...Or Else What?

A Mechanico-Ethical Introspective Dialog

Who are those guys with the lab coats and clipboards to tell us how to do our work? What do they know? Let's just ignore 'em and hammer out some cars.

Then what?

Don't they drive ya nuts? 'Do it this way.' 'Do it that way.' And never in any way that makes the work go faster or easier – if you do what they say, it always takes more effort and time, never less. So..., what if you don't?

Let's take some examples. Just think how much nagging there is about brakes. Haven't you heard them droning on and on about flushing the hydraulic system 'at least every other year'? How can that be such a big deal, after all, brake fluid is just oil and oil is oil, right? Besides, who wants to risk breaking off those dinky little bleeders and having to drill 'em out?

Well, not quite. Ever get brake fluid on your hands? *Well, natch, a person can't be too fussy about spilling a little stuff here and there, as long as you keep it off paint that shows. But it does quite a number on your skin.*

It does that number because it draws all the water out. Brake fluid is "hygroscopic," that is, it naturally absorbs water. This leads to two bad results over the long haul: rust on the steel inside the hydraulic system and dilution of the brake fluid with water, lowering the temperature at which it will boil. In the first case, you get hard abrasives circulating with the fluid, causing wear. If the car has antilock brakes, you can get grit in a solenoid valve and lose the safety effectiveness of the system entirely. In the second case, a water dilution of only three percent will lower the boiling temperature of the brake fluid to just over three hundred degrees.

Well, so the brake fluid gets a little hot and boils. Big deal.

A bigger deal than you might think. Once it boils, it becomes a vapor, not a fluid. And vapors, unlike fluids, are compressible. What that means is that under the worst possible circumstances, such as a hard braking down a long, steep mountain, the brake pedal can suddenly fall to the floor. If it happens because the fluid boiled, no amount of pedal pumping will make any difference – you'd just be squashing the brake vapor over and over, transmitting little or no clamping force to the brake pads and rotors. This can mean, and has meant, people die in the resulting crash.

Oh. Well, that is something. But what about all that stuff regarding brake rotor and drum dimensions? Geez, what's an extra couple of thousandths of an inch? How many people go flying around at a hundred miles an hour, anyway?

Yes, it's possible a motorist will never exceed 25 mph, but you can't work on that kind of assumption. The mass of the brake components is a critical element in the conversion of motion to heat. When that mass falls below a certain threshold, it will just get hotter and hotter under sustained braking, rather than reaching a maximum working temperature and not exceeding that. If so, of course, you – or the motorist, that is – encounters brake fade.

Moving Toward Safety

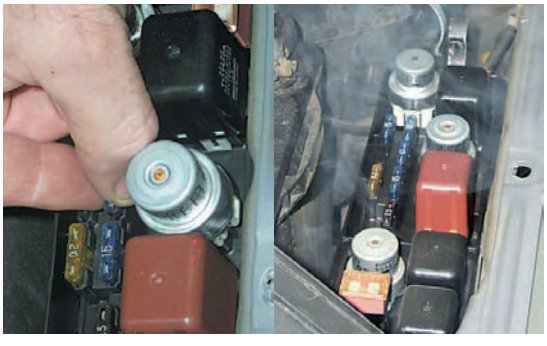
OK, OK, I guess brakes are important enough you do have to follow the procedures established for safety. Let's move on to a few other things, like using torque wrenches for everything from opening a can of pop to brushing your teeth. You can't tell me wheels are going to fall off if you hammer them on with an airwrench. You want 'em tight, so they don't fall off. And I suppose you buy the story about tightening lugs in star patterns rather than in order around the wheel – I like to do it one right after the other to keep track of where I am.

The more turns you make with a nut or bolt does not necessarily correspond to the tighter, nor do you necessarily want every nut and bolt on the car to be as tight as possible without breaking, on the theory that for proper torque you should tighten until the bolt snaps and then back off half a turn. Every threaded fastener is essentially a helical wedge, forcing two parts together with a certain 'clamping force.' Just as you wouldn't use a breaker bar and a cheater to tighten transmission pan bolts – otherwise they'll just bend the pan and make the gasket leak – overtightening any other bolt will have bad consequences.

Yes, you might snap off a brake bleeder doing routine brake fluid flushes. But the brake system will fail if the flush is never done.

The cast-iron 'meat' left on a brake disc can determine whether it converts all the vehicle's motion to heat, or whether it just gets hotter and hotter.

Airwrenches can put out tremendous torque. Enough to bend hubs and wheels or stretch wheelstuds and strip the threads out of nuts. That's not the way to tighten a critical fastener.



Replace that troublesome and often-blowing fifteen-amp fuse with a larger current version, and you could let the smoke out of the wires.

A wheelstud tightened beyond the design specification will not hold the wheel on the car more securely; it merely bends the wheel and hub and weakens the wheel stud itself by stretching. A cylinder head bolt overtightened will provide more clamping force while the engine is on the assembly stand and cold, but once the parts reach operating temperature their differences in expansion rate could mean almost anything for the force the bolts exert holding the head against the block. While it's true that mechanics many years ago got very good at guessing torque on cylinder heads, they were using very thick, coarse-thread bolts, clamping cast iron heads to cast iron blocks. Nothing did much stretching or squashing in that assembly, so the torque spec and the point beyond which a human arm couldn't turn the bolt corresponded pretty closely.

But if you really want to consider the risks from playing fast and loose with torque, think of suspension fasteners. Make one tight enough to break or loose enough to fall out, and you'll be dealing not even so much with your customer as with the other guy's — the guy he runs into — insurance company's lawyer. His concern for your convenience by avoiding the awkward use of a torque wrench could hardly be lower.

Turn Again

All right! All right! But this one you can't argue: Suppose a car keeps blowing a fifteen-amp fuse. If we put a twenty- in instead, how much chance is there of a problem? A measly additional five amps!? Couldn't light a match.

But it could light a gas tank. Or let the smoke out of the wires and squirrelly little parts in the computer. Carmakers don't put smaller fuses on certain circuits to save money. In the quantity they buy, fuses all cost about the same. The fuses are smaller for the lower amperage circuits because something else on that circuit will become the fuse instead if you increase its rating. After all, a circuit that keeps popping a fifteen-amp fuse probably won't blow a fifty-. But something on that circuit is still the 'fuse' and is going to melt. If you're lucky, it will just be something you can bolt back in, like the computer. If you're not, it'll all get sorted out in court.

Thanks for cheering me up. Think I'll have a few beers before I tackle the next car – No, put a cork in it! That was a joke! ■

— By Joe Woods