

REALLY Using Machine Vision

Recipe: _____ MACHINE VISION SYSTEM _____



SERVES: ONE RAILROAD

Start with MULTIPLE LINE SCAN CAMERAS. Sprinkle in a few AREA SCAN CAMERAS. Add in sufficient ILLUMINATION with a touch of AXLE TIMING.

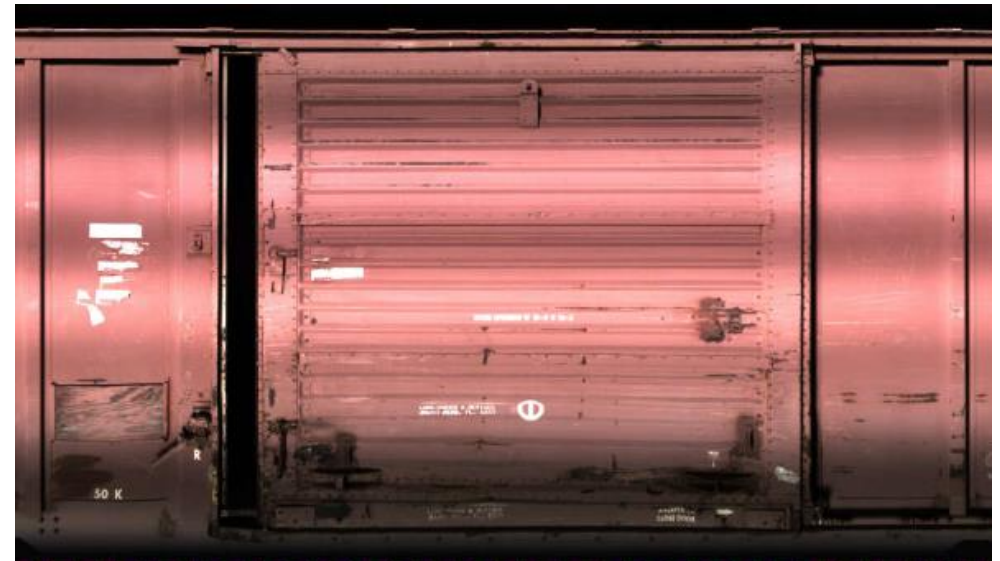


On a LARGE SERVER, prep all necessary MACHINE LEARNING ALGORITHMS.

Serve with a side of AEI and keep C&S and Technology nearby.

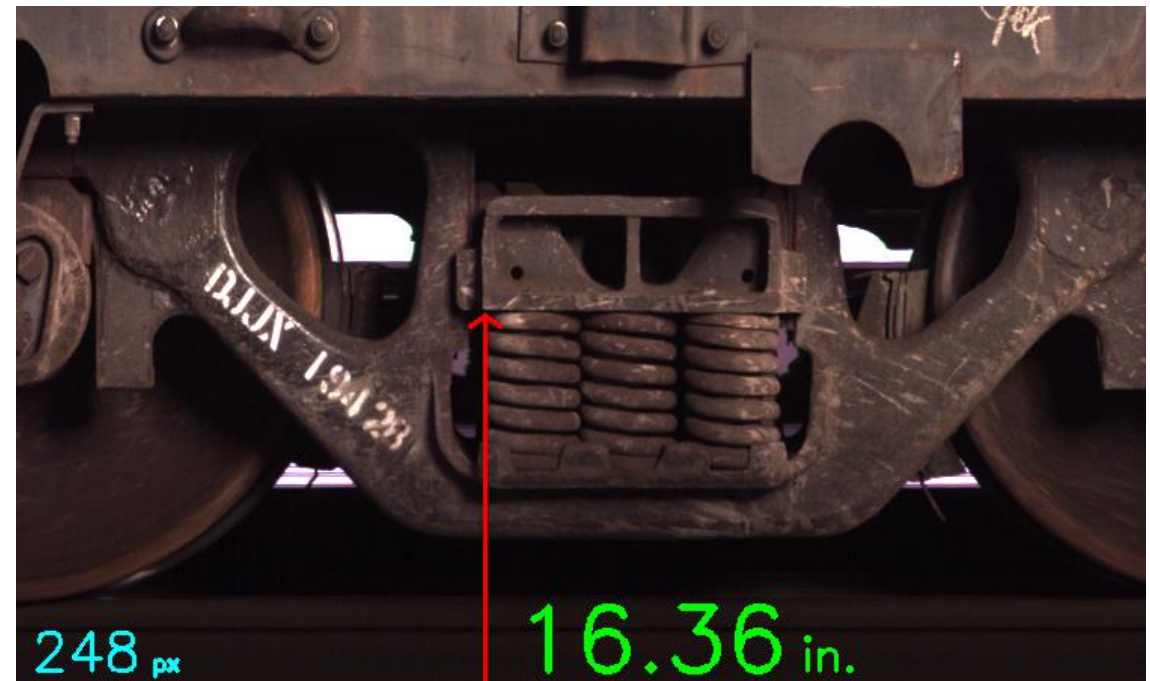
Should We Target Operational Issues?

