil Changed Client Info 0 131 5463 Oil Changed Client Info 0 131 5463 Oil Changed Client Info 0 131 5463 CONTAMINATION method innit/base current history1 history2 Fuel VCO Method >4.0 <1.0 <1.0 stito Glycol WC Method >0.1 NEG NEG NEG Glycol WC Method >0.1 8 25 Chromium ppm ASTM 05155 5 0 0 0 Kickel ppm ASTM 05155 >5 0 0 0 0 Silver ppm ASTM 05155 >17 0 0 0 0	SAMPLE INFORM	IATION	method	limit/base	current	history1	history2
Machine Age hrs Client Info 3364 0 0 Oil Age Irrs Client Info 0 131 5463 Sample Status Imit Changed Changed NORMAL NORMAL NORMAL CONTAMINATION method imit/base current History1 History2 Fuel WC Method >4.0 <1.0 <1.0 <1.0 Water WC Method >0.1 NEG NEG NEG Glycol WC Method >50 1 8 25 Chromium ppm ASTM D5155m >50 0 0 0 Nickel ppm ASTM D515m >52 0 0 0 0 Silver ppm ASTM D515m >52 0 0 0 0 Silver ppm ASTM D515m >5 0 0 0 0 Chromium ppm ASTM D515m 5 0 0 0 0 <th>Sample Number</th> <th></th> <th>Client Info</th> <th></th> <th>WC0769549</th> <th>WC0769473</th> <th>WC0731847</th>	Sample Number		Client Info		WC0769549	WC0769473	WC0731847
Oil Age hrs Client Info 0 131 5463 Oil Changed Client Info Changed NA Sample Status Imil/base current history1 history2 Fuel WC Method >4.0 <1.0 <1.0 <1.0 Water WC Method >4.0 <1.0 <1.0 <1.0 Water WC Method Soft NEG NEG NEG WeAR METALS method imil/base current history1 history2 Iron ppm ASTM D5185m >50 1 8 25 Chromium ppm ASTM D5185m >50 0 0 0 Nickel ppm ASTM D5185m >50 0 0 0 Silver ppm ASTM D5185m >12 1 3 1 1 Lead ppm ASTM D5185m >70 <1 0 0 0 Changium ppm ASTM D51	Sample Date		Client Info		28 Mar 2024	08 Aug 2023	01 Oct 2022
Oil Changed Sample Status Client Info Changed NORMAL N/A N/A CONTAMINATION method limit/base current history1 history2 Fuel WC Method >4.0 <1.0 <1.0 <1.0 <1.0 Water WC Method >0.1 NEG NEG NEG Glycol WC Method >0.1 NEG NEG NEG WEAR METALS method limit/base current history1 history2 Iron ppm ASTM D5185m >50 1 8 25 Chromium ppm ASTM D5185m >2 0 0 0 Silver ppm ASTM D5185m >12 1 3 1 1 Lead ppm ASTM D5185m >17 0 0 0 0 Vanadium ppm ASTM D5185m 15 0 <1 0 Vanadium ppm ASTM D5185m 10 0 0	Machine Age	hrs	Client Info		3364	0	0
Sample Status NORMAL NORMAL NORMAL NORMAL NORMAL CONTAMINATION method imit/base current history1 history2 Fuel WC Method >4.0 <1.0 <1.0 <1.0 Water WC Method >0.1 NEG NEG NEG Glycol WC Method NEG NEG NEG NEG WEAR METALS method imit/base current history1 history2 Iron ppm ASTM D5185m<>50 1 8 25 Chromium ppm ASTM D5185m<>2 0 0 0 Chromium ppm ASTM D5185m<>2 0 0 0 0 Silver ppm ASTM D5185m<>12 1 3 1 Lead ppm ASTM D5185m<>17 0 0 0 0 0 Cadmium ppm ASTM D5185m 17 0 0 0 0 0 Cadmium ppm	Oil Age	hrs	Client Info		0	131	5463
