META-LAX®

STRESS RELIEF & WELD CONDITIONING TECHNOLOGY

BONAL TECHNOLOGIES, INC.

SUBSIDIARY OF BONAL INTERNATIONAL, INC.

*A Public Company • OTCBB "**BONL**"*

WHAT IS META-LAX?

MET•A•LAX (mĕt'-ə-lăks') adj. **1.** A patented process by Bonal that relieves thermal stress within metal components by using nondestructive sub-harmonic vibrations. **2.** Metal relaxation.

Thermal stress is caused by a sharp temperature drop in metal. It creates problems of distortion (immediately following machining or over time) and premature cracking. "Stress relieving" reduces these effects.

It may be helpful to relate META-LAX to "thermal" stress relief in that both induce internal accelerated motion in the metal to cause stress relief. It also may be helpful to relate META-LAX to "natural aging" in that both do not cause heat side effects like scaling, softening, or reducing mechanical properties. META-LAX processing usually takes 1/2 to 2 hours for application and does not cause treatment distortion.

HOW DOES META-LAX WORK?

The META-LAX process induces a mechanical energy into the workpiece by means of vibration. Different levels of induced energy will have different effects on metal. With vibration, as with heat, there is an optimum energy level that will cause stress relief.

All metal components exhibit harmonic and non-harmonic responses to external energy input (picture a flat line leading into a bell-shaped curve). The amplitude of displacement of the metal component is a function of the induced vibration frequency.

When the frequency of vibration is increased, the metal dissipates the induced energy through internal friction and results in lower amplitudes. The amount of energy being dissipated by the metal is its stress relief potential. ***This dissipated energy reaches a maximum at and near the leading portion of the harmonic curve ("SUB-HARMONIC") which is the optimum vibration stress relief frequency.*** Beyond this range the metal component cannot dissipate the induced energy and responds with a violent reaction (higher amplitudes) which is usually observed as bouncing and high noise levels. Beyond the harmonic range the metal regains its capability of dissipating the induced energy which results in lower amplitudes.

If the metal component contains thermally induced stress, the harmonic curve will be out of phase when compared to its natural frequency in a stress free state. Upon META-LAX stress relieving, the initial harmonic curve shifts to and stabilizes at a new location which is its natural frequency. This explanation is presented graphically on page 4.

WHY USE META-LAX?

- **Meets or Exceeds Thermal Stress Relief (TSR) Quality**
- Certifiable Stress Relief
- No Treatment Distortion
- 90% Less Processing Costs
- 98% Less Processing Time
- 41% Less Machining Time
- 500% Fatigue Life Improvement
- 86% Less Distortion
- 95% Less Weld Cracking
- 66% Less Preheat
- Less Weld Porosity
- No Size or Weight Limitations
- Consistently Effective
- Scientifically and Academically Verified
- **800% Return on Investment**

Cover - STS-34 Atlantis Space Shuttle Carrying Galileo Space Probe: Meta-Lax Stress Relief on Shuttle Landing Gears.

Machining & Mold Manufacturing

Eliminated Furnace Stress Relief. Hammond Machinery.

Reduced Machine Distortion. Multi-Precision Detail.

Eliminated Furnace Stress Relief. Paragon Die.

Eliminated Cracking From EDM. Hydro-Cam.

Fabricating "Meta-Lax Weld Conditioning"

Reduced Weld Distortion 85%. General Motors Truck & Bus.

Reduced Weld Distortion 70%. Grumman Aerospace.

Improved Fatigue Life 500%. National Steel, Great Lakes Div.

Reduced Weld Cracking 75%. Build-A-Mold.

High Performance Engine Building &

World Record Holder. Cooper's Express (Miss META-LAX).

Improved Fatigue Life 300%. Miss Madison.

Fabricating & Machining

Saved $150,000 Over TSR Costs.
General Motors.

Reduced Machine Distortion 80%.
K & M Machine.

Reduced Machine Distortion 86%.
Bonal Corporation.

Reduced Premature Cracking.
NASA - Langley Research Center.

Die Casting

Reduced Sudden Failure.
Inverness Castings.

Improved Fatigue Life.
ITT Automotive.

Improved Weld Quality.
Modern Tooling.

Eliminated Furnace Stress Relief.
Emerson Motors.

High Performance Component Manufacturing

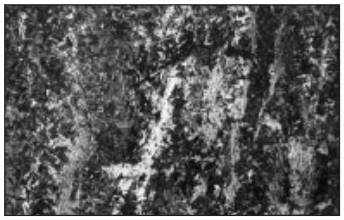
Doubled the Life of Valve Springs.
Paul Pfaff Enterprises.

Improved Fatigue Life 200%.
Automotive Specialists.

WHAT IS WELD CONDITIONING?

Weld Conditioning is the application of Bonal's patented META-LAX process and equipment **during welding**. Weld conditioning will relieve thermal stresses as they are being introduced during weld solidification. This procedure produces several desirable benefits for the weld metal and the heat affected zone. Two obvious benefits are minimization, if not total elimination, of weld cracking and weld distortion.

Other benefits include welding faster by increasing amperage which also allows deeper weld penetration. Metallurgically, weld conditioning produces a finer, more uniform weld grain structure, thus improving the weld's mechanical properties and ultimate fatigue life. Weld ductility is increased as much as 400% and impact is increased as much as 100% over a non-weld-conditioned weld!