- No Hump conditions
- EOTs laying on running boards
- Hazmat Placards intact
- Load Securement – OTL, tarps, loose straps
- Direction of loaded Automobiles
- Product Leakage
- Trespassers?
- Doors secured?
- Bad Order Tags



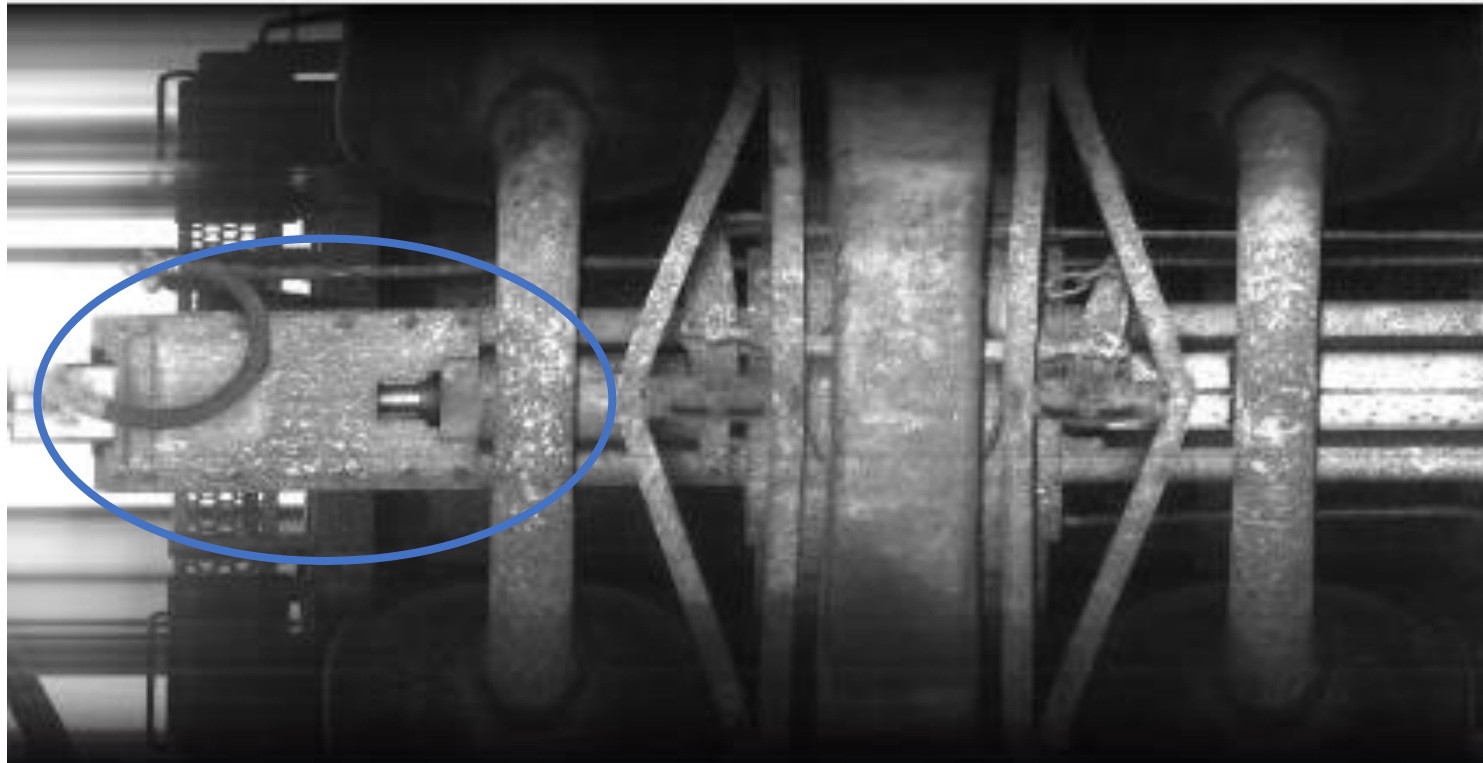
Should We Target Carbody Issues?

