SOLAR ATMOSPHERES

INSIDE THIS ISSUE

THE SPOTLIGHT

May 2011, Vol. 18

A Solar Atmospheres Publication

Solar Atmospheres of California Receives AS9100 / ISO 9001:2008 Certification

Solar Atmospheres of California (SCA) is proud to announce the successful completion of the AS9100 / ISO 9001:2008 certification - the premium quality system standard for companies operating in the aerospace industry.

The AS9100 quality standard was established in 1999 from the desire of leading businesses and organizations in the aerospace and defense industries to identify quality suppliers. AS9100 encompasses the entire current version of ISO 9001, as well as specific requirements addressing well-known problems related to the aerospace sector.

SCA's certification is the culmination of a four-month effort that was fast-tracked at the request of several current and prospective customers. With this assessment completed, all of Solar Atmospheres' commercial vacuum heat treating and brazing facilities are now AS9100 registered.

Solar passed its external audit with an accumulated score of 98.86%. The audit was performed by International Standards Authority, Inc. (ISA) from March 30 through April 1, 2011. Certification was awarded on April 11, 2011.

"SCA's near-perfect score under an accelerated schedule is a testament to our strong commitment and dedication to quality.

Furthermore, the AS9100 registration supports the goal Solar Atmospheres of California has to increase its business in the aerospace industry," said Solar Atmospheres Director of Quality, Mike Moffit.

"We decided to pursue AS9100 Certification to enhance our Quality System in conjunction with our growing business in the aerospace sector. Our successful certification exemplifies our commitment to continual improvement. We are excited about the growth that this certification will allow and the added confidence that it will provide to our customers," states Derek Dennis, President of Solar Atmospheres of California.

Certificate of Registration

This is to certify that the Quality Management System of

Solar Atmospheres of California
8606 Live Oak Avenue
Fontana, CA 92335

has been assessed for conformance with the provisions set forth by

ISO 9001:2008
AS9100 Rev B

Scope of Registration:

Vacuum Heat Treating and Brazing.

Exclusions: Design, Development and Servicing

The assessment was performed in accordance with the requirements of the latest version of AS9104 Rev A. ISA is accredited under the Aerospace Registrar Management Program.

Certificate No. 1380 | Initial Certification: 04/11/2011 | Expiration: 04/01/2014

Such products, processes or services shall be manufactured or offered at or from, only the address given above. This registration is granted subject to the organization maintaining compliance to the noted standard. This Certificate is not transferable and remains the property of International Standards Authority, Inc.

ANAB ACCREDITED

The validity of this certificate is dependent upon ongoing surveillance.

President

International Standards Authority, Inc.
www.isaregistrar.com
525 Queensland Cir.
Corona, CA 92879. USA
Tel: 951-736-0035

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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Western PA Adds Jon Garcia to the Team

Jon Garcia recently joined Solar Atmospheres of Western PA as an assembler/packer. Jon works in the lab, where he prepares and fixtures parts prior to heat treating. Many pieces have to be placed on racks or in special baskets to allow for even heating and to minimize distortion. With his tremendous dexterity and focus, Jon excels at setting up the smallest, most difficult components for the medical industry. He is also responsible for the organized and careful handling of ingoing and outgoing customer parts. Since Jon has started at Solar, our on-time deliveries for these customers have improved tenfold.

Jon Garcia

Jon is 23 years old and resides in Sharon, PA with his parents. He proudly graduated from Sharon High School with perfect attendance. Jon loves working at Solar Atmospheres and considers it his "real" job. We, at Solar Atmospheres, are certainly enthused about Jon joining our team. Our customers are excited as well.

DID YOU **KNOW**

Vacuum Furnace brazed joints are stronger than welds.

This statement is true when joining 300 series stainless steel using BNi-2 filler metal on properly designed lap joints. The lap joint should overlap by 3T – 4T (T being the thickness of the thinner of the two metals being joined). If this rule is followed the joint strength will be higher than the yield strength of the base metal at room and elevated temperatures. Ductility will be sufficient to withstand mechanical and thermal fatigue stress. The depth of the braze joint may be more than 3T – 4T for ease of assembly, but not shallower.

