



SPARK OF GENIUS

Alfa Romeo's switch to twin-spark plugs per cylinder has proved inspired. The new cylinder head design has transformed Alfa's Novamotor F3 engine into a consistent winner in a very competitive formula. Tony Dodgins explains how

Bertrand Gachot's Formula 3 victory at Brands Hatch on 17 May marked not only the Belgian's first win in the category, but, perhaps more significantly, the first time in 63 races that a VW-powered car had failed to win a British F3 event. The engine that cracked that superb run of success was the twin-spark Alfa Romeo twin-cam, an engine radically different from that in the new 2-litre Alfa 75 saloon.

Providing technical support to the British F3 Alfa clients is John Penistan, who quite literally knows the engine inside out having spent 11 years working with Novamotor in Italy where the engines go for rebuilding. Penistan claims that the twin-spark head has transformed Alfa Romeo's Formula 3 unit: "The old engine had been around the F3 scene since the early '80s, with considerable European success, but the problem with it was the actual combustion chamber.

"It had a hemispherical combustion chamber and one so large that to get any compression out of it you had

Bertrand Gachot and West Surrey Racing Ralt have proved to be a highly successful combination this year in F3

very high rises on the pistons, producing a very bad burn. The block and the bottom end, however, were always very good and when Alfa came along with the twin-spark cylinder head, the improvement was great. We remove the cam chain and put on a belt drive with a gear pack to run the two cams. The valve gear and the camshaft profiles are changed, although the main advantage is burn. The shape of the revised combustion chamber together with a much flatter piston means there is a faster burn at the front of the flame path and we can relocate the spark. The valves are too big for a central spark and so the purpose of the twin plugs is to get combustion as close to the middle of the chamber as possible."

Although it is now arguably the most competitive engine on the F3 scene, the Alfa did not win immediately. A couple of months'

development work was necessary to bring it up to the level of Johnny Herbert's Spiess-tuned VW unit. Part of the problem is that F3 engines are strangled by a 24mm air intake restrictor which makes it very difficult to achieve any power advantage. Instead, attention is turned to the black art of developing electronic management systems. Penistan explains: "It's really a matter of cleaning up the fuel throughout the whole of the rev range. Whereas we had to compromise with a mechanical system, with the electronic one we feel we can improve both the early and later part of the range. However, we actually got hold of the engine late, in February just a month before the start of the new season and this meant that development was a bit slow. When the engine first arrived, it had something of a torque problem."

This became apparent when West Surrey Racing and Gachot first began testing the engine back in March. Having contested the first race with a John Judd-prepared VW engine and finishing second to Herbert's Spiess-tuned VW, Gachot realised that he had less power. Knowing that Eddie Jordan had an exclusive Spiess deal in the UK, Gachot and West Surrey team boss Dick Bennetts had decided to sign a works deal with Alfa Romeo. Gachot takes up the story: "At that time the biggest difference was that the Alfa had more power but very little torque. The power came in very suddenly, like an on/off switch at 5000rpm and it would run well up to about 6200rpm. But it was very difficult to find the right gears because below 5000rpm there was just nothing. That meant that it was very difficult to set up the car because you did not have constant handling in the corners."

The team was dejected after such a great deal of effort to install the engine at short notice into the Marlboro-sponsored Ralt. Ralt itself carried out much of the major work, such as the oil tank adaptor, and West

Surrey Racing modified the exhaust, water pipes and electrics.

Realising that the Alfa engine was not located as securely as the VW at the front, the team put in some stiffening braces to support the engine bay in time for the British Grand Prix meeting in July. That, incidentally, was a race which Gachot dominated, emphasising both the progress made in four months and the Alfa's unbeatable top end on a circuit like Silverstone.

How has the twin-spark been developed since the beginning of the year? Penistan: "A compromise was made by lengthening the induction ports and altering the shape. On the outside the injectors were raised, increasing the density of the fuel charge and this gave us more torque. That is where we are concentrating our development work at the moment; the induction length, the induction manifold, all that area."

Gachot found the improvement on the track obvious: "They really have made it a lot better. We now have power from 4600rpm, and it comes in much more smoothly. As well as being effective on top end tracks like Silverstone, it is now a really strong engine on short circuits like Brands Hatch.

"When you consider that the other engines have had much more development, the Alfa undoubtedly has the most potential. It is amazing how much difference the varying management chips make to the entire characteristics of F3 engines, and fortunately the electronics have proved very reliable. It's such a strong engine, too. For instance I blew one at Snetterton when the cooling was fouled up by grass as I was taking off on the first lap. It lasted for 10 laps with the water at 160degC."

Across Europe, the Alfa has scored more F3 wins than any of its rivals this year. Such success has its price: if you were to go to Novamotor to buy a twin-spark F3 motor you would return with no change out of



Belgian driver Bertrand Gachot (above) says: "Throttle response is very good and it revs like no other engine that I know"
Production of individual engine components is contracted out to an assortment of specialists

£13,000. That does not compare too well with around £8000 for the VW. Why the additional expense? Penistan again: "All the Alfa components have to be made specially for it."

"There is a lot of machining on the engine. Starting with the basic block, it is a wet-liner designer that is then made into a dry-liner. The casing is located and pegged in because the regulations do not allow us to weld. Apart from all the work involved in producing the block itself, you then have all the non-standard steel and titanium components. The cranks are made in Italy by one or two companies, chiefly Montpelier, the liners by Borg, the pistons by Mondial, the valves by a local firm, BS Valves. All the gaskets are produced in Turin by an Alfa-owned company and the ignition is by Weber Marelli."

Novamotor is the thriving business of the Pedrazzani brothers, Johnny

the elder, and Aresti. They have been around the motor racing scene for some 30 years, dating back to Formula Junior days. Apart from a short spell when they had a service contract with BMW for the F2 engines and worked on some DFVs, the brothers have stayed loyal to the F3/F Junior scene.

At the moment Novamotor's Alfa engine is very competitive, although there are rumours in the F3 world that the 24mm restrictor may be opened up in the near future to give the cars more power. That might prove to be too much for the Hewland Mk 9 gearbox, and if the restrictor was opened up substantially, could mean that the Alfa would struggle against four valve/cylinder engines such as the TOM's Toyota. At the moment, however, the 24mm formula works well, different manufacturers finishing up with similar power outputs. The skill in engine building then becomes a juggling act between maintaining top-end power and torque, and reducing frictional losses, with electronics the key. It's an act Penistan and Novamotor seem very good at, judging by their success so far this season. ■