- End Air Hose Arrangements
- Car Number Stencil vs. AEI
- Air Hose Heights
- Built Date stencil vs. Umler
- Sill Steps/Ladder Rungs present
- Spring Nest Height
- Hatches closed?
- Hopper doors closed?
- Type of Box Car Door
- Type of Tank Car Valve
- Type of Brake System?

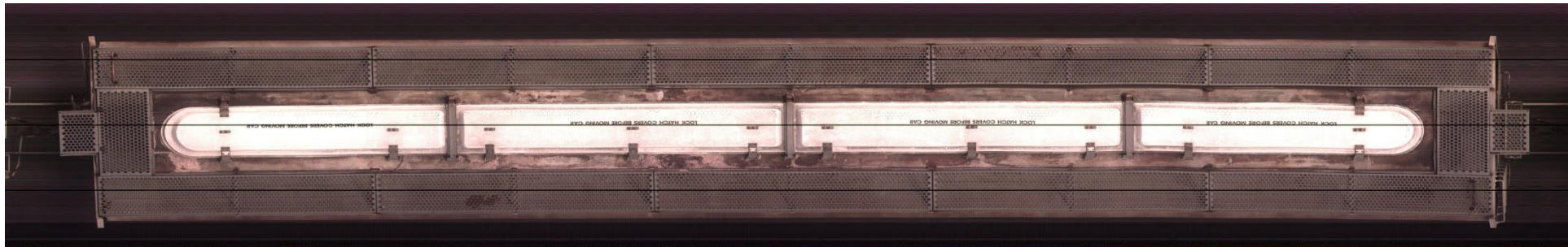
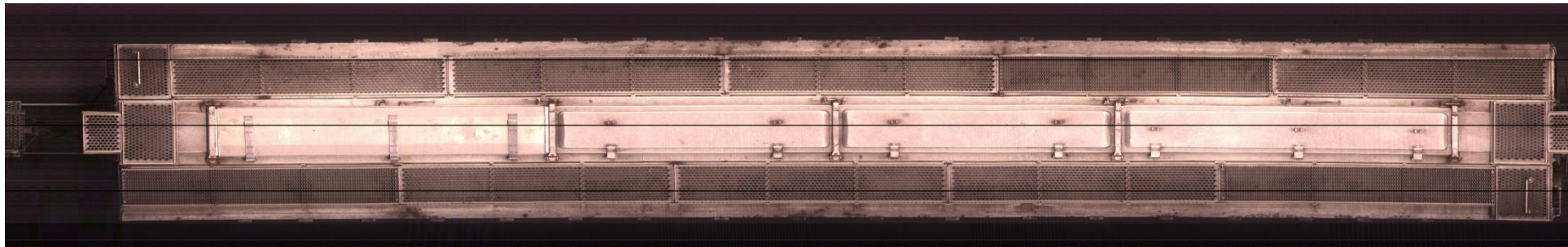
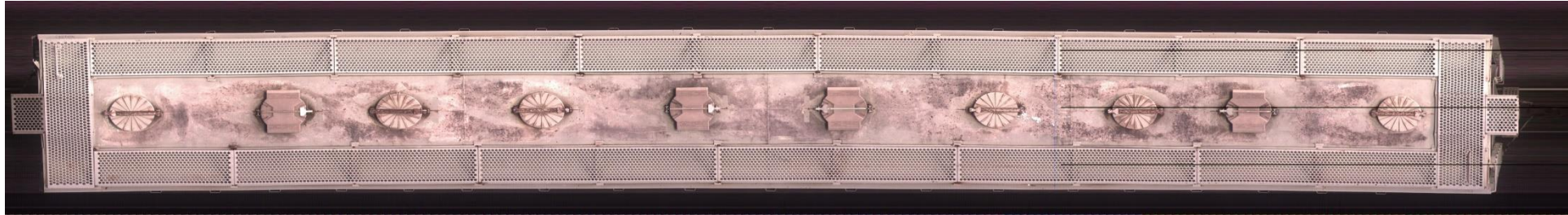


Should We Target Warranty Issues?

