

# NU claims

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SCENE DO NOT CROSS



Figure 1: Motorcycle drive wheel valve stem indicated by the arrow.

## Motorcycle Wheel Valve Stem Failure

By Charles C. Roberts, Jr., Ph.D., P.E.

**THIS CASE STUDY DEALS WITH AN** accident caused by a sudden motorcycle rear tire deflation. According to a witness, the motorcyclist riding ahead suddenly started to weave as a result of a flat rear tire. The motorcycle eventually traveled off the road and into a ditch, causing severe injury to the rider. The rear wheel of the motorcycle is depicted in Figure 1. The tire had been replaced approximately a month before the accident by a motorcycle shop and was a new tire. The tire bead was intact and appeared properly mounted. However, when pressurized, a severe leak was noted at the valve stem that is indicated by the arrow.

Figure 2 is a view of the valve stem with the arrow indicating the fractured rubber portion of the valve stem. Figure 3 shows the fracture surface of the valve stem



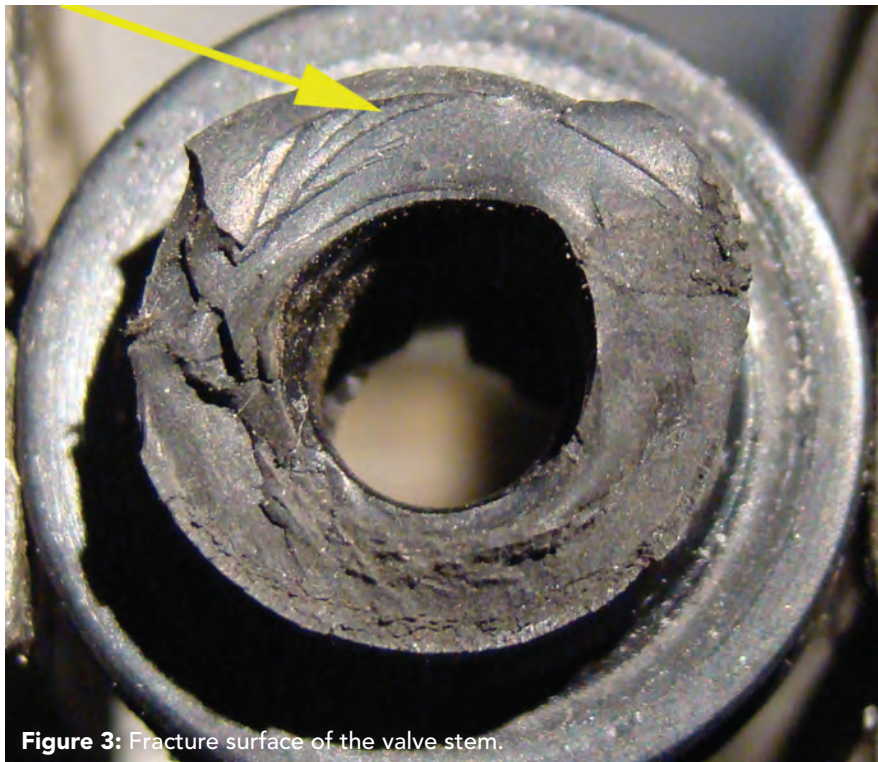
Figure 2: Crack in valve stem where air leakage occurred.

shaft. The arrow points to the striations indicative of crack growth over time.

This is a failure mode of rubber that appears over time as a result of the loss of elasticity from exposure to oxygen (ozone). The crosslinking of the polymer molecules by oxygen atoms over time causes a loss of flexibility of the rubber making it hard, brittle and prone to cracking. It is apparent that the valve stem was not replaced when the tire was replaced. It is common practice among motorcycle repair shops to replace the valve stem when the tire is changed. It was not done in this case, which resulted in an accident and injury to the motorcycle rider.

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**Figure 3:** Fracture surface of the valve stem.