SOD-1Plus MARINE

Test Results

Test Partner: Minoshima Marine Ltd

D1 Chemical Co. Ltd

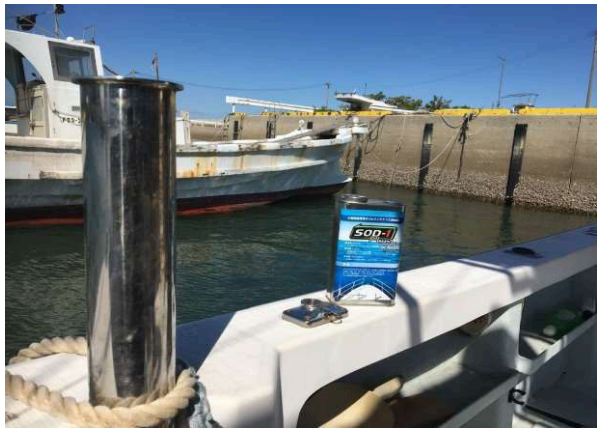
Test Vessel Data ①

Test date : 7/10/21
Test boat : Yanmar EX40-DS
Engine : 6CXAS-GT　443hp
Drive type : Shaft driven
Hour meter : 538hrs（※1）
Fuel : Diesel
Year of manufacture : 2006

Current state

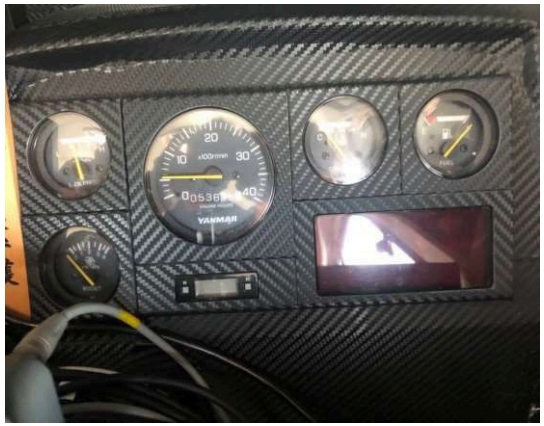
- Main engine state good, no damage to hull visible
- Some black smoke emittted
- Some oil leaks around oil cooler
- Recent oil change

※1　年数的に1周以上回った可能性があるとの事



Weather : Sunny
Temp : 26.6℃
Humidity : 60%
Air press : 1013hpa

Engine view



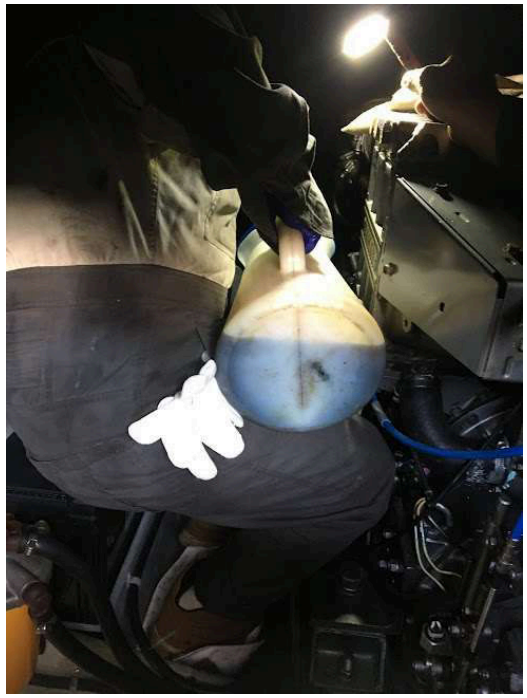
Meter reading 536hrs
Idling speed 500rpm

Vibration measurement
Owner using steering wheel

Noise measurement
Maintenance hatch edge

Measuring devices
Vibration : TYPE 3116（Accor)
Noise : NL-42(RION)

SOD-1Plus MARINE Adding Method



- Addition ratio 10% of engine oil。
- 6CXAS-GT Engine Oil amount：40L＝36L＋SOD-1Plus for MARINE　4L
- SOD-1Plus MARINE not pre-mixed with engine oil、simply added after oil
- SOD-1Plus MARINE can be added to engine, marine gear, drive gear

Vibration data

Pre-addition idling 500rpm
Vibration level：2.25m/s2

Post-addition idling 600rpm
Vibration level：1.22m/s2

Pre-addition engine at 1,000rpm
Vibration level：1.04m/s2

Post-addition engine at 1,000rpm
Vibration level：0.30m/s2

・Vibration at idling reduced by 1.03m/s2。Idling level increased by 100rpm but vibration level fell greatly。
・Vibration level fell by more than 50% even at engine level 1000rpm。Smoother running made for more comfortable vessel.
・Steering wheel vibration reduction makes for easier handling.

