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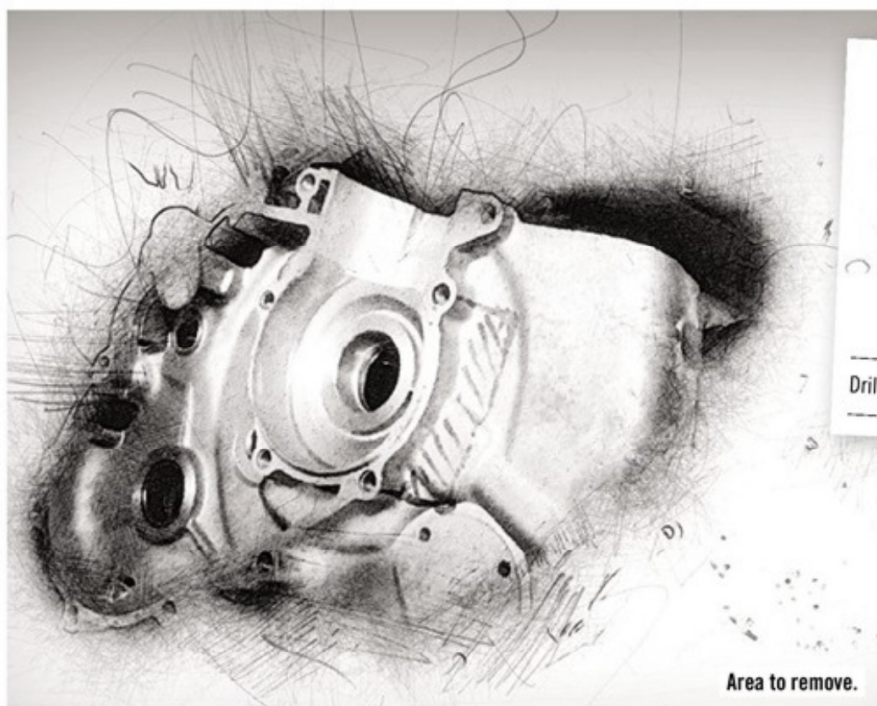
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MORTONS

Shed Tune: Vespa 30hp

Italian stallion Christian Giarizzo finds a good old-fashioned 'home brew' shed-tune on his travels, and describes it to us with his unmistakable Italian twang...



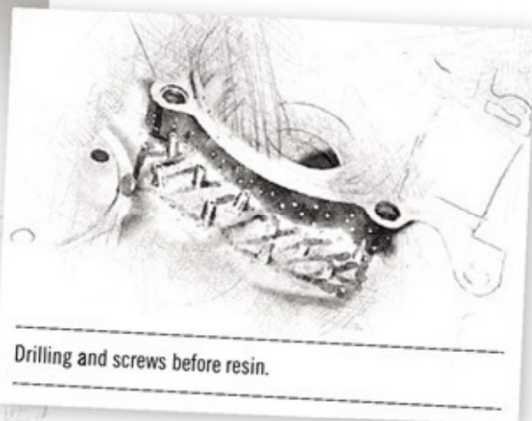
Area to remove.

I was travelling inside the area called 'castelli' (Roman castles), famous one time for clandestine night-time street races and competitions (and the best olive oil in Lazio region). A mysterious and chatty girl picked me up from the Tube station, a terminus where you can find everything from 'carabinieri', homeless people and businessmen in a hurry. My escort took me into a large garage complex nearby, a grey portcullis was opened and my eyes were soon swimming in a few square metres of scooter heaven! Vintage scooters, old engines and that unmistakable aroma of SAE30 gear oil perfume. Inside, just in front of me, two Vespa engines were waiting on an iron worktable for my camera and uncomfortable questions. Just above my head, hidden inside one of the complex apartments, lived Damiano, a young engineer who gave everything to the mechanical discipline.