META-LAX *Weld Conditioned Photomicrograph*

Normal Photomicrograph

Another important benefit of META-LAX Weld Conditioning is that it stress relieves the weldment, therefore no additional post weld stress relief is needed.

WHAT MATERIALS CAN BE USED WITH META-LAX ?

- Low Carbon- HOT ROLLED- 1018, 1020, A36, 4620, 8620
- Medium Carbon- 1045, 1060, 4140, 4340, H13, P20
- Tool Steel- A2, D2, M1, M2, M3, M4, S7, HY80, HY100
- Aluminum- 356, 2000, 5000, 6000, 7000
- Stainless Steel- 304, 316, 410, 416
- Cast Iron- Gray, Nodular, Meehanite
- Exotic Metal- Gold, Titanium, Magnesium, Inconel, Monel, Bronze, Waspalloy, Hastelloy, Stellite
- Weldments • Forgings
- Castings • Hardened • And others

WHO IS BONAL TECHNOLOGIES, INC.?

Bonal Technologies, Inc., of Southfield, Michigan, U.S.A., is a wholly-owned subsidiary of Bonal International, a publicly held OTC company. Bonal is the pioneer and world's leading provider of sub-harmonic vibrational stress relief and weld conditioning equipment for metal. Besides manufacturing META-LAX Stress Relief and Weld Conditioning systems, Bonal also provides complete consulting, program design and metal stress relief services to customers in the automotive, aerospace, defense, agriculture, shipbuilding, mining, power generation, machine tool, plastic molding and die casting industries.

Bonal's META-LAX equipment is sold throughout the world through a network of national and international distributorships.

Bonal's META-LAX equipment includes a full compliment of economical systems from manual documentation series to computerized documentation series.

META-LAX Increases Stress Relief Capability

Hardened

Reduced Grinding Distortion 80%.
Toyoda Machinery USA.

Aluminum

Eliminated Furnace Stress Relief.
Edel-Brown.

Assembled

Reduced Machine Distortion.
Parker Boring.

Tubing

Eliminated a 50% Scrap Rate.
U.S. Army.

Size

Reduced Premature Cracking.
U.S. Navy.

Weight

Stress Relieved 80,000lbs. in 8 hrs.
Danly-Komatsu.

On - Site

Controlled Machine Distortion.
J & J Burning Co.

Weld Conditioning

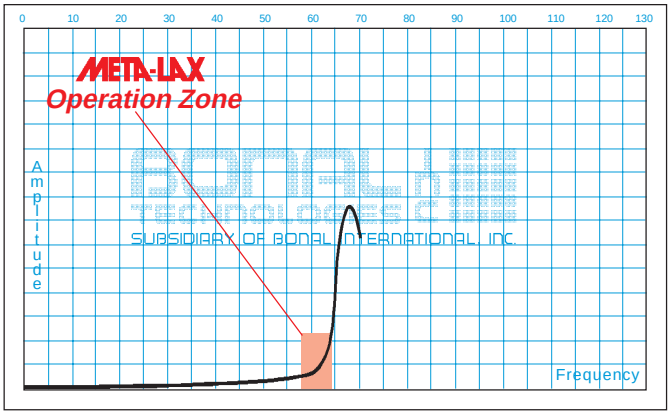
Quality Assurance.
NASA - Edwards AFB.

META-LAX

The Patented Process

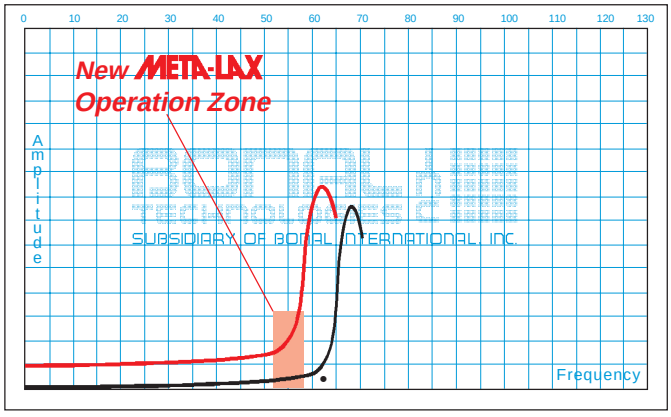
Principle #1

Sub-harmonic energy must be used for the stress relieving frequency. This is the optimal level for vibrational stress relief.



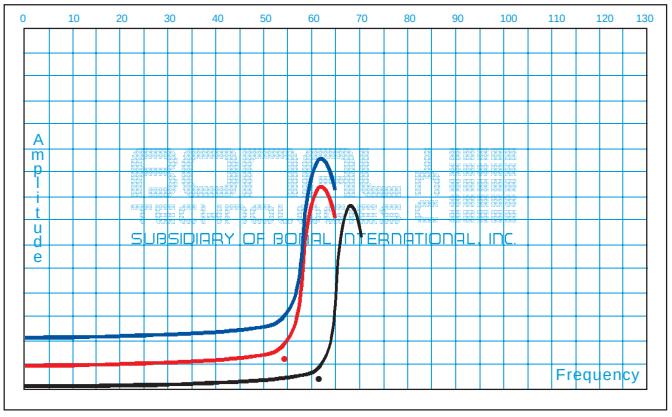
1st Scan: Represents initial response of workpiece.

Principle #2a



2nd Scan: Represents change due to reduction of thermal stress.

Principle #2b



3rd Scan: Repeats prior scan certifying that stress relief is complete.

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TECHNOLOGY AND EQUIPMENT FOR THE NEXT MILLENNIUM