Aluminum Panels
And Structures
Damage Analysis
(DAM05e)
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Module 1 - Aluminum Properties And Identification
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**Video: Aluminum Work Hardening**

The physical properties of aluminum cause it to react differently than mild steel when excessively work hardened. To demonstrate the effect of work hardening, let’s compare how a mild steel panel and an aluminum panel of equal thickness react when work hardened in a similar manner.

When aluminum is bent, it gains strength. When it is continually bent, the increased strength makes the aluminum more brittle. Using the same amount of force, notice how the aluminum plate breaks rather quickly, while the mild steel plate continues to be bent over and over without breaking. This is because the aluminum work hardens much faster than mild steel.
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Module 2 - Aluminum Exterior Panel Damage Analysis
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Video: Dye Penetrant

Dye penetrant can be used to locate cracks and defects in aluminum. To show how it is used, we’ll be using this aluminum welded panel, wax and grease remover, dye penetrant, and the developer for the dye penetrant.

After the part has been completely cleaned and the wax and grease remover has evaporated, the dye is applied to the weld and allowed to soak into any defects. After allowing the dye to penetrate for a few minutes, the surface is wiped with a cloth moistened with cleaner.

After all the dye is removed, the developer is lightly misted across the weld and allowed to dry. As you can see, it doesn’t take a heavy amount of developer to locate the defects.

As we’ve shown in this demonstration, dye penetrate is a useful tool in locating cracks and defects.
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Module 3 - Aluminum Structure Damage Analysis
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Video: Structural Shape And State

When performing damage analysis on aluminum structural parts, understanding how aluminum grain structure reacts to minor and severe bending may help with repair or replace decisions.

Aluminum in an undamaged state shows evenly sized and spaced molecules. Minor bending of aluminum shows slight distortion of the molecules. Minor bends like this may be removed if allowed by the vehicle maker. Correct straightening and stress relieving techniques can return the aluminum to the original shape and state.

Kinks or severe bends can cause considerable distortion to aluminum’s molecular structure. Straightening severely damaged aluminum even with proper straightening and stress relieving techniques can leave weak spots caused by excessive work hardening. Also, areas adjacent to the damage can become over work hardened during straightening attempts, further compromising structural integrity.
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