LAMBDA Technologies Group.

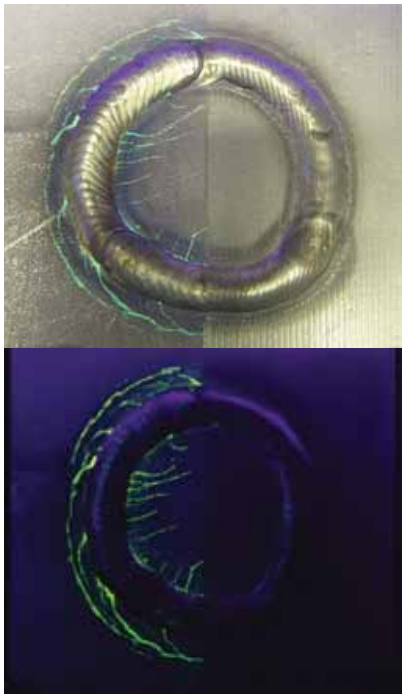
LPB® Application Note

IMPROVING COMPONENT LIFE AND PERFORMANCE

NUCLEAR WASTE CONTAINERS

Lambda-designed tool imparting residual stresses in a radioactive waste container weld

LPB Eliminates SCC In Nuclear Welds



Pentrant dye showing SCC eliminated in TIG closure weld treated with LPB

Changes in national energy policy have caused temporary nuclear waste containment facilities to convert to long-term solutions. This makes the integrity of containment vessels a priority for storage facilities and power producers. SCC has plagued existing casks, impacting design life, safety and cost. By introducing a deep, stable layer of compressive residual stress, low plasticity burnishing (LPB) has been proven to eliminate SCC in nuclear grade alloys, providing a permanent solution to the problem.

- Extends Plant Life
- Smooth Finish Facilitates NDE
- Reduces Maintenance Costs
- Does Not Alter Material or Design

Lambda combines world-class fatigue analysis from our state of the art lab, with top-notch practical engineering to provide a solution to the SCC problem that fits your budget. LPB can be applied during initial manufacturing, maintenance and repair operations or in-situ. With LPB it is possible to exceed design life requirements.

Contact us to learn how LPB can increase the life of critical nuclear components.

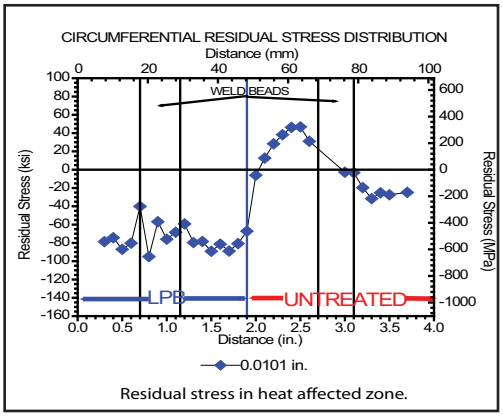
Lambda Technologies ▪ 3929 Virginia Avenue, Cincinnati, OH 45227
Tel (513) 561-0883 ▪ Toll Free/U.S. (800) 883-0851 ▪ Fax (513) 322-7186

www.lambdatechs.com

LAMBDA Technologies Group.

Mitigating SCC in Welds

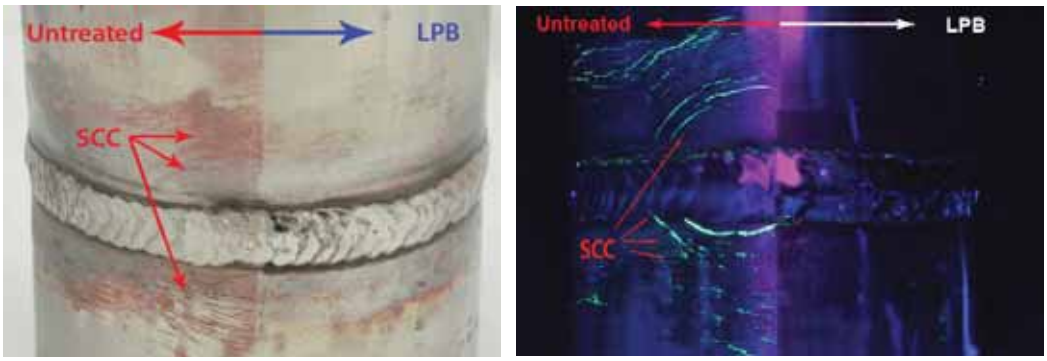
Testing was performed to evaluate the benefit from LPB in preventing SCC initiation in welded austenitic stainless steels commonly used in nuclear casks. Each specimen was welded and then subsequently LPB processed on half of its face. Welds were made using both 304L and 316L stainless steels. X-ray diffraction residual stress measurements confirmed that the LPB treated half of the specimens were in a state of deep residual compression while the untreated sides were in tension. The specimens were tested in boiling $MgCl_2$ in accordance with ASTM standards.



Residual stress in heat affected zone.

After 100 hours of exposure, the untreated sides of all specimens exhibited severe hoop and radial SCC completely penetrating through the half inch thickness. The LPB treated areas contained no SCC and retained 100% of the initial compression induced by the LPB process. SCC stopped completely at the LPB treated boundary.

Through innovative technologies such as LPB, it is possible to extend the life of nuclear casks to meet the needs of the industry. In a time when the demand for power is rapidly increasing, LPB can provide the needed improvement in material integrity to ensure safe, clean and efficient storage of nuclear waste products. For the full details of this research, please view our technical papers listed below.



304L Stainless Steel welds. The untreated half of the specimen was catastrophically damaged. The LPB processed weld region showed no damage or cracking.

To learn how LPB can increase the life of critical nuclear components, please visit www.LambdaTechs.com or contact Kim Bellamy at (513)561-0883.

References:

- J. Scheel, N. Jayaraman, D. Hornbach. "Preventing Stress Corrosion Cracking of Nuclear Weldments Via Low Plasticity Burnishing." April 2010 http://www.lambdatechs.com/html/resources/278.pdf.
- J. Scheel, N. Jayaraman, P. Prevey. "Mitigation of Stress Corrosion Cracking in Nuclear Weldments using Low Plasticity Burnishing". Proceedings of the 16th International Conference on Nuclear Engineering ICONE16 Orlando, Florida, USA, May 11-15, 2008.
- N. Jayaraman and P. Prevey. "Comparison of Mechanical Suppression by Shot Peening and LPB to Mitigate SCC and Corrosion Fatigue Failures in 300M landing Gear Steel." Proceedings of ICSP 9 Paris, Marne la Vallee, France, Sept. 6-9, 2005.

http://www.lambdatechs.com/publications/publications.html

Accreditation:

- ISO/IEC 17025 Accredited Laboratory
- ISO 9001:2008 Certified
- Selected by Department of Energy for waste container closure

For more information on Lambda, LPB or to read complete papers, please visit www.LambdaTechs.com

www.lambdatechs.com

Lambda Technologies ■ 3929 Virginia Avenue, Cincinnati, OH 45227
Tel (513) 561-0883 ■ Toll Free/U.S. (800) 883-0851 ■ Fax (513) 322-7186