

## **THE NEW REV 4-STROKE**

In the world of motorcycling there is now no getting away from problems connected with the environmental impact of emissions, and the corresponding restrictions. A direct consequence of this is the progressive shift from 2-stroke to 4-stroke engines, which over the last few years has also started to affect the off-road sector. The trial has been the last bastion of the 2-stroke because of the engine's undisputed capacity to combine lightness, compactness and torque right from low revs, but it has recently seen the appearance of 4-stroke motors, which are however often derived from other applications (principally motocross). Beta, with its long tradition of specialising in trials, now introduces the first 4-stroke engine designed, developed and dedicated entirely to trials. The all-new 250cc 4-stroke engine will power the new REV and will stand side by side with the traditional 2-stroke configuration, the tried and trusted warhorse of the Beta range.

### **Main features:**

- > **Lightness, compactness and reliability.** The designers have devoted their main efforts to containing weight and dimensions. The result is a power unit with characteristics as similar as possible to those of the Beta 2-strokes of the last few years. With a weight of only 23 kg, the new engine compares favourably with the 2-stroke of the same capacity. This lightness and compactness, however, has been achieved without compromising the design brief, which was to create a modern 4-stroke engine delivering the highest standards of reliability.
- > **Lubrication.** Lubrication is taken care of by two separate oil pumps. This leads to an increase in the overall efficiency of the oil circuit. The output pump picks up oil from the gearbox area and delivers it to the head and barrel, crank and conrod. The second or scavenge pump returns it to the gearbox to restart the cycle. This dual circuit, as well as the number of oil jets in crucial positions and the sheer quantity of oil in the system, ensures optimum circulation and improved cooling of the parts involved in combustion, and this results in an increase in the mechanical reliability of the engine.
- > **Controlled pressure.** The reliability of the lubrication circuit is ensured by a maximum pressure valve, located immediately after the output oil pump. This valve monitors oil flow, and if the pressure exceeds 3.5 bar the valve opens to reduce the flow. The way the valve operates also allows the oil pressure to be regulated on the basis of its

density in such a way as to ensure optimum lubrication in all running conditions (for example, at startup as opposed to when hot).

- > **Complex ramifications of the oil system.** The lubrication circuit supplying the new 4-stroke engine makes use of a series of steel pipes built into the engine castings themselves (the output pipes are in the right-hand crankcase, the scavenge pipes in the left). This solution enables the motor to be made more compact and eliminates the need for external oilpipes.
- > **Dedicated trials gearbox.** A huge amount of work was invested in the design of the gearbox, developed from scratch specifically for this discipline. It is a 5-speed box for 100% trials use: The 1st, 2nd and 3rd are designed for section riding and negotiating obstacles. The 4th and 5th are intended for use in moving between sections. In deciding the dimensions of the gearbox, the main objective was the maximum possible weight saving, but generous safety factors were still applied so that lightness was not achieved at the cost of reliability. Increased reliability was also obtained by the use of suitably positioned oil jets to provide continuous optimal lubrication to the gearbox. The gearbox is also capable of potential further development by the addition of a sixth gear in future applications.
- > **Better contact.** It is a well-known fact that lubrication of the camshaft and of the cam-follower surfaces of the rockers is often critical. To eliminate the consequent wear problems and to increase the general reliability of the timing system on the new 4-stroke, the camshaft is housed in ball bearings. In the same way, the traditional cam-follower surfaces of the rockers have been replaced by roller bearings, which improve contact with the camshaft.
- > **Designed to grow.** While the strength of the new 4-stroke engine consists in the design work which went into equipping it for trials, it was also developed with a view to being able to give birth to a series of motors for the twin sport of mountain riding. From the same base unit, it will be possible to derive 250 and 400cc motors which, with suitable modifications (6-speed box, balancer shaft, EFI and electric start), will power a new generation of modern mountain bikes.
- > **Quietness.** The new 4-stroke engine is exceptionally quiet, both in terms of mechanical noise and of gas dynamics, setting new standards for 4-stroke competition. Low environmental impact does not just mean reduction of harmful emissions. It also concerns the general quietness of the vehicle, a quality which all trials riders appreciate as they journey into nature.

- > **Rider-friendliness and feel.** Much has been written about how trials changes the rider's attitude to the bike and the experience and sensations of riding. The team which designed and tested the new REV 4T worked hard to preserve the same feeling of confidence which is universally agreed to be a feature of the way the 2T behaves, the same perception of immediacy and symbiosis between rider and machine. A significant example of this is the work which went into the carburettor and throttle control: the result of this development work is a perfect dialogue between bike and rider. Each time the throttle is opened it transmits exactly the expected response to the rider, a sensation of immediacy and oneness with the machine which has never before been experienced on a 4-stroke trials bike.
- > **Low minimum revs.** Anyone who rides trials appreciates the value of a well-calibrated lower end to the rev range: in the sections, the detailed movements, the split-seconds of reflection before tackling an obstacle, require the ability to pause at tickover with a minimum of movement. When the moment comes to open the throttle, the well-thought-out carburation of the new REV 4T ensures a full and smooth power delivery, with no holding-back or holes in the rev range.
- > **Balance.** Important design work was also done on the engine-to-frame mounting points. The engine is secured to the main beam of the frame by drop-arms, and it is positioned in such a way as to reduce to a minimum the vibrations transmitted to the rider, thereby increasing riding pleasure.
- > **High centre of gravity.** The centre of gravity of the new REV 4T has been moved noticeably higher so as to offer the rider maximum handling feel for trials riding. The new overall weight distribution instils more confidence when negotiating obstacles.