

How-To

FORK SEAL LEAKS

Preventing One of Motorcycling's Most Common Maladies

by Fred Rau

IT SEEMS TO me that the most common mechanical affliction to eat away at motorcyclists' wallets (aside from dead batteries) is the dreaded fork seal disease. If you don't believe it, just walk around the parking lot at any gathering of 50 or more bikes and I'll bet you can find at least two or three with leaking front fork seals.

Besides being about as common as dirt, fork seal leaks are relatively expensive to repair, messy to clean up after, and potentially dangerous to both you and your machine. And, unfortunately, seals of any kind are considered by most bike manufacturers to be "normal wear items," meaning they are rarely, if ever, covered under your bike's warranty terms.

For those reasons we decided to do a little research to help us all understand how fork seals work, why they fail and, most importantly, what can be done to lengthen their service life.

How They Work

There are numerous types and styles of sealing arrangements on different motorcycle front suspensions, but most commonly all are made up of five basic parts or elements: A dust seal, a stopper ring, an oil seal, a backup ring and a slider bushing. Each performs a specific function, though in some bikes you may find two elements combined into one, performing double duty.

The dust seal is nothing more complicated than its name implies. It is the only part of the sealing system normally visible on the bike, and consists of simply a rubber or plastic "grommet" seated where the two halves of your shock assembly come together, sometimes covered by a chrome appearance cap. It is the only element of the system that can usually be removed from its seat with nothing more than your bare hands, and it serves to keep dirt and debris from reaching the actual oil seal. It does this both by covering the area where the two halves mate, and by acting as a sort of "wiper," cleaning the surface of the shock tube on its downward slide, just before it reaches the seal. (Note: For the purpose of this article, I am referring always to a standard front fork setup. Naturally, on a bike

In letters and e-mails, and during seminar sessions, one of the most common problems we hear about from our readers are leaking front fork seals on their bikes. It seems, though this condition has become much less prevalent than it was, say, 10 years ago, that it still causes a lot of headaches and expense for motorcycle owners—especially those that own older machines.

I wrote a "How-To" article nearly 10 years ago on the subject (RR/MCN, June 1992), and we decided perhaps it was time to rerun that piece, with a few updates. —FR



with "upside-down forks," some things would be reversed, such as the wiping action described here.)

Next in line, going from top to bottom, is the stopper ring. The stopper ring is usually a ring of steel spring wire or a large C-clip that fits into a machined groove in the shock housing below the dust seal. Its one and only purpose is to keep the seal below it from being forced upward and out of position by the force of the springs during shock compression.

Below the stopper ring will be the actual oil seal itself. The oil seal is usually made of steel, for strength, yet covered completely in rubber, for an oil-proof fit. The oil seal is generally pressed or "hammered" into its seat in the housing, using a specially-fit driver. The seal's purpose, obviously, is to keep the oil inside the fork, though an almost equally important purpose is to keep the dirt out.

Below the oil seal will usually be a backup ring, which looks like nothing more than a large washer—which is essentially what it is. The backup ring serves several purposes, most notably dissipating the upward forces against the seal, causing them to spread evenly over the sealing surface. It also protects the seal from the slider bushing inadvertently being driven too far up the tube and into the delicate rubber parts of the seal.

Last, but definitely not least, is the slider bushing. Those of you with an engineering or mechanical background will recognize the slider bushing as being a type of "tilted pad" bearing. The slider bushing (usually made of brass) creates a compression zone, wherein the oil can form a low-friction film between the shock tube and the housing. Think of it sort of like a piston ring.

All of these elements combine to form a combination seal/bushing area where the shock tube can slide freely in and out of the housing without losing the fork oil bath contained within the housing. This is crucial because the fork oil, besides providing lubrication for the springs, is the primary control for your rebound damping.

When the springs are compressed from a sudden shock, it is the resistance of the oil that causes them to re-extend in a relatively slow and controlled manner. Without the oil to "damp" their reactions, the springs would do what springs like to do best, which is bounce up and down several times. With-