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19/1/24

18 year test: ~5x increase in engine lifespan

At ~20,000 km a 2006 Toyota 1.3 L (2NZ-FE) 4-cylinder Yaris 5-door hatch was treated with XcelPlus Engine Treatment (via the oil).

After treatment with XcelPlus Engine Treatment wear was reduced by ~84 % (measured at 366,294 km): This is 1/5 normal wear and is equivalent to a ~5x increase in engine lifespan N.B. The primary wear metal in alloy engines is iron, followed by aluminium and copper. The number of breakdowns/repairs reduces in direct proportion to a reduction in wear.

Table 1 Oil analysis

Metals	Parts Per Million (ppm) mg/L			
	20,607 km*	366,294 km	Change	%
Iron (Fe)	22	6	-16	-72
Copper	11	0	-11	-100
Aluminium (Al)	7	0	-7	-100
Chromium (Cr)	0	0	n/a	n/a
Tin (Sn)	2	0	-2	-100
Nickel (Ni)	2	0	-2	-100
Lead (Pb)	1	3	n/a	n/a
Total	45	9	-38	-84

*Compared with a similar untreated (2NZ-FE) engine from a 2015 Yaris

Background

- Serviced regularly at ~10,000 km intervals
- Compression test at ~340,000 km showed 142 PSI across all 4 cylinders
- Cam chain shows no signs of wear
- The engine is very quiet: An indicator of good lubrication
- It runs like it did when it was new e.g. Fuel efficiency remains at ~14 km/L
- Passed 2023 roadworthy: No problems identified
- No work has been done to the engine other than normal service items
- Retreated with XcelPlus Engine Treatment ~180,000 km (as per recommendation)



Figure 1 2006 Toyota Yaris 1.3 L 5-door hatch

Fuel dilution

Two per cent fuel dilution was identified as being caused by the use of E10 (10% ethanol) fuel. Ethanol is a much stronger solvent than petrol and will bypass the rings. Ethanol ends up in the sump causing fuel dilution. Fuel dilution compromises the lubricating properties of oil. Newer cars with low-tension rings and direct injection engines are particularly prone to fuel dilution N.B. Normally wear would increase if lubrication is compromised: Fuel dilution has not increased wear due to XcelPlus protection.

Sludge formation

Ethanol oxidises upon combustion and polymerises to form sticky viscous sludge. This gums up your rings which increases oil use and fuel dilution of the oil. This is why anyone using ethanol fuel should change oil more frequently N.B. Flushing with XcelPlus Sludge Out (carried out just before an oil change) and treating with XcelPlus Ring Free (applied after changing the oil) are two ways to remove sludge from an engine.

TECHNICAL ADVANCE FOR ECONOMIC GAIN
Wear Metal Report:

00429352

Client:

MICHAEL CZAJKA

Attention:

-

Machine:

TOYOTA YARIS 2006

ID No: 1EH5AU

Oil Name:

LUBRIMAXX POWER SYN ENGINE OIL

Visc@40°C:

105

Visc@100°C:

15

TBN:

8

Compartm't:

ENGINE

Sample Date:

- - - - - 29/12/2023

Received Date

- - - - - 04/01/2024

Analysis Date:

- - - - - 04/01/2024

Reported Date

- - - - - 05/01/2024

Sample no:

- - - - - 00429352

SMU:(hrs)

- - - - - 366294

Oil Hrs:

- - - - - 10284

Oil Changed:

- - - - - Yes

Component Hours

- - - - - -

Wear Metal Rate

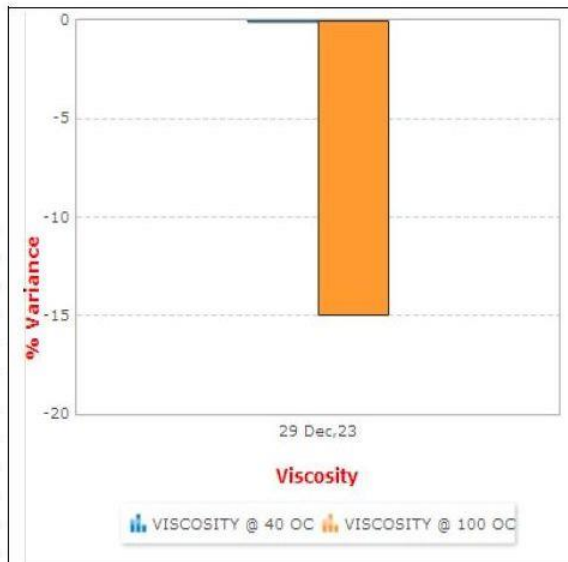
- - - - - 0.00

Serial Number

- - - - - -

Work Order Number

- - - - - -


Wear Metals

	METHOD	PPM	PPM	PPM	PPM	PPM	PPM	Caut	High
lead (Pb)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	3.0	9	15
iron (Fe)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	6.0	65	75
aluminium (Al)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	0.0	15	22
copper (Cu)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	0.0	10	15
chromium (Cr)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	0.0	9	15
tin (Sn)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	0.0	9	15
nickel (Ni)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	0.0	9	15

Contaminants

silicon (Si)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	4.0	18	25
sodium (Na)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	8.0	10	18

Oil Additives

magnesium (Mg)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	139.0		
zinc (Zn)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	742.0	0	0
molybdenum (Mo)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	17.0	0	0
calcium (Ca)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	1489.0	0	0
phosphorous (P)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	650.0	0	0
boron (B)(mg/kg)	ASTM D5185	n/a	n/a	n/a	n/a	n/a	42.0	0	0

Infra Red

TBN(mg KOH/gr)	ASTM E2412	n/a	n/a	n/a	n/a	n/a	4.5	+25	+50
TAN(mg KOH/gr)	ASTM D974*	n/a	n/a	n/a	n/a	n/a	0.0	1.5	3
soot(Abs/cm)	ASTM E2412	n/a	n/a	n/a	n/a	n/a	24.0	40	70
glycol(% vol)	ASTM E2412	n/a	n/a	n/a	n/a	n/a	n/a	0	0
water(ppm)	ASTM D6304	n/a	n/a	n/a	n/a	n/a	0.0	0	0
fuel dilution(% vol)	ASTM D7593	n/a	n/a	n/a	n/a	n/a	2.00	1	3
oxidation((x.100)abs/0.1mm)	ASTM E2412	n/a	n/a	n/a	n/a	n/a	17.0	24	40
nitration((x.100)abs/0.1mm)	ASTM E2412	n/a	n/a	n/a	n/a	n/a	8.0	24	40
sulphation((x.100)abs/0.1mm)	ASTM E2412	n/a	n/a	n/a	n/a	n/a	23.0	24	40

Physical Tests

water(% vol)	ASTM E2412	n/a	n/a	n/a	n/a	n/a	0.0	0.2	0.5
F.debris(mg Fe/L)	ASTM D8120	n/a	n/a	n/a	n/a	n/a	0.0	23	38
visc @ 100oC(cSt)	ASTM D7279	n/a	n/a	n/a	n/a	n/a	12.8	+10	+30
visc @ 40oC(cSt)	ASTM D7279	n/a	n/a	n/a	n/a	n/a	n/a	0	0
ISO Code Part/ml(Part/mL)	ISO 4406*	-/-	-/-	-/-	-/-	-/-	0/0/0	-/-	-/-

Particle Cleanliness Analysis - ISO CODE 4406

4 m	0.00
6 µm	0.00
14 µm	0.00
SAE AS 4059 NAS CODE	-

Element Trends Graph

For enquiries, contact: Gunnedah Laboratory email: laboratory@techenomics.com phone: (02) 6742 1892

Notes: * Out of accreditation. This wear analysis and oil condition report should be used in conjunction with normal maintenance and evaluated from sample to sample. Every care will be taken in processing samples but no express or implied guarantee is furnished in regard to the continuing operation or condition of this machinery or any part thereof.