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## Soot was totally eliminated & engine life was doubled

The 2012 Suzuki DR650 is a single-cylinder air-cooled 4-stroke motorcycle with a wet sump and an external oil cooler. It has twin spark plugs and a foam air filter (which reduces silicon levels). An air-cooled engine runs at almost double the temperature (~180 °C) of a water-cooled engine (<100 °C). Higher temperatures make the oil work much harder, increase wear and require more frequent 6,000 km oil change intervals.

After running in the engine for 16,000 km, the first oil sample was taken. The oil and filter were changed before adding Xcelplus Engine Treatment. Sampling intervals were ~6,000 km for all samples.

## **Summary**

Engine wear was halved (-55 %): Half the wear = double the lifespan

Soot production was eliminated: Cleaner combustion increases engine life. Soot can produce significant amounts of engine wear through abrasion

✓ Soot -100 %

Table 1 Reduction in wear, improvement in combustion efficiency and viscosity

Metals	ppm			
	16,001 km	34,037 km	Change	%
Iron (Fe)	60	31	-29	-48
Aluminium (Al)	21	9	-12	-57
Copper (Cu) <sup>1</sup>	61	24	-37	-60
Tin (Sn)	15	6	-9	-60
Nickel (Ni)	1	1	0	0
Lead (Pb)	1	1	0	0
<b>Total metals</b>	159	72	87	-55
Soot <sup>2</sup>	16	0	-16	-100
Total particles <sup>3</sup>	175	72	-103	-59
Viscosity <sup>4</sup> @ 100 °C	11.20	13.90	+2.7	+24
Viscosity @ 40 °C	83.00	97.00	+14	+16

- 1) Copper wear fluctuates from test to test and probably comes from the oil cooler.
- 2) Soot is the by-product of incomplete combustion and adsorbs the anti-wear additives in your oil.
- 3) Particles in an engine cause wear, increase noise, vibration and temperature while decreasing power.
- 4) The viscosity of the oil improves as wear decreases, and the engine runs cleaner.



Figure 1 DR650SE 2012



## **CONDITION MONITORING**

0.0

-20.0



**PROBLEM** 

Viscosity

## TECHNICAL ADVANCE FOR ECONOMIC GAIN

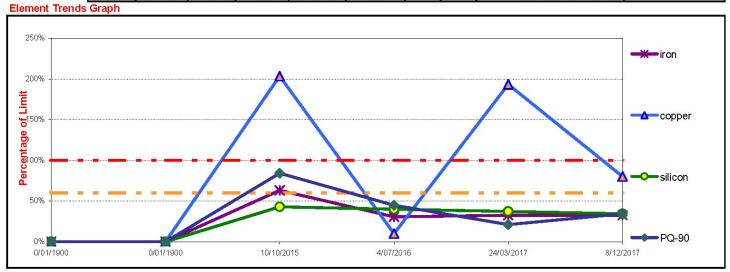
Wear Metal Report: 355,840
Client MICHAEL CZAJKA
Attention MICHAEL CZAJKA

