



Progress Rail

A Caterpillar Company

BENEFITS OF UIT ON MINING EQUIPMENT

ULTRASONIC PEENING

REDEFINING RELIABILITY: DRAGLINE PROBLEM SOLVED

Mines across the country are experiencing repetitive cracking in critical areas in the masthead of their 1370 and 1570 Bucyrus draglines. To fix these masthead crack problems, the mine owner must either perform repetitive repairs, resulting in significant lost production, or a multi-million dollar redesign. Progress Rail's UIT Division provides an innovative third solution: a fast, simple repair that lasts years instead of months and requires no more downtime than a standard weld repair.

SITUATION

CF Industries' phosphate mine in Wauchula, Florida was spending considerable time and money to weld repair problem areas in the masthead on their two 1370's. To address these masthead cracks, CF Industries performed a 5-day repair, **repeated every 6 months**. At tens of thousands of dollars per hour in downtime costs, this is a costly problem. The dragline manufacturer's redesign fix requires laying the boom down and retrofitting the problem area with thicker plate. This procedure takes 30-45 days, costing the mine millions of dollars in lost production and downtime costs. The mine maintenance supervisor at CF Industries decided to use Progress Rail's Ultrasonics services, representing a whole new way of tackling repair problems.

RESULT

Progress Rail's UIT Division sent a service team to the mine site to employ their innovative repair methodology and worked in conjunction with Bucyrus welders. There was one variation to the normal weld repair procedure — they used Ultrasonic Impact Technology (UIT) for onsite stress relief in place of thermo post weld heat treatment. This minor change shortened the repair time and substantially improved the results. With the Progress UIT repair procedure, the masthead passed inspection with no cracks after over 5 years of operation. The dragline continues to operate crack free, and UIT has added **millions to the customer's bottom line**.

We can provide service onsite to maximize cost effectiveness for the customer.

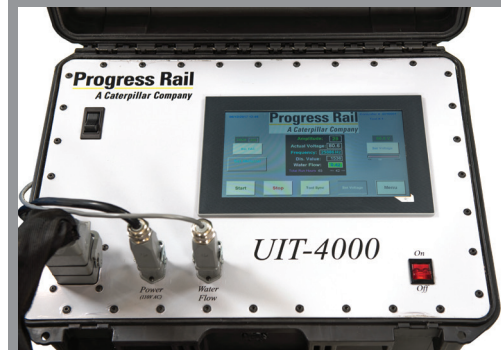
To learn how Progress Rail's UIT Division can help your company, please contact us.

EFFECTS OF UIT

- Increases life of repairs from months to years
- Relieves welding stress
- Refurbishes old materials and previous repairs
- Prevents cracking from fatigue and stress

BENEFITS OF UIT

- Save money by reducing future maintenance
- Save time and cost of post-weld heat treatment
- Increase revenue with increased uptime
- Save money on replacement/redesign costs





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BENEFITS OF UIT— ON MINING EQUIPMENT

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CERTIFICATIONS

Progress Rail's UIT process has been certified by numerous 3rd party organizations related to the Oil and Gas industry. Organizations such as:

- American Bureau of Shipping
- Det Norske Veritas
- Lloyd's of London

Publications touting the efficacy and advantages of UIT have been released by many renowned facilities, examples include:

- Lehigh University
- University of Texas at Austin
- Portland State University
- Sheffield-Hallam University
- Stuttgart University
- University of Waterloo
- Nippon Steel Technoresearch

UIT EFFECTS

UIT is able to enhance new materials or refurbish old materials. UIT provides exceptional distortion control and fatigue life improvement. The UIT process provides additional benefits related to:

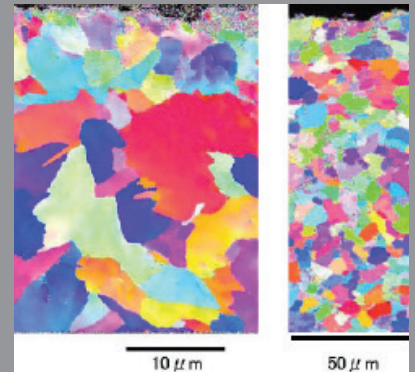
- Localized Non-Thermal Stress Relief
- Residual Compressive Stress
- Grain Structure Modification
- Stress Riser Reduction - Weld Toe Geometry
- Improved Surface Hardness

Progress Rail's UIT is capable of imparting residual compressive stress to a controlled depth of 0.040" -0.240" based on material type and thickness.

UIT provides the greatest depth of compressive stress in the industry coupled with grain structure modification. The UIT process retards inter-granular crack growth while improving fatigue strength and controlling distortion in welded materials.

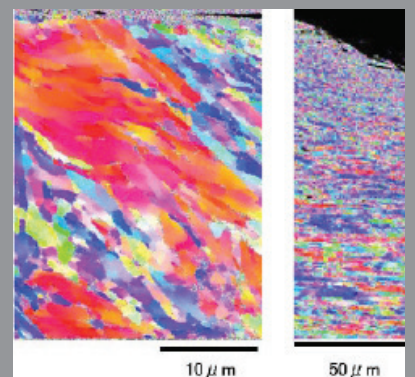
Progress Ultrasonics offers UIT service, leases or rentals, and our team of engineers and technicians is standing by to discuss the cost savings, increased reliability and asset life extension available to you and your business.

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As Welded

Grain micrographs illustrating grain size and orientation near the surface in as-welded specimen (top) and after UIT (below). Grains in as-welded specimen demonstrate random orientation and are roughly 10 microns in diameter while post-UIT grains are layered and are ultrafine at roughly 0.5 microns.



After UIT