

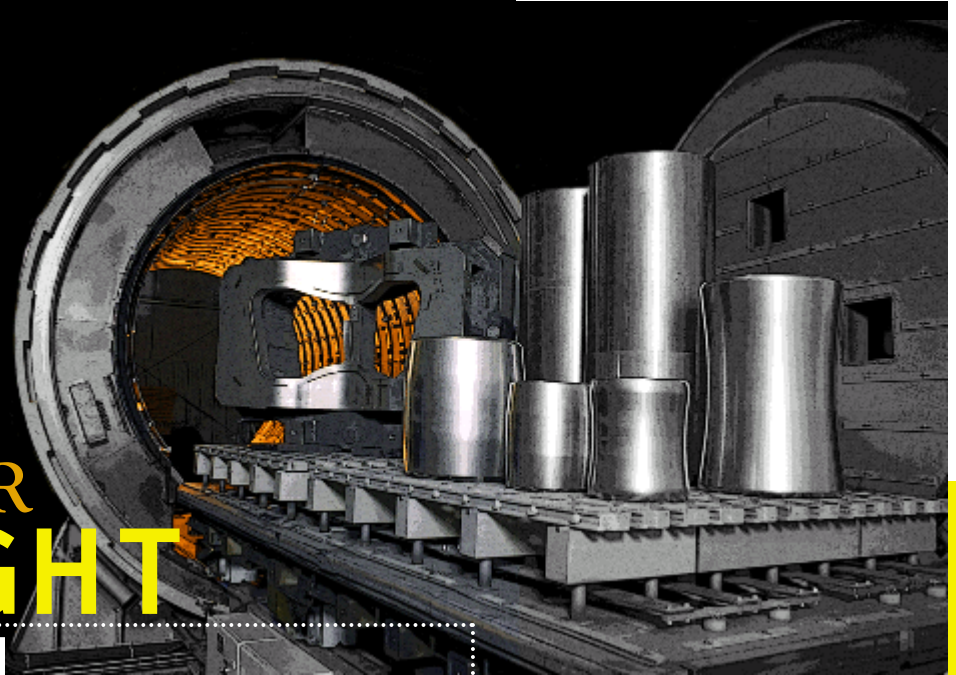
INSIDE THIS ISSUE

THE GREENING OF SOLAR
PAGE THREE

THE FIVE "S'S" OF SAFETY
PAGE FOUR

VACUUM CARBURIZING SEMINAR
PAGE FIVE

THE SOLAR SPOTLIGHT



THE OAK RIDGE CHALLENGE

Oak Ridge National Laboratory is a major DOE research facility in Oak Ridge, TN. The newest project at the site is the \$1.4 billion Spallation Neutron Source (SNS) facility which is about 16% operational at this time. The SNS facility is dedicated to high energy and fundamental physics research.

The material processed by Solar is being installed by Amuneal on a dual-layer magnetically shielded enclosure for the Neutron Spin Echo Spectrometer on SNS Beam Line 15. This instrument will provide ultra-high resolution spectroscopy for material analysis. According to the ORNL website, the instrument is, "specially suited for analyzing slow dynamical processes, and thereby, unraveling molecular motions and movements on a nanoscopic and mesoscopic level." In order for this instrument to operate effectively it must be isolated from external magnetic interference.

In the future, scientists from all over the world will travel to Oak Ridge National Labs to conduct basic research using this instrument. Studies conducted there will eventually contribute to advances in medicine, electronics and transportation, which will impact our lives on many different levels.



A QUARTERLY PUBLICATION BY SOLAR ATMOSPHERES

AMUNEAL'S CHALLENGE TO SOLAR

When Larry Maltin and his team at Amuneal Manufacturing, Philadelphia, PA, quoted magnetic shielding for the Neutron Spin Echo Spectrometer installation at Oak Ridge National Laboratory, they knew the heat-treating process would be a challenge.

When awarded the contract, Amuneal met with Solar to discuss magnetic annealing hundreds of strips, angles, and odd shapes in addition to several hundred 36-inch by 60-inch sheets. Developing the proper fixturing to heat treat the sheets was critical.

At .062" thick (technically thin), the dynamics of heating and cooling make these large sheets very difficult to process without severe distortion. Making matters worse, the "mu-metal" nickel-iron magnetic alloy requires four hours of processing at 2150°F to optimize magnetic

shielding properties. That being the case, the sheets cannot be stacked on top of each other or they will diffusion bond (stick). Single-layer processing was not cost-effective. The sheets under their own weight could not be stood on edge in a rack at high temperature since they "relax" or distort. The clincher is that only a few materials can contact this alloy at 2150°F without creating a eutectic melt and make the parts scrap.

