

Charlie Edmonds performance tuning



Charlie with just a few of the adjustable exhaust sections used to develop his race exhaust.



Charlie Edmonds had quietly been porting scooters and motorcycles in Northampton for years without attracting much attention. Then he took up scooter racing, and arrived like a large rock thrown into a small pond. The waves have yet to settle. In his second year of Group 4 (essentially a class for full frame Lambrettas using piston-port cylinders) he won not only the class, but – controversially – also the overall BSSO championship. In 2007 he's done the double again. The sledgehammer that he used on this particular nut was a keenness to bring new technology to a very old class, and a dedication to test and prove theories both on his dyno and the track. Oh, and a 37hp Mugello-cylindered Serveta... Scooter racing is often the testing ground for new ideas that go on to benefit road-going scooterists. Charlie has been working with Tino Sacchi to revise the porting of his Mugello and Imola cylinders. Subsequent fruit of his collaboration with Tino will be a totally new 225cc Lambretta reedvalve cylinder and exhaust kit that is expected to produce over 30hp out of the box. Charlie talks exclusively to Scootering about his racing scooter, his development programme and shaking up the old order of things...

Interview and photos: Sticky



IMOLA RACING TEAM

IMOLA RACING TEAM – MONZA 200 CC SPRINTER Barone - Tarlazzi - Pirini

Si è conclusa la stagione con brillanti risultati delle altrettante brillanti attività del nuovo Imola Racing Team di Castiglione di Cervia e Savio.

Non pochi i lambrettisti che si sono già rivolti al Centro Assistenza Romagnolo sia per mantenere in perfetta efficienza la loro Lambretta sia per revisioni originali o elaborazioni sportive, con l'ausilio di un moderno banco dinamometrico.

Il Centro nasce ed opera nelle gare di accelerazione, nelle preparazioni sportive e turistiche e come detto precedentemente nel fornire assistenza ai lambrettisti a 360 gradi.

Eccellenti e inaspettati, in tempi così brevi, i risultati nella preparazione di una Lambretta con telaio fornito da Terry Ward (n° 1 degli sprinter in UK).

Facendo proprie le linee guida fornite, il Team ha sviluppato un propulsore di oltre 34 hp.

Questa potenza (insolita almeno in Italia) è stata ottenuta senza stravolgere il motore utilizzando parti di produzione: kit Monza 200 cc, Varitronic, Supercrank, marmitte Jolly Motor o JL, frizione 6 dischi ed operando certosinamente nella messa a punto e nella ricerca di raffinate soluzioni meccaniche anziché inseguire la potenza con il bovino incremento della cilindrata.

Al controllo è stata l'unica Lambretta trovata coerente con il regolamento e si è sempre dimostrata superiore alle presenti sullo strip di gara.

Gli ottimi risultati raggiunti serviranno soprattutto da esperienza, come banco di prova per valutare, in termini di prestazioni e durata, i componenti utilizzati e saranno quindi un utile bagaglio tecnico per il futuro.

Il team è in contatto con Performance Tuning per scambi di informazioni ed esperienze.

ELABORAZIONI CHE TRASFORMANO UNA LAMBRETTA IN UNA VELOCE, AFFIDABILE E SICURA LAMBRETTA

KIT MUGELLO – IMOLA – MONZA in alluminio/nicasil, ad immissione lamellare e piston-porting da 186 a 225 cc e oltre. Potenze da 17 a 32 hp.

SUPER MUGELLO a 5 travasi, Imola a 6 travasi, tutti con teste a cupola centrale e candela laterale con fissaggio al cilindro con 7 tiranti per una tenuta superiore senza deformazioni. Cilindri Montlery per D-LD 125/150 in alluminio/nicasil.

SUPER MONZA 200 – 225 Nuovo cilindro ad immissione lamellare assolutamente innovativo, con filtro aria all'interno delle scocche e potenza di 29 hp con carburatore diametro 28 e 34 Hp con carburatore diametro 32/34.

NUOVI KIT RB di A.F. Rayspeed con marmitta e collettore a € 600,00

PISTONI leggeri e robusti con una o due fasce cromate da 1mm – Diametri da 64 – 66 – 70 – 72 compressioni 30 – 38.

VARITRONIC per Li/SX/TV e DL anche per D-LD 125/150. Accensioni ad anticipo variabile anche con centralina programmabile tramite PC.

TESTATE SPECIALI a cupola centrale per tutti i kit diametro 64 – 66 – 70 – 72 di assoluta indeformabilità con 7 tiranti (candela laterale) 8 tiranti (candela centrale). Totale tranquillità e prestazioni eccellenti con consumi contenuti.

ALBERI MOTORE con spalle piene ed inserti in tungsteno per una perfetta bilanciatura. Bielle forgiate 106 – 115 con gabbie argentate a rulli liberi (15 o 17 a richiesta). Anche alberi originali, tipo sport, super sport. Alberi per D/LD 125 -150.

CAMPANE FRIZIONE ALLEGGERITE con bussole sinterizzate autolubrificanti da 46 – 47 denti per frizioni a 4-5-6 dischi in alluminio o standard. Molle rinforzate. Combinazione corona Z46 pignone Z16.

NUOVE BIELLETTE forgiate per freno a disco per Li/SX/TV adattabili a DL. Molle rinforzate ad assorbimento progressivo.

CARBURATORI Dell'Orto e KOSO e altre marche e tipologie fino a diametro 38.

NUOVI CERCHI standard e larghi in acciaio color alluminio e bianco.

CERCHI TUBELESS alluminio anodizzato stretti e larghi.

CUSCINETTI, PARAOLI SPECIALI, SUPPORTI BANCO tutto con rulli assolutamente robusti con attriti ridotti per una durata illimitata del motore.

MARMITTE, frizioni, collettori di diametro e forma per ogni applicazione, assi messa in moto, pignoni.

MARMITTE ad espansione JL e Jolly Motors con flange per ogni cilindro.

MARMITTE ANCILLOTTI con tubo collettore in INOX a diametri progressivi, completi di fascette per montaggio facilitato.

FRENI A DISCO originali (tipo Campagnolo) autoventilanti e non.

FRENI A DISCO esterni idraulici e antidive.

AMMORTIZZATORI std e registrabili. Kit a fascetta con ammortizzatori anteriori e molle progressive rinforzate.

KIT VESPA 125 cc per PK-ET3

Seigiorni (M1) ad aspirazione tradizionale

Seigiorni (M1L) lamellare

Seigiorni (M1C) R2R pronta corse (cassetta completa 31 hp a 13000 giri)

KIT VESPA 175 per PX 125/150

Millemiglia (M1X) ad aspirazione tradizionale

Millemiglia (M1XL) lamellare

Inoltre tutti i ricambi per la manutenzione, restauro originale e per grandi viaggi.

... a due passi dal cielo,
noi c'eravamo...



tinno sacchi - www.lambretta.it - Tel./Fax 02 90631759 - Cell. 3355444929

rolled the metal into cones for a proper expansion chamber. That forced them to change the rules."

On Influences...

"In racing the person I most admire is Dave Webster because he's got what I'm getting. He pushed things forward. People watch the scooters racing now and the front runners are flying and it looks good. People crawling round is no good – that's not racing."

On business...

"I've got enough work that I can pick and choose. I don't sell parts, I only want to build complete packages and to develop stuff. I can build a customer a 32.5hp race motor including pipe, crank, modified 34mm carb, gearbox, ignition and drive-train for about £3500-4000. James Campen races one of those engines. He has had a very reliable season and only changed the piston once all year."

On the new Tino Sacchi kit...

"It will be an alloy-Nicasil reed valve 225 kit – but it can be a 200cc as well. You could say elements are similar to the RB kit, but I've been working on this since January – way before the RB came out. At the moment it's bolted to a bog stock Indian casing with no matching and it's already putting out 31hp with a straight-line pipe and 28mm carb. With the 34 carb it has 33hp and 21ft-lb torque which is massive. That'll probably yield another 2hp. I should think once the pipe is coiled up you should have 29-30hp with the small carb and 31-32hp with the big carb as a pure bolt-on."

"With this kit I'm trying to make sure that everything is matched – the ignition, the port timing, the pipe and the compression ratio. Everything is doing what it should within the specified rpm range. The kit will be for all-round use – designed to work with a 28mm carb and filter all under the sidepanel so that you aren't

using gallons of fuel. Peak power will be at 8000rpm but low and midrange will still be phenomenal, with peak torque at 6500rpm. It won't have a lot of over-rev though so you cannot bully the engine, which is what breaks them.

"I'm also designing new cylinder heads for Tino's kit with a centre squish and room for eight bolts, but it will still take a normal spark plug. There will also be options for a centre plug head and a choice of two different compression ratios.

"I don't know how the exhaust will be constructed yet because it's still under development, but I think the plan is to make it in Italy. It's a very fat pipe but I'm sure it can be made to fit a road-going scooter. The complete kit should be on sale next year through Cambridge Lambretta in the UK. **SC**

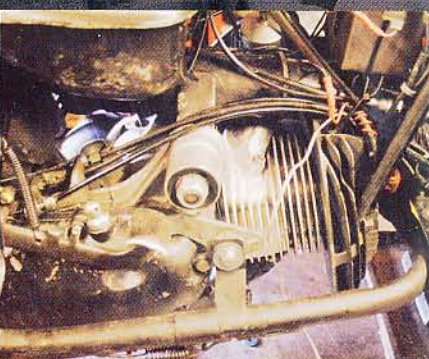
■ To contact Performance Tuning call 01604 765425 or email performancetuning@btinternet.com



All the sections of the exhaust are designed in computer software. Charlie first makes the pipe in paper – then in cardboard – while trying to formulate a layout.

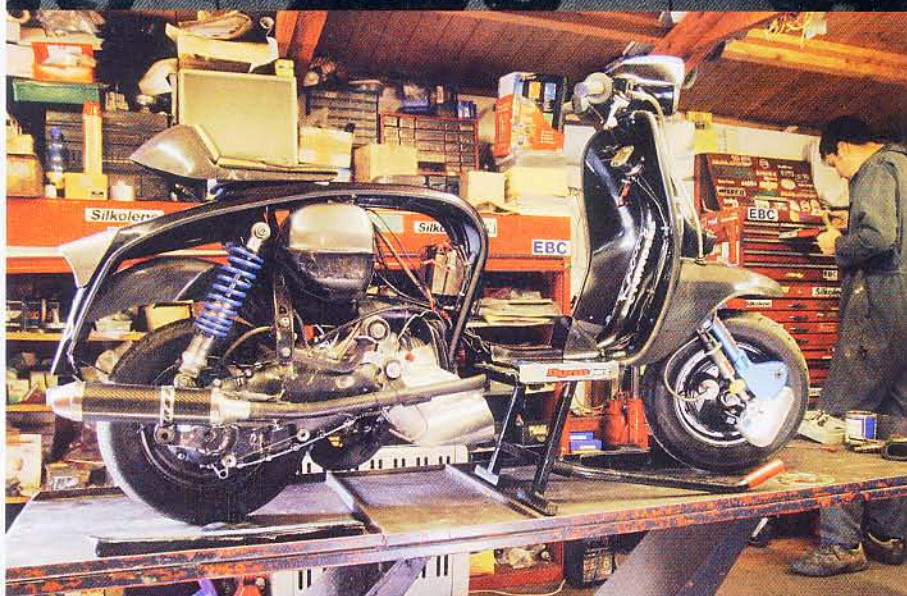


The main chamber actually sits where the flywheel cowling would have been.



At the core of the racer is a humble two-transfer Mugello cylinder. Note the length of the removable exhaust stinger. This exhaust layout makes for easy gearing changes.

Inside the beast



Carb: Dell'Orto VHSB – D-shaped to 39.5mm
Ignition: Varitronic flywheel with the weight removed and boss welded to prevent the rivets breaking. A Malossi-based ignition was also tried but suffered reliability problems.

Crankshaft: Modified Tino 'Supercrank' webs fitted with a long Japanese con rod and welded pin.

Cylinder: A normal Nicasil-lined Mugello cylinder at 67mm with two ports and the larger (V2) transfer openings. There's a lot of controversy about it, but it is a two-port not a three-port cylinder. They've been hard to get but CLW are restocking them for '08.

Cylinder head: From one of the last of the Yamaha 400cc motocrossers, machined to take removable domes. It's two days' work on the cylinder head alone. Domes are sealed to the heads with special heat transfer sealant.

Pistons: 67mm cast piston with a Japanese Teflon coating using different piston ring and gudgeon pin. The piston gets changed every two meetings.

Transmission: Eight-plate clutch with aluminium plates. Gear cluster made using gears pinched from other Lambretta boxes. These are pressed on and TIG welded in position.