It is said that when his fiancée takes

“ I don't think the Parmakit ignition, however, has a proper cooling system as the fan supplied does not guarantee its function at high revs due to muddled air-wing design and insufficient size. ”

him to the beach, the man hides under his hat, resisting the idea of taking a swim or applying sun-cream over his girl's body (*Editor's note – I love scooters, but I'm available for sun lotion application if she would like to send a photo first!*). Damiano would rather devour mechanical engineering manuals instead. His brunette partner, on the other hand, prefers to



Drilling and screws before resin.

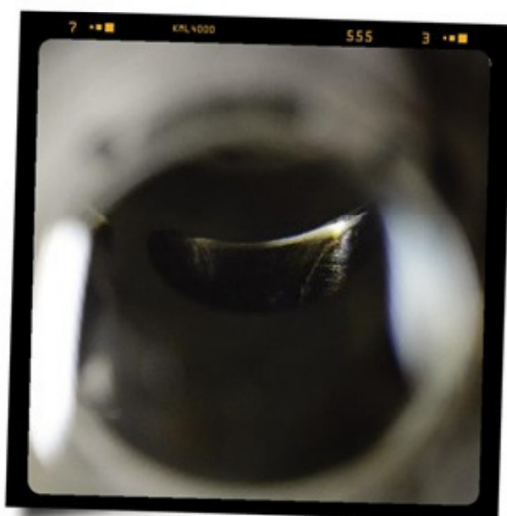
accompany her man in his pursuits, not rejecting his passion like so many women ... a relationship in which, on Valentine's Day, they give each other spare parts and chromed, tuned goods (*Editor's note – Damn! Maybe she has a sister?*). After all, you know, men must be monitored if they are not to skid off the rails! For one moment, though, consider how many advantages a man can have from a rapport of such kind. Could you imagine buying an upgraded con-rod or race crank as a birthday present? Scooter Nirvana. Damiano showed himself, emerging from the black shadow of the car port, and entered the garage of a few square metres in which I was waiting.

Inside the beast...

He began: "Sei pronto per il viaggio dentro questi motori?" ("Are you ready to travel inside these engines?") He smiled at me while in just a few minutes the engine was torn apart like a post-mortem analysis. From the first two sentences I considered Damiano more as a researcher than a simple enthusiast. He slipped his hands inside a pair of black gloves and introduced the topic while my focus centred around the items now displayed on the bench. He explained: "The basic idea was to couple a large reed-valve inlet, transplanted from an Aprilia RS 125 and



Crimaz clutch.



derived from a Rotax 125 cylinder, on to a Piaggio Cosa crankcase large-frame model. Just a bit later, during the usual welding that distinguishes these types of projects, I realised that after the process the casing was broken through. Therein I had an idea. The most interesting peculiarity is the position of the intake manifold, which is coupled with the large crankcase. This setup allows working with resin, by removing some material (drawing 1). The fundamental purpose is to give a wide passage to the intake airflow. This solution allows me to have the flow oriented towards the centre. Another advantage is the cooling fan turbulence used at its best."

Damiano continued, showing me the crankshaft with sparkling eyes. "It is laser welded, with a 60mm stroke, a 110 BGM con-rod. Static-balanced at the 12 o'clock position, which would be a perfect compromise between weight, cost, rod strength and general assembly. Consider

that this prototype must withstand at least 30hp in order to better manage the vastly improved torque (three times the standard), the carburettor (OKO) is a reproduction of the 40mm PWK, fed by a four-petal reed-valve (not six-petal as Aprilia design). I applied a TM-KART derivation flow guide machined on the side to stay in the housing. After cutting and milling by a machine, we made the surfaces smooth and refined to ensure better casing closure. At this point the epoxy resin came into play, self-drilling screws were inserted on the clutch side to improve the mechanical characteristics of the chemical complex and not permit the resin itself to blow off." (See drawing 2). He expanded further: "Let's talk now about the resin. It is similar to Asportec brand, mixed in equal parts, in my case I used 35g + 35g just to repair the damaged crankcase and of course blended by hand."