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Fuel WC Method >4.0 <1.0	Sample Status				NORMAL	NORMAL	NORMAL
Water WC Method >0.1 NEG NEG NEG NEG Glycol WC Method NEG NEG NEG NEG WEAR METALS method limit/base current history1 history2 Iron ppm ASTM D5185m >50 1 8 25 Chromium ppm ASTM D5185m >2 0 0 0 Nickel ppm ASTM D5185m >2 0 0 0 Silver ppm ASTM D5185m >2 0 0 0 Aluminum ppm ASTM D5185m >70 <1 1 4 Tin ppm ASTM D5185m >15 0 <1 0 Vanadium ppm ASTM D5185m 0 0 0 0 Cadmium ppm ASTM D5185m 0 <1 0 0 ADDITIVES method imit/base current history1 history2 <th>CONTAMINATION</th> <th>N</th> <th>method</th> <th>limit/base</th> <th>current</th> <th>history1</th> <th>history2</th>	CONTAMINATION	N	method	limit/base	current	history1	history2
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WEAR METALS method limit/base current history1 history2 Iron ppm ASTM D5185m >50 1 8 25 Chromium ppm ASTM D5185m >4 0 <1 <1 Nickel ppm ASTM D5185m >2 0 0 0 Silver ppm ASTM D5185m >5 0 0 0 Aluminum ppm ASTM D5185m >5 0 0 0 Lead ppm ASTM D5185m >12 1 3 1 Lead ppm ASTM D5185m >70 <1 1 4 Tin ppm ASTM D5185m 0 0 0 0 Cadmium ppm ASTM D5185m 0 0 0 0 Vanadium ppm ASTM D5185m 6 3 0 0 Boron ppm ASTM D5185m 53 20 61 Manganese </th <th>Water</th> <th></th> <th>WC Method</th> <th>>0.1</th> <th>NEG</th> <th>NEG</th> <th>NEG</th>	Water		WC Method	>0.1	NEG	NEG	NEG
Iron ppm ASTM D5185m >50 1 8 25 Chromium ppm ASTM D5185m >4 0 <1 <1 Nickel ppm ASTM D5185m >2 0 0 0 Silver ppm ASTM D5185m >5 0 0 0 Aluminum ppm ASTM D5185m >5 0 0 0 Lead ppm ASTM D5185m >12 1 3 1 Lead ppm ASTM D5185m >70 <1 1 4 Tin ppm ASTM D5185m >70 <1 1 4 Tin ppm ASTM D5185m >15 0 <1 0 Vanadium ppm ASTM D5185m 0 0 0 0 Cadmium ppm ASTM D5185m 0 0 0 0 Barium ppm ASTM D5185m 53 20 61	Glycol		WC Method		NEG	NEG	NEG
Chromium ppm ASTM D5185m >4 0 <1	WEAR METALS		method	limit/base	current	history1	history2
Nickel ppm ASTM D5185m >2 0 0 0 Titanium ppm ASTM D5185m >5 0 0 0 Silver ppm ASTM D5185m >12 1 3 1 Lead ppm ASTM D5185m >12 1 3 1 Lead ppm ASTM D5185m >17 0 0 0 Copper ppm ASTM D5185m >15 0 <1 0 Vanadium ppm ASTM D5185m 15 0 <1 0 Vanadium ppm ASTM D5185m 0 0 0 0 Cadmium ppm ASTM D5185m 6 3 0 0 Boron ppm ASTM D5185m 0 0 0 0 Magnesium ppm ASTM D5185m 53 20 61 Magnesium ppm ASTM D5185m 1297 28 850 Cal	Iron	ppm	ASTM D5185m	>50	1	8	25