Chassis: Serveta Jet 200 frame, GP legshields, no lower rebound bushes in the forks and an extended rear shock to raise the scooter by about 25mm to improve ground clearance.

Forks: GP forks with modified disc brake links – the fork feet have been modified to take larger link bolts, Bitubo front shocks for Indian forks used as dampers with the springs removed and heavier weight oil.

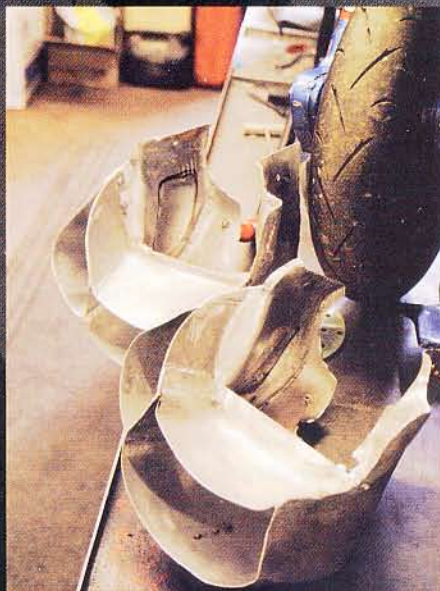
Front brake: Innocenti disc brake hub and backplate converted to hydraulic. The disc is a thin EBC ATV disc that mounts to a floating carrier and uses matching EBC pads which are specially machined to suit so that they can't rotate.

Rear brake: Standard drum with heel-operated pedal.

Tyres: Dunlop TT91 in the dry, Sava in the wet on standard narrow rims.



The EBC disc and pads that Charlie modifies for his front brake.



Cooling scoops have been carefully designed and sectioned to direct air across both the barrel and the head.

end, but on the midrange and top end they are flat. A lot of people say you want a flat topped power curve. You don't want to be looking at the power curve, you need to look at the torque curve – that's what needs to be flat. You need 30hp with 20ft-lb of torque – that's how you get a scooter to go well."

On gearing...

"Until I came along everyone was using three gears for racing: first gear just to start and then riding around in the other three. At slow corners

they'd have to slip the clutch like mad in second to get out of the corner. My idea was to use a taller first gear and then use all four gears when I'm riding. Let the clutch do the start, and then when you come to a slow corner you can use first gear.

"In my gearbox all four gears are close and you change through them very quickly. To do this though you must have a clutch that is designed to be slipped. Tino suggested making the alloy plates and I tested them. The thing with the alloy ones is that they dissipate the heat better and

don't warp when they get hot like the steel ones. Plus you are saving weight – almost 300 grams over a complete eight-plate clutch!

"Having the gear ratios so close prevents a lot of strain on the gearbox. In layman's terms it's the difference between trying to climb three stairs at a time, and trying to climb just one."

On race politics...

"When the competition have been doing something for 20 years and you come along and basically annihilate them, they think you must be cheating. I take my hat off to them for what they've done, but now they have to rethink what they are doing. They think too much about 'scooter tuning'. If you think that way you'll always stay the same – you need to look at race engines and why they've evolved the way they have.

"I'm always looking to improve. I tested a water injection system at the first race of the year. By injecting water into the pipe you are tricking it into behaving in a different way so it makes more power at low rpm so it is useful when coming out of a corner. It just happened that one of the hoses came off in the paddock, it started leaking and the switch was stuck on so everyone saw it. Nothing in the rules said you couldn't do that but I took it off.

"The biggest arse is that the system I came up with could have been built and fitted to anyone's scooter for about £50 using really easy bits. I used a car washer jet pump, a micro-switch and a cyclist's drinking bottle. Some people thought it was a good idea and others thought it wasn't in the spirit of things, but at least I was trying different ideas.

"It's only through this sort of thinking that we are allowed to use expansion chambers in Group 4 – they used to insist people ran the standard box exhaust until someone cut one up, flattened it and

Riding the beast

Dynojet Performance Evaluation Program



Fast circuit specification.

I forgot quite how boggy large-carbed piston-port engines are below the power band and almost stalled the engine when pulling away between the lorries on Charlie's 'private test track'. Another try with more revs and more clutch slip and suddenly the engine lights up and we are away.

