



Carburizing Critical Firearms and Aerospace Components

Solar East Receives MedAccred Approval

Solar of Western PA Adds New Furnace

Solar Launches a New Website



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The Spotlight | Solar Atmospheres' Newsletter  
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## Low Pressure Vacuum Carburizing of Critical Components in Firearms and Aerospace Industries

contributed by  
**Michael Moyer** Sales Director

Carburizing is a diffusion process where free carbon is adsorbed by a base material, typically steel. Since carbon is the main constituent in steel that facilitates hardening, one can design a part from medium carbon steel and carburize the surface achieving a hard, wear resistant surface (case) with a tough, ductile core. A byproduct of the carburization process is the compressive stress created by having a different, higher volume microstructure only on the surface of a part. This compressive stress is beneficial for fatigue properties. Gear makers have long understood this benefit of carburizing and there are few critical gears today that do not see a carburization process.

### History of Carburizing

Carburization was discovered hundreds of years ago when blacksmiths learned they would sometimes achieve a higher hardness on the surface of steel when burning carbon-based products in their fires; wood for instance. The concept was well known even though the science was not understood. Over the years the process developed into pack carburizing whereby parts would be contained in a retort or closed heat treat container with carbon based materials inside. During the heat treatment portion of the process the carbon-based materials would decompose freeing carbon to carburize the steel. In this case the carbon based material could be as simple as wood or cardboard. Later processes were developed where a carbon-based gas was added to the furnace atmosphere. No matter what the method



*Rotorcraft pinion gear.*

however, it was always difficult to control the carbon diffusion rate and since there was always at least some oxygen (present) the microstructure would contain InterGranular Oxidation (IGO). The case could be non-uniform in depth and quality, with excess carbon leading to undesirable carbide formations and retained austenite in the final microstructure. It was nearly impossible to achieve carburization in blind holes. At the roots of gears the case would be very thin compared to the pitch of the gear tooth leading to limited part life and fatigue failure.

### Low Pressure Vacuum Carburizing (LPVC)

When it comes to critical components, the challenges listed above become serious risks. In the event of a poorly carburized rotorcraft gear the result could be loss of flight and life. In a modern firearms application the bolt carrier

must function flawlessly in defense of life and poorly carburized parts could fracture and fail. In these types of applications there can be no substitute for the best, and LPVC reduces these risks to a manageable level because the method introduces a whole new level of control and quality to the carburization process. Since the process uses a boost then diffuse cycling action with vacuum and partial vacuum, blind holes and gear roots are carburized without issue. The diffusion process is carefully timed and cycled with the carbon introduction to effectively control the carbon diffusion and thus control retained austenite and carbide formations. Since the process is performed at a relatively deep level of vacuum there is not enough residual oxygen to form IGO.

LPVC is a versatile and effective process, next time you have a part that needs carburizing please contact Solar Atmospheres to see how you can benefit from the technology.



*Complete AR-15 bolt carrier group.*

# Solar Atmospheres Receives First MedAccred Accreditation



Solar Atmospheres, Inc. announced on April 14, 2015 that it has become the first company to receive MedAccred accreditation. Medical prime contractors are demanding that environmental conditions are controlled, processes validated, and the risk of foreign object debris (FOD) reduced.

Performance Review Institute (PRI) states that MedAccred is an industry managed supply chain oversight program that bolsters patient safety. It does this through clarification of requirements and better identifying how they apply to critical processes used in the production of medical devices.

“Achieving MedAccred accreditation is not easy: it is one of the ways in which the medical device manufacturing industry identifies those suppliers capable of providing superior critical process manufacturing to the device industry. Solar Atmospheres has worked hard to obtain this status and they should be justifiably proud of it,” said Joe Pinto, Executive Vice President and Chief Operating Officer at the Performance Review Institute. “PRI is proud to support continual improvement in the medical device manufacturing industry by helping companies such as Solar Atmospheres be successful and we look forward to continuing to assist the industry moving forward. I would like

to add my personal congratulations to everyone at Solar Atmospheres, as the company has been actively involved in the MedAccred program for some time now, and volunteered to pioneer this process. Their positivity and diligence has paid off and I am delighted to award them the first ever MedAccred certificate.”

Mike Moyer, Director of Sales at Solar Atmospheres, Inc. states, “Many companies only enter these programs when their customers mandate compliance. At Solar Atmospheres we embrace these programs as opportunities. It is a good thing when industry original equipment manufacturers (OEM) and final device makers recognize the benefits that accrue when suppliers become involved in the global management of activities surrounding their special process. After all, who knows a special process better than the companies that perform it every day? These programs inevitably bring the OEMs and suppliers together at the same table where pertinent discussions lead to achieving the following goals: first, improvements in the substance and flow-down of the requirements from the OEMs, second, improvements in the performance of the supplier base, and third, improved products to doctors and patients resulting in better quality medical care with fewer complications.”