- Inspection of EOC carrier plate fasteners?



General Images: Covered Hopper Hatch Views



General Images: Open Top Load Views



Center Beam
Cables



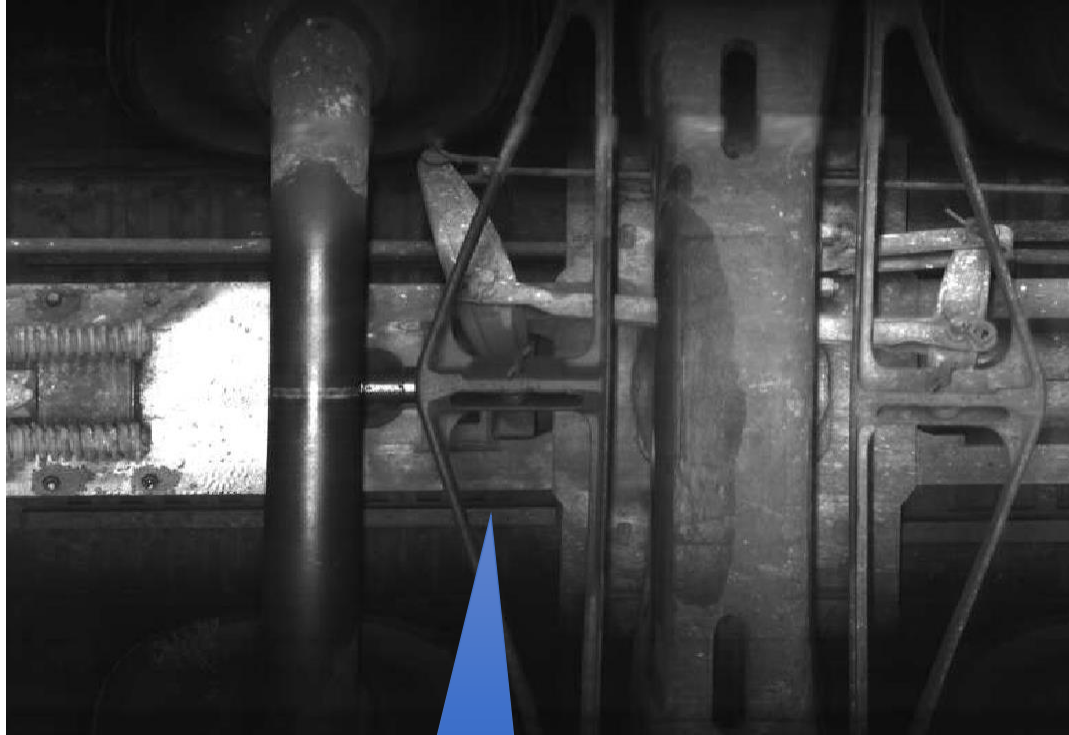
Top View of
Trash / Tarp

What Defects Can You Really See?