Resin? Really?

At this point I imagined the scooter-world experts' faces seeing a carpenter application on a 30-horsepower engine. However, in defence of my interviewee I concurred that was a very good home solution for those who want cost-effective experimentation engines, that could later become 'proper' new projects. Damiano, though, read my face eventually and teased me: "As a matter of fact 400 grams of resin compound costs €30, if you had to redo welding, grind and work overall parts it would probably cost more than €200, not to mention that such a quantity of welding could deform the bearing seats which therefore should also be checked." Damiano adjusted his collar and went on: "Self-tapping screws were applied to the clutch side casing too. It looks ugly but it works well, during the

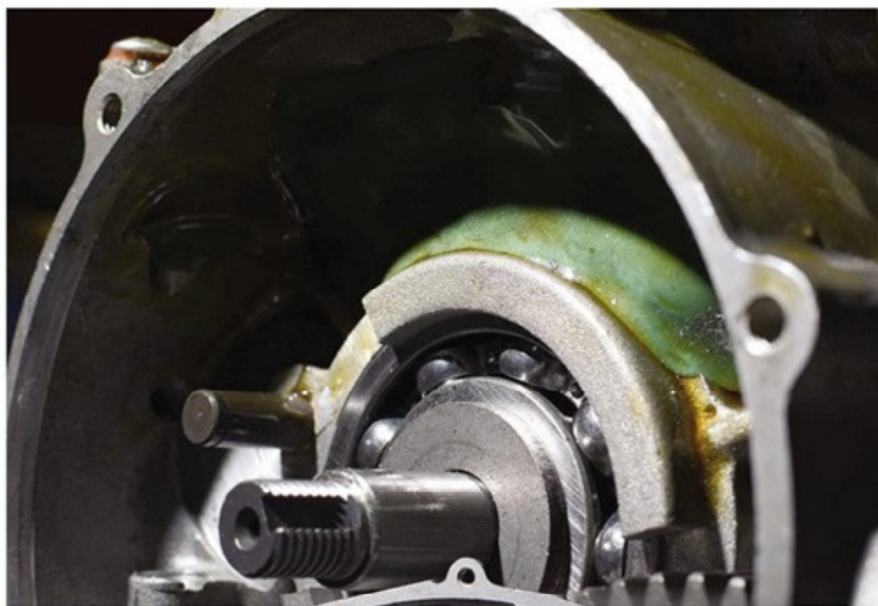
application of the resin particular attention must be paid in order to prevent air leaks. Another crucial milestone to consider was the directional flow inside the reed-valve pack area. This zone was most worked and ground to allow flow to travel towards the central point of the crankshaft."

Friction...

