THE POMPONE LEGEND

CONTINUES WITH THE NEW 1000 DS

Halfway-house

DUCATI TECHNICAL

In 2003, the 904cc Desmodue engine will be replaced

by a 1000cc power unit that maintains the traditional "L" shaped twin-cylinder with desmodromic timing.

This engine, fitted to the Monster, Supersport and Multistrada families, is the result of an innovative project ad cannot be labelled simply as an evolution of Ducati's twin-valve engines.
Our engineers wanted to completely rethink the legendary 904cc pompone which, continuously developed over the years, has represented the Ducati brand all over the world.

"Such a noble, well-tested starting point is a guarantee of success," explains Ducati R&D Manager, Gigi Mengoli, "and, at the same time, a remarkable challenge: it is not at all easy to improve such a fully developed engine.
For a long time, we have studied and improved the heat balance, i.e. all the heat flows that must be well matched if you want a "healthy", efficient engine. Excessively high temperatures will disturb the engine operation and, particularly, will cause distortion in certain components such as valves, rocker arms, piston, head...".
Mechanical reliability, compliance with pollution-preventing regulations and an even better, smoother power delivery were the aims in designing the 1000 DS. The new displacement, obtained by increasing the stroke (from 68 mm to 71.5 mm) and bore (from 92 mm to 94 mm), is actually 991.88 cc.
The distance between con-rod centres remains at 130 mm.

THE CRANKCASE AND GEARBOX

The crankcase consists of two castings joined vertically according to a completely new design: several innovations have been introduced in the construction of the moulds.

An additional support has been introduced in the rear part of the starter motor, made more powerful so as to ensure prompt engine ignition; while the cylinder stud arrangement has been modified: the stud spacing has been enlarged to facilitate larger-diameter liners.
A bushing has been added in the crankcase-oil gallery to prevent any sealant entering

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the system during assembly.

The transmission shaft (secondar supported by a double-row ball b sprocket side, to improve the distri generated by the transmission.

The sprocket is fixed by a nut and

THE CRANKSHAFT ASSEMBLY

The crankshaft has been completely redesigned using powerful calculus and simulation tools: the stroke has been increased, while the crank pin (42 mm) and main pin (35 mm) diameters remain the same.

Rigidity, meanwhile, has been increased considerably.

Completely new internal oil ducts allow a fully reliabile crankbearings lubrication.

The Con rods maintain the usual 130 mm distance between centres but have been built according to new construction criteria: they are easier to mould due to smoother radiuses on the H stem.

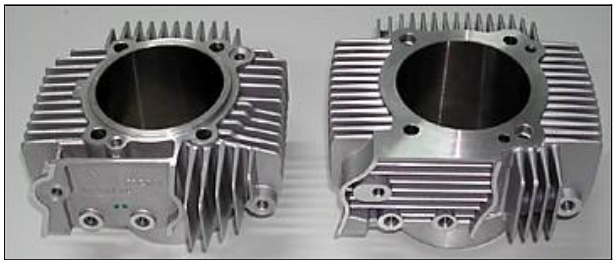
To improve the fatigue strength, surfaces have been treated by vibration tumbling with an added chemical agent so that surface flaws likely to grow into surface cracks have been eliminated.

CYLINDER & PISTON

The liner thickness has been increased to improve rigidity so that there is no liner deformation when the cylinder/head assembly is fixed tightly onto the crankcase. Any blow-by (fresh mixture seeping from the combustion chamber into the crankcase) is thus kept to a minimum.

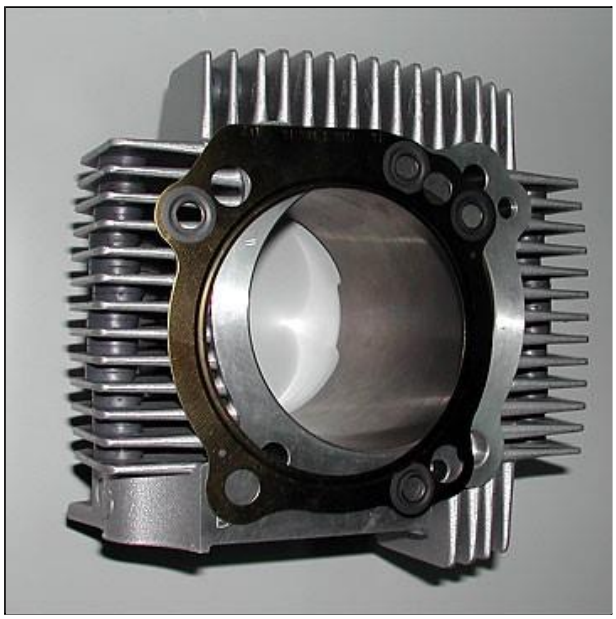
Two extensions have been introduced at the base of the liner to improve piston guidance when close to BDC.

