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Dyno Testing

To make a realistic picture of your tuning efforts it's best to use the same dyno on the same day with identical adjustments. I know that this is difficult so try to use at least the same dyno for testing.
A good example is the following from the company WIWA. They claimed to have measured the performance at the rear wheel which makes it difficult to compare with the measurements from Figure 3, because they measured "clutch" performance.
Fact is that WIWA reached a bunch of 7 extra horses at the cost of a thousand extra revs (If we believe that they tested the same bike ...).
One thing is not quite clear: Yamaha claims to build engines (31K) with 59HP at 9200 Rpm. This bike had maximum performance at 8600 Rpm. Either they chose a rather weak bike or the dyno tachometer was not adjusted properly.

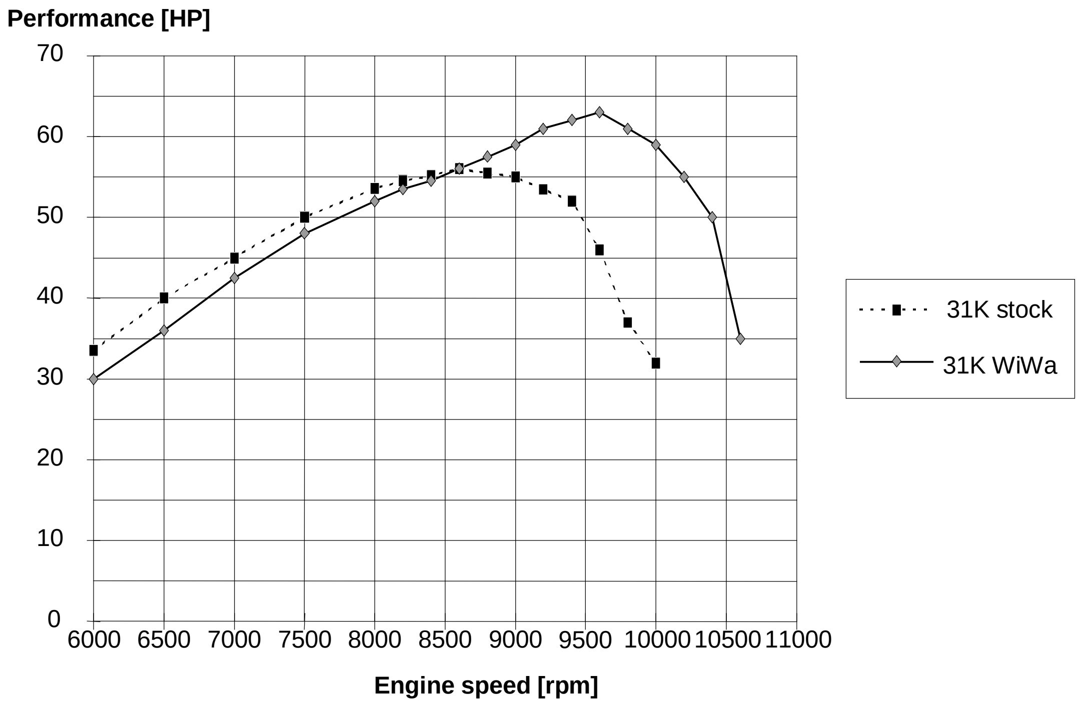
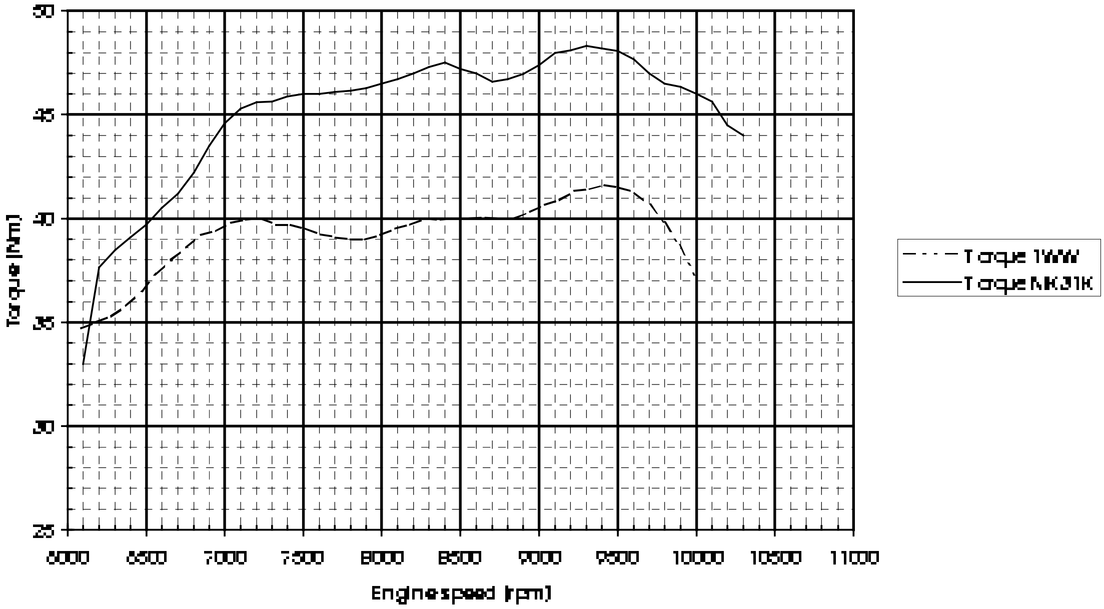