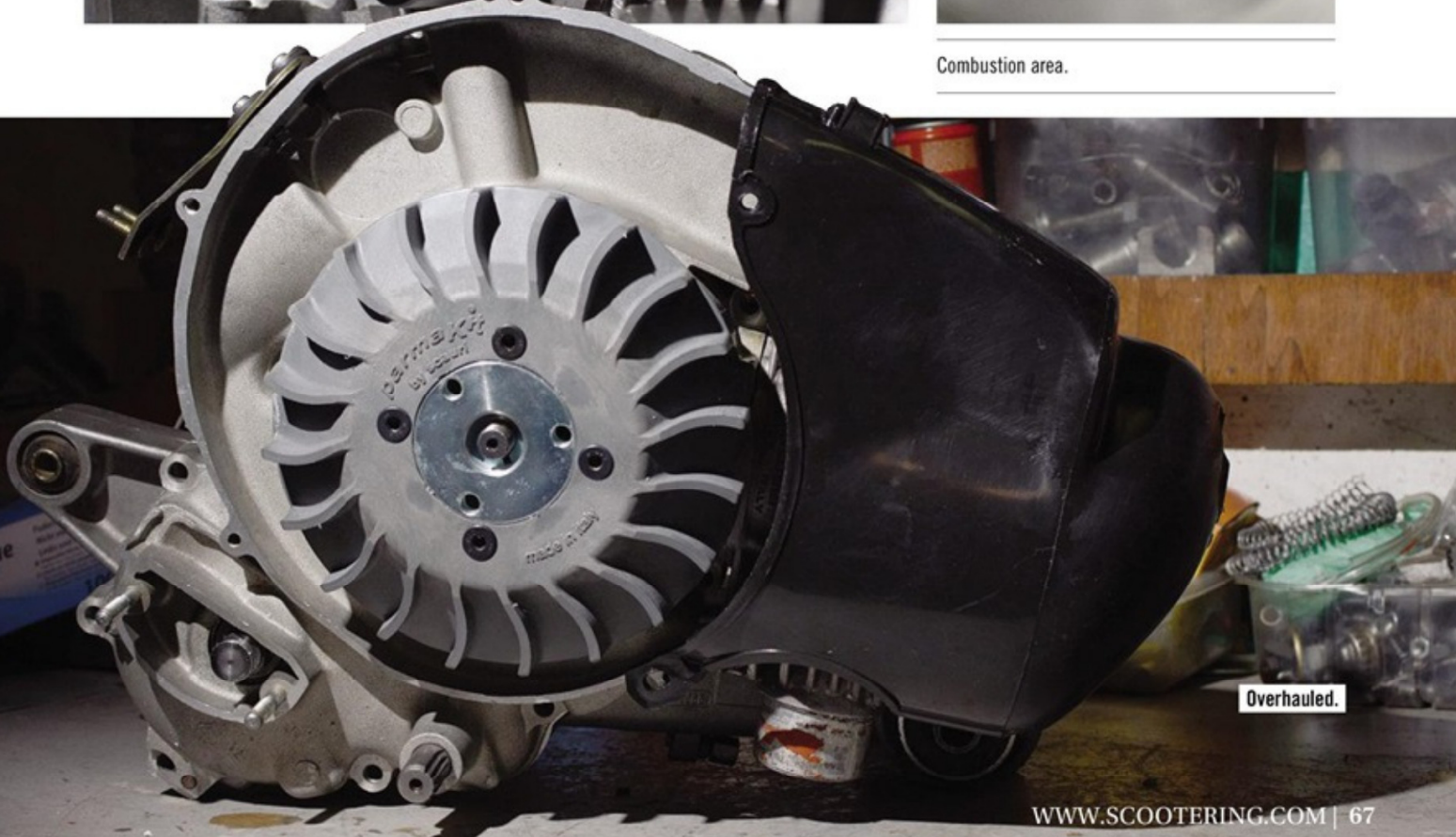
A Crimaz clutch equipped with sintered discs was added to the equation. Damiano looked at me as if to reveal a very important statement: "Characteristic of this clutch, I want to share by on-the-road-experiments, is the very little movement of the lever toward the biting point and the following extreme force to the wheel. This is because the aluminium discs have greater friction. In the same Crimaz kit, however, there are a few little parts you want to tweak on assembly to change the

behaviour of this problem. I absolutely suggest to do so." The air compressor stopped its music and Damiano continued: "I don't think the Parmakit ignition, however, has a proper cooling system as the fan supplied does not guarantee its function at high revs due to muddled air-wing design and insufficient size. The flywheel (with DM stator) is 2.4kg heavy. In my opinion I would suggest to use this mass as often as you can. We tried to fit in lighter bits with poor results in terms of reliability. With all parts chosen, I used the resin again to fill the gap inside the inlet manifold and machine it to 40mm to match the carburettor. I then proceeded to complete a further polishing until the finished result and assembled the casing together.

