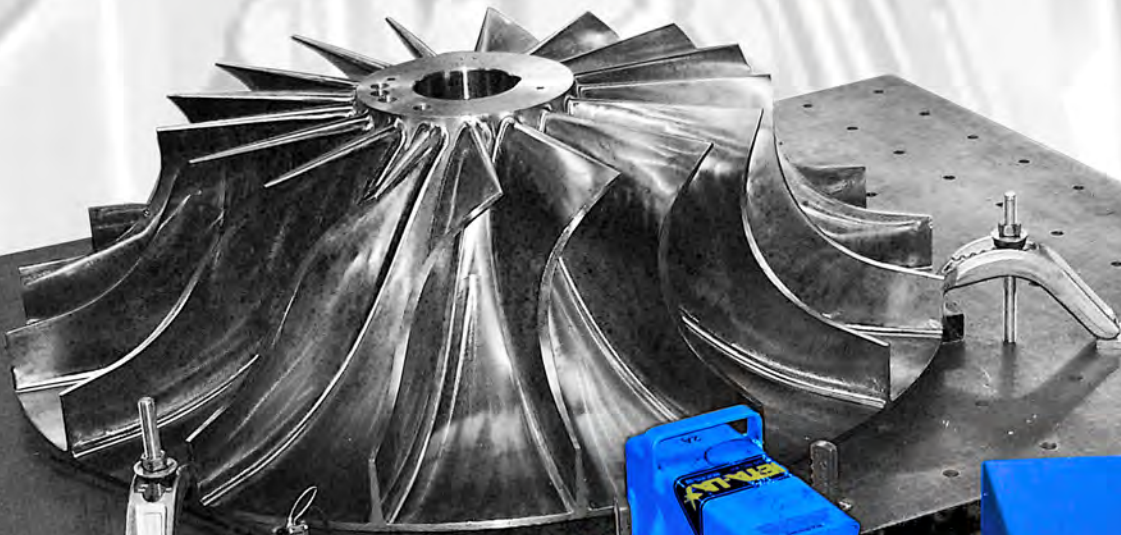


# **META-LAX<sup>®</sup>**

*The most advanced metal stress relief on the planet.*



## ***Stress Relief and Weld Conditioning***



[www.Bonal.com](http://www.Bonal.com)  
(800) Meta-Lax



# Meta-Lax Technology

**Meta-lax is the most advanced metal stress relief process on the planet.**

Meta-Lax (metal relaxation) is a patented process that uses non-destructive, mild, Sub-Harmonic vibrations to treat metal parts. The Meta-Lax process may be applied in two ways: as a *stress relief* to remove thermal stress and *during welding* to prevent most weld-related problems.

**Benefits of Meta-Lax Stress Relief:** Meta-Lax costs a fraction of the time and expense of heat-treat stress relief but achieves quality equal to, and in some cases better than, heat treatment. Further, the unique method by which Meta-Lax certifies that stress relief is complete assures consistent and effective results.

**Benefits of Meta-Lax Weld Conditioning:** Using the Meta-Lax process while welding helps welders prevent up to 90% of both weld distortion and weld cracking, resulting in better and stronger welds.

Meta-Lax is consistent, effective, and reliable. In short – Meta-Lax works!

## Proven Results

The **U.S. Department of Energy** found that the Meta-Lax Sub-Harmonic process is:

- Comparable to, or better than, heat-treat stress relief,
- Takes 98% less time than heat treat stress relief, and
- Is 98% more energy efficient than natural gas furnaces.





## ***Meta-Lax Stress Relief***

Meta-Lax was designed for companies that need consistently effective stress relief results. The patented Meta-Lax process includes steps to determine when stress relief is complete. Its graphic certification assures confidence in achieving problem-free results. The time and cost of Meta-Lax processing are a fraction of heat treat stress relief.



***See page 4***

## ***Meta-Lax Weld Conditioning***

Meta-Lax Weld Conditioning (Meta-Lax stress relief applied during welding) was designed for fabricators that want to either improve weld quality or reduce the effort and expense in achieving normal weld quality. Meta-Lax Weld Conditioning is used to help welders prevent most problems such as weld distortion, weld cracking, and porosity. It can also be used to reduce preheat temps and weld faster.



***See page 8***





# Steps of Meta-Lax® Stress Relief

## Step 1

The Meta-Lax equipment is attached to the part and then a precision vibration scan is taken to determine the part's unique harmonic curve.