Noise Level Data

Pre-addition at
1,500rpm
Noise : 84.9dB

Post-addition at
1,500rpm
Noise : 84.1dB

Pre-ad 2,000rpm
Noise : 93.3dB

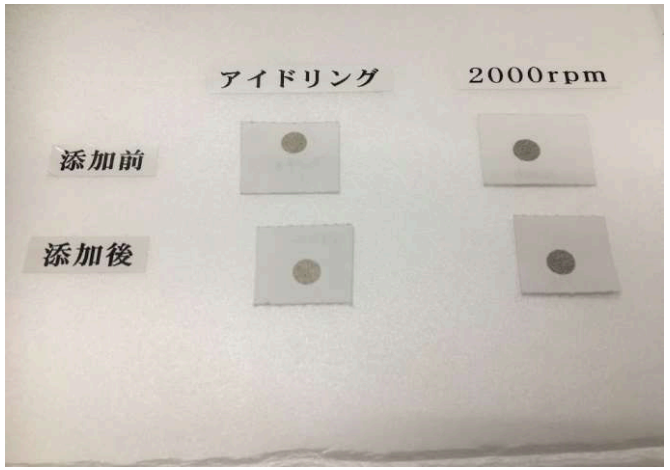
Post-ad 2,000rpm
Noise : 93.1dB

- No noise reduction at idling speed
- At higher speed noise reduction not much
- Character of noise changed from harsh to normal

Overall Evaluation

Pre-ad idling 500rpm

Post-ad idling 600rpm



Exhaust soot test

- For no-throttle diesel engines, idling speed is set by adjusting the amount of fuel injected.
- The cause of an extra 100rpm idling speed after addition is the decrease in resistance within the engine, hence a smoother revolution, and improved compression because of a thicker oil film. Better combustion efficiency for the same amount of fuel injected leads to higher revolution.
- The exhaust soot test showed a slight decrease in soot emitted, due to improved combustion efficiency.

The Merit of SOD-1PlusMARINE

- Improved engine power and exhaust soot reduction because of better combustion efficiency.
- More comfort due to vibration reduction. Less damage due to vibration.
- Reduced engine wear from better lubrication and longer engine life.
- Elimination of dry starts due to oil film strength in engines unused for long periods.
- Removal of engine sludge due to detergent effect and prevention of varnish buildup.

Test Vessel Data ②

Test boat : Yanmar fishing boat
Engine : 4JH3　69hp
Drive type : Drive engine
Hour meter : 2426hrs（※1）
Fuel : Diesel

Current state

- Excessive oil consumption（1 litre/month。）
- Black, blue smoke exhaust emission
- Jarring engine noise

※1　年数的に1周以上回った可能性があるとの事

Pre-addition data【13：00～14：00】

Weather：cloudy
rain
Temp 17．4℃
Humid.36．4%
Press.1020hpa

Engine view

Hour meter 2426h

Pre-ad idling 500rpm
Vibration：5.84m/s2
Noise：87.8dB

Pre-ad 1,500rpm
Vibration：15.68m/s2
Noise：96.7dB

- Measured while idling, jarring noise and heavy vibrations
- Vibrations increased as speed increased.

Maintenance tasks

Boat on wharf

Standard Yanmar engine oil

Oil removed

SOD! Plus added

This boat regularly maintained by Minoshima Co. so drive gear oil in good state.
Because of excessive oil consumption, extra oil added sometimes.

- Drive gear oil capacity 3L　10%　300ml SOD1 Plus
- Engine oil capacity 7L　10%　700ml SOD1 Plus