"It was possible, at this point, to remove even further material from the crankshaft which as in bottom dead centre would open much more than the existing space. The little rib in the crankshaft counter-balancer was completely removed due to the abundance of resin on the other case side. At that point when the BGM crank was static-balanced slightly to 11 o'clock so any other intervention was negligible. Experience told me vibrations are rare in backward balancing as in this case, so I

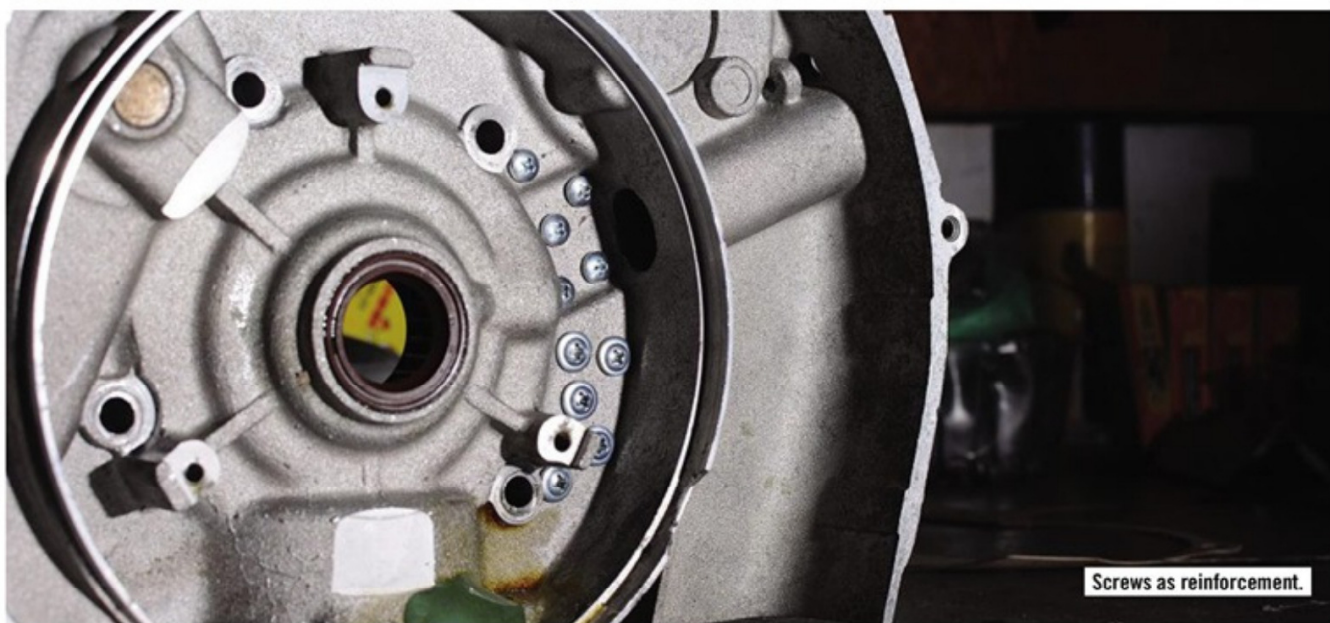


Combustion area.





Resin area built up and ported.



Screws as reinforcement.

thought everything was now set and ready for assembly and final test."

Does it resonate with you?

I re-emerged from my long silence asking why the clearance between bottom dead centre and inlet valve. Damiano explained: "Because when they are both fully open and the exhaust is properly designed, the theory is to match a resonating 'exhaust wave-signal' in the return journey through the reed valve." He continued: "CNC milling and finishing come into play at this point to co-ordinate all the pieces together. The cylinder enters the equation too, a Malossi MHR coupled with Vertex light piston, 130 degrees of transfer timing and 190 degrees of exhaust is originally designed around a 57mm stroke. I was evaluating the air flow passage when another idea hit me. Was it possible to find a better crankshaft for this project? Believe me or not I found a very rare 60-stroke 110-rod Tameni reinforced crank, which thanks to its specification helped further due to its 'beefy shoulders'. The choice of Malossi cylinder was combined with the use of the lighter and more robust Vertex piston.