Machine: 2012 SUZUKI DR650 ID No: 1M4FV

Oil Name: SYNTECH SEMI SYN15W50

Visc@40°C: 144 Visc@100°C: 19 TBN: 0

Sample Date   Analysis Date   Sample Property	Visc@40°C: Compartm't	ENGINE	VIS	c@100°C:	19	TBN:	U	Varianc	0 -	
Analysis Date Sample no, SMU	Sample Date	0/01/1900	0/01/1900	10/10/2015	4/07/2016	24/03/2017	8/12/2017	\$-80.	0 -	
SMU	Analysis Date	0/01/1900	0/01/1900	19/10/2015	15/07/2016	29/03/2017	18/12/2017			
Oil Changed Oil Ch	Sample no.	0	0	329487	339976	347772	355840	-100.	0 -	
Oil Changed   O	SMU	0	0	16001km	22022km	28067km	34037km			
Vear Metals   ppm   pp	Oil Hrs	0	0	5,990	6,021	6,045	5,970	-120.	0 ——	Puico @ 40oC
lead   ron   0   0   1   1   1   1   1   60   80   Copper is elevated at 24ppm. Copper can come from thrust with   copper   chromium	Oil Changed	0	0	Yes	Yes	Yes	Yes			■ VISC @ 400C ■ VISC @ 1000C
Iron   0	Wear Metals	ppm	ppm	ppm	ppm	ppm	ppm	Caut	High	Comments on elevated results
Additive	lead	0	0	1	1	1	1	60	80	Copper is elevated at 24ppm. Copper can come from thrust
Copper   Chromium	iron	0	0	60	29	31	31	75	95	
Chromium	aluminium	0	0	21	12	10	9	10	16	
tin nickel 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	copper	0	0	61	3	58	24	20	30	history, please confirm oil type being used.
Nicke    O	chromium	0	0		- 53.7	0	1	10	1000	
Contaminants	tin	0	0	15	11	5	6	10	15	
Silicon	nickel	0	0	1	1	1	1	10	15	
Sodium	Contaminants									
Oil Additives   magnesium   2	silicon	0	0		14	13	12	20	35	
magnesium   0   0   7   2   2   2   0   0   0   0   0   0   0	sodium	0	0	19	7	6	4	20	30	
Zinc   O   O   822   790   826   746   O   O   O   O   O   O   O   O   O	Oil Additives									
Modern	magnesium	0	0	58	2000	2	5.000	0	0	
Calcium   O   O   1591   1584   1666   1569   O   O   O   O   O   O   O   O   O	zinc	0	0	822	790	826	746	0	0	
Phosphorous   0   0   0   0   0   660   641   0   0   0   0   0   0   0   0   0	molybdenum		0	12		3	1	0	0	
Doron   O   O   O   O   O   O   O   O   O	calcium	0	0	1591	1584	1666	1569	0	0	
TBN   0.00   0.00   10.20   10.10   9.70   4.00   -25%   -50%	phosphorous	0	0	0	0	660	641	0	0	
TBN 0.00 0.00 10.20 10.10 9.70 4.00 -25% -50% soot 0 0 0 16 2 6 0 50 70 glycol% 0 0 0 0 0 0 0 1 2 water (ppm) 0.00 0.00 0.00 0.00 0.00 1 2 fuel dilution% 0 0 3 2 0 0 1 2 oxidation 0 0 11 11 11 10 11 30 40 sulphation 0 0 9 9 8 8 8 30 40 sulphation 0 0 0 21 18 17 18 30 40 TAN 0.00 0.00 0.00 0.00 0.00 - 0 0 0 0 0 0	boron	0	0	0	0	0	2	0	0	
Soot   0   0   16   2   6   0   50   70   70   70   70   70   70	Infra Red									
glycol%	TBN	0.00	0.00	10.20	10.10	9.70	4.00			
water (ppm) fuel dilution% 0 0 0.00 0.00 0.00 0.00 0.00 1 2 0.00 0.00	soot	17700	0	16	777	2000	0	900//100	70	
fuel dilution%         0         0         3         2         0         0         1         2           oxidation nitration of particle or sulphation sulphation TAN 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	glycol%	550		TS.		8355		- 25	1998	
oxidation nitration of particle Cleanliness Analysis - ISO CODE 4406         Output of particle Cleanliness Analysis - ISO CODE 4406         Particle Cleanliness Analysis - ISO	water (ppm)	0.00	0.00	0.00	0.00	0.00	0.00	1	2	
nitration   0   0   9   9   8   8   30   40	fuel dilution%	97900				V/////		100		
sulphation         0         0         21         18         17         18         30         40           TAN         0.00         0.00         0.00         0.00         -         0         0           Physical Tests           water %         0         0         0         0         0         0         4 μm         -           PQ-90 mg / ltr         0         0         0         8         13         20         38         6 μm         -           visc @ 100oC         0.00         0.00         11.20         11.50         12.20         13.90         +-10%         +-30%         14 μm         -	oxidation	0	0	11	100000	10	11	30	4000	
TAN 0.00 0.00 0.00 0.00 0.00 - 0 0 0  Physical Tests  water % 0 0 0 0 0 0 0 0 0 4 μm -   PQ-90 mg / ltr 0 0 0 0 8 13 20 38 6 μm -   visc @ 100oC 0.00 0.00 11.20 11.50 12.20 13.90 +-10% +-30% 14 μm -	nitration	922		1,18	- 13	557		30	40	
Physical Tests   water %   0   0   0   0   0   0   0   0   0	sulphation						18	30	40	
water %     0     0     0     0     0     0     4 μm     -       PQ-90 mg / ltr     0     0     0     8     13     20     38     6 μm     -       visc @ 100oC     0.00     0.00     11.20     11.50     12.20     13.90     +-10%     +-30%     14 μm     -	TAN	0.00	0.00	0.00	0.00	0.00	12	0	_	
PQ-90 mg / ltr 0 0 0 0 8 13 20 38 6 μm - visc @ 100oC 0.00 0.00 11.20 11.50 12.20 13.90 +-10% +-30% 14 μm -	Physical Tests								F	article Cleanliness Analysis - ISO CODE 4406
visc @ 100oC 0.00 0.00 11.20 11.50 12.20 13.90 +-10% +-30% 14 µm		107500		- 10	73	10000			1977	4 μm
	the state of the s									
visc @ 40oC 0.00 0.00 83.00 83.00 88.00 97.00 +-10% +-30% SAE AS 4059 NAS CODE -	visc @ 100oC									
	visc @ 40oC	0.00	0.00	83.00	83.00	88.00	97.00	+-10%	+-30%	SAE AS 4059 NAS CODE -



For enquiries, contact: phone: fax: mobile: