

INSIDE THIS ISSUE

New Personnel pg. 2

High Performance Racing pg. 4

Vacuum Carburizing pg. 5



THE SPOTLIGHT

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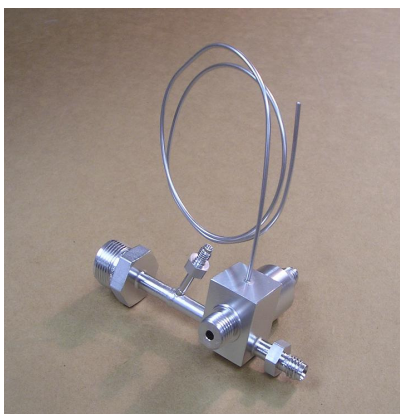
A Solar Atmospheres Publication

Vacuum Brazing at Solar Atmospheres

The American Welding Society defines brazing as a welding process for joining materials by heating them in the presence of a filler metal that will melt above 840°F. The liquid filler metal is drawn between the closely fitting surfaces by capillary action. Brazing does not melt the base metal, only the filler metal.

Vacuum brazing is a batch process used to join parts by placing them in a vacuum furnace. The entire part is heated under vacuum by radiant heat from heating elements. No flux is used in these furnaces because the pressure and temperature combine to reduce surface oxides and allow the liquid filler metal to wet the base metal. Assemblies come out of the furnace cleaner than they went in.

By far, the most common type of material brazed at Solar is 300 series stainless steel. These base metals are brazed using a nickel based filler metal. The filler metal creates a permanent bond that is stronger than the base metal. Distortion is also greatly reduced over traditional welding processes because the entire part is heated.



The most important consideration when brazing is part design. It is so important to successful brazing that Solar offers design review at no charge to our customers. A part designed for welding can usually be brazed with only minor modifications to the joint.

Solar can braze parts one at a time or thousands at a time. The parts can be small or up to 36 feet in length. Dissimilar materials can

be joined, such as copper to stainless steels. Some of the other common materials that are brazed include carbon steel, alloy steel, tool steel and high nickel alloys.

 *Mike Drakeley, Director of Sales*

SAWPA Enters Long Term Agreement with RTI International Metals



Solar Atmospheres of Western PA announced that it has signed a long-term agreement with RTI International

Metals, Inc. (NYSE:RTI). Solar will provide the services of vacuum heat treating, vacuum creep forming, and fluorescent liquid penetrant inspection (NDT) of structural titanium components manufactured by RTI for the Boeing 787 Dreamliner. Solar is the exclusive vacuum heat treater for the 787 PAX Floor Pi-Box Seat Track Program. RTI, as the lead integrator among multiple supply chain partners, will extrude, machine, and assemble the finished titanium components used for the seat tracks in the floor structure of the 787. This contract expands Solar's role as a strategic supplier to RTI.

SAWPA's President, Bob Hill, states "Solar has been under long term contracts for aerospace products that are supplied to The Boeing Company since 2000 and this contract continues to strengthen our position in the aerospace market. Once again, Solar has proven itself as a leader in vacuum technology while displaying our dedication to resolving any technical issue, inherent within any new program involving an airplane".

The Boeing 787 Dreamliner is a mid-sized, wide body, twin engine jet airliner developed by Boeing Commercial Airplanes. It seats 210 to 330 passengers based

Continued on Page 2

MISSION

The Mission of Solar Atmospheres is to add significant value to our customer's operations by thermally treating parts, principally in a vacuum environment, with an unwavering commitment to honesty in all relationships.

We will strive to fulfill this mission while...

- Performing our work with an emphasis on quality and responsiveness.
- Operating with an awareness and appreciation of the value of our customer's parts while in our care.
- Forever looking "forward" in the area of technical capabilities.
- Demonstrating a willingness to "accept the challenge."
- Providing and maintaining a work environment that is safe, clean, and reflects our respect for human dignity.
- Providing our employees with an opportunity for personal growth, challenge and reward.
- Maintaining a workplace that is environmentally friendly.
- Sustaining long-term growth and profitability.

The Spotlight is a quarterly publication of Solar Atmospheres

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Continued from Page 1

on the various models and seat configurations. The 787 has become the fastest selling wide body airliner in history, with nearly 900 orders to date.

The airframe in the 787 features a lighter weight construction; the plane's materials consist of 50% composite, 20% aluminum, 15% titanium, 10% steel,

and 5% other. The titanium that Solar is vacuum heat treating for this aircraft includes not only the seat/floor grid, but also wing boxes, tail structures, engine components and fasteners. The use of these lightweight materials does enable Boeing to produce the most fuel-efficient airliner in the history of aviation.

The aircraft was originally scheduled to enter service in May of 2008, but production has been delayed multiple times. The first delivery is now scheduled for the fourth quarter of 2010. The aircraft's maiden flight took place December 15, 2009 at the Boeing field in Seattle, WA.

With considerable investment and dedication towards this program, Solar Atmospheres of Western PA will feel tremendous pride on the day that the first 787 delivery is made to All Nippon Airways in Japan.

 *Bob Hill, President, SAWPA*

Hermitage, PA adds new face to staff

Solar Atmospheres of Western, PA is pleased to announce the hiring of Mr. Eric Carothers for the technical sales position. Eric has been located in technical sales most of his career, primarily selling metals. Eric is now reporting to Mike Johnson, Sales Manager. Bob Hill, President of SAWPA states, "We are excited to acquire a person of Eric's caliber to be a member of our Solar Atmospheres sales team."



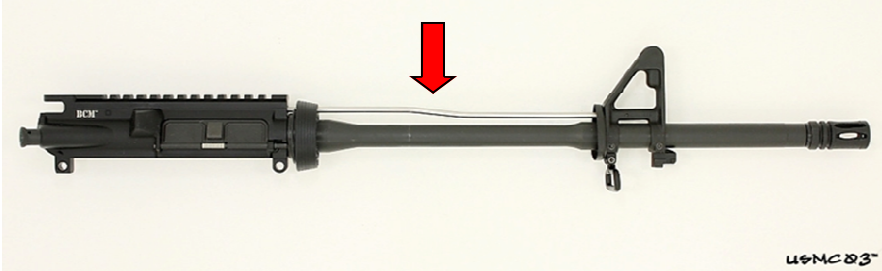
Eric Carothers

Upon graduation in 1985 from Grove City College, Eric and his wife first settled in Rancho Cucamonga, CA, where they started their career and raised their two children. Eric earned his MBA at the University of La Verne in La Verne, CA. He worked in a sales function on the West Coast for Inco Alloys, Climax Molybdenum, NGK, and Tamco Steel. In August of 2008, he and his family decided to relocate back east to Grove City, PA to be closer to family. He immediately began working with a plastics company, but realized his true love was selling metals, due in part to his Metallurgical Engineering degree and background.

 *Bob Hill, President, SAWPA*

The Firearms Market

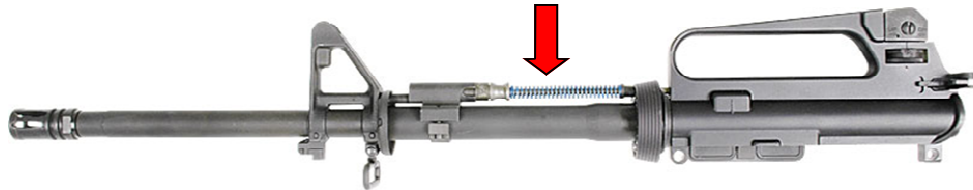
The firearms market has been a strong market as of late. The strength is not just in the civilian market but also the military and law enforcement markets. The military market has been strong in response to massive amounts of feedback being received from our front-line troops. The law enforcement market has seen a long and steady growth period after the astonishing "North Hollywood Shootout" in February of 1997. Since then, police departments have been equipping themselves with firearms that can penetrate body armor and fire large quantities of lead down range.



Over the last decade the US military has adopted numerous new calibers and weapon systems and has used the private sector to help develop them. An example of this is the LWRCI AR-style rifle. Many of us have seen pictures of troops in Vietnam toting their new ARs (AR=Armalite Rifle) high over their heads while wading across streams. The reason for this is due to the fact that the standard-issue AR has a small tube that transports exhaust gas from the

Old Gas Tube Design barrel into the receiver where it cycles the bolt automatically during firing. If the tube is filled with water when fired, the tube will rupture, damaging the firearm and potentially injuring or killing the operator. For the Navy Seals that was unacceptable, so they looked to known experts in the field. LWRCI is a company that has solved this problem by incorporating a gas piston design eliminating the tube and keeping hot exhaust gases from entering the receiver. The firearm can be fired directly upon being removed from being submerged.