Post—addition data

Pre-addition idling [500rpm]
Vibration：5.84m/s2
Noise：87.8dB

Post-ad idling [500rpm]
Vibration：4.22m/s2
Noise：87.5dB

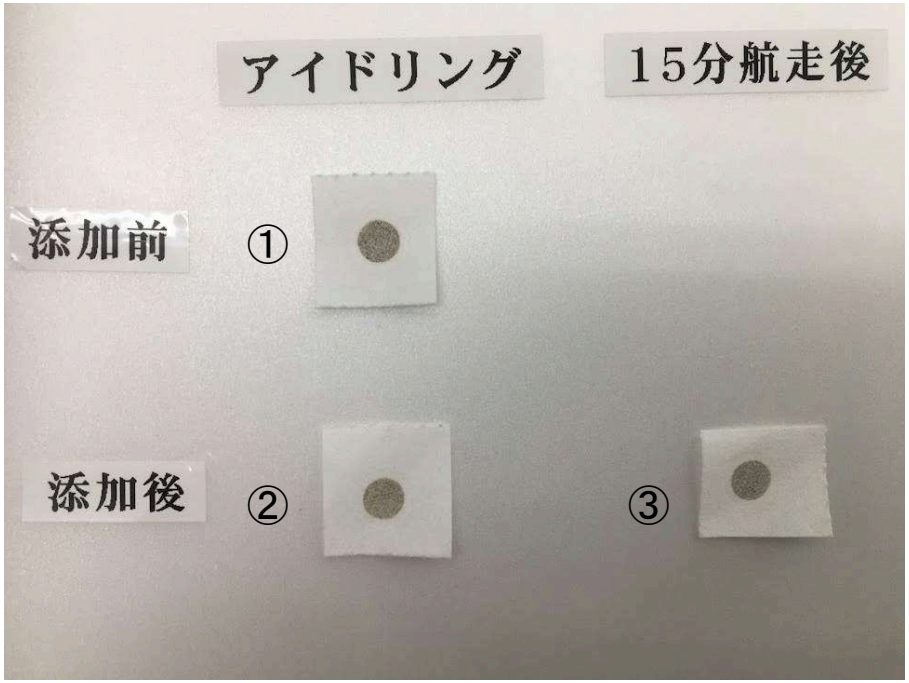
Pre-add 1,500rpm
Vibration：15.68m/s2
Noise：96.7dB

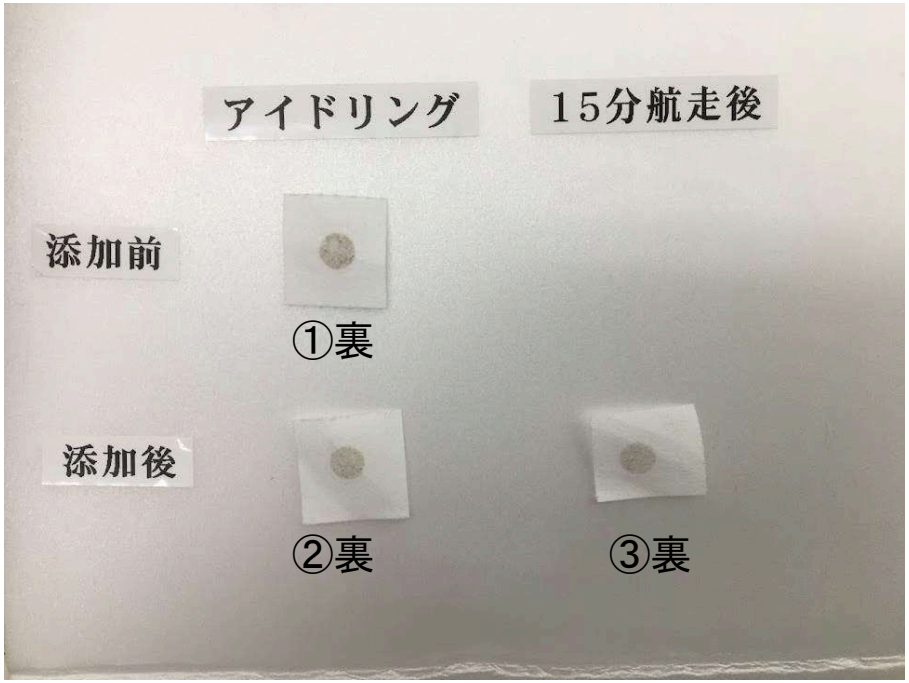
Post-ad 1,500rpm
Vibration：11.99m/s2
Noise：96.3dB

天候：くもり
気温18.0℃
湿度40.5%
大気圧1020hpa

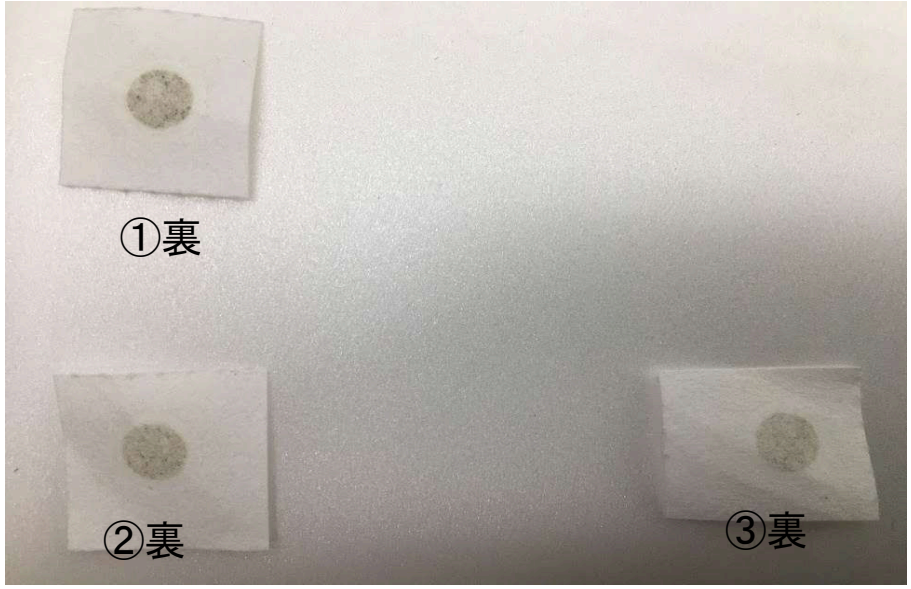
・After addition, jarring metallic engine noise reduced and overall noise level reduced.
・Vibration level greatly reduced, wear and tear on engine reduced due to smoother engine revolution.