Figure 4: Dyno test WIWA catalogue

Most common dynos measure the angular acceleration of a heavy barrel with a known mass inertia. The rear wheel torque is calculated with inertia and acceleration. After the acceleration part you can also measure your gearbox losses by letting the engine roll out. The deceleration of the barrel gives you the gearbox torque losses. If you add both curves you will get the "clutch" torque.
Up to this all dynos differ only a few per cent, because no engine Rpm was measured. To calculate engine performance the computer needs information about the actual engine revs. To get the angular acceleration all dynos have their own tachometer at the barrel. The difficulty is to synchronise it to the bike's tacho properly.

Some mechanics do that quick and dirty by just performing a short ride with let's say 4000 Rpm. If the dyno's tacho shows 2000 Rpm you just type in a conversion factor of 2 and afterwards the dyno shows the same (inaccurate) value rather than your tachometer. This leads to somewhat higher "measured" performance than there really is, because the torque is assigned to a too high Rpm value. Remember: Dyno owners are salesmen, and you won't come back if you were disappointed by an honest dyno test, so they will always use a conversion factor that leads to a higher performance!

A proper dyno has an inductive coil to measure engine Rpm directly using a clamp on the ignition cables!



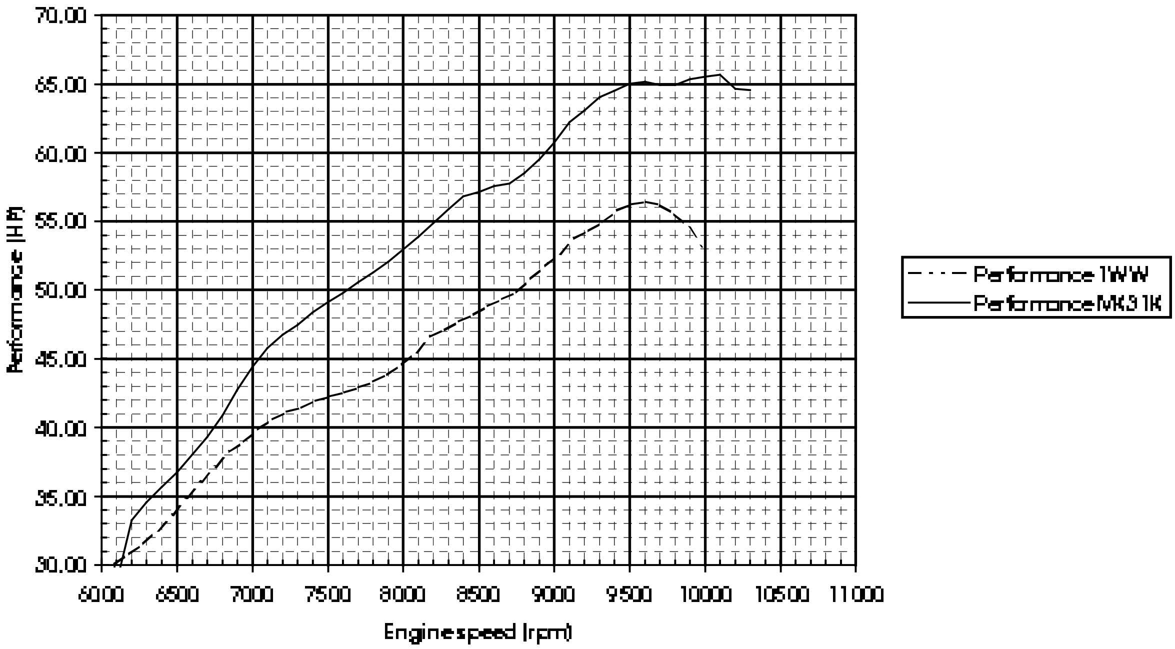


Figure 5: Dyno test with 31K and reference 1WW 2/3.2.95

Maintain optimum stock performance

It was already mentioned before: The German model codes for the RD350 YPVS are 31K (1983-85) and 1WW (since 1986). The most significant difference is in the pipe shape, the 1WW has silver coloured silencers and the 31K has a tapered ending and it's all in black. The second thing is the number on the side of the intake area: The 1WW is labelled 1UA, the 31K has a 31K. The RD250/350LC (1980-82) without power valve had the model codes 4L1 and 4L0. Later on I will use the model codes rather than the full name.

All German RD's were restricted in quite a simple way. The 31K was available in three different performance steps. Due to the former German driving license system there was a 27HP version (Nowadays there is a 34HP version instead). The insurance system was responsible for the 50HP version and full performance was 59HP.

You can enjoy full engine performance just by removing the exhaust inlet and checking the main jet size.

	Main Jet	Bush ∅	Bush length
27 HP	#200	18 mm	60 mm
50 HP	#240	26 mm	60 mm
59 HP	#240	remove	bush

Table 1: Jetting for different stock performance stages (31K)

It's fairly tricky to remove the inlet, because mostly it's welded. Use a drill, a grinder or other force. The needle position is 4'th groove from top for all versions.

