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TPMS AND TIRE FIRE: A Cautionary Tale (April 2012)

When you get new tires mounted, it is customary to have new valve stems installed, as the rubber bits dry out over time, and it's cheap insurance. The advent of Tire Pressure Monitoring Systems (TPMS), though, has created some confusion. Specifically, not all technicians servicing tires inspect the TPMS units carefully, and even fewer replace the rubber components on each TPMS transponder and valve stem.

One common style TPMS manufactured by FoMoCo, and used by many manufacturers is shown in Figure 1. Service kits are available from many online sources for prices ranging from a $4 to $15 per kit. The parts contained in a typical kit are shown in Figure 2.

Figure 1: Exemplar TPMS unit, with stem nut removed.

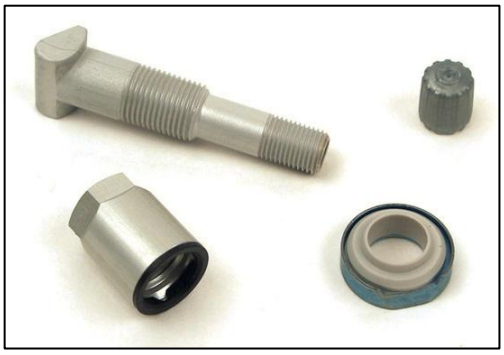

Figure 2: Typical TPMS service kit components.

The owner's manual for one such equipped vehicle instructed that "***If a tire is changed, the sensor's seal, nut, and valve core should be replaced,***" and included the following caution:

> When low inflation pressure is detected, TPMS will light up the tire pressure warning light ( ) (also referred to as a telltale) in the instrument panel, and will display a message in the text window. The wording of this message is determined by the degree of inflation pressure loss.

In the immediate case, the 2008 model year passenger car from New England with approximately 34,000 miles on the odometer received two new front tires at a service center, but no TPMS service kits. After driving the vehicle 20 miles, the driver noticed smoke, pulled over and observed fire on the front right wheel. He reported that he did not notice any warnings on the dashboard, but that he wasn't looking at it, either.

The front right fender burn pattern was consistent with the tire having burned in place while stopped, as shown in Figure 3. The fire was successfully extinguished and the mini-spare was mounted on the front right wheel position allowing the car to be driven

around the lot and into the service bay. The newly installed but now damaged tire is shown in Figure 4, still mounted to the wheel. Taking the valve stem hole as 12-o'clock, the tire outer sidewall was still intact between about 10-o'clock and 12-o'clock. The inner sidewall had a somewhat longer section still intact. In these areas, the sidewall showed both directional rubber tearing and grinding which had obliterated portions of the raised lettering. This damage is consistent with having been driven at severely low or zero air pressure. The TPMS unit was missing completely. The aluminum wheel displayed no slumping or heat deformation which would be expected to completely destroy the TPMS unit or allow it to separate from the wheel.

Figure 3: Burn pattern on fender.

Figure 4: Damaged wheel and tire.

The stem nut on the left front wheel showed corrosion, but appeared to be intact. The stem nut on the left rear wheel was obviously split, with what appeared to be aluminum oxide and road grime entrained in the opening, as shown in Figure 5. It also had additional cracks visible at the outer surface. The stem nut on the right rear wheel exhibited a crack at the outer edge, but was not opened as much, as shown in Figure 6.

Figure 5: Split stem nut on left rear.

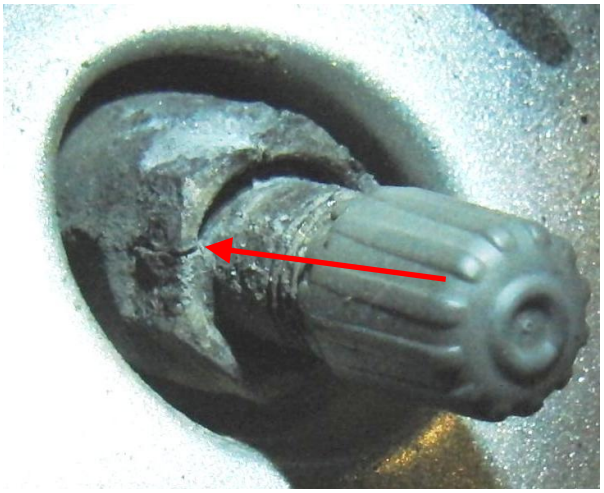

Figure 6: Fracture on right rear stem nut

The missing TPMS unit was not located in an area where fire could have melted the metallic components. The wheel surface near the valve stem hole was sooted. This indicates that the TPMS sensor was not lost simply as a result of the fire, but rather came out for other reasons, and was not in place during at least most of the conflagration.

A cracked stem nut will eventually cease to retain the valve stem and the attached TPMS unit, allowing an air leak. A completely fractured nut will eventually fall off. The TPMS sensor would then be loose inside the wheel. The best explanation for the front right TPMS unit missing now is that it fell out of the damaged wheel either while driving after it came out, or during recovery. The car lived in northern New England, where road-salt is common in winter, which may have played a role in this event.

Protracted operation at low air pressure, most likely in the presence of the dashboard warning, allowed the tire to overheat enough to ignite the internal components. This conflagration erupted once the car was stopped.

CONCLUSION

The “take-away” from this story is that TPMS sensors should be inspected and serviced as recommended by the manufacturer, even though they are mostly made of metallic components. Also, low-pressure tires running at highway speeds can overheat to the point of fire within a few miles.