The Ultimate Strip Mix-Up

A customer called Electronics Inc. (EI) and was very upset. "Your strips from lot 76547/1-23 aren't conforming to their N1-SS designation," he said. "We want them replaced." N1-SS strips are 100% inspected for prebow to ±0.0003'' and are used in the most demanding aerospace applications. The following are results from the Failure Analysis conducted by EI's Operations Manager. The analysis uncovered multiple problems when the strips, recovered from the customer's worksite, were inspected.

The Ultimate Strip Mix-up

Before 2007, EI didn't manufacture their own strips—for the sake of simplicity, they will be called "earlier" EI strips. A visual inspection showed that earlier EI strips had been mixed with newer EI strips in some of the boxes. The earlier EI strips were darker due to a different heat treatment and they had oil stains. (Figures 1 and 2). Dark coloration and oil stains aren't defects, just an indicator of a different manufacturing method. Also, some of the boxes had an older package design that EI hasn't used for several years and these were clearly marked with lot number B55294B-08 and a N1-S grade.

The newer EI strips were measured for compliance to the N1-SS prebow specification (0.0003") on the EI Super Gage (Figure 3). The Super Gage has a resolution of 0.00001", compared to a TSP-3 Almen gage which has a resolution of 0.00005". EI has two Super Gages and two gage operators, and the readings from the instruments are compared and monitored. For additional verification, the prebow of the strips was measured on a TSP-3 and the results were the same: All of the new EI strips were within N1-SS specification.

EI then measured the earlier EI strips for compliance to the N1-SS prebow specification. Some of the strips did not meet the prebow requirement. The earlier EI strips were not sold as N1-SS strips, as the boxes were clearly marked with the N1-S grade, but the inclusion of these strips with the EI N1-SS strips accounted for the customer's claim that EI strips weren't meeting specifications.

Boxes With Altered Labeling

In addition to the mixing of the strips, there is another interesting twist to the story. Two of the EI boxes from the customer had altered labeling. The "Lot Number," "Inspected By" and "Date" had been marked out with a black marker and replaced with lot number 76547/1-23 and a 2009 date. EI's Operations Manager removed the black marker and found lot number B55294B-08 and a 2006 date (Figure 4). The N1-S grade had been checked on the top of the box by EI and it was not marked out. The Super Gage operators measured the prebow of strips in lot number B55294B-08 and the strips conformed to N1-S specification.

The Failure Analysis was shared with the customer and the customer accepted the findings.

EI's new numbering system will denote genuine EI Almen strips. If numbers on a strip or box have been altered, the customer should contact EI or their distributor immediately.

Figure 1. The box on the left holds the newer EI strips and the "earlier" EI strips. The ends of the earlier EI strips are darker due to a different heat treatment.

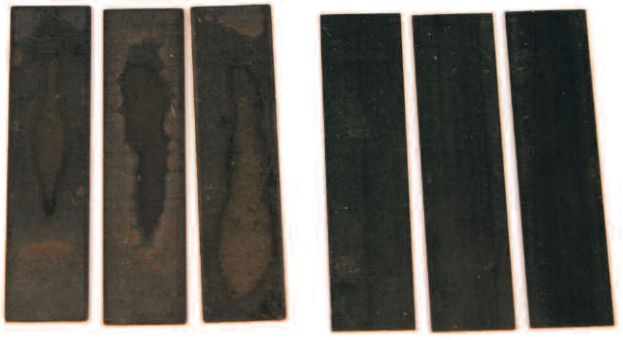

Figure 2. When strips were pulled from the box, it was even more obvious that they were from different manufacturing processes. Note the oil stains on the strips on the left.

Figure 3. An EI "super" gage with .01000'' certified step block. EI has two super gages that measure prebow to a resolution of 0.00001'' and meet SAE J 442 and AMS 2430 for #2 Almen gages. The readings from the gages are continually compared and monitored for accuracy.

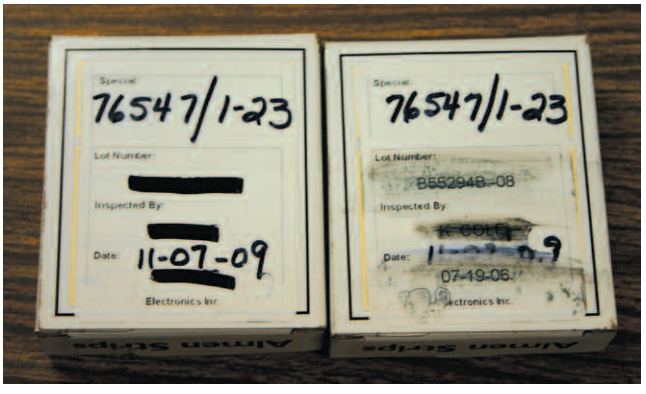

Figure 4. EI was curious about the black markings on two of the returned boxes. They removed the marks and found a different lot number and date.