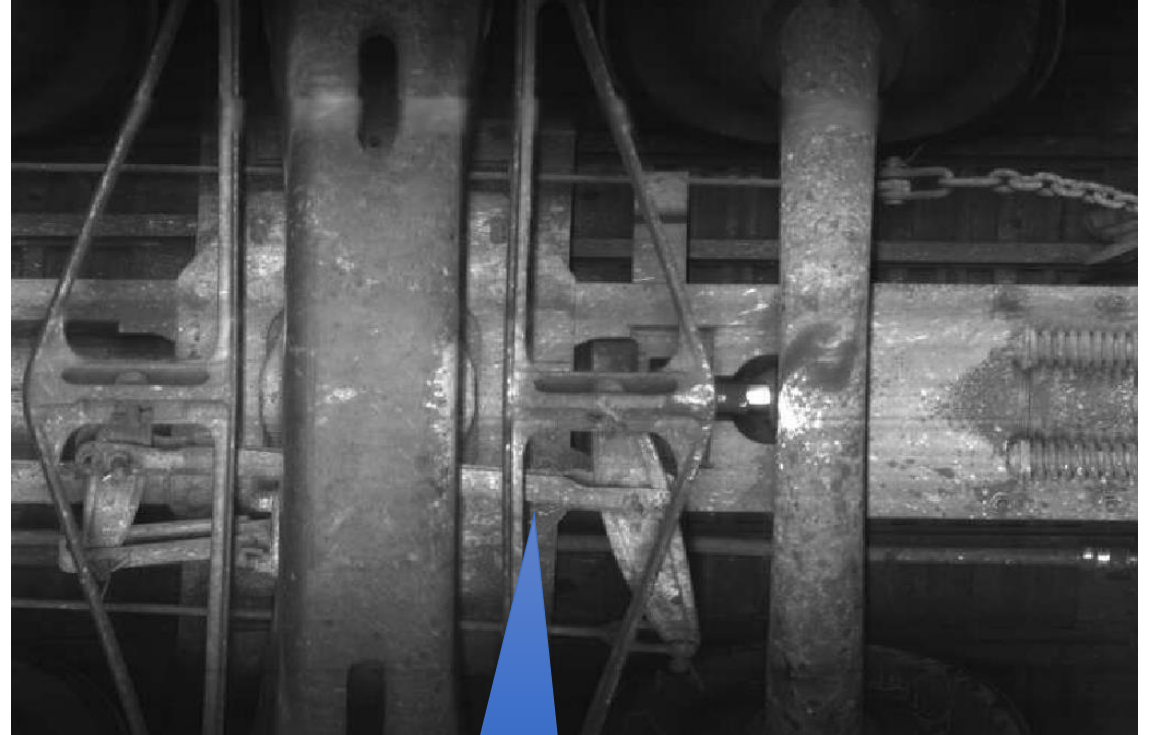


Cut Lever
Hanging Out

What Defects Can You Really See?