The 1WW had some more carburettor modifications in addition to the exhaust inlet. The 27HP version had it's own model code 1WX (carb label 1XE00). If you find that on your bike this means red alert, because you ought to check the power jet system.

	Main Jet	Power jet	Idle Jet	Nozzles	Bush ∅	Bush length
27 HP	#180	#20/25	#25	N-8 (8 bores)	18,5 mm	60 mm
50 HP	#185	#60/65	#27,5	N-8 (4 bores)	26 mm	60 mm
63 HP	#185	#60/65	#27,5	N-8 (4 bores) Prt.Nr.: 1XA-14141-28	remove	bush

Table 2: Jetting for different stock performance stages (1WW)

As you can see the 1WW has a modified carb system, which enables the YAMAHA engineers to use a very lean main jet for good throttle response. The power jet adds the extra fuel during full throttle operation. The jet is located at the lower end of the black tube which connects upper and lower part of the carb. If you are not sure about the actual jet size (or if you want to find a new setup) you can drill out the stock jet and tap in an M4 thread. After that you can use stock Mikuni jets (N100606) with a broad range of available numbers.

Stock carbs

The right carburettor setting is very important for two strokes. Stock RD's require the following setup:

	31K	1WW
Main Jet	#240	#185
Idle Jet	#22,5	#27,5
Needle Jet	P-0 (345)	N-8 (532) (4 vents)
Tapered Needle	5K1 (4. pos. From top)	5L20 (2. pos. from top)
Slide Cutaway	2,0	2,0
Float Height	21 mm ±0,5 mm	21 mm ±0,5 mm
Power Jet	---	R: #60 ; L: #65

Table 3: Stock carb setups

For warm weather in summer you can go down to #220 - #230. A Friend of mine used to ride with #200, but his engine seized as soon as he fitted the 1WW pipes!
On a stock 31K you can clip the needle one or two steps lower. That would be position 2 in summer and 3 in winter.

The 1WW models don't need any rejetting, the stock setup is very good.

After fitting the carbs onto the inlet rubbers, you must synchronise the left and right carb slide. This means that you use the cable adjustment screw to adjust both slides to the same height.
This is extremely important, because if you leave this maintenance work, it is possible that one slide hangs lower than the other. The result would be a seizure caused by the leaner mixture on one cylinder.
To perform the synchronisation properly it's insufficient to use the YAMAHA workshop method. It's better to remove the air filter cover and the upper part of the filter box (You will have to remove the battery and the oil tank, too).
Now you can use a mirror to have a look at the carburettors from the back. Adjust the cables so that both slides begin to vanish at the same throttle position behind the upper edge of the carb bore. Take care that you pull and release the throttle a few times before and after adjustment. Check your work at least twice.

All table values consider this effect. Slight deviations are possible because of the given dimensions 65,5 mm and 0,7 +0,1 mm.