Be careful though, gasket kits are still supplied with old Malossi specs and are smaller than the MHR or Sport Malossi kit, therefore they must be trimmed and adjusted to the cylinder. Otherwise there is a heavy penalty in airflow. After gaskets were trimmed and cylinder matched to the crankcase, and a handful of aluminium on the ground, I was ready for the first partial assembly."

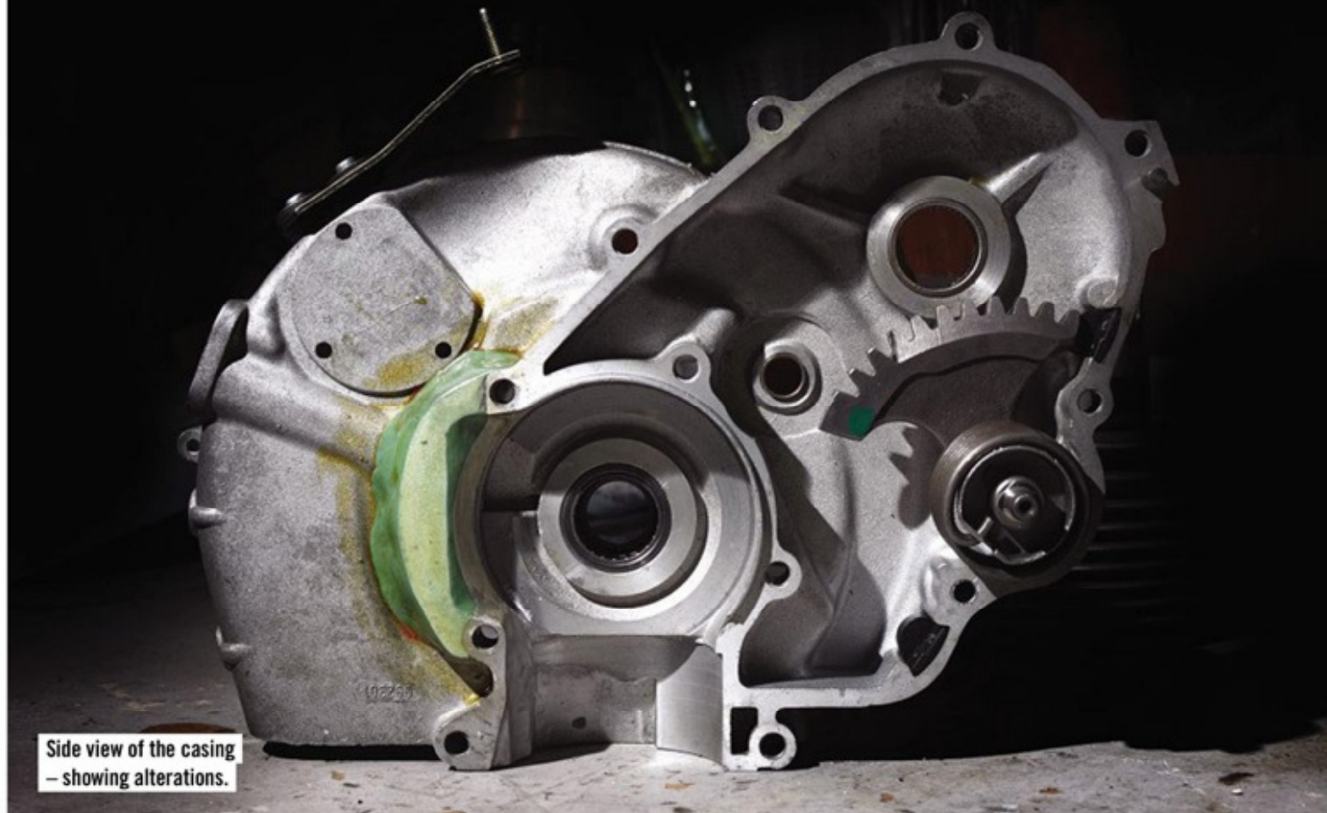
The engineer stopped as if to enjoy the pause before the satisfaction. "Permit me a little reasoning. Why on earth, you might think, did I chance a crankshaft (already modified) in favour of the Tameni? Balancing matters, firstly. When I checked both cranks, the BGM was 11 o'clock balanced, the Tameni at one o'clock. So after the modification by removing some material near the crankshaft valve edge, it was back to 12 o'clock. Mission accomplished. In addition to this matter I pre-assembled the casings and despite the bigger inlet volume of the BGM and less weight (1790g vs 1830g) the Tameni was still a better solution due to airflow. Remember that you WANT the flow to go to the centre, as close as possible to the ideal



Crimax upgrade.

