TESTING OF ENERGY PERFORMANCE AND EXHAUST EMISSIONS OF THE “SIČ MOTOR 240 CC” ENGINE

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The investigation of the energy performance and exhaust emissions of the “Sič Motor 240 CC” engine was carried out at the request of Mr. Tihomir Sič of Subotica, owner of the patent for the new piston–crank mechanism.

This document is an English translation of the Serbian report. Figures and measured data are reproduced from that report; it is not a new test or a certification.

Contents

1. OBJECTIVE OF THE TEST

The purpose of the test was to determine the energy performance (engine speed, torque, power and fuel consumption) and exhaust gas characteristics of the “Sič Motor 240 CC” engine. The engine represents a completely new concept for transferring energy from the axially moving piston to the crankshaft (Figure 1). It is an original technical solution by Mr. Tihomir Sič of Subotica, Serbia.

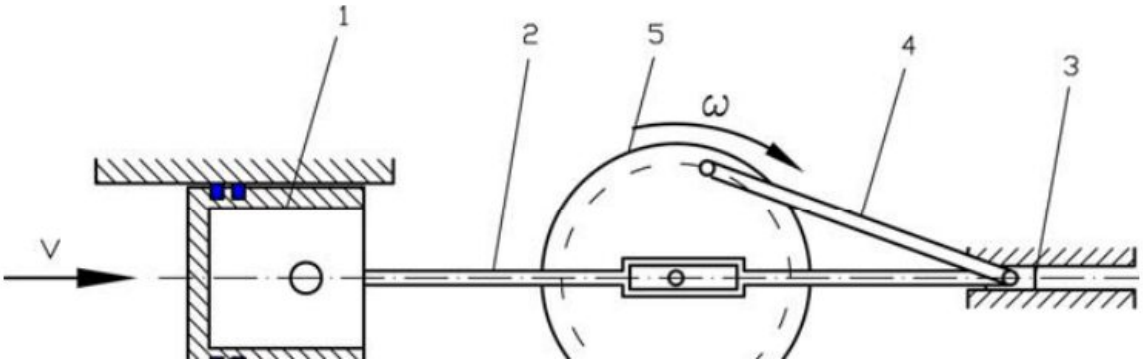

Figure 1. Schematic of the transmission mechanism: 1 piston; 2 transmission lever; 3 crosshead; 4 connecting rod; 5 crankshaft.

2. MATERIALS AND METHODS

During testing, a 3% mixture of BMB 95 petrol and two-stroke engine oil (Arol 2T, produced by MOL, API TA quality level) was used.

Figure 2. Sič Motor 240 CC.

Technical characteristics of the tested engine

Number of cylinders	4
Engine displacement	232 cm³
Cylinder bore	42 mm
Engine cycle	Two-stroke

Cooling	Air

The engine is based on the DMB 1DM60 engine (cylinder head, cylinder, piston assembly, system for preparing and delivering the mixture to the compression chamber, and exhaust system). The DMB engine has a displacement of 58 cm³, a compression ratio of 7.5:1, power of 1.84 kW at 6,000 rpm, and torque of 3.5 Nm at 5,000 rpm.

Fuel consumption was measured by the volumetric method using a graduated glass measuring vessel with a reading accuracy of 1 ml.

Figure 3. Fuel consumption measurement: (a) connection of the measuring vessel to the engine; (b) measuring vessel.

The engine load was simulated by braking. A specially built test bench with a disc friction brake was used for this purpose (Figure 4).

