

## Root Cause Analysis Learning

This "learning" reminds me of a truism I heard in a reliability training class, "This ain't no spectator sport." We experienced a series of bucket elevator shaft failures last year, 4 broken shafts in about 2 months. The shafts are at the bottom of a 60 foot bucket elevator in coal service. It is a 2.75 inch diameter shaft, 1040 steel with a single chain sprocket about 20 inches in diameter. This shaft is the idler with tensioning adjustments. All the shaft breaks showed fatigue failure.

We went through all the likely causes, bearings binding, brake binding, coal plugging the elevator chute misalignment of the buckets and so on. Finally, our shift mechanic decided to watch the elevator in operation. He spent nearly an hour in "the pit" and discovered that the tensioners were tightening as they vibrated during operation. We slid a bolt through a hole in the tensioner shaft to keep them from turning and haven't had a failure since. There is no substitute for applying field time to some problems.

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**Reliability Tip from Reliability Web**