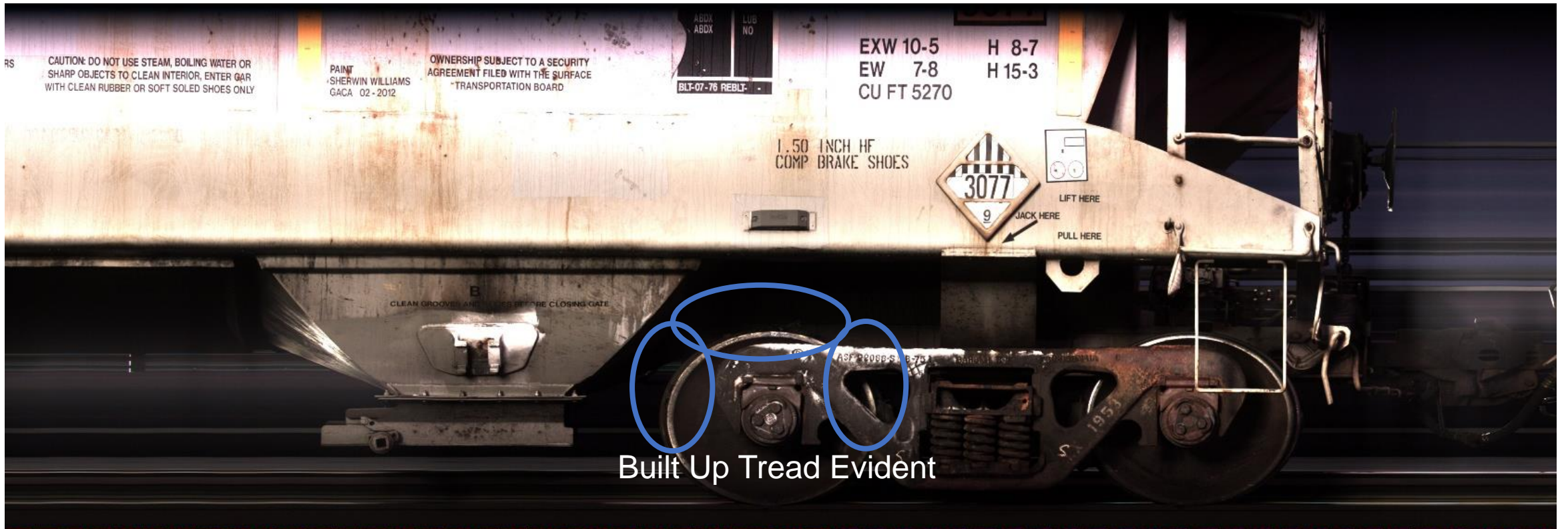


Cushion Unit
Leaking



Cushion Unit
Good

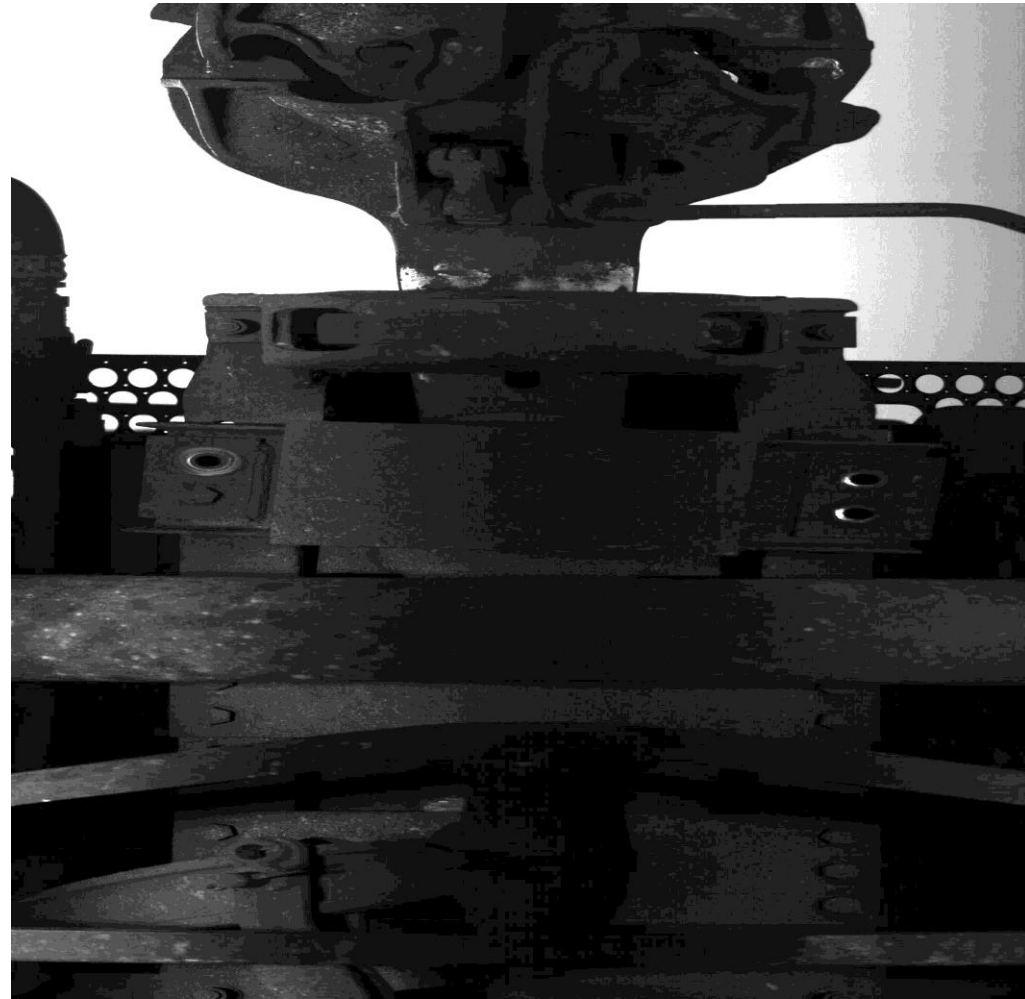
What Defects Can You Really See?