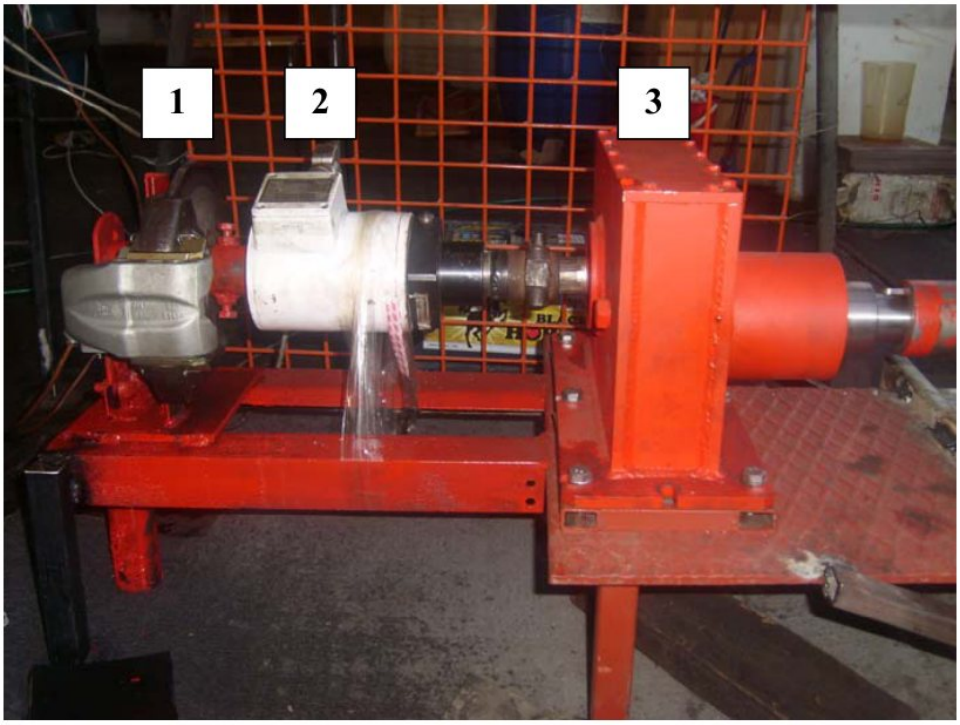

Figure 4. Engine test bench: 1 disc friction brake; 2 DMT III rotary dynamometer; 3 gearbox (ratio 1:5.5).

Torque and rotational speed at the engine flywheel were measured with a rotary dynamometer (DMT III, TRC Novi Sad). The dynamometer was installed between the output of the 1:5.5 gearbox and the input shaft of the disc brake.

The analogue signal from the rotary dynamometer was converted to digital data using a Spider 8 data acquisition unit. The digital data were stored on a PC using the Beam software package. Engine characteristics were tested in accordance with JUS ISO 2288:1989.

Exhaust emission testing

Exhaust emissions were tested at idle using an Eko 21B gas analyser manufactured by TRC Novi Sad (Figure 5).

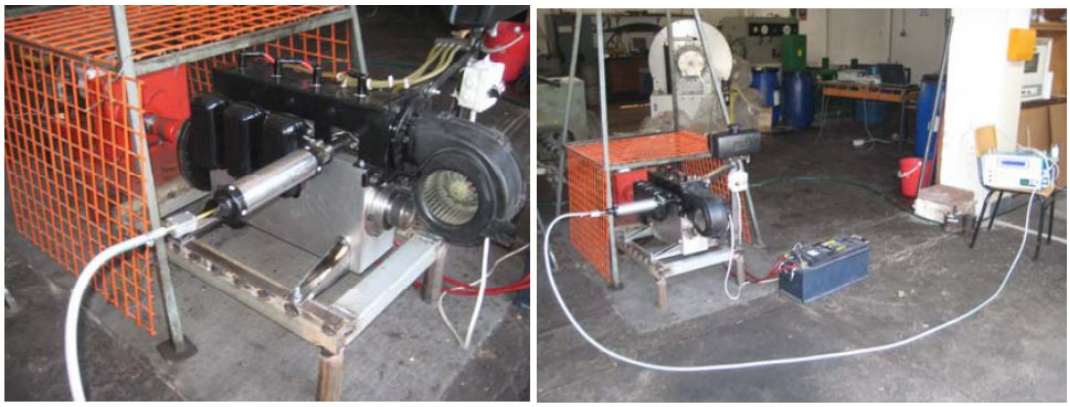

Figure 5. Sampling of combustion products.

The parameters monitored were exhaust gas temperature, CO, CO_2 and unburned hydrocarbons (HC).

3. TEST RESULTS

3.1. Engine performance and fuel consumption

Engine performance and fuel consumption were tested with the throttle in its end position (full throttle).