**Example Harmonic Curve**

The harmonic curve is a graphical representation of the part's response to vibrational energy. Thermal stress causes a slight shift in the harmonic peak that the Meta-Lax equipment can detect by comparing vibration scans.

## Step 2

The vibration level is set in the Sub-Harmonic zone for the first treatment. The treatment will last between 15-60 minutes depending on the weight and material of the part.



**Meta-Lax Sub-Harmonic Zone**

The Sub-Harmonic zone is located between 5-50% of the height of the harmonic peak. This energy level is optimum for vibratory stress relief.

## Step 3

After the first treatment is complete, the part is scanned again. When stress in the part is reduced, the frequency of the harmonic curve will shift.



**Harmonic Peak Shift**

When the thermal stress in a part is reduced, the harmonic curve will shift into a more natural state. This change is documented by measuring the shift in the frequency of the harmonic peak.

## Meta-Lax Speed Advantage

Meta-Lax can fully stress relieve most parts in two hours or less. Faster stress relief means reduced downtime and lower costs. Combined with the advantage of having stress relief on-site and at your convenience, Meta-Lax offers unparalleled speed and value.





### New Sub-Harmonic Zone

When a verification treatment is needed, the new harmonic curve will be used to determine the new Sub-Harmonic zone.

### Step 4

When the harmonic peak shifts frequency, a verification treatment is needed. The energy level is set within the new Sub-Harmonic zone and treated for 5-15 additional minutes.

### Step 5

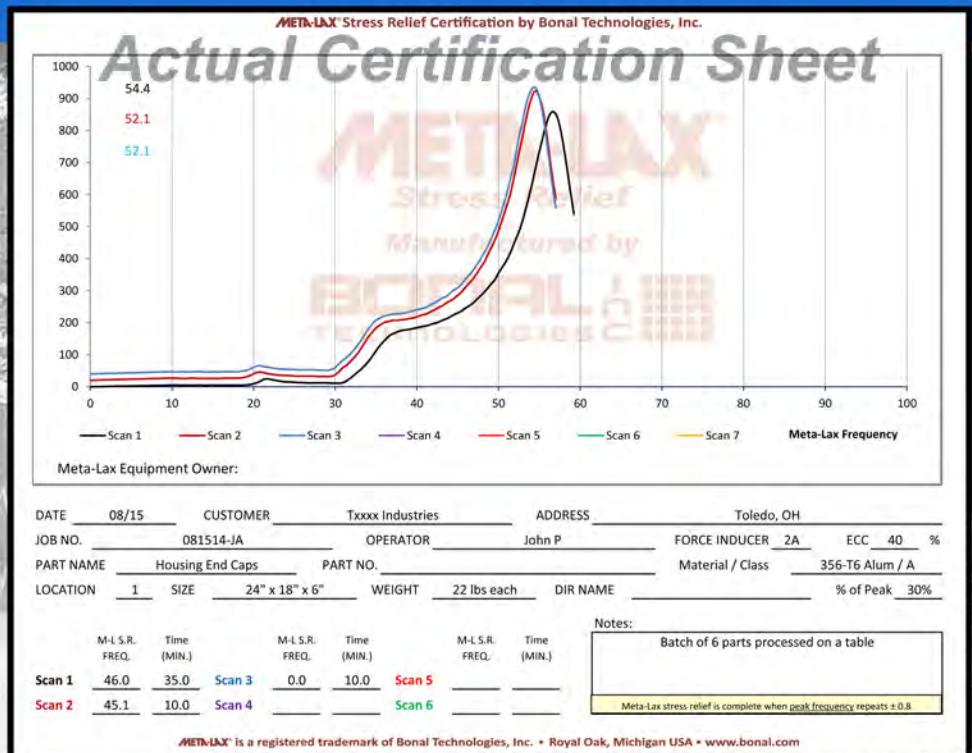
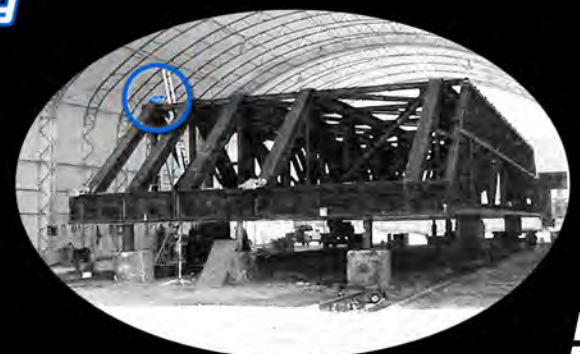
Another scan is taken. When the harmonic peak repeats the same frequency as the previous scan, stress relief has been completed.