On Three Sisters 'short circuit spec' the scooter just wants to stand on its tail as soon as you hit the power in first gear. After that it's a frantic

Dynojet Performance Evaluation Program



Short circuit specification.

effort to feed it more gears and keep it boiling between 8000 to 10,000rpm. When it's in 'the band' it accelerates strongly but predictably, with no steps or surges in power. This is the key to obtaining the good off-corner acceleration needed to win races. Out of the power band it's an evil spitting pig. My god it's fast, but thank heaven for reed-valves!

On work...

"I've been tuning full time for about 12 years and using dynos for about seven years.

"About 60 per cent of my work is on scooters and the rest is on racing bikes. I've already done an 85cc and a 100cc for a girl in motocross, and she's going to 250cc at world championship level next year.

"I also work for people doing grass track and racing TZ Yamahas. I have a soft spot for scooters though because you are doing something that shouldn't be done."

On learning tuning...

"I've had help from a toolmaker/engineer called Paul Wallis (Beaker) and also from Richard Trasler who does bodywork on Aston Martins. Richard taught me about pipes: how you beat and shape the metal so you don't create pipes that crack all the time. Most people TIG weld them but I gas weld every section, which stops them fracturing. In the last two or three years racing I've never had a pipe crack.

"Another tuner – Gerry Pell – taught me a lot and now I've ended up doing tuning for him. He does crankshafts and I do heads for him. His bikes have cleaned up in the LC series for years."

On dyno testing...

"A lot of people have dynos but they don't know how to use them. You can look at the air/fuel ratio on one run and it looks perfect, but add some load to the engine and you can see the fuelling change. That's why so many people get a bike set up on the dyno and then put holes in pistons. Interpreting this only comes with experience.

"When I test a bike on a dyno for race conditions I run it through three power runs, then I run it all through the gears – holding it in top gear – then slow it down on the brake and hold it there, then I'll run it again. Only then you can say 'at the start of the race I had XXhp, but two laps later it's dropped down to XXhp...' Then you can adjust your settings to get a consistent motor. Air-cooled engines are a nightmare though – they can drop maybe 5hp – especially when they are scoop-cooled. At a short twisty track a you simply don't get enough airflow."

On power...

"The best I've seen on my racer is just under 40hp with a straight pipe and around 38hp once the pipe was coiled up, but it became just too unrideable coming out of the corners. I've now

retuned it to just under 37hp and come up with two alternative cylinder and head configurations to suit long and short circuits.

"It'll do 100mph with the tallest gearing, but if you put a lighter bloke on it would go even faster. You don't gear it like that for the track though: you gear it to be doing 90mph halfway down the straight and not much more at the end. Pulling strongly out of the corners is more important than top speed.

"I'm sure that you could get the same performance out of a Rapido barrel. There's more material on the Rapido to make bigger transfers but I never bothered. I saw the Mugello, which is Nicasil lined, and thought that was a better bet.

"There aren't many people out there that can get this sort of power out of a two transfer port motor. The closest thing is the guys who race Villiers engines and they get high-20s. That's nowhere near – I got 30hp at the first attempt at an engine and pipe for racing. With the right work a two-port Lambretta engine can make this power, and it can be done within the rules – no matter what anyone else says."

On tuning philosophy...

"People ask if it's my exhausts that have made the difference but it isn't – it's a combination of about 10 different things that have done it: crankcase pressures, big pipes, madder porting, making the gearbox and the clutch work and so on.

"The biggest problem in scooter tuning today is that they are all going down the 'old man's route': which is to pack out the crankshaft to increase crankcase compression, but that's the wrong way.

"Modern motocrossers are down to 1.2:1 crankcase compression but even a standard Lambretta is 1.65:1. Innocenti designed the Lambretta with high crankcase compression because it had a box pipe. They knew nothing about expansion chambers at the time. With a big exhaust you actually need to increase the volume in the crankcase.

"People say that it does make a difference boosting the crankcase compression – well it does if you've got a crap pipe. If you've got a useless, small diameter pipe then the pumping action of the engine and the exhaust are sharing the effort to draw gasses up the transfers. But why not design a good pipe that does 80-90 per cent of that work: that's what they are there for! Low crankcase compression is one of the keys to making good power, but you'll fall on your ass if you don't have the right pipe to work with it.



No knee sliders required. Charlie has a totally different riding style to previous Group 4 champion, SRP Racetec's Stuart Day.