Vacuum Furnace brazing is commonly used to attach small diameter thin-walled stainless tubing to fittings and manifolds. The process allows for large batches of tube assemblies to be brazed in a single run. The uniform heating and cooling of the whole assembly greatly minimizes the distortion common with welding. Since the parts are heated in a Vacuum Furnace oven to 1950F, the stainless will fully anneal and the surface will come out bright and clean.

Small diameter thin-walled stainless tubing can be welded, but the weld creates a weak spot in the assembly just outside the weld in the heat affected zone. Too much or too little heat results in a poor weld. This problem is eliminated by vacuum brazing.

A Unique Method to Oxynitride in a Vacuum Furnace

Recent advancements in instrumentation and other process controls have allowed engineers, chemists, and metallurgists to continually strive to develop new applications for the modern vacuum furnace. Heat treating cycles continue to be developed for materials and processes not previously thought to be applicable to vacuum equipment.

One of the more recent successes was to Oxynitride steel product in a continuous process in one furnace and one cycle. Although this trial was completed in a laboratory type R & D furnace on a rather small scale, it is anticipated that equipment such as the modern Vacuum Gas-Nitriding Furnace described in a recent ASM Publication[1] would be easily applicable and provide production load capabilities.

Oxynitriding can best be described as a process where the material has first been Nitrided and is then purposely oxidized to form an additional performance enhancing layer. We realize that existing efforts for providing an Oxynitrided-type product are usually processed in salt bath or gas retort type equipment with varying success.[2] Our effort was to try to advance and improve the process by using a vacuum furnace to provide an environmentally clean, "Green" method with faster and more consistent results.

The resulting complex oxidized surface layer improves part corrosion resistance, while still maintaining the excellent wear resistance imparted by the Nitriding. The end product has an attractive dark, matte gray finish. We believe varying the oxidizing time will result in several different shades of gray that can approach black if desired. Certainly, the application of supplemental corrosion inhibiting polymer treatments could potentially allow for a variety of colors to be produced, including an aesthetically pleasing dark, lustrous black.

The development of this Oxynitriding process in a vacuum furnace and its benefit regarding improved corrosion resistance consisted of the following:

1. Three samples of H-13 Tool Steel were prepared for processing.
2. One piece of the material was set aside to represent the Non -Treated virgin state.
3. One piece was vacuum gas Nitrided and set aside to represent the Nitrided only condition.
4. The remaining piece was gas Nitrided in the vacuum furnace and then oxidized in the same cycle by the introduction of a partial pressure of wet inert gas. The wet inert gas provided the oxidizing agent (dissociated H_2O at the Nitriding temperature) to achieve the desired end result.
5. This piece was set aside to represent the Oxynitrided condition of the testing.
6. The three samples were then subjected to an ASTM B117 salt spray test for 156 hours by an independent commercial testing laboratory. The objective was to compare the corrosion resistance of the Oxynitrided part to the Nitrided and Non-Treated virgin part throughout the salt spray testing time. The results were photographically recorded at specific time intervals of testing to determine how each part and treatment compared.
7. The laboratory reported the % of red rust on each sample surface after each time interval (see Table 1)

Table 1: H–13 Sample Results Versus Salt Spray Time Exposure
% Rust Observed

Exposure Time (HRS)	Non-Treated Virgin Metal	Nitrided Only	Oxynitrided Only	Photos
O	0 % Rust	0 % Rust	0 % Rust	See Figure 1
12	75 % Rust	5 % Rust	0 % Rust	
24	85 % rust	12 % Rust	1 % Rust	
36	90 % Rust	18 % rust	1 % Rust	
48	90 % Rust	20 % Rust	2 % Rust	
60	90 % Rust	25 % Rust	2 % Rust	
72	95 % Rust	30 % Rust	3 % Rust	
84	96 % Rust	40 % Rust	5 % Rust	See Figure 2
96	96 % Rust	50 % Rust	5 % Rust	
156	98 % Rust	75 % Rust	8 % Rust	See Figure 3
156				See Figure 4 Micrograph of Oxynitrided Specimen

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Hermitage Receives SHARP Accreditation

Bob Sandora and Wes Hoffman with the accreditation plaque

Solar Atmospheres of Western PA has received SHARP Accreditation - the highest safety designation bestowed on small businesses from OSHA (Occupational Safety & Health Administration). Through Solar's commitment to The Safety and Health Achievement Recognition Program (SHARP) Solar Atmospheres of Western PA has singled itself out among its business peers as a model for worksite safety and health.