### Harmonic Peak Repeats

When the harmonic peak repeats, as shown by the repetition of a harmonic curve, the part is stress relieved. Note that the curve of the blue scan repeats the red scan.

## Unlimited Size and Weight Capacity

Meta-Lax has no size or weight limitations. Enormous work pieces can now be fully treated by processing one section at a time. Consider this 480,000-pound bulkhead commissioned for the U.S. Army Corps of Engineers. It was fully Meta-Lax Stress Relieved by moving the force inducer to several locations around the part to assure complete coverage.





# Meta-Lax Stress Relief: Providing Extraordinary Results

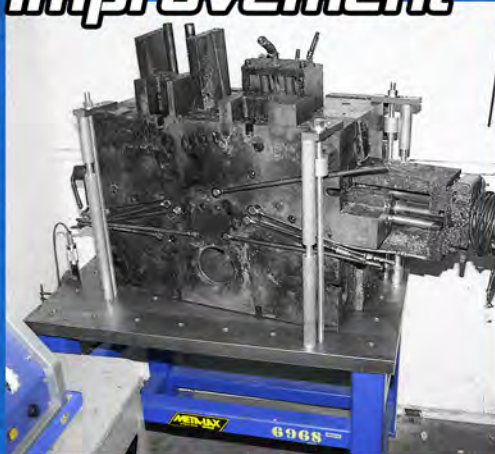
## Extraordinary Distortion Control



"You can't do precision machining without Meta-Lax. In machining 18 workcenters, we found that the worst cartridge bore had only a 0.0004-inch deviation on repeatability."

-Andy Parker  
Parker Boring  
(Bought by Normac)

## Extraordinary Fatigue Life Improvement



"We couldn't get along without it. I fully expect to triple the die life from this die. It's at 170,000 shots now and we haven't touched it for maintenance except for applying Meta-Lax."

-Ray Troup  
Airtex

## Extraordinary Cracking Reduction



"Since using Meta-Lax, we eliminated cracking in the last 600-700 cross tubes we made over a four-year period. That's unheard of in our business!"

-Jim Kelly  
Corrosion Engineering

## Statistics on Distortion Prevention



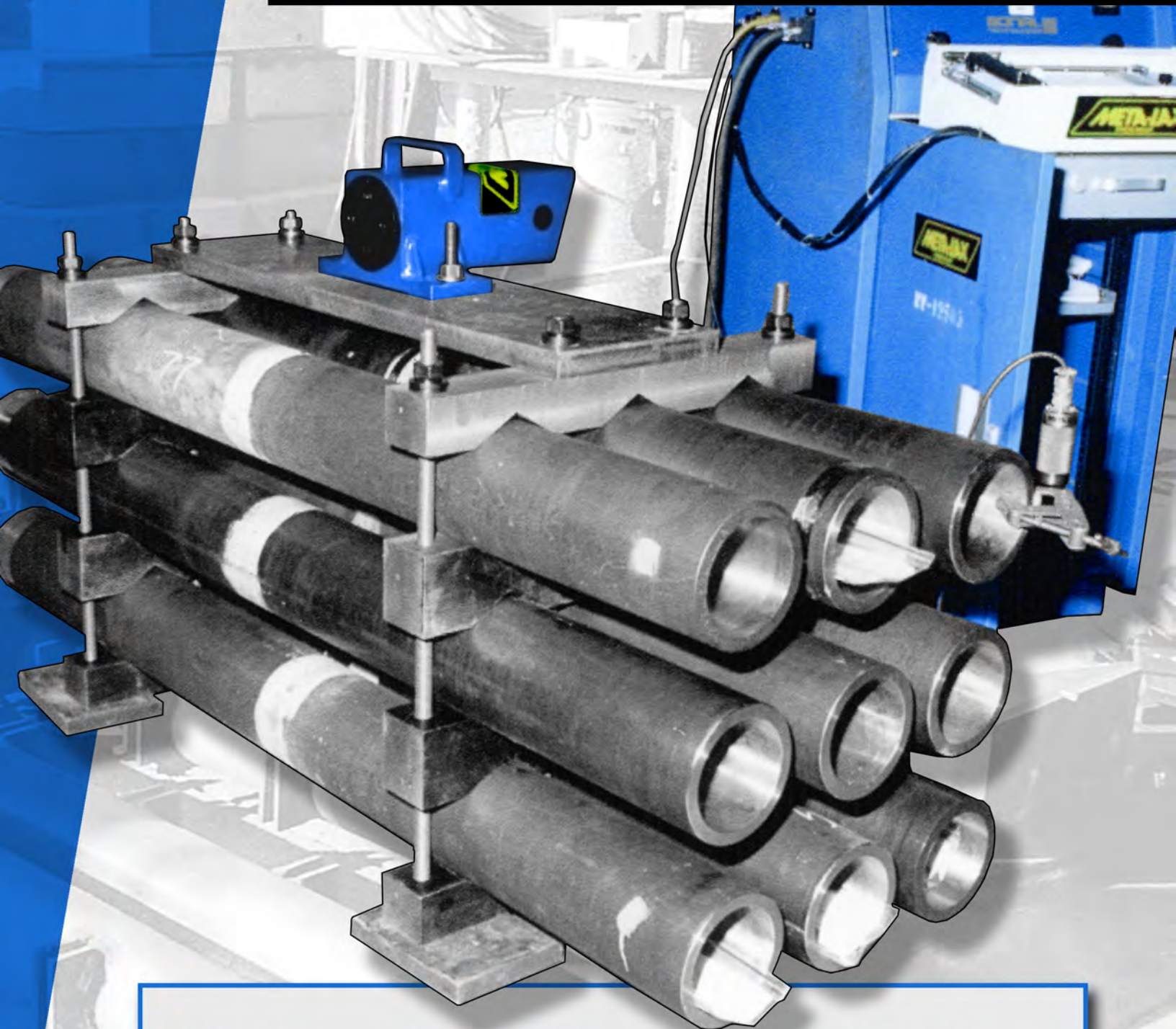
Grumman Aerospace found that Meta-Lax was the best method of controlling distortion. They measured distortion after machining and found:

- 0.029-inch without stress relief
- 0.003-inch with heat treat stress relief and
- **0.002-inch with Meta-lax stress relief**





## ***Eliminate Scrap Due to Distortion***



*"Meta-Lax has performed flawlessly. We saw our scrap rate go **from 50% to zero** and stay there."*

*-Tim O'Connor  
U.S. Army, Watervliet Arsenal*

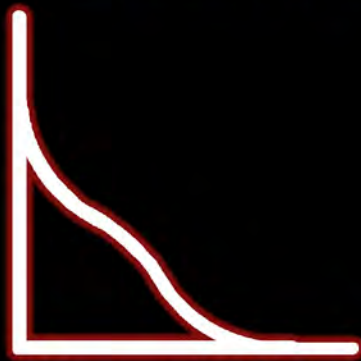


# Meta-Lax<sup>®</sup> Weld Conditioning

## Prevent Weld Distortion

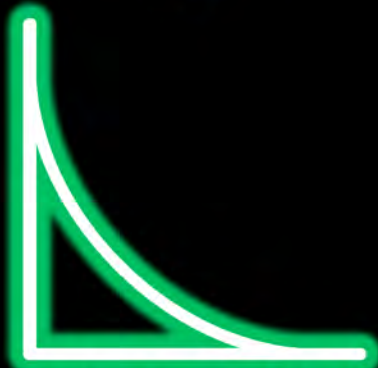
Meta-Lax Weld Conditioning forces the weld metal to stay liquid a few seconds longer. This allows the weld metal to solidify from the root gradually out to the face. The result to the weldment is less pull on the base metal which translates into less weld distortion.