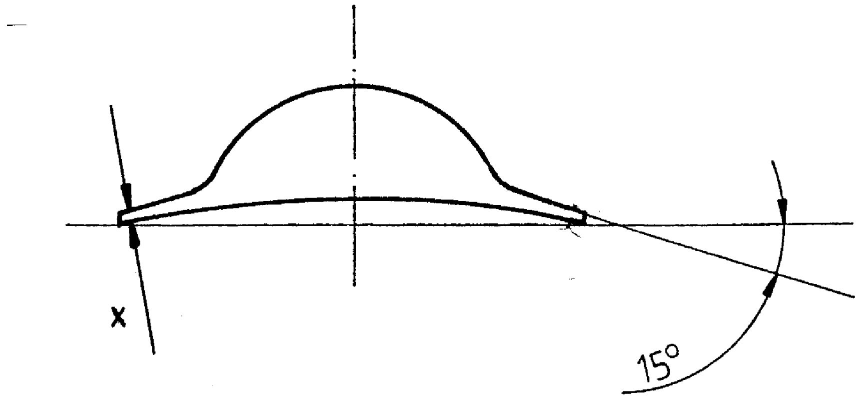


Figure 39: Cross-section of the stock combustion chamber in TDC position

(optimum dimension X: 0.75 – 0.9 mm or 0.03 – 0.035 inch)

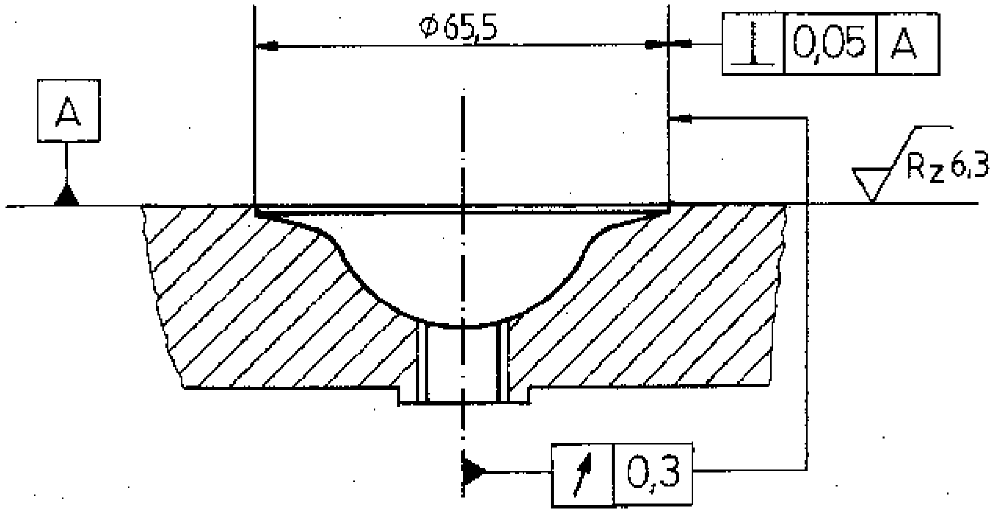


Figure 40: Cross-section of the cylinder head with rework dimensions

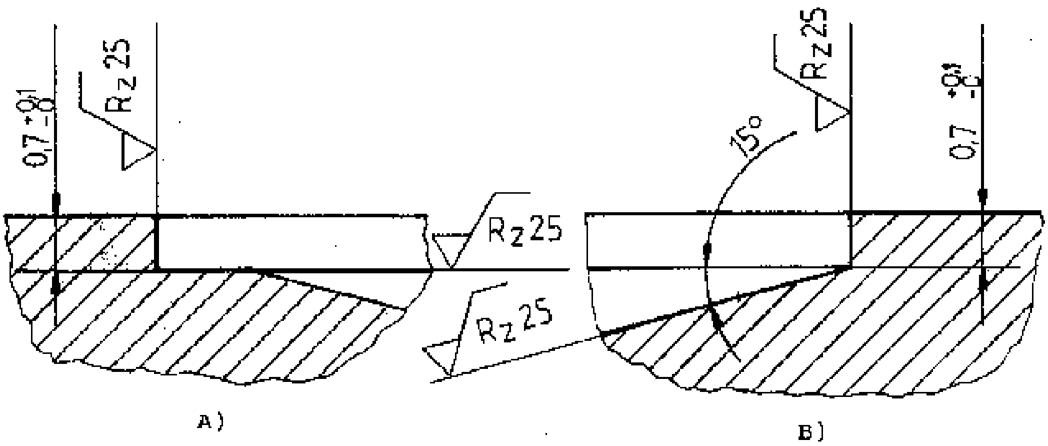


Figure 41: Reworked squish-area; A) The easy way: edge with 90° and 0,7 mm height. ; B) The better way: angle of 15° remains.