Titanium ppm ASTM D5185m 0 0 0 Silver ppm ASTM D5185m >5 0 0 0 Aluminum ppm ASTM D5185m >12 1 3 1 Lead ppm ASTM D5185m >17 0 0 0 Copper ppm ASTM D5185m >70 <1 1 4 Tin ppm ASTM D5185m >70 <1 0 0 Vanadium ppm ASTM D5185m 0 0 0 0 Cadmium ppm ASTM D5185m 0 0 0 0 Boron ppm ASTM D5185m 0 0 0 0 Magnesium ppm ASTM D5185m 53 20 61 Magnesium ppm ASTM D5185m 1297 28 850 Calcium ppm ASTM D5185m 1025 4123 2030 Phosphorus ppm <th>Chromium</th> <th>ppm</th> <th>ASTM D5185m</th> <th>>4</th> <th>0</th> <th><1</th> <th><1</th>	Chromium	ppm	ASTM D5185m	>4	0	<1	<1
Silver ppm ASTM D5185m >5 0 0 0 Aluminum ppm ASTM D5185m >12 1 3 1 Lead ppm ASTM D5185m >17 0 0 0 Copper ppm ASTM D5185m >70 <1 1 4 Tin ppm ASTM D5185m >15 0 <1 0 Vanadium ppm ASTM D5185m 0 0 0 0 Cadmium ppm ASTM D5185m 0 0 0 0 ADDITIVES method Imit/base current history1 history2 Boron ppm ASTM D5185m 6 3 0 0 Magnaese ppm ASTM D5185m 53 20 61 0 Magnesium ppm ASTM D5185m 1297 28 850 2030 Phosphorus ppm ASTM D5185m 971 27 603	Nickel	ppm	ASTM D5185m	>2	0	0	0
Atuminum ppm ASTM D5185m >12 1 3 1 Lead ppm ASTM D5185m >17 0 0 0 Copper ppm ASTM D5185m >70 <1 1 4 Tin ppm ASTM D5185m >15 0 <1 0 Vanadium ppm ASTM D5185m 0 0 0 0 Cadmium ppm ASTM D5185m 0 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185m 6 3 0 0 Magnaese ppm ASTM D5185m 53 20 61 Magnesium ppm ASTM D5185m 1297 28 850 Calcium ppm ASTM D5185m 1297 603 2030 Phosphorus ppm ASTM D5185m 971 27 603 Sulfur	Titanium	ppm	ASTM D5185m		0	0	0
Lead ppm ASTM D5185m >17 0 0 0 Copper ppm ASTM D5185m >70 <1 1 4 Tin ppm ASTM D5185m >15 0 <1 0 Vanadium ppm ASTM D5185m 0 0 0 0 Cadmium ppm ASTM D5185m 0 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185m 6 3 0 0 Malganese ppm ASTM D5185m 0 0 0 0 Magnesium ppm ASTM D5185m 1297 28 850 0 2030 Phosphorus ppm ASTM D5185m 1297 28 850 Calcium ppm ASTM D5185m 971 27 603 2030 Phosphorus ppm ASTM D5185m 971 27 603 <t< th=""><th>Silver</th><th>ppm</th><th>ASTM D5185m</th><th>>5</th><th>0</th><th>0</th><th>0</th></t<>	Silver	ppm	ASTM D5185m	>5	0	0	0
Copper ppm ASTM D5185m >70 <1	Aluminum	ppm	ASTM D5185m	>12	1	3	1
Tin ppm ASTM D5185m >15 0 <1	Lead	ppm	ASTM D5185m	>17	0	0	0
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Cadmium ppm ASTM D5185m 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185m 6 3 0 Barium ppm ASTM D5185m 6 3 0 Barium ppm ASTM D5185m 0 0 0 0 Molybdenum ppm ASTM D5185m 53 20 61 Manganese ppm ASTM D5185m 1297 28 850 Calcium ppm ASTM D5185m 1025 4123 2030 Phosphorus ppm ASTM D5185m 971 27 603 Zinc ppm ASTM D5185m 971 27 603 Sulfur ppm ASTM D5185m 3964 4195 3707 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >20 1	Tin	ppm	ASTM D5185m	>15	0	<1	0