"The other problem with scooter tuning in the UK is that 80 per cent of the tuners will take a pipe and a barrel, and they'll keep tuning the barrel and not change the pipe. The barrel is now ported to work at 9000rpm but the exhaust was designed to work at 6500rpm. What's happening is the components are squabbling with each other – the waves are travelling down the exhaust and arriving at the wrong times. If you've ever looked in a cylinder and seen brown marks inside the transfer ports that's because the pipe is out of sync with the ports. The pulse from the exhaust is returning so early it's stuffing burnt mixture back down the transfer ports. That's also why you see reeds with petals that are all feathered at the tips and burnt away.

"I can see why tuners do it – and I used to do it – because it is cheap. Buy this kit, offer the customer a tune and it's 3hp better, which is great. 'But this is what you could have won with the right pipe – here's 8hp!' The customer says '£500 for an exhaust – I don't fancy that.' OK, but without the pipe you aren't going to get the power."

On exhaust design...

"All the current Lambretta road pipes are about 100mm diameter at the fattest. Mine are 125-128mm at the most. Show that to a scooterist and they won't believe it will fit under the bodywork, but you can fit them if you know what you are doing.

"All the current road pipes work well on the low



The Dell'Orto has been reworked to almost 40mm diameter and fitted with a cable-controlled powerjet.



Thumb operated powerjet lever is used to add more fuel during a race when the motor starts to overheat.



A blank Yamaha 400 head and one of the interchangeable combustion chamber domes.



1° ASSOLUTO PER IL SECONDO ANNO CONSECUTIVO

Charlie Edmonds è vincitore assoluto, pur essendo iscritto nella categoria (gruppo 4) essenzialmente nella categoria derivata di serie con Lambretta standard, con cilindro tradizionale (piston porting) Mugello 205 di 37 hp, accensione Varitronic e albero motore 12000 Supercrank. Questa sua "performance" è derivata prima di tutto dalla sua capacità di preparatore e di grintoso pilota che ha saputo cogliere, nella qualità dei nostri componenti, le caratteristiche necessarie per dominare nelle gare di campionato inglese organizzate dalla BSSO.

Basandosi soprattutto sulla sperimentazione e ricerca, ha inoltre messo a punto un nuovo kit di 200 - 225 cc denominato SuperMonza.

Supermonza by Charlie Edmonds e Tino Sacchi

Kit innovativo con filtro alloggiato all'interno dei cofani, possibilità di intervenire direttamente sulle lamelle senza il distacco del motore, testata a 7 tiranti.

Se a queste peculiarità aggiungiamo che il kit fornisce potenze importanti già con carburatori relativamente contenuti (29hp con diametro 28, 31hp con diametro 30 e 34hp con diametro 34) e una coppia che consente accelerazioni brucianti con due persone in sella a partire da 60 km/h in quarta, è chiaro che siamo di fronte a qualcosa di profondamente nuovo volto a cambiare il contenuto prestazionale della mitica Lambretta.

Alle facili insinuazioni che qualche "esperto" sicuramente farà sulla durata nel motore, fin da ora rassicuriamo che le doti di robustezza dei nostri kit, che sono stati alla base del successo di migliaia di esemplari venduti, sono stati gli obiettivi principali di cui Charlie in primis ha tenuto conto, soprattutto nelle versioni più potenti, con prolungate prove al banco e su pista.

I pistoni adottati, a due fasce, spinotto diametro 16 e diametro 70 nelle altezze 30 e 39 mm derivano direttamente dai pistoni Husqvarna, quindi massima sicurezza.

I cultori delle prestazioni dovranno attendere ancora un po' prima di entrare in possesso di questo nuovo SuperMonza che fa onore al circuito italiano da cui prende il nome.

Per le sue caratteristiche, SuperMonza verrà fornito completo di tutti i componenti necessari a formare una robusta catena performante e sicura, dal carburatore all'ultimo tratto di silenziatore.

Il kit sarà comprensivo di Supercrank con biella e gabbie maggiorate, marmitta stradale o corsa con silenziatori efficienti, testata, pistone, Varitronic e altri dettagli come i nuovi supporti banco appositamente predisposti, frizione in alluminio a 6 dischi.

Saranno a disposizione per i lambrettisti sportivi il SuperMugello 5 travasi con traversino.

Anche i tradizionali Imola e Monza si avvarranno di migliorie per incrementare la coppia e la potenza con i travasi e altro.

