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By Recall Management division at 10:21 am, Nov 29, 2013

Addendum to 573 Document for CSN 581 26-Nov-13

Background information:
CSN 531 was executed in the 2009/2010 timeframe to address frame failures in the WC126/166 product. There were 681 chippers in the affected population. This CSN involved adding a support bracket to the fabricated chipper frame. In some instances, damage necessitated an entire frame replacement. When a full frame replacement took place, an older structural frame design was used that had been produced for several decades without any field issues. Once this campaign commenced, the production frame spec for the WC126/166 product reverted to the older structural frame design.

While in the process of executing CSN 531, cracks were observed in the mounting brackets that are part of the axle assembly for some chippers. The exact number of chippers that exhibited this issue is unknown. Axle cracks were welded closed for chippers that exhibited this issue.

The conclusion of CSN 531 produced 4 different combinations of frame/axle configurations in the field:

1. Structural steel frames with welded axles
2. Structural steel frames with original axles
3. Fabricated frames with support brackets and welded axles
4. Fabricated frames with support brackets and original axles

CSN 581 Scope:
The scope of CSN 581 is to inspect and, if necessary, repair chipper axles in the affected population. The scope of the campaign is justified by the following issues:

- While cracks have been observed in axles in the field, there have been no failures.
- When the axle failures were observed in the field, investigation showed that the orientation of the axle mounting bracket was not optimal. A reversed orientation is recommended (but not required) by the axle supplier. Current production, as well as the campaign axles, will use the improved axle specification with the reversed axle mounting bracket.
- Altec performed two forms of testing on the axles to better understand the stresses that exist and how cracks can grow over time. (1) Data acquisition was performed on the different axle/frame combinations that showed unacceptably high stresses in the axle mounting bracket for the original configuration that was part of CSN 531, and much lower stresses in the resulting frame/axle combinations that are in the field today. These are significantly lower strains than the initial frame/axle configurations that produced the frame failures and the axle cracks.

They meet Altec's acceptance criteria for structural integrity. (2) Lab-scale durability testing was performed on the fabricated frame/axle combination that was originally in the field. This testing reproduced the cracks seen in the field. The cracks also had reasonable temporal correlation in terms of length at equivalent field time to actual field machines that exhibit axle cracks. This testing showed that the cracks grow very slowly and do not lead to axle failure at the end of design life.

- The field population contains axles that were not welded as part of CSN 531. These units were operated for 2-3 years with a fabricated frame that imparted high stresses on the mounting bracket that is integral to the axle. Both frame configurations that are now installed on the axles produce significantly lower stresses that are within acceptable limits for fatigue life. However the unmodified axles could have initiated cracks in the first several years of operation that were not visible to the naked eye, and therefore not repaired during CSN531. Theses cracks could have grown over time due to the stress concentrations at the crack root. If CSN 531 was completed prior to crack initiation, no crack is expected to develop.
- In summary, the data leads Altec to believe that the combination of frame and axle configurations in the field contains some chippers that will have cracked axles, and others that will not exhibit or develop cracks. The best estimate at the present time is that ~50% of the field population will require new axles as part of the campaign. Altec will replace axles as part of CSN 581 no matter how high the observed failure rate is. The replacement of axles in the present field population, as well as ongoing annual inspection for cracks, sufficiently mitigates risk of having an actual failure. Altec believes that field replacement of an axle that has years of service without a crack is not warranted. Specifically, if an axle has not developed cracks by now, the assembly does not contain overstressed components. It will not be prone to crack initiation as seen in other units.
- The chippers in the affected population are at 75% of their service life.
- Inspection for axle cracks is built into the annual chipper inspection as part of the campaign.