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Boron ppm ASTM D5185m 6 3 0 Barium ppm ASTM D5185m 0 0 0 0 Molybdenum ppm ASTM D5185m 53 20 61 Manganese ppm ASTM D5185m 53 20 61 Manganese ppm ASTM D5185m 53 20 61 Magnesium ppm ASTM D5185m 1297 28 850 Calcium ppm ASTM D5185m 1025 4123 2030 Phosphorus ppm ASTM D5185m 971 27 603 Zinc ppm ASTM D5185m 971 27 603 Sulfur ppm ASTM D5185m 3964 4195 3707 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >20 1 <1 0 INFRA-RED method limit/base current	Cadmium	ppm	ASTM D5185m		0	0	0
Barium ppm ASTM D5185m 0 0 0 Molybdenum ppm ASTM D5185m 53 20 61 Manganese ppm ASTM D5185m <1 <1 0 Magnesium ppm ASTM D5185m 1297 28 850 Calcium ppm ASTM D5185m 1025 4123 2030 Phosphorus ppm ASTM D5185m 971 27 603 Zinc ppm ASTM D5185m 971 27 603 Sulfur ppm ASTM D5185m 971 27 603 Sulfur ppm ASTM D5185m 971 27 603 Sulfur ppm ASTM D5185m 3964 4195 3707 CONTAMINANTS method Imit/base current history1 history2 Silicon ppm ASTM D5185m >20 1 <1 0 INFRA-RED method Imit/base current history1	ADDITIVES		method	limit/base	current	history1	history2
Molybdenum ppm ASTM D5185m 53 20 61 Manganese ppm ASTM D5185m <1 <1 0 Magnesium ppm ASTM D5185m 1297 28 850 Calcium ppm ASTM D5185m 1025 4123 2030 Phosphorus ppm ASTM D5185m 971 27 603 Zinc ppm ASTM D5185m 971 27 603 Sulfur ppm ASTM D5185m 3964 4195 3707 Solicon ppm ASTM D5185m >25 4 3 4 Sodium ppm ASTM D5185m >20 1 <1 0 INFRA-RED method limit/base current history1	Boron	ppm	ASTM D5185m		6	3	0
Marganese ppm ASTM D5185m <1	Barium	ppm	ASTM D5185m		0	0	0
Magnesium ppm ASTM D5185m 1297 28 850 Calcium ppm ASTM D5185m 1025 4123 2030 Phosphorus ppm ASTM D5185m 971 27 603 Zinc ppm ASTM D5185m 971 27 603 Sulfur ppm ASTM D5185m 971 27 603 Sulfur ppm ASTM D5185m 971 27 603 Sulfur ppm ASTM D5185m 3964 4195 3707 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >25 4 3 4 Sodium ppm ASTM D5185m >20 1 <1 0 Potassium ppm ASTM D5185m >20 1 <1 0.2 INFRA-RED method limit/base current history1 history2 Soot % % *ASTM	•	ppm	ASTM D5185m		53	20	61
Calcium ppm ASTM D5185m 1025 4123 2030 Phosphorus ppm ASTM D5185m 971 27 603 Zinc ppm ASTM D5185m 971 27 603 Sulfur ppm ASTM D5185m 1136 9 761 Sulfur ppm ASTM D5185m 3964 4195 3707 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >25 4 3 4 Sodium ppm ASTM D5185m >25 4 3 4 Sodium ppm ASTM D5185m >25 4 3 4 Sodium ppm ASTM D5185m >20 1 <1 0 INFRA-RED method limit/base current history1 history2 Soot % % *ASTM D7624 >20 5.2 10.5 13.1 Sulfation	Manganese	ppm	ASTM D5185m		<1	<1	0
