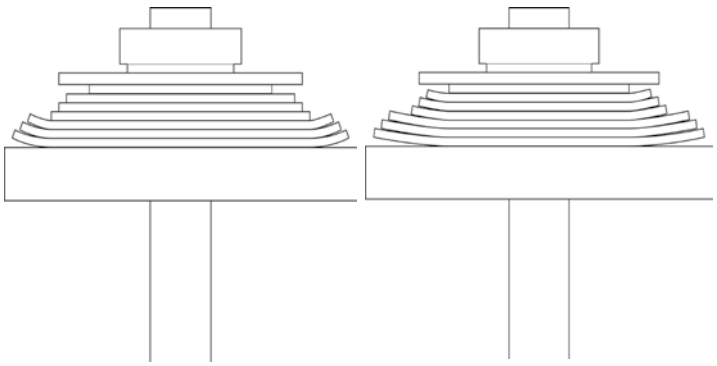
SHIMS, PISTON, DAMPING

Hi fellow country men. I hope all is well down in good old SA. I cannot complain too much at the moment as I am a proud dad as from the 11 May, my daughter Mia was born in Austria on Mothers Day. It is also summer now in Austria and that makes life much easier for a South African.

Last month I explained a little about damping and the difference between high and low speed damping. I thought that now it would be a good time to explain a little about how we create damping. It is important to try get an idea of how the damping is created within the shock and fork, especially if you want to try to change settings yourself, or even service your suspension successfully.

Damping is created by oil being forced through a piston with specific sized holes, these holes are then covered by stainless steel discs of different thickness and diameter called shims. Shims cover the holes in the piston and can bend open and allow oil to flow through the piston in one direction only thus acting like a valve.
I think it is easiest to understand how the shims bend by looking at the simple sketch below. In the sketch you can see the basic functioning of the piston and shims. Use the diagram below to try to understand the principal of high and low speed damping.



Low speed damping High speed damping

Low speed damping:
This can be created in two ways. By oil bypassing the shims through a small bleed hole in the piston, and by the bigger diameter shims closest to the piston surface bending up at the edges from the oil pressure acting on them through the piston holes. This allows a small amount of oil to pass the piston thus creating low speed damping. Some pistons do not use a bleed hole (as above) and in this case low speed damping is only caused from the larger diameter shims closest to the piston surface bending up at the outside edges.

High speed damping:
As the speed of the piston increases so does the oil pressure dynamics acting across the piston and shims change. At higher piston speeds the entire shim stack tends to bend open. In high speed situations most of the resistance comes from the shims further from the piston surface and closer to the piston nut.

It is important to realise that the amount of resistance created by the oil pressure bending open the shim stack is directly proportional to the amount of damping created. Shim stack and piston act as a valve through which the oil pressure, stiffness of the shim stack and size of the piston holes regulates how much resistance is created by the valve. By changing the shim stack we can fine tune our valve in both the compression and rebound directions.
Shock and fork pistons share the same basic function by having a rebound side and a compression side, but differ a little in the way the compression and rebound holes are made.

Shock pistons:
Compression holes are generally larger than the rebound holes, and this is the way you can tell the compression side from the rebound side of the piston.

Fork pistons: Front forks have 2 pistons, the compression piston which is found either at the top or bottom of the fork cartridge, and the rebound piston which is found in the middle of the fork cartridge.
Fork compression piston is opposite to the shock piston in that the smaller holes are the compression side and the bigger holes are the rebound check valve side.
Fork rebound piston (piston found in middle of the cartridge) has smaller holes on the rebound side and bigger holes on the compression check valve side.

N.B: If you are working on your own suspension it is important to check the following points.

All piston surfaces on which the shims rest must be completely flat in order for the shims to seal. In the case of small irregularities on the piston surface, you must lap the piston on a piece of flat glass using 800 grade sandpaper. Lap the piston using a figure of eight motion.

Shims must also be completely flat and any shims that are bent slightly must be replaced.

Torque the nut that holds the shim packet down to the correct torque to prevent shims bending up from over tightening.

Make sure that the nut used is completely flat, most good suspension manufacturers use ground nuts.

I feel that is enough for this week about damping and how it is created. It is important to grasp these basic concepts about suspension and damping if you want to work on and understand suspension yourself. In the future I will explain more on the different types of damping systems and adjustment of damping.

Enjoy your riding and always remember to service your suspension regularly. Set your bike sag correctly and use standard click settings in the beginning. Never change more than one adjuster at a time when testing your suspension and always go back to standard adjustments when you are lost.

Happy riding until we talk next month.
Cheers Hilton.