To become eligible this recognition, Solar needed to have an OSHA consultant perform a comprehensive consultation which included a hazard survey. The consultant reviewed his findings and suggested corrections with management so Solar could implement and maintain a health and safety system addressing OSHA's Safety and Health Program Management Guidelines. In addition, the Away, Restricted, or Transferred (DART) and Total Recordable Case (TRC) rates for Solar had to be below the national average for the heat treating industry.

The SHARP accreditation benefits are:

- Improved employee protection
- Healthy and safe working environment
- Increased worker morale
- Enhanced reputation for safety
- Reduced costs through worker retention

SHARP
Safety & Health Achievement Recognition Program
Consultation: An OSHA Cooperative Program

Only 43 companies in Pennsylvania have attained this recognition. Solar Atmospheres of Western PA is the only commercial heat treating company on that list.

Bob Hill states, "Employee safety is the ultimate goal here. It is knowing that the employees will return home to their families at the end of the day as healthy and as whole as when they arrive at the beginning of their work day."

Bob Hill would also like to specifically thank Bob Sandora for all of his hard work in attaining this state-wide accreditation. To recognize their achievement, Solar Atmospheres of Western PA will have their official certification and a SHARP flag on display.

Holiday Plant Schedule

Please note, all Solar plants will be closed on:

May 30th — Memorial Day

July 4th — Independence Day

September 5th — Labor Day

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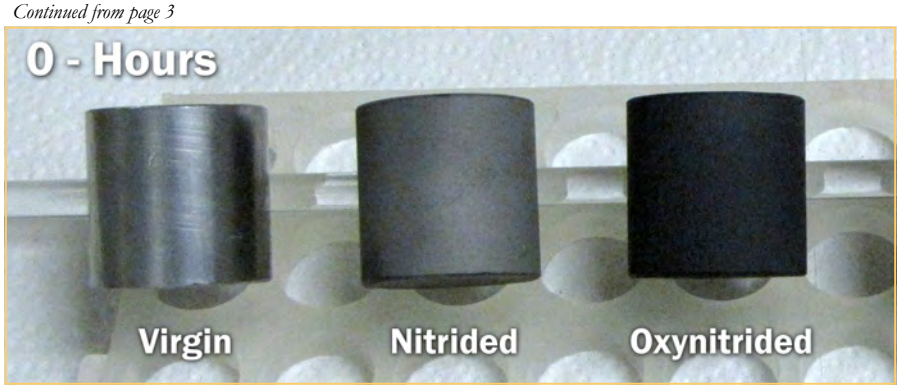