Phosphorus ppm ASTM D5185m 971 27 603 Zinc ppm ASTM D5185m 1136 9 761 Sulfur ppm ASTM D5185m 3964 4195 3707 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >25 4 3 4 Sodium ppm ASTM D5185m >25 4 3 4 Sodium ppm ASTM D5185m >20 1 <10	Magnesium	ppm	ASTM D5185m		1297	28	850
Zinc ppm ASTM D5185m 1136 9 761 Sulfur ppm ASTM D5185m 3964 4195 3707 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >25 4 3 4 Sodium ppm ASTM D5185m >25 4 3 4 Sodium ppm ASTM D5185m >20 5 11 0 INFRA-RED method limit/base current history1 history2 Soot % % *ASTM D7844 0.1 0.1 0.2 Nitration Abs/cm *ASTM D7624 >20 5.2 10.5 13.1 Sulfation Abs/.imm *ASTM D7415 >30 18.3 13.4 21.5 FLUID DEGRADATION method limit/base current history1 history2	Calcium	ppm	ASTM D5185m		1025	4123	2030
SulfurppmASTM D5185m396441953707CONTAMINANTSmethodlimit/basecurrenthistory1history2SiliconppmASTM D5185m>25434SodiumppmASTM D5185m0511PotassiumppmASTM D5185m>201<10INFRA-REDmethodlimit/basecurrenthistory1history2Soot %%*ASTM D78440.10.10.2NitrationAbs/cm*ASTM D7624>205.210.513.1SulfationAbs/lmm*ASTM D7415>3018.313.421.5FLUID DEGRADATIONmethodlimit/basecurrenthistory1history2	Phosphorus	ppm					
CONTAMINANTSmethodlimit/basecurrenthistory1history2SiliconppmASTM D5185m>25434SodiumppmASTM D5185m0511PotassiumppmASTM D5185m>201<10INFRA-REDmethodlimit/basecurrenthistory1history2Soot %%*ASTM D78440.10.10.2NitrationAbs/cm*ASTM D7624>205.210.513.1SulfationAbs/lmm*ASTM D7415>3018.313.421.5FLUID DEGRADATIONmethodlimit/basecurrenthistory1history2	Zinc	ppm				9	
Silicon ppm ASTM D5185m >25 4 3 4 Sodium ppm ASTM D5185m 0 5 11 Potassium ppm ASTM D5185m >20 1 <1	Sulfur	ppm	ASTM D5185m		3964	4195	3707
Sodium ppm ASTM D5185m 0 5 11 Potassium ppm ASTM D5185m<>20 1 <1 0 INFRA-RED method limit/base current history1 history2 Soot % % *ASTM D7844 0.1 0.1 0.2 Nitration Abs/cm *ASTM D7624 >20 5.2 10.5 13.1 Sulfation Abs/.1mm *ASTM D7415 >30 18.3 13.4 21.5 FLUID DEGRADATION method limit/base current history1 history2	CONTAMINANTS		method	limit/base	current	history1	history2
Potassium ppm ASTM D5185m >20 1 <1	Silicon	ppm	ASTM D5185m	>25	4	3	4
INFRA-REDmethodlimit/basecurrenthistory1history2Soot %%*ASTM D78440.10.10.2NitrationAbs/cm*ASTM D7624>205.210.513.1SulfationAbs/.tmm*ASTM D7415>3018.313.421.5FLUID DEGRADATIONmethodlimit/basecurrenthistory1history2	Sodium	ppm	ASTM D5185m		0	5	11
Soot % % *ASTM D7844 0.1 0.1 0.2 Nitration Abs/cm *ASTM D7624 >20 5.2 10.5 13.1 Sulfation Abs/.1mm *ASTM D7415 >30 18.3 13.4 21.5 FLUID DEGRADATION method limit/base current history1 history2	Potassium	ppm	ASTM D5185m	>20	1	<1	0