TECH SPEC:

Standard Arcobaleno gearbox with 24/62 Denti Dritti.
Crimax Clutch, reinforced.
MHR cylinder kit.
Copper handmade head gasket.
Reed valve four-petal from Aprilia 125.
Intake guide from TM Kart.
Handmade exhaust manifold.
40mm carburettor (OKO equivalent).
Piaggio Cosa casing.



Side view of the casing
– showing alterations.

vacuum condition in which gases start to move by their own direction. We made a few tests on the dyno too and discovered 10% gain only by following this simple notion."

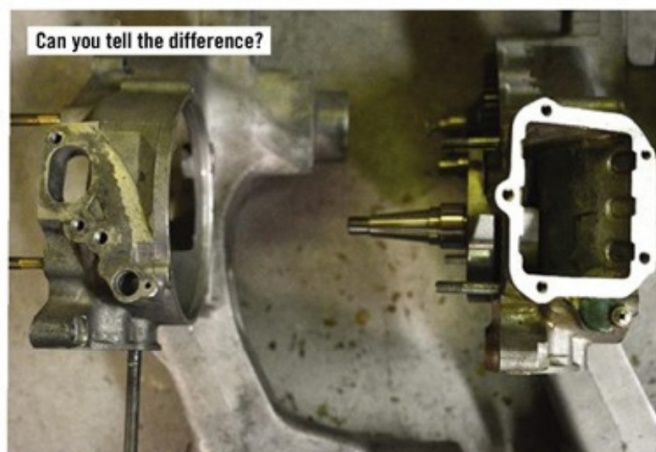
Does she sing?

I must admit that Damiano was pretty convincing about this project but I teased him to invite me to the first test on the track. He accepted fiercely.

I also wanted to confirm the port timings of this engine myself, so I asked Damiano to take the usual 0.20mm feeler gauge; I measured 130 degrees transfer and 195 degrees exhaust. Pretty wild for 'endurance'. The only missing thing now was to hear and see this engine running, a solemn promise was made and I am attending the notorious test ride in future. The clandestine races during the '80s indeed took part in the

'castelli Romani' so the 'pedigree' of the city was not at stake. I wondered though, just after leaving Damiano to his own thoughts, if the next article about him would talk about a blow-up or a success. On the other hand, the stronger and crazier the stakes, the more interesting is the solution.

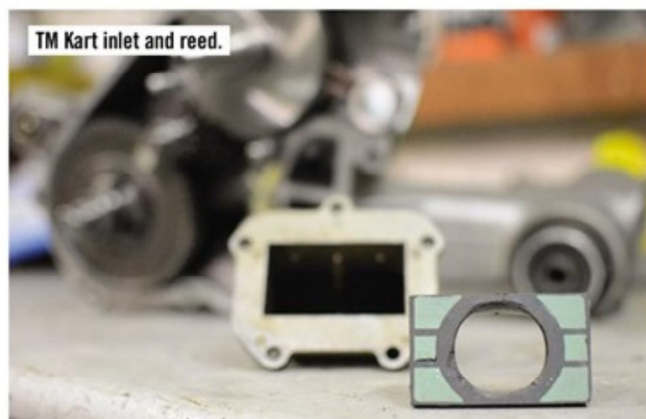
Words and photographs: Christian Giarrizzo



Can you tell the difference?



Simple solution.



TM Kart inlet and reed.