Another prime military example is the .50 Beowulf® (.50 caliber) cartridge and firearm. Developed by Alexander Arms, the .50 Beowulf® is a massive .50" round that is designed for short range (within 200 meters), high impact battles, such as stopping a speeding vehicle full of explosives. The round was designed to be fired from the standard AR rifle, a firearm that all military personnel already know. Compared to the standard issue 5.56 x 45 (nearly the same as the .223 Remington) the difference is astounding. The .50 Beowulf can fire a projectile as heavy as 400 grains (.83 oz) while the 5.56 is 62 grains. The energy of the Beowulf is nearly 6.5 times the energy of the standard-issue 5.56 round. For stopping power there is really no comparison.




New Gas Piston Design



5.56x45 NATO vs. .50 Beowulf

These new rifles and cartridges all require manufacturing facilities and processes. To make improvements to the metal firearm components, coatings and surface treatments play an important role. A hard wear-surface with anti-fouling and anti-corrosion characteristics is the desirable result. This is where Solar Atmospheres plays a role. Today's high quality specialty parts warrant high quality results. Solar's LPVC (low pressure vacuum carburizing) process delivers better control of carbon diffusion and subsequent control of case depth/quality. This is achieved through process control that cannot be achieved in a conventional process. Likewise, Solar's Vacuum Gas Nitriding process gives a higher quality surface case with more uniform and consistent results. Also promising is the new "oxy-nitriding" process Solar has developed. This process produces a hard wear surface that is corrosion resistant, an excellent fit for the firearms market. Today's manufacturers of firearms demand today's technology and Solar Atmospheres provides it.

 Mike Moyer, Corporate Quality Manager

Vacuum Heat Treating Applications for Performance Racing

Vacuum heat treating provides the highest quality standards of obtainable heat treat processing, owing to the inert atmosphere of vacuum, the uniform heating, and uniform cooling, all digitally monitored with our microprocessor controls. These features allow for precise temperature and an atmosphere control that assures the accurate and repeatable results. The vacuum process yields clean, bright results with minimal distortion.

Solar Atmospheres processes performance critical suspension, valve, and drive train components. Materials processed include, but are not limited to, low and high alloy medium carbon steels; die, mold, and high speed tool steels, some of which are: H-11, H-13, M-50, S-7, 4140/50, 4340, 300M, AerMet 100, Questek Ferrium alloys and CPM powder metal products such as Rex 76. Alternative processes include solution treating, age hardening, annealing, and stress relieving. Cryogenic treating is or can be coupled to the heat treating process that completes metallurgical reactions, provides enhanced dimensional stability, and improves toughness. An important aspect of Solar's services is our company's ability to provide process development and metallurgical consultation for any application, which enables customers to consistently and quickly achieve their performance goals.



Rocker Arms for Small Bore Racing Engines, Photo Courtesy of Raceseng Designs

Solar Atmospheres also provides services for vacuum carburizing, which eliminates intergranular oxidation characteristic of atmospheric carburizing. Like other vacuum processing, vacuum carburizing uses microprocessor controls that provide for very accurate, uniform, and repeatable case depths. Uniform case depths, such as root to pitch ratios in gears of better than 90%, improve dimensional stability, which in turn enhances the performance characteristics.

Vacuum gas nitriding is now available for most alloy steels, providing a hardened case while preserving core strength and durability. The principle benefits of nitriding are anti-galling, improved fatigue strength, and the corrosion resistance. Both vacuum gas nitriding and vacuum carburizing induce compressive stress in the parts surface for improved fatigue life not found in conventionally quenched, through hardened gears.

The Solar Atmospheres Technology Group is poised to provide the latest in vacuum heat treat processing to exceed the stringent requirements of the performance racing market.



Tim Steber, Regional Sales Manager, Don Jordan, Corporate Metallurgist

Did you know?

Stress relieving can reduce distortion in heat treated parts and tools.

Very often we will be asked "how much will my parts move during heat treatment?" That question can be answered by asking another question: "How much stored stress is in your parts?" Of course, no one has ever been able to answer that question.

Residual stresses are built up in a part during the course of a manufacturing sequence. Some of the common causes of residual stresses are: cold working, welding, grinding, and machining. These stresses are either pushing (compressive) or pulling (tensile) the part in one direction or another. At room temperature the material is strong enough to hold the part straight.

These stresses can be relieved by heating a part to the temperature range of 1100 - 1200 °F and holding for an hour or two (based on the material type and part size). This allows the stresses to relieve without significant distortion to the part. For close tolerance parts, it is best to stress relieve after rough machining, letting the part relax with some movement, then finish machine back to true.