### Compare Weld Profiles



**Normal Weld**

**VS.**



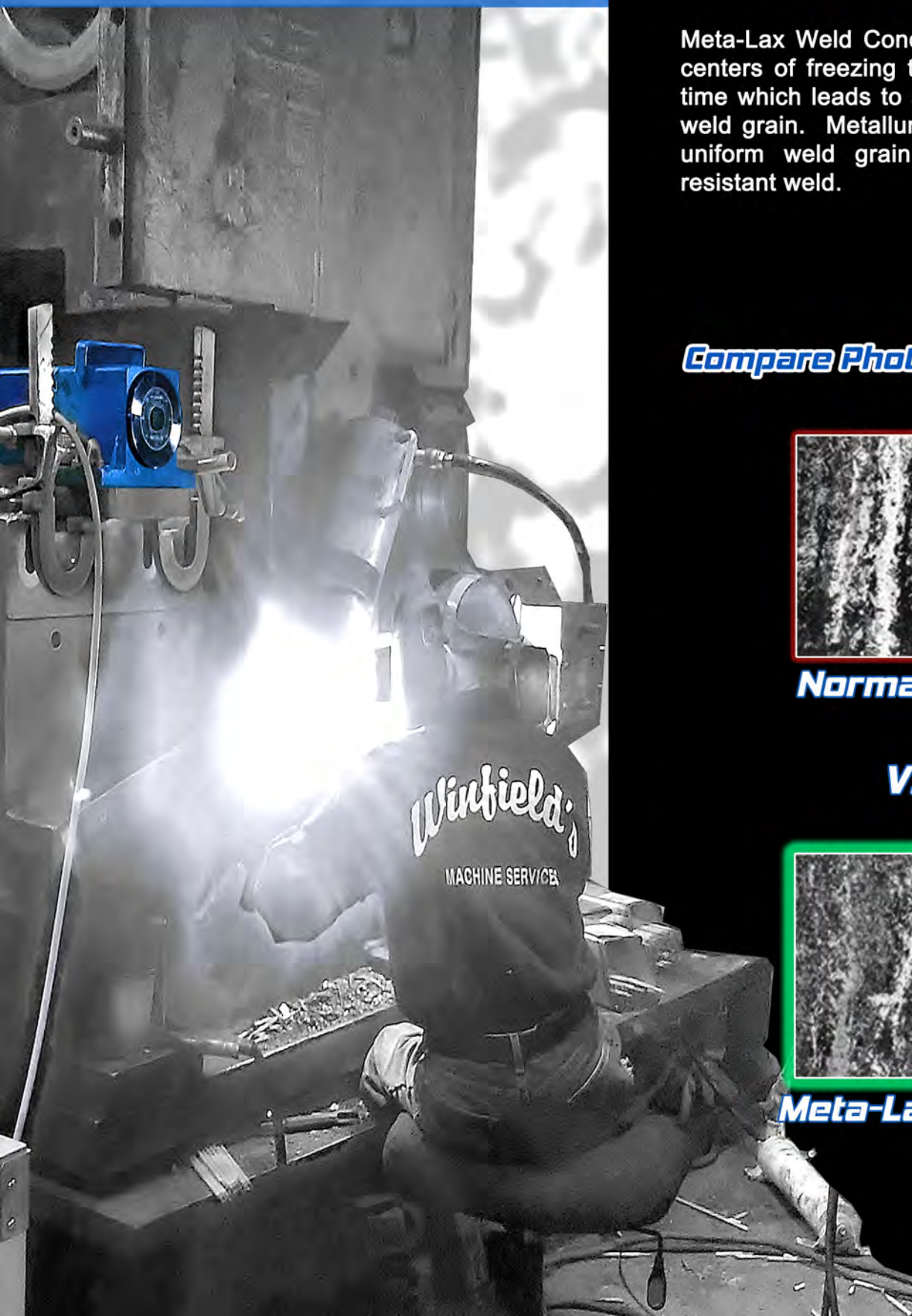
**Meta-Lax Weld**

Sub-harmonic vibrations are so mild that they can be applied during welding, a process called Meta-Lax Weld Conditioning, for the purpose of preventing weld distortion and weld cracking. Weld Conditioning can reduce both cracking and distortion by up to 90%.





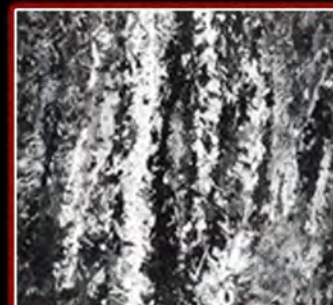
Besides preventing weld distortion and weld cracking, Meta-Lax Weld Conditioned weldments achieve much longer service life, routinely 50-200% longer. Additionally, Weld Conditioning allows welders to weld faster and use lower preheat temperatures.



## ***Prevent Weld Cracking***

Meta-Lax Weld Conditioning allows more centers of freezing to occur at the same time which leads to a finer, more uniform weld grain. Metallurgically, a finer, more uniform weld grain indicates a crack-resistant weld.