Figure 1 - Prior to salt-spray test

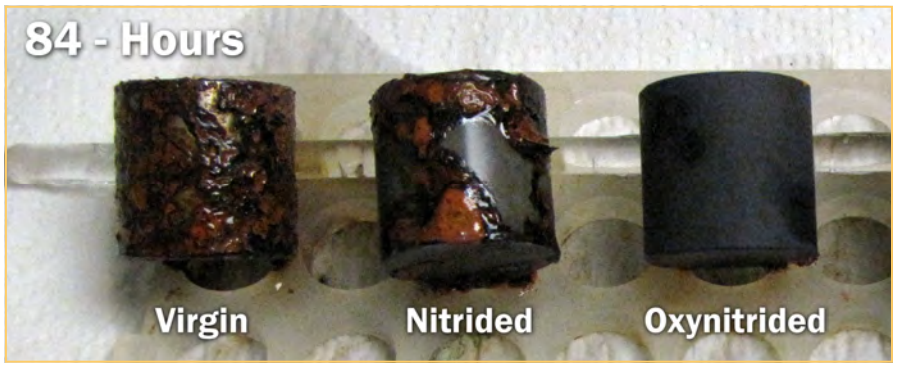

Figure 2 - Salt-spray test result after 84 hours

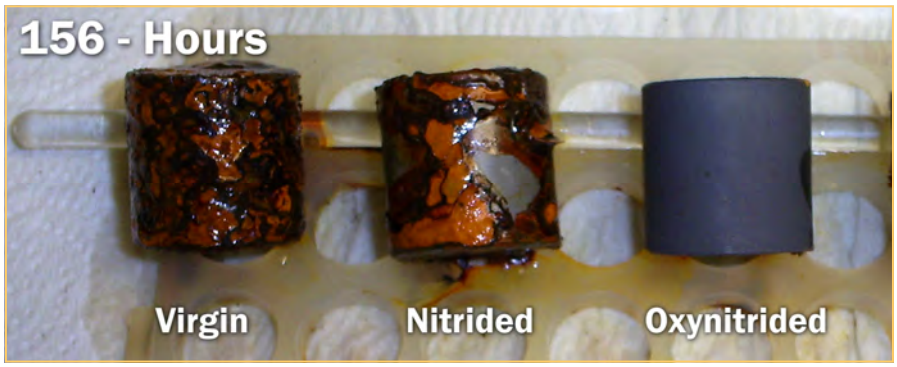

Figure 3 - Salt-spray test result after 156 hours

Figure 4 - Photomicrograph of part after 156 hours

Results:
The comparison of rust progression on the Non-Treated virgin, Nitrided, and Oxynitrided parts is detailed in Table 1. Figures 1-3 are visual views of corrosion development for time periods of 0, 84, and 156 hours, respectively. Additionally, Figure 4 is a photomicrograph of the Oxynitrided part after the 156 hours salt spray test, clearly showing that no observable corrosion attack has occurred on the surface.

Conclusions:

1. A Nitrided only part will improve corrosion resistance of H–13 steel by more than 50 % in the short term and more than 25 % over a long period of use.
2. An Oxynitrided H-13 steel part processed in a vacuum furnace will greatly improve corrosion resistance by more than 90 % over a long term of application.
3. It is anticipated that further improvements in corrosion resistance can be achieved on an Oxynitrided part with the additional application of polymeric anticorrosion coatings or corrosion inhibiting oils. Future testing will continue to confirm these expected improvements.
4. Examination of the Oxynitrided part microstructure revealed no indication of corrosion attack.

Although there are certainly many advantages of the Oxynitriding process using the vacuum furnace, the prime result is to be able to consistently achieve the desired Nitrided case depth and white layer control and to be able to add extended corrosion resistance to the product in one continuous cycle. There is no need for other equipment or a second step in the process. The cycle is a relatively low temperature process (typically 950 – 1000° F) and thus greatly minimizes the possibility of part distortion. The vacuum furnace application of the Oxynitriding process allows for precise, shorter, and repeatable cycles resulting in high quality parts exhibiting unique surface attributes all produced in a non-contaminating Green environment.

In summary, specific advantages of the Oxynitriding process in a vacuum furnace include:

- Vastly improved corrosion resistance.
- Significantly improved wear resistance, particularly sliding-contact wear.
- Improved fatigue strength.
- Aesthetically pleasing dark gray/black finish.
- Significantly higher surface hardness for long durable service life.
- Confidence that the process is reliably repeatable owing to the precise controls of the vacuum furnace.
- Can be considered as a replacement for expensive plating requirements.

Don Jordan, Corporate Metallurgist

1. Don Jordan; Harry Antes, *Vacuum Gas-Nitriding Furnace Produces Precision Nitrided Parts,* Published in ASM Heat Treating Progress, September 2009

2. Totten, George, *Steel Heat Treatment; Metallurgy and Technologies*, CRC Press, Boca Raton, 2007, 496.

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Souderton, PA 18964

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Eastern, PA
1969 Clearview Road
Souderton, PA 18964
800-347-3236
Fax: 215-723-6460
info@solaratm.com

Western, PA
30 Industrial Road
Hermitage, PA 16148
866-982-0660
Fax: 724-982-0593
wpa@solaratm.com

Fontana, CA
8606 Live Oak Avenue
Fontana, CA 92335
866-559-5994
Fax: 909-854-0509
info@solaratm-ca.com

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AEROMAT 2011 Conference and Exposition

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