



The timing sequence is the heartbeat of any engine. Altering parts of an engine may alter the timing as well.

I ENJOYED myself immensely riding the Yamaha because in several respects it is like no other moped (or "noped") I have experienced. Top speed (42 m.p.h.) was one reason, acceleration was another. These, however, are merely matters of degree and I think it was the engine characteristics which provided the greatest contrast. Most mopeds are equipped with gearboxes giving little if no overlap between the rev ranges in the different gears. This means that if one is "poodling" along in top gear behind a bus and one wishes to accelerate past it quickly it is rarely any use "dropping a cog" as this will only cause the engine to scream needlessly and will not produce any startling acceleration.

Not only does this factor operate when the need for acceleration is at hand but also when it is necessary to slow down. Racing drivers, most motor-cyclists and a fair proportion of sports car drivers use their gearbox as a means of progressive deceleration, it saves the brakes and allows the person in control to accelerate away when the opportunity arises. Such tactics on a moped are rarely feasible. Snap into second gear when riding along smartly in top gear and the resultant revs can only have a damaging effect on the engine in general and the elements of transmission in particular.

The Yamaha did not fit into this restricted category, however, and the gears could be wound on to good effect when it was necessary, or quite normal low level (and economical) changes could be made under average road conditions.

This flexibility combined with brilliant acceleration and high top speed is a very desirable element in any vehicle and is particularly welcome in a moped. In effect it gives a machine a dual personality—it can behave like a perfectly normal 50cc. machine or it can bare its teeth now and again when it becomes imperative to do a smart bit of accelerating out of trouble. Obviously this is an ideal to be aimed at with all machines since there is thus no necessity to sell a separate "sports"

## Tuning for Speed

Ron Phillips, with the Yamaha in mind, talks about some of the difficulties of 'hotting-up' a moped

model as the two are combined in one frame and one engine. Unfortunately it is not an accidental attribute but the result of very careful design. Usually it is necessary to sacrifice a little performance (not apparent in the Yamaha I must admit) while other factors must be carefully balanced.

Pondering along this line of thought leads me automatically to a recurrent set of queries I am bombarded with through the CYCLING AND MOPEDS enquiry service. Basically all the questions add up to the same thing—increasing the performance of a specific machine. In most cases I must perforce answer in the negative. There seems to be a wide variety of people who think they will buy an old machine and "hot it up". This is, of course, starting at the wrong end entirely. Greater power requires greater reliability of components and there is usually little point in attempting to obtain abnormal performance from a worn, tired old engine.

On top of this is the question "Is it worth it?" The small two-stroke used to power the average moped is not in any sense designed for high performance apart from in the excep-

tional case of the Yamaha. Converting it (I use this word rather than the word "tune" as the latter seems to suggest that all that is required is for the mechanic to adjust a few nuts and bolts here and there and the top speed will become magically greater) is a complicated business.

The initial aim is to ensure that more fuel is sucked in and that the exhaust gases are dealt with quicker, thus giving greater r.p.m. which, by suitable gearing, can be converted to increased r.p.m. of the rear wheel. Since the ports in the cylinder wall are designed to provide an entrance for fuel vapour and an exit for exhaust gases at a much more modest r.p.m. level, to ensure that they work efficiently at higher crankshaft speeds, which, inevitably, means that they will work less efficiently at lower speeds, they will probably have to be altered—obviously not a job for an amateur. This is the equivalent to adjusting the valve operation on a four-stroke engine.

### Experimentation

The compression ratio is raised, the jet size increased in the carburetter, and the ignition timing is readjusted. The latter two factors require some experimentation since one is moving into realms where text books can only give general instructions, but at least not much mechanical knowledge is needed for this work.

However, there is also another factor to be balanced—that of exhaust design. An efficient engine does not just suck in large quantities of fuel and burn it, it must also be capable of getting rid of the burnt fuel incurred during the last power stroke. It is at this point that "tuning" ceases to be straightforward mechanical work and becomes more and more instinctive. Differences as small as half an inch in the length of an exhaust pipe can have an overwhelming effect on overall performance, and as far as using the machine on the road, things become even more complicated by the fact that the exhaust note rapidly assumes the sort of pitch likely to attract every policeman within a quarter of a mile.

But we will assume that more by luck than judgment an engine has been produced that will deliver a good deal more power than it did in its earlier "cooking" state. It will not, of course, be suitable for traffic riding since the hotter grade of plug necessary will be prone to oiling-up trouble at low revs. Therefore clear, open roads (or even better—the race track) will be necessary for any gallops.

This is only the beginning of the riding worries. The chances are that the engine characteristics will have changed out of recognition and to use any of that power so jealously harvested the engine will have to be kept "on the boil" at all times. There are two ways of doing this. One is to ride round all corners flat out, not shutting off an iota, and maintaining the revs by maintaining the speed of the rear wheel. Not to be recommended. The other is have a lot more gears to play about with so that any road condition can be met by an appropriate cog. Rather expensive.

Of course if the moped was originally of open-frame design this will also militate against a high top speed since it will inhibit the rider's crouch and wind resistance will put paid to a lot of the extra m.p.h. I leave the rider to solve that one for himself.

# IceniCAM Information Service



[www.icenicam.org.uk](http://www.icenicam.org.uk)