

# Cylinder tuning – Part 2

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Two-stroke tuning has been around longer than Lambretta its self. Lambretta tuning became famous in the 1950s, 60s, 70s and more recently the mid 1980s. The majority of these tunes were very poor and unreliable giving tuning a bad name to many people.

Tuning when done correctly can be very reliable possibly even more so than standard engines. The main failure was the piston quality, as pistons improved con rods failed and so on. From the beginning MB have aimed to improve the Lambretta tuned engine!

This article is a reference to Lambretta tuning available from Mark Broadhurst, all the information is here to help you to decide the type of tune to suit you and your riding style. There are a number of considerations you should take into account when choosing the tune for you.

- How much do you want to spend
- How fast do you really want to go
- Do you mainly ride two up
- What preference of carb and exhaust do you have
- What type of riding do you do? Around town, cities, commuting to work etc, Country roads, motorways, road racing etc, Motorways, rallies touring etc

With this in mind you can read and pick through the type of tune and conversion to suit you. Regardless of the kit to be fitted MB recommend these stages of tunes for

## OVAL TYPE EXHAUST PORT CYLINDERS

### Small Block

- Cast Iron
- Mugello alloy
- Race-Tour alloy
- Casa alloy
- SR alloy/cast
- GT Iron

### Large Block

- Cast Iron
- Mugello alloy
- Rapido alloy/iron
- Race-Tour alloy

- Casa alloy
- Indian alloy/cast
- Indian SIL Factory

#### STAGE 1. BLUE PRINT

This consists of basically blue printing the engine, polish and match ports to gaskets and check out clearances.

No real tuning gain would be obtained here.

#### STAGE 2. TOWN / CITY TUNE

Standard 125, 150 and 175 engines are slow by today's standards; Very little work is required. The stage 2 gives brisk acceleration and increased pulling speed both one up or with a passenger, top end speed increases a little but may struggle to keep up with modern motorway speeds. The inlet port is roughly cleaned up which matches the standard inlet manifold and carb, the transfer ports are roughly cleaned and slightly flowed on their entry, the exhaust port is matched to a standard exhaust gasket then the exhaust port raised and polished. The cylinder head is reprofiled to suit the piston and the compression is lowered to run on unleaded fuel. The standard 18, 20 or 22mm carb would be used along with the standard exhaust. The kit was designed with towns and city commuting in mind so scooters have the power to pull away from the dangers of modern traffic. This kit would also be at home on country roads having much more power than standard. The limitation of the kit will always be the standard carbs and exhausts. For more power and speed fit a 24 or 25mm PHBL carb and either an Indian big bore exhaust or a Clubman exhaust. Fitting larger carbs and expansions is an option but is a bit of over kill as the porting spec is not large enough for it.

#### STAGE 3. TOWN / OPEN ROADS

The stage 3 tune is an ideal tune to suit steady speeds both two up and one up. It is an easy ride around towns, open roads and can cruise nicely on motorways. It lacks the acceleration and top speed for the stage 4 and 5 tune and can take some time winding up to reach top speed. The inlet port is cleaned up, squared off and matched to 24 – 25mm carbs and inlet manifolds. The transfer ports are flowed at their entry, flowed along their length and satin polished. The exhaust port is matched to a standard exhaust gasket then the exhaust port is raised, widened and polished. The cylinder head is reprofiled to suit the piston and the compression is lowered to run on unleaded fuel. The standard 18, 20 or 22mm carb could be used along with the standard exhaust. This tune is ideal for the slightly larger 24 / 25mm carb, Indian big bore or Clubman exhaust. This kit would also be at home in Towns, Cities and open roads. The limitation of the kit will be the carb and exhaust used. Fitting a larger carb is an option but is a bit of over kill as the inlet port is not large enough. Fitting a mild touring style expansion is OK to increase top end speed.

#### STAGE 4. TOURING / TWO UP RIDING

The stage 4 tune is to be considered as a very good all round tune ideal for

town, open roads with good pulling power for motorways and two up driving. It has brisk acceleration and cruises nicely allowing more power to overtake. The Inlet port is opened, flowed and polished to suit larger 28 – 30mm carbs. The transfer ports are flowed at their entry, flowed along their length and satin polished. The exhaust port is matched to a big bore exhaust flange and gasket then raised and widened internally. The cylinder head is reprofiled to suit the piston and the compression is lowered to run on unleaded fuel. The kit is ideally made for 28 -30mm carbs, Clubman exhausts for town or touring work or expansion chambers for quicker speeds. Any carb and exhaust could be used, but this would be a waste of time spending the extra on the tune.