## Benefits of MedAccred

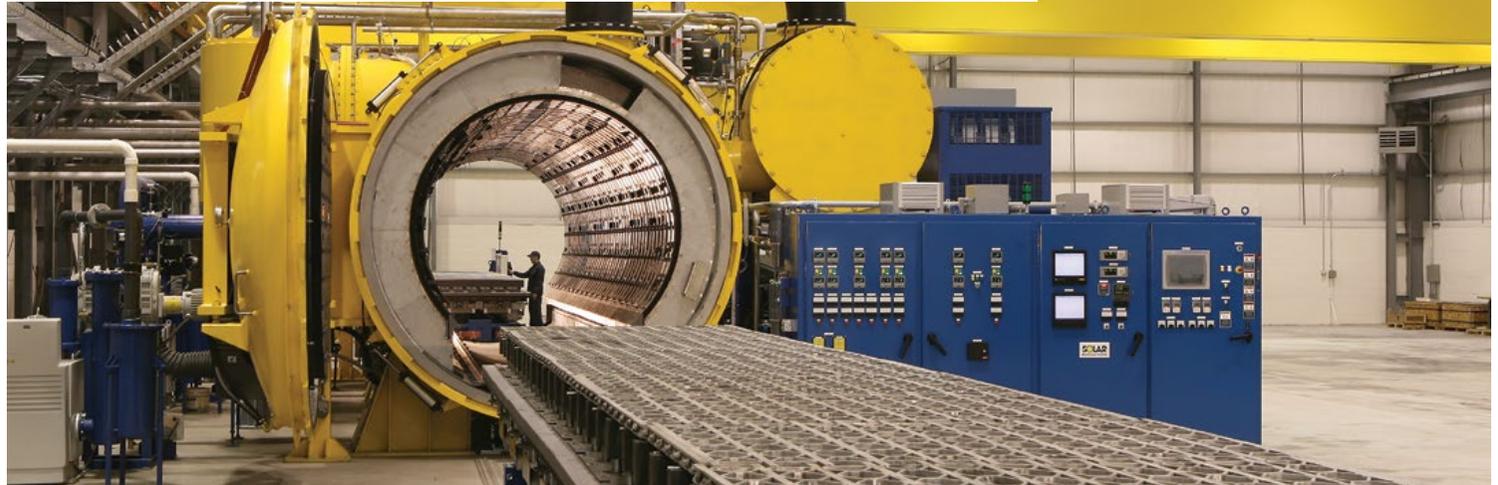
- Provides consistent/standardized critical process accreditation accepted by the Medical Device Industry resulting in fewer redundant onsite audits by multiple OEMs
- Conducts in-depth critical process audits that are compliant and consistent to accepted industry/technical standards and conducted by Subject Matter Experts
- Provides greater visibility of the supply chain to all levels and sub-tiers that provide critical processes, consistent with regulatory requirements (e.g. FDA, ISO 13485, MDD, etc.)
- Improves flow down of OEM requirements to sub-tier suppliers
- Medical device industry-accepted and consistent technical requirements leading to process discipline, greater operational efficiency and continuous improvement resulting in higher quality and lower overall cost



Joe Pinto of PRI presents MedAccred Accreditation certificate to Solar Atmospheres inside the climate controlled room.



# Largest Horizontal Vacuum Furnace Coming to Solar Atmospheres of Western Pennsylvania



Solar Atmospheres of Western Pennsylvania announces that it will be installing the largest horizontal high vacuum furnace ever constructed at their Hermitage facility. The furnace will be engineered and manufactured by their sister company, Solar Manufacturing, Inc.

The entire investment for Solar Atmospheres will be in the order of \$8,000,000 including the cost of this large furnace, a new 20,000 square foot building addition, and utilities to operate this large system.

Robert Hill, President of Solar Atmospheres Western Pennsylvania, states "We will all be very busy over the next year, not only preparing a site to expand our current facility by another 20,000 square feet to house this newest piece of equipment, but also assembling and building the new equipment on-site. All of our employees are eagerly anticipating the day that we commission one of the most unique vacuum furnaces in the world."

This car-bottom type furnace Model HCB-84576-2EQ will have a work-zone that measures seven feet in diameter by forty-eight feet long and will be capable of handling loads up to 150,000 pounds at 2400°F. Dual US patented loading cars are provided for loading/unloading from both ends of this furnace with its 48 foot long hot zone.

The vacuum chamber is being manufactured by Youngberg Industries, Inc. of Rockford, IL and will incorporate three 48" diameter vacuum ports as well as six 24" diameter ports for gas cooling inlet and outlet. Autoclave type locking doors are included at both ends of the furnace. Tom Larson, CEO of Youngberg Industries indicates "this is the largest horizontal high vacuum chamber we have ever manufactured."

The programs for the engineering and construction phases have been initiated with key orders placed for major system components. The ultimate goal is to have installation and testing completed by the first quarter of 2016.

Solar Atmospheres and Solar Manufacturing are part of the Solar Group of companies. Solar Atmospheres provides commercial heat treating and brazing services to a wide array of industries with four facilities located in Eastern and Western Pennsylvania, South Carolina, and California. Solar Manufacturing specializes in the manufacture of new vacuum furnaces as well as providing hot zone replacements and aftermarket spare parts and service.

## Upcoming Trade Shows



**Westec**  
Sept. 15-17, 2015  
Los Angeles, CA

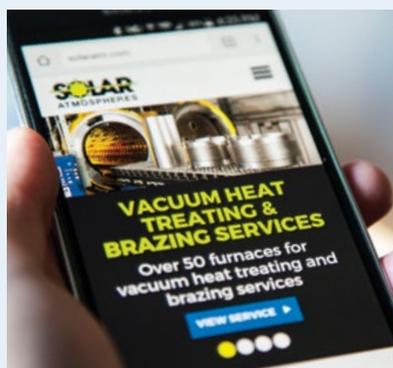


**Titanium USA**  
Oct. 4-7, 2015  
Orlando, FL



**Heat Treat Expo**  
Oct. 20-22, 2015  
Detroit, MI

## Solar Launches a New Website



With the changes in technology and the company expansion, Solar was proactive in improving the current website to a more mobile friendly version while adding features to assist new and existing customers.

While the look and feel of the website is all-new, many of the best features have been kept and updated. It is now easier to use Live Chat to talk in real time with a Solar salesperson and to access our wealth of technical documents.

This newsletter is published by Solar Atmospheres, a leader in world-class vacuum heat treating.

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