Black smoke emission test results





Rear of test filter



Rear of test filter view

・Pre- and post-addition, although filters seem unchanged, No. 3 filter is clearly less marked after 15 mins running. This is because the engine burned less oil than before SOD1 Plus was added, so soot was much reduced.

Test Vessel Data ③

Test date : 24/12/2021
Test boat : Yamaha 4-cycle 88hp Outboard motor
Engine type : F90C
Hour meter : 105hrs
Fuel : Petrol
Engine oil capacity : 3.0L～3．2L
Gear oil capacity : 0．76L

Current state

- Good condition, regular maintenance done.
- No breakdowns or oil leaks

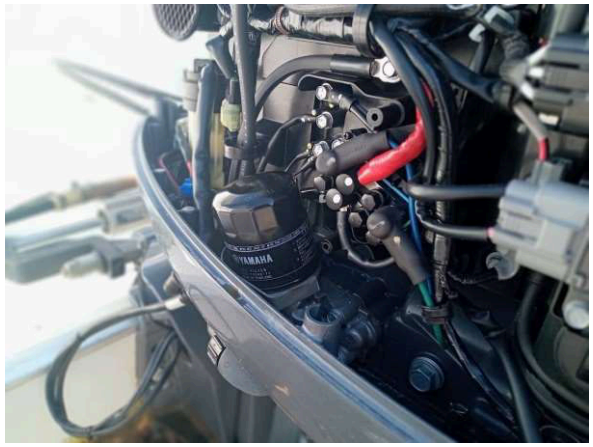
Pre-addition data 【11:00～11:20】

Weather: Sunny
Temp:10. 6℃
Humidity:10. 2%
Bar. Pressure:1020hpa

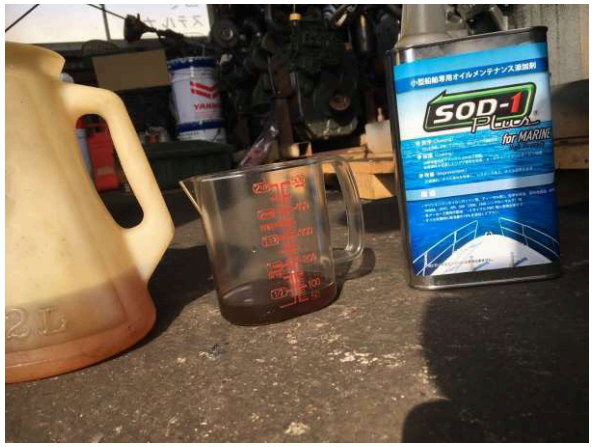
Pre-ad idling 700rpm
Vibration : 1.84m/s2
Noise : 64.1dB

Pre-ad speed 1,500rpm
Vibration : 2.69m/s2
Noise : 70.9dB

Maintenance tasks



Remove engine cover



Pre-mix with gear oil

Inject using pump

Pre-mix with engine oil

Pour in engine oil

- Drive gear oil
  0.76L 10% 76ml SOD1 Plus

- Engine oil
  3L～3.2L 10% 320ml SOD1 Plus

Post-addition data【14:00～14:30】

Pre-ad idling 700rpm
Vibration：1.84m/s2
Noise：64.1dB

Post-ad idling 700rpm
Vibration：1.06m/s2
Noise：62.3dB

Pre-ad speed 1,500rpm
Vibration：2.69m/s2
Noise：70.9dB

Post-ad speed1,500rpm
Vibration：2.49m/s2
Noise：70.2dB

Both vibration and noise levels reduced.

Overall Evaluation

Conclusions after test adding SOD-1Plus Marine

- Vibration greatly reduced when added to engine oil.
- Combustion efficiency increased so black and blue smoke reduced.
- Noise level reduction makes for more comfortable operation.

Expected benefits of adding SOD-1Plus MARINE

・Engine vibration reduced, friction reduced, longer engine life.
・Reduced trouble from dirty oil, maintenance costs down.
・Improved oil consumption.
・Sludge removed from engine parts, varnish prevention.
・Cleaner exhaust gas.
・Drive gear friction reduced, improved power transmission
・Engine and gear oil leaks prevented.