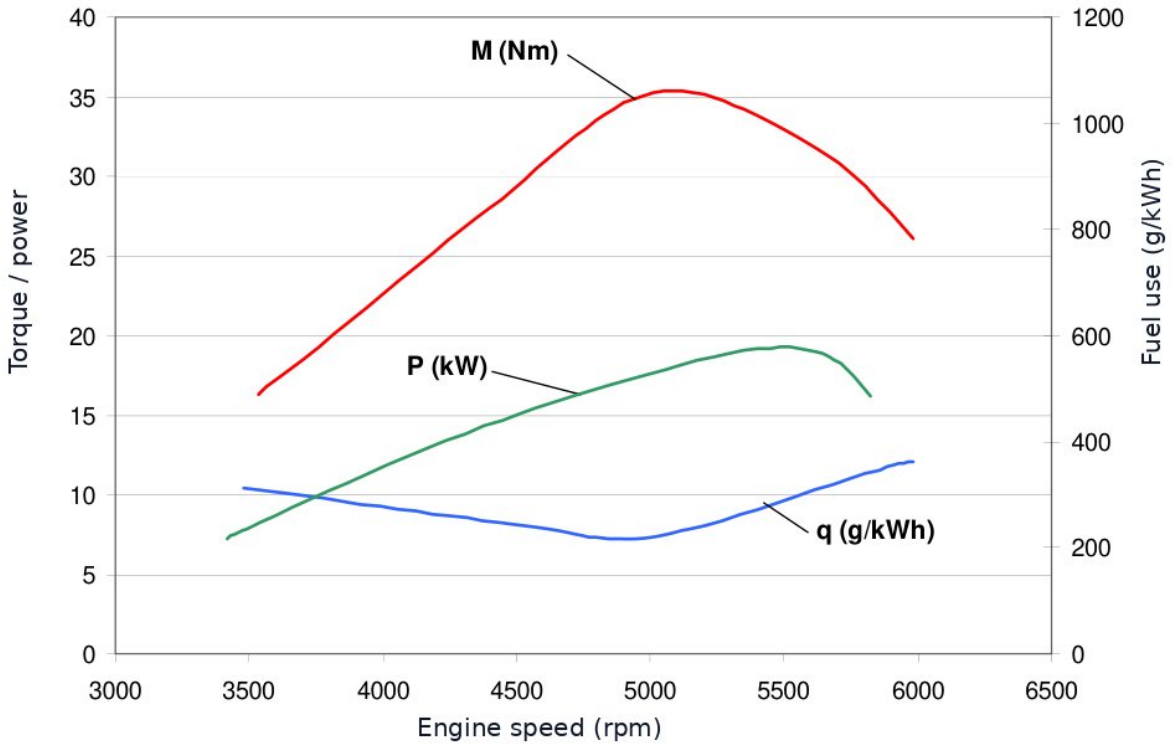

Figure 6. Torque (M), power (P) and specific fuel consumption (q) versus engine speed.

Testing found a maximum torque of 35.8 Nm at 4,989 rpm and maximum power of 18.2 kW at 5,480 rpm. Specific torque (per unit of engine displacement) was 0.154 Nm/cm³, an increase of 157% compared with the original DMB 1DM60 engine, whose specific torque was 0.06 Nm/cm³ at 5,000 rpm. The Sič Motor 240 CC specific power was 0.078 kW/cm³ at 5,480 rpm, 160% higher than the DMB 1DM60 figure of 0.03 kW/cm³ at 6,000 rpm.

The minimum specific fuel consumption was 230 g/kWh at 4,980 rpm, 42.5% lower than that of the original DMB 1DM60 engine. Average specific fuel consumption across the measured range was 274 g/kWh.

3.2. Exhaust emission test results

Exhaust emissions were tested at idle (engine speed 880 rpm). The measured parameters were CO, CO_2, unburned hydrocarbons (HC) and exhaust gas temperature. Table 1 gives their values in the combustion products.

Parameter	Unit	Measured value
Exhaust gas temperature	°C	98.8
CO	%	0.27

CO_2	%	5.6
HC	ppm	3,380

Table 1. Exhaust emissions of the Sič Motor 240 CC engine.

4. CONCLUSION

On the basis of testing of engine performance, exhaust emissions and fuel consumption, the following conclusions were reached:

• The tested Sič Motor 240 CC engine achieved maximum power of 18.2 kW at 5,480 rpm and maximum torque of 35.8 Nm at 4,989 rpm; minimum specific fuel consumption was 230 g/kWh.

• In the combustion products, carbon monoxide was 0.27%, carbon dioxide was 5.6%, and unburned hydrocarbons were 3,380 ppm.

Translation of the original report issued in Novi Sad, August 2009. The source document remains authoritative.