### ***Compare Photomicrographs***



***Normal Weld***

***VS.***



***Meta-Lax Weld***



# ***Meta-Lax Weld Conditioning: Unparalleled Weld Improvement***

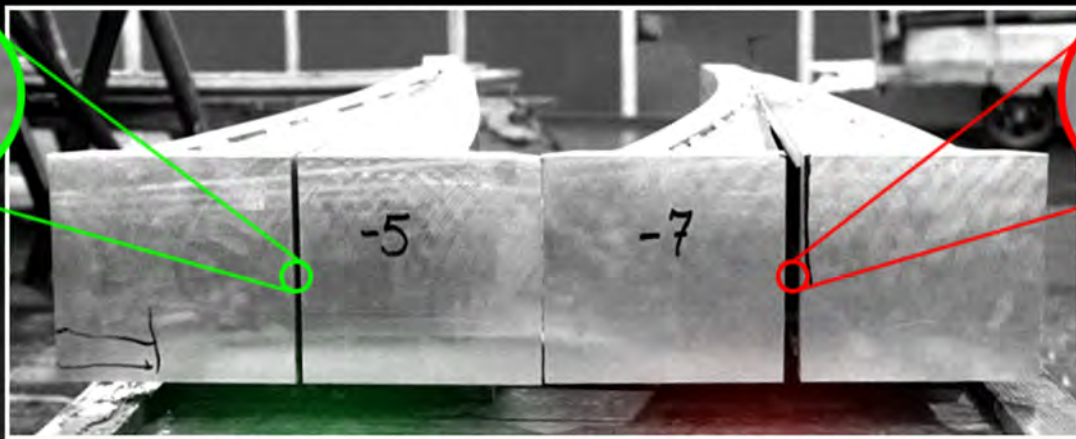
## ***Unrivalled Distortion Control***

*In an independent test, Meta-Lax Weld Conditioning was 69% better at preventing weld distortion than heat-treat stress relief.*

**- Grumman Areospace**



## ***Grumman Test Results***



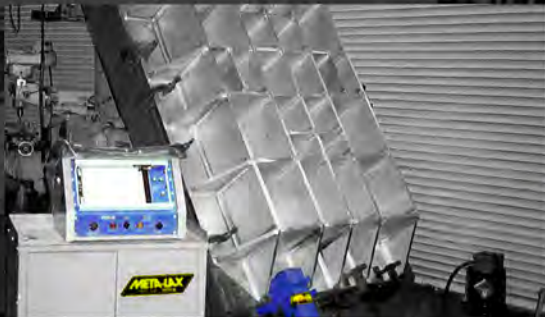
**Meta-Lax Weld  
Conditioned parts  
distorted only  
0.161-inches.**

**Heat-treat  
stress relieved  
parts distorted  
0.524-inches.**





## Unequaled Distortion Prevention



"The use of Meta-Lax as applied during welding has helped us control the flatness of the platens, previously 1-inch plus to the current 0.100-inch TIR. That's a 90% reduction!"

-Pete Hann

C.L. Hann

## Unmatched Weld Durability



"I've never been disappointed with Meta-Lax—ever! A repaired ripper shank lasted less than three hours in the field. We welded it again, this time we added Meta-Lax during welding and it then wore out without any breakage."

-John Sparovic

Weber Machine & Welding

## Unheard-of Weld Crack Reductions



"Bottom line—after 70-80 hours of Meta-Lax weld conditioning per mold there were NO CRACKS! That's proof positive for me!"

-Bruce Kronk

WesTool

## Unprecedented Distortion Minimization



"After all the welding was complete [which took over 30 days] we measured only  $\frac{1}{8}$ -inch corner to corner out of flatness and  $\frac{1}{8}$ -inch out of squareness! Normally, even when using holding fixtures, welding the gussets caused at least a  $\frac{1}{2}$ -inch distortion."

-Don Whitfield

NASA – Dryden Flight Research Center



# ***You can rely on Meta-Lax®*** ***(The U.S. Government does.)***

***“Meta-Lax is a proven substitute for 80% to 90% of heat-treatment stress relief in metal-working applications. It improves the inconsistencies of the previous resonant-vibration technology by using more efficient, more consistent ‘subharmonic’ vibrational energy, which is the optimum vibrations stress-relief frequency.”***

***- U.S. Department of Energy***

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