Nitration Abs/cm *ASTM D7624 >20 5.2 10.5 13.1 Sulfation Abs/.1mm *ASTM D7415 >30 18.3 13.4 21.5 FLUID DEGRADATION method limit/base current history1 history2	INFRA-RED		method	limit/base	current	history1	history2
SulfationAbs/.1mm*ASTM D7415>3018.313.421.5FLUID DEGRADATIONmethodlimit/basecurrenthistory1history2	Soot %	%	*ASTM D7844		0.1	0.1	0.2
FLUID DEGRADATION method limit/base current history1 history2	Nitration	Abs/cm	*ASTM D7624	>20	5.2	10.5	13.1
	Sulfation	Abs/.1mm	*ASTM D7415	>30	18.3	13.4	21.5
Oxidation Abs/.1mm *ASTM D7414 >25 14.5 8.8 21.0	FLUID DEGRADA	TION	method	limit/base	current	history1	history2
	Oxidation	Abs/.1mm	*ASTM D7414	>25	14.5	8.8	21.0

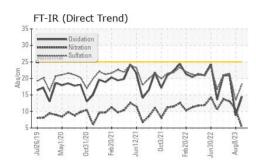
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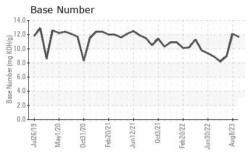
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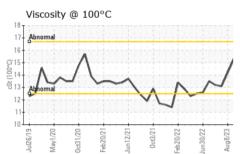
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OIL ANALYSIS REPORT

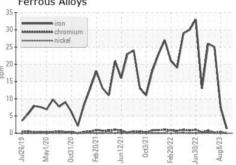


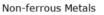


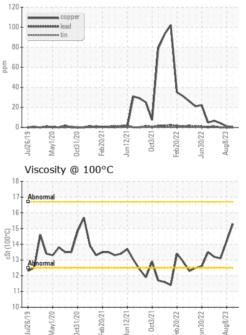


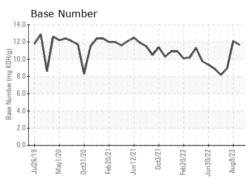
VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Yellow Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Precipitate	scalar	*Visual	NONE	NONE	NONE	NONE
Silt	scalar	*Visual	NONE	NONE	NONE	NONE
Debris	scalar	*Visual	NONE	NONE	NONE	NONE
Sand/Dirt	scalar	*Visual	NONE	NONE	NONE	NONE
Appearance	scalar	*Visual	NORML	NORML	NORML	NORML
Odor	scalar	*Visual	NORML	NORML	NORML	NORML
Emulsified Water	scalar	*Visual	>0.1	NEG	NEG	NEG
Free Water	scalar	*Visual		NEG	NEG	NEG
FLUID PROPERT	IES	method	limit/base	current	history1	history2
Visc @ 100°C	cSt	ASTM D445		15.3	14.2	13.1
GRAPHS						

Ferrous Alloys









Laboratory : WearCheck USA - 501 Madison Ave., Cary, NC 27513 MARATHON PETROLEUM CO. : WC0769549 Sample No. Received : 05 Apr 2024 101 12TH ST Lab Number : 06140131 Tested : 08 Apr 2024 CATLETTSBURG, KY Unique Number : 10964939 Diagnosed : 09 Apr 2024 - Sean Felton US 41169 Test Package : IND 2 Contact: Barry Bridges Certificate 12367 To discuss this sample report, contact Customer Service at 1-800-237-1369. babridges@marathonpetroleum.com * - Denotes test methods that are outside of the ISO 17025 scope of accreditation. T: (731)607-4313 Statements of conformity to specifications are based on the simple acceptance decision rule (JCGM 106:2012) F:

Report Id: MARCAT [WUSCAR] 06140131 (Generated: 04/09/2024 15:13:22) Rev: 1

Submitted By: M/V CATLETTSBURG

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