The other option is to try and heat treat the part as is. As the part is heated to a higher temperature, the material will lose strength; the stored stress will push or pull the part, resulting in part distortion.

An interesting historical tidbit; automotive companies used to leave cast iron engine blocks outside in a yard for up to a year to let them "naturally" stress relieve in hot and cold weather.

Should you be stress relieving your parts or tools?

Low Pressure Vacuum Carburizing offered at Solar



Solar Atmospheres offers low pressure vacuum carburizing as the optimum case hardening process for your parts. Resulting from over six years of research and development, this process has been proven to produce parts that will meet and exceed your expectations. Vacuum carburizing has been one of the newest and hottest topics in the heat treating industry and Solar Atmospheres is proud to be a pioneer in the next generation of case hardening.

The benefits of vacuum carburizing are wear resistant part surfaces with case depth uniformity, and maximum case integrity. Vacuum carburizing coupled with high pressure gas quenching results in minimal distortion and bright, clean parts that do not require post-process washing. The benefit of minimized distortion is a reduced amount of post heat treating and finishing operations. Heat treating operations in a vacuum furnace, free from oxygen or other contaminants, prevents the formation of inner-granular oxidation and oxide scaling at the surface.

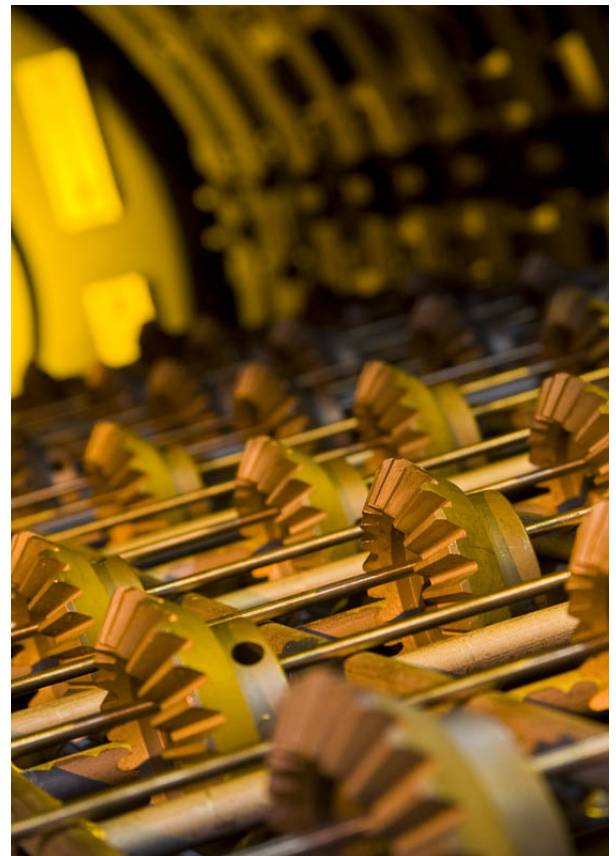
The process produces compressive residual stresses at the surface, an important factor for gear and bearing applications by improving wear life. An added benefit to gearing applications is the case depth root to pitch ratio improvement of vacuum carburizing over conventional carburizing methods. Vacuum carburizing typically results in root to pitch case depth ratios in excess of 90% while conventional carburizing methods will produce

ratios of approximately 70%. Because the process is performed at sub-atmospheric pressures, the ability to carburize deep into blind holes is also an inherent advantage.

Vacuum carburizing offers a level of precision not available in conventional carburizing equipment. Solar Atmospheres has developed a proven vacuum carburizing furnace and process. Our furnaces utilize state of the art microprocessor controls that offer cycle repeatability from load to load and digital paperless recording instruments that simplify the customers' review of heat treating charts.

Cycles for many different steels have been developed and are available to ensure final case depth requirements. Vacuum carburizing is suitable for processing high alloy steels and stainless steels used in most critical and demanding applications.

 Trevor Jones, Project Engineer





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UPCOMING TRADE SHOWS



Orthopaedic Capital Center
at Grace College
May 12-13
Warsaw, IN
Booth # 219



Eastern States Exposition
May 25-27, 2010
West Springfield, MA
Booth # 1256



Santa Clara Convention Center
May 19-20
Santa Clara, CA
Booth # 321



Westin Diplomat Hotel
June 27-30, 2010
Hollywood, FL
Booth # 305