#### STAGE 5. ROAD RACE SPEC

The stage 5 tune is to be considered as a quick road going tune capable of fast acceleration and high motorway speed. It is ideally suited for one up riding but is quite capable of two up riding at high speeds loaded up. The inlet port is increased in size compared to a stage 4 to match to the larger 30 – 35mm carbs required to give more speed. The transfer feeds are lowered at their feeds then flowed and satin polished along their length. The exhaust port is matched to a big bore exhaust flange and gasket then raised and widened internally to make a larger port. The cylinder head is reprofiled to suit the piston and the compression is lowered to run on unleaded fuel. The kit ideally would use 30 – 35mm carbs and run with expansion chambers.

#### STAGE 6. RACE TUNE

The stage 6 tune is to be considered a full race spec engine brought about though track racing. The inlet port is opened to its maximum matched and race flowed to 30 – 35mm carbs and manifolds. The transfer ports are opened to the maximum along their length, flowed and polished (the casing transfers require matching). The exhaust port is opened to its maximum for race tuning then matched to a full race expansion. The used of high compression centre plug cylinder heads could be used. Stage 6 tuning is hardly ever used this days, the reason being a lot of work is required which in turn costs a lot of money, for around the same money the TS1, RB, Monza or Imola kit could be used with the extra benefits that they bring.

#### STAGE 7. FULL RACE SPEC TUNE

The stage 7 tune was considered for a time in the mid 1980s to be ultimate race tune. It was the same as a stage 6 but with the added benefit of a reed valve. Since the introduction of the alloy reed cylinders this tune is a bit of a waste of time, but it can still be done and over the years have proved to be reliable. Today the oval cast style cylinder on the left hand side reed valve has made a comeback, but mainly for doing touring tunes and curing spit back and poorly tuned engines. Any tuning spec claiming to be higher than stage 7 would be considered total rubbish and pub talk!

#### ROUND TYPE EXHAUST PORT CYLINDERS

Small Block

- Imola
- RB20

## Large Block

- TS1
- Monza
- RB20
- RB25

MB tune Round type cylinders with a different school of thought compared to cast iron cylinders. These cylinders are already tuned as standard. This doesn't mean they can not be improved upon and tuned further. Because these cylinders come pre tuned we don't use the same standards of tuning as with the Oval type cylinder Stage 1, 2, 3, 4, 5, 6 or 7.

### STAGE 1. ROAD (TOURING) TUNE

Cylinder ports are flowed and polished, exhaust port is widened. The casings require matching to the standard cylinder transfer feeds. The cylinder base could be machined to lower port heights this then spreads power output, when this is done a 1.5mm cylinder head gasket is required, this is also an improvement as standard head gaskets tend to blow. This is tune has been very popular over the years aimed at touring.

### STAGE 2. ROAD / RACE TUNE

Inlet port is flowed and polished, the boost port is widened and the exhaust port is widened and raised, the transfer 2nd port is matched. The casings require matching to the standard cylinder transfer feeds. The cylinder base could be machined to lower port heights, this then spreads power output, when this is done a 1.5mm cylinder head gasket is required, this is also an improvement as standard head gaskets tend to blow. Again this has been a very popular tune over the years.

### STAGE 3. RACE TUNE

Inlet port is opened, flowed and polished. The boost port is widened. The exhaust port is widened, raised and opened up to race porting spec. The 2nd transfer ports are widened and the feeds are opened to the maximum safe limit! The casings need to be opened to the larger size. Some times it is an advantage to weld the casings to strengthen around the transfer area as casings can crack through vibration. This was quiet a rare tune mainly aimed at a level entry Group 6 race bike or someone wanting a fast Road Race engine.

### STAGE 4, 4A AND 4B

We have named a few cylinders like this when we have iron lined cylinders to repair or modify them. When iron lining a cylinder you can move ports around especially the boost ports or you can add an extra port or two depending on spec and piston used. Also by using a liner you can extend the top of the cylinder to help locate the head. Today we still do all these

conversions and repairs but don't bother naming them stage 4, a or b it just got too complicated. A lot of these cylinders used extra inlet to crankcase ports and or welded casings. As we developed the Race-Tour tune we found some very high powered engines without welding the casings!

