

## 2-Cycle Testing

The most important test for all 2 Cycle engine oils is JASO M345: Japanese Automotive Standards Organization [http://www.jalos.or.jp/onfile/pdf/2T\\_EV1904.pdf](http://www.jalos.or.jp/onfile/pdf/2T_EV1904.pdf)

The leading OEMs for small engine power equipment build their equipment around the JASO standard. Its critical for any oil to adhere to the minimum standards of JASO M345 to maintain the OEM warranty across all equipment such as; chainsaws, mowers, hedgers, leaf blowers, etc. The main characteristics of the JASO test are lubricity and detergency.

NV EARTH 2 Cycle oil has passed the minimum standards for JASO M345 and qualifies for JASO FD certification. Due to the official costs of the tests and FD certifications from SWRi, NV EARTH is postponing certification until Gen2. With a significant formula change in progress from Gen1, NV EARTH can claim "meets and exceeds" JASO M345 minimum specifications based on the 1000+ hours of testing but the official FD certification will be on Gen2, in late 2019. Some of the testing data is below where NV EARTH is compared against a petroleum synthetic (Sample B) and a leading conventional petroleum brand (Sample C). Same test, same equipment, different results.

### PISTON INTAKE



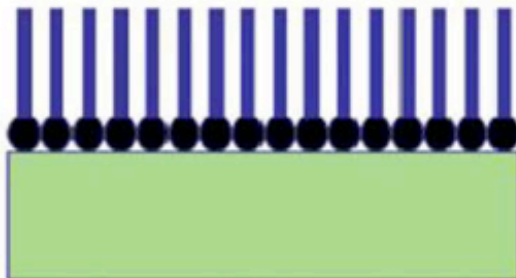
### PISTON PTO



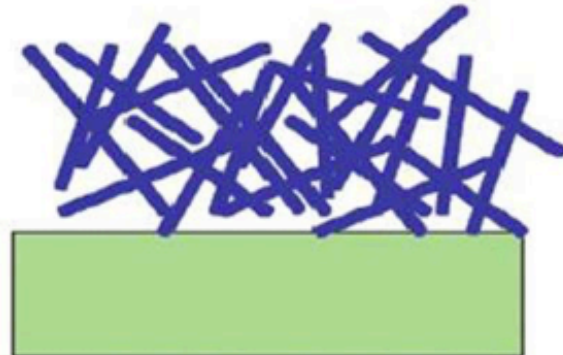
### PISTON EXHAUST



The smaller molecule and polarity, which petroleum does not have, allows the plant oil to cover more places (microscopically) and have a stronger boundary film.



**Bio-based  
lubricants are  
attracted to metal**



**Petroleum Oil is  
non-polar, no  
attraction**

NV EARTH 2 Cycle Engine Oil uses the same base oil that is in the NV EARTH 4 Cycle Engine Oil, NV EARTH ISO Hydraulic Fluids and NV EARTH Automotive Engine Oil. All NV EARTH engine oils are tested against petroleum standards which include JASO, API, ISO, ASTM, SAE, etc. The following is a summary of NV EARTH engine testing as of March 2019. Further testing will be completed and released in 2019 as NV EARTH commercializes the second generation of formulas that will match or exceed synthetic petroleum. Today NV EARTH meets and exceeds conventional petroleum properties and equipment standards but the mission is to have the highest performance engine oil in the industry while also being the absolute safest for the operator and the environment.

Item		Test Method	Test Result (Performance Index)	Standard Index FD	
Lubricity		JASO M 340	125	95 Min.	
Initial Torque		JASO M 340	99	98 Min.	
Detergency	60 Min.	Fundamental Part	JASO M 341	100	
		Piston Skirt Part	60 Min. test	97	
	180 Min.	Fundamental Part	JASO M 341	128	125 Min.
		Piston Skirt Part	180 Min. test	105	95 Min.
Smoke		JASO M 342	113	85 Min.	
Exhaust System Blocking Test		JASO M 343	158	90 Min.	

## Physical and Chemical Properties

Item		Test Method	Measured Value	Specification
		ASTM		
Density (15°C)	g/cm <sup>3</sup>	D1298	0.8432	Report
Flash Point	°C	D92	138	70 Min.
Kinematic Viscosity (40°C)	mm <sup>2</sup> /s	D445	54.2	Report
Kinematic Viscosity (100°C)	mm <sup>2</sup> /s	D445	8.5	6.5 Min.
Viscosity Index		D2270	131	Report
Brookfield Viscosity (-25°C)	cP	D2983	7098	<7500
<i>SAE Fluidity – Grade 3</i>				
Sulfated Ash	Mass %	D874	0.09	0.25 Max.
Pour Point	°C	D97	-42	Report
Color (Visual Inspection)			red	Report