Optimized for a *Single* Component

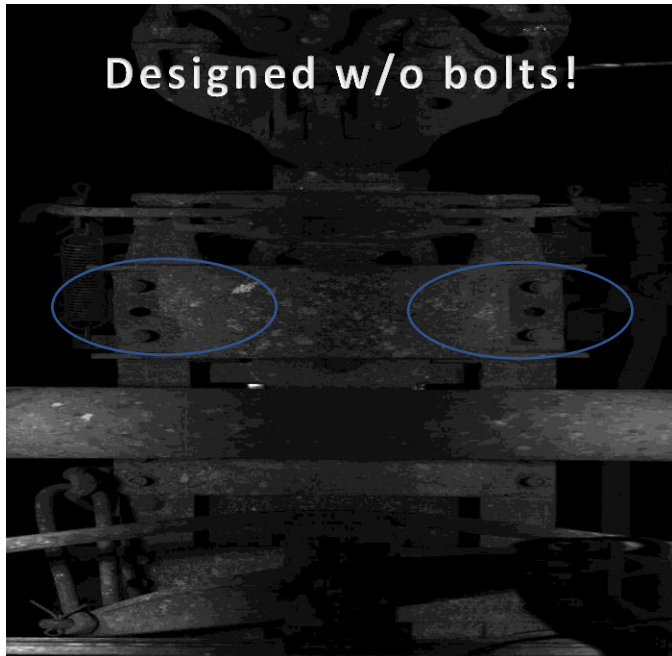


Specific Images Optimized for a *Single* Component

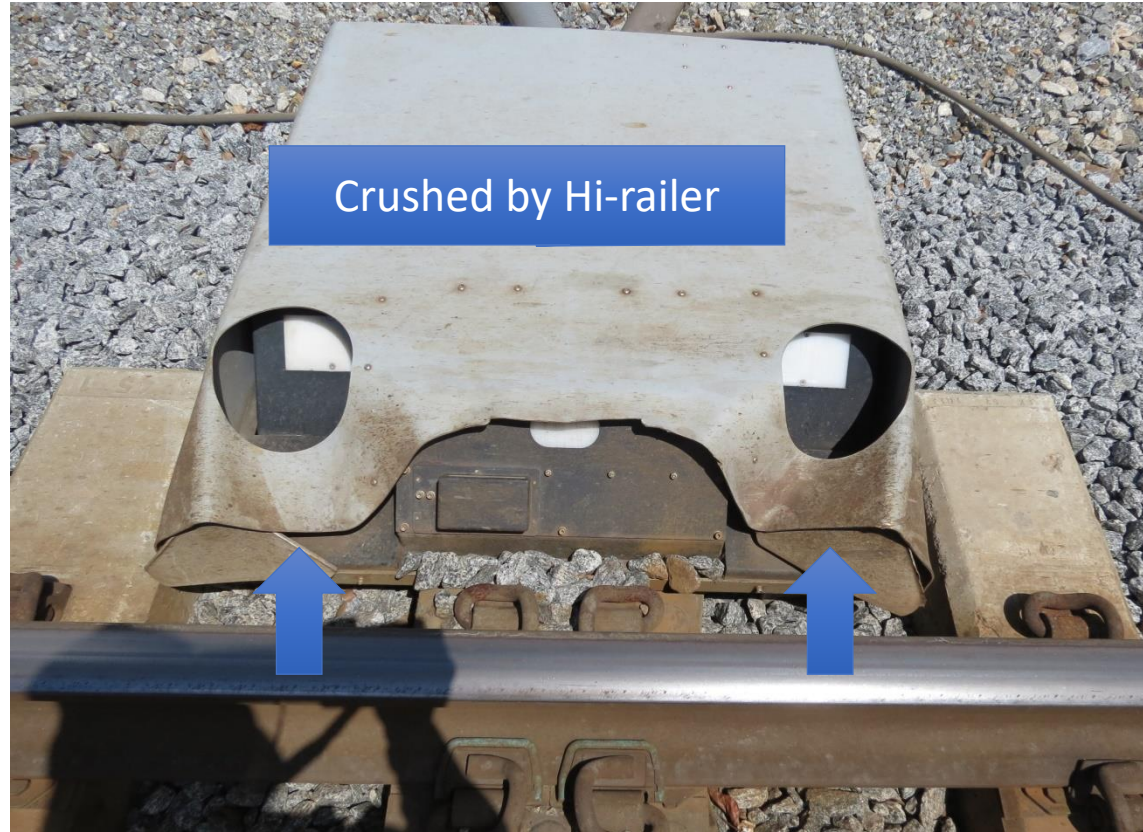


Processing Images is Not Without Hiccups

- Algorithms are not perfect!
- Images are not perfect!
- Car construction isn't standard!



Other Challenges: MOW Gangs



Full Train Imaging: Proof of Concept