#### MB RACE-TOUR TUNE

We developed this tune from 3 months of testing a TS1 engine back to back with a RB engine, its a mixture of Stage 1, 2 and 3 tunes and is now our most common TS1 cylinder tune. The Inlet port is the same as a Stage 1, the boost port is similar to the Stage 2/3, the exhaust and transfer feeds are similar to a Stage 3, we also do some small mods internally with the transfers and the transfer feeds are opened as per Stage 3. We call it Race-Tour because you can miss match cylinder head compressions, reed blocks and gaskets.

For Road Touring use these

- Low compression road heads
- Standard, Yamaha/BGM reed blocks
- Use a fat head gasket (lowers port timings)
- Use a standard flywheel
- Use fixed standard ignition

For Road / Race

- High compression race heads
- V-Force reed blocks, flow the inlet manifold
- Use a thin or no head gasket (raises port timings)
- Use a lightened flywheel
- Maybe use an advance ignition

#### MONZA 200/225 CYLINDERS

These are similar to a TS1 cylinder, ports are slightly rougher and there are various casting versions, these can all be tuned to similar to the above section but need much more work to make them work.

#### IMOLA 190 CYLINDERS

These are similar to a TS1 cylinder but smaller, ports are slightly rougher and there are various casting versions, these can all be tuned to similar to the above section.

#### RB CYLINDERS

RB cylinders are a totally different cylinder with more ports and feeds compared to the TS1 style cylinder it also has a ROUND exhaust flange but is at an angle so a new exhaust is required. Tuning is different again and its more of a case of de-tune in a way to gain power as we consider it an over tuned cylinder. When we developed the Race-Tour tune we found the smaller ports of the TS1 gave more power and was more ride-able and drive-able and was more reliable for a less of a tune!

When tuning a standard RB we raise the exhaust port to make the cylinder more racey and flow some ports. We usually get RB cylinders in for repair when the little sub exhaust ports crack. It's common to have to strip the plating, grind out the subs, weld up the exhaust and re design the port to be a single more reliable shape. These cylinders resemble a Motocross cylinder and there is a lot of demand to weld casings and over tune them. Ideally you need to use the fat head gasket technique to lower transfer port timings with a raised exhaust port to make it work even better.

## CASING TUNES

Most tunes would benefit from the casing matching to the cylinder transfers, on it's own it may not offer a mass of power but it will help smooth gas flow transition from the casings into the transfers feeds on the cylinder. Some kits can just be bolted onto a casing and nothing needs doing. The chances are the Small Block 125-190 and Large Block 200-225 does not need anything doing as the transfers will not be opened out beyond standard and are just flowed along their length. Some kits are so badly made and twisted that the transfer feeds need opening to suit a standard casing or have been cast too big like the Mugello, Imola, Monza and SR cylinders, ideally these need matching and opening together. Some cylinders have been butchered before by a over enthusiastic hand so the only thing to do is clean them up and match to a casing. Some kits are designed larger than standard and ideally need casings matching, these include Rapido's, TS1's and RB kits.

We break these tunes down into 4, it's not the correct term as it's just matching, but matching is all part of tuning including flowing, adding sections of a tune into one package which works well compared to something that is just thrown together.

- Stage 1 and 2, this is based on a Round ported cylinder where we match a casing to the a cylinder transfer feeds. This includes standard TS1's, Rapido's and RB cylinders and also includes SR, Mugello, Imola and Monza kits after cleaning up their transfer feeds
- Stage 3 is more like the old Group 3, 4, 5 and 6 Race tunes where the casings are open to the MAX (without welding) and a cylinder is matched to the casings this suits Oval ported cylinders tuned to stage 6 and TS1, Monza, Imola, RB's where the cylinders have been tuned to the casing size
- And then there is extra tuning based on having casings welded, either to repair over sized previously tuned cylinders or to match a cylinder where transfer feeds are required to be much larger
- And there is casings welded to match cylinders that have been welded or opened to the max like a Group 5-6 full race spec motor where the transfers are more than twice as large and may have a inlet to casing feed

To date Jan 2023 MB have tuned over 2200 tuned cylinder kits and engines plus hundreds of Factory tuned kits and Vespa casing matching which we have never logged.

Onto PART 3 Explaining advanced tuning

If you have a question please Email [mark@scooters.co.uk](mailto:mark@scooters.co.uk) Mark Broadhurst