The best alternative was hanging the sheets from a rack of molybdenum bars, but there were still difficulties. The sheets did not have holes large enough to hang them and the racking would have to be robust enough to hold the weight of at least 54 sheets (42 pounds each) without distorting at 2150°F. The rack would also have to be able to last for at least 24 thermal cycles. If the fixturing would distort, the sheets would not hang evenly, causing waves in the sheets.

(continued on page five)

SOLAR
ATMOSPHERES

HYDRIDING SERVICES

Eastern PA is experiencing significant growth with a 25% increase over last year's sales. This is well above the industry average. New work, new customers and the development of new services keeps Eastern PA's furnaces busy. Solar's Technology Center initiates new services and new applications in response to customer needs. Two growing process technologies are vacuum carburizing and the heat treating of metal powders and titanium "scrap." These two processes are on the edge of new material specifications for growing market demands.

To help handle processing, Souderton's newest 12 foot, car bottom, double entry furnace was installed in 2006. The new furnace is now the most productive workhorse in Souderton. Although not a new service, hydriding and dehydriding titanium scrap to recycle the valuable metal is a newly developed production application. The introduction of hydrogen to the metal makes it brittle in order to pulverize the material into a powder. Since the powder is in the brittle condition after pulverization, it must then be dyhydrided to make it useable for manufacturing.

New carburizing applications are being achieved in the revolutionary insitu (in place), gas quenching, vacuum furnace. This new carburizing process provides an optimum case (no intergranular oxidation) with minimal distortion for high value parts. Handling the expanding carburizing applications is a constant challenge for Project Engineer, Trevor Jones. Trevor applies the Technical Center's processing developments and makes them work for Solar's customers. He regularly interfaces with customers to achieve the best metallurgical specifications for part wear life.

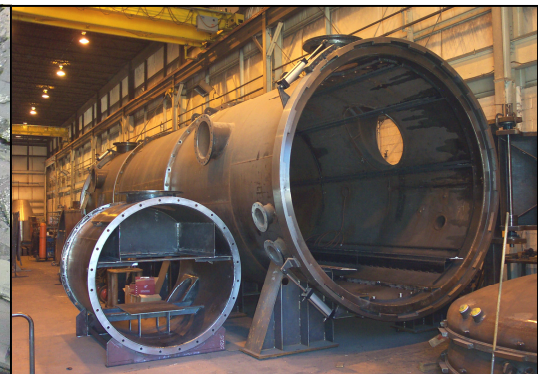
Trevor summarizes the dynamic of his work. "Each job has a unique combination of material, part geometry, specifications / requirements and load size. All of these factors contribute to the carburizing cycle. This constant challenge adds to Solar's processing knowledge and providing customers a high quality part is the job satisfaction that is very important to me." ✨

WESTERN PA: NEW BUILDING, NEW FURNACE

Static is not a word to describe the development of Solar Atmospheres, particularly in Western PA. Only six years ago this facility opened with three vacuum furnaces, albeit one was the world's largest. Now there are a dozen furnaces, including three 24 foot furnaces, which truly makes Hermitage the world's center of large vacuum furnace processing. However, the 24 foot furnaces will soon no longer have the status of *world's largest*.



experience in plant additions, states, "In January of 2007 everyone at Solar Atmospheres of Western PA. was anxiously awaiting the arrival of our third 24 foot furnace. By May the furnace was operational, but we already saw a need for another furnace to process even longer parts. It didn't take long to decide that we needed to build a new 20,000 square foot addition to house a 36 foot long furnace. The new building is laid out and the excavators and



Left to right: hydriding of tantalum; work begins on Solar's new 36 ft furnace

Early in 2008, Western PA Solar will complete its second plant addition and house the newest and largest commercial vacuum furnace, 36 feet long with a load capacity of 150,000 pounds! This will be a double entry, car bottom load furnace. The beauty of this car bottom system is while a 36 foot load truck is in the furnace, the other load truck is being readied for the next operation.

Bob Sandora, who has now had extensive

building contractors are working diligently to erect the building by the end of 2007."

Why all this furnace capacity? Aerospace work from Boeing and other manufacturers is ramping up for the 787 Dreamliner. Additionally, the primary and secondary titanium needed to produce these new airplanes is being vacuum processed to attain the required metallurgical specifications for manufacturing. ✨



MELISSA'S NEW CAREER

To enjoy her pregnancy, Melissa Delgado, Data Entry Supervisor at Solar Eastern PA, had planned to leave Solar in May and prepare for motherhood. Alas, with the Barndts moving to Florida and new people in the office, training and more training was needed to facilitate a smooth and orderly transition. Melissa willingly stayed an extra three months to ensure a good transition for order entry and customer service at Solar. In appreciation, an office baby shower (with men present) was held on August 10th for Melissa. Solar continually seeks to encourage its employees, even the ones who leave for new careers.