The cylinders and heads also have a new finning to improve heat dissipation: a special gravity melting process has been adopted (tilt chill) to make variable-



thickness (tapered) fins and increase the number of fins (closely-packed fins).

THE HEAD
The seal between the head and the cylinder is a metal packing which replaces the earlier coupling step.



The new metal packing seal prevents gas leaks (especially in the exhaust valve area) and, above all, ensures more efficient heat transference from the head to the cylinder, which is usually colder. This is able to occur because of a larger contact surface between these two parts.

Temperature control is a key factor in determining the design of these large capacity air -cooled power units: if heat is correctly dissipated, less heat distortion will occur and all the engine's "strategic" parts (valves, rocker arms, piston, head etc.) will remain perfectly efficient.

As with the cylinder, the head is cast by gravity (tilt chilling), with the combustion chamber turned downwards (towards the bottom of the permanent mould).

This way, the first part of the casting cools down rapidly, guaranteeing a better material crystal structure (the aluminium grain size is smaller and behaves better at high temperatures).

A fluid-dynamic study shows an effective "swirl" due to the tangential position of the intake port. This will ensure good mixture uniformity around the spark plug. Double ignition considerably improves combustion. This translates into:

- higher torque under partial load conditions
- lower pollutant emissions
- reduced spark advance (higher efficiency)
- lower temperatures in the combustion chamber

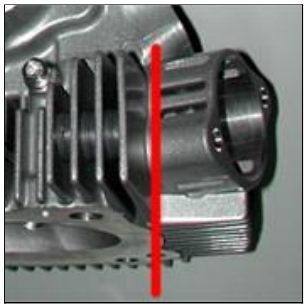
The angle between the valves has been decreased from 60° to 56°, improving the valve seat and desmodromic timing part arrangement, which now operates with improved geometries.

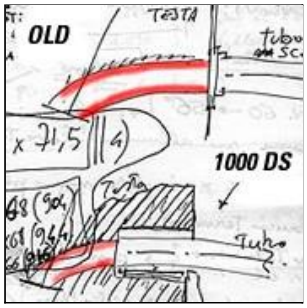
The valve diameters have been increased to 45 mm (intake) and 40 mm

(exhaust), which has resulted in improved breathing.

The valve stems are thinner (with diameters decreased from 8 to 7 mm), which also means the valves are lighter: this has resulted in decreased inertia and the reduction of heat transferred to the head.

The valve seats are completely new designs made from beryllium bronze, a very high-tech material used, until now, only in racing engines. This has guaranteed less wear and better heat dissipation.





Finally, lower head temperatures have been achieved by shortening the exhaust port: the manifold is connected to the head internally, at a position closer to the exhaust valve.

The manifold -being made from steel- is high-temperature resistant and is able to dissipate most of the heat generated in the exhaust port.

TIMING

The camshafts now turn on sliding friction bearings directly machined from the aluminium of the cylinder head, a solution inherited from the Testastretta which eliminates problems caused by the large, noisy and heavy ball bearings used prior to the Testastretta.

The cam pulleys have 2 additional teeth for smoother belt routing and increased working efficiency.

The belt tension rollers are also a new design, with an

integral bearing and
improved lubrication
tightness.

As summarised by Gianluigi Mengoli:
"This project has resulted in a strong, extremely reliable engine, whose power and torque have been considerably increased.
In view of the fact that road bikes are used most of the time at medium-to-low RPM, we have improved the low RPM torque so as to guarantee total riding satisfaction!"

TOP

Stefano Bianucci