SOLAR'S GREEN SIDE

Imagine a workplace where 90% of the employees enjoy daylight in their workspaces and a view to the outside. They conscientiously discard paper into a separate bin for recycling. They love their job because they know that the company is utilizing energy in the most efficient manner; saving water, electric and fuel in an effort to sustain the environment for future generations. Does this sound like your place of employment?

Does Solar Atmospheres meet the stringent requirements of the US Green Building Council LEED Program? At first glance, perhaps not. None of our power is wind generated, and despite our name, we have no affiliation with solar photovoltaics. You will find no grass growing on our roofs nor have we installed any rainwater reclamation systems. However, there are two substantial factors that contribute to Solar's environmental sustainability - our commitment to energy efficiency and the nature of our business, vacuum processing.

At Solar Atmospheres, 99% of our processing energy is electric. Therefore, electric power conservation is our first "Green" priority. Corporate goals to be energy efficient include:

- *Electric motors* - As a rule, any electric motor that enters the plant is high efficiency.
- *Water cooling system* - All pumps are regulated by variable frequency drives. During low demand, only 41% of pumping horsepower is required.

- *Electrical Demand* - A demand predictor enables us to minimize our peak load, relieving the grid while minimizing our electric bill as much as a few thousand dollars per month.
- *Vacuum Pumping Systems* - Our newest generation of furnaces incorporate the ConserVac system to conserve energy consumed by the vacuum pumping system. Variable frequency drives are replacing traditional starters on all older furnace vacuum boosters to conserve power after vacuum level has been achieved.
- *Furnace Power Supplies* - The development of the FCS-2000 power supplies manufactured by Magnetic Specialties Inc., initiated by Solar, enables us to achieve a 95%+ power factor.
- *Hot Zone Improvements* - Each time a hot zone is rebuilt, we ask "how can this be improved?" Hot Zone insulation has been increased by 60% or more on each rebuild.

Solar Atmospheres uses vacuum technology to thermally process metals. By nature, vacuum processing is a clean process and several complimentary goals have enhanced its "Greenness."

- *Cooling Towers* - Evaporative cooling towers consume copious amounts of water. Solar's closed loop cooling loses virtually no water from evaporation.
- *Quenching* - Our equipment uses gases



that are inert and non-hazardous. There are no quench oil mixtures in our plant and no brine or cyanide salt wastes.

- *Heating Fuel* - No combustion gas is used to heat our furnaces. This reduces the risk of explosion. There are no billowing smokestack silhouettes from the Solar Facilities over our neighboring communities.
- *Fire Risks* - Because of the lack of fuel and quench oils, the risk of fire and smoke in our plant is dramatically reduced, improving the indoor environmental quality and safety of our facility.
- *Waste Stream* - No hazardous degreaser waste is produced in our plants. Waste oil from vacuum pumps has achieved a "non-hazardous" status.

Not to be forgotten is the office where lighting has been replaced with electronically ballasted fixtures. Energy efficiency and clean processing is part of Solar's culture. Achieving the Green Building certification is in line with our Mission Statement: "providing and maintaining a work environment that is safe, clean and reflects our respect for human dignity." ☀️

MOTORSPORT HEAT TREATING

Optimizing parts for durability and performance is the goal of every motorsport team. To reach the checkered flag, part usage and manufacturing is scrutinized, including heat treatment. For a number of motorsport part manufacturers, Solar's services are an important step in this quest. Of special interest are the advances in heat treating for Solar's motorsport customers.

Historically, Solar's motorsport heat treating has bright hardened and tempered tool, high speed and alloy steels including H-11, H-13, S-7. With *Advanced Quenching*, oil quench materials 4340, 300M and CPM materials are processed. Other heat treating services include solution treating and annealing Aermet 100. Parts proc-



essed include valvetrain components such as push rod ends, rocker arm rollers, adjusters and lift rollers. Heat treated drivetrain parts include transmission gears and shafts, ring and pinion gears plus axles. In addition, parts for the fuel systems and control valves are processed.

New vacuum furnace processes reflect the advancement of heat treating at Solar. Titanium parts are now annealed or stress relieved. Procedures to vacuum braze heat exchangers have been developed for a major car manufacturer. Vacuum carburizing provides an optimum case hardness for gears with minimal distortion and a bright finish. If less of a case is required, ion nitriding surface hardens wear areas and lubricity potential is improved.

To discuss current and new applications for motorsport applications, call Solar. If you can get tickets, come to the PRI show, motorsport's annual gathering in Orlando, Florida, December 6-8 and visit Solar's booth, #1936.

THE FIVE "S's" OF SAFETY

Included in the Solar Atmospheres Health and Safety Policy is the statement that our company is committed to providing a healthy and safe working environment for all employees. In conjunction with our health and safety initiatives the company provides employee safety training and safety equipment, plus places a significant emphasis on a culture of safe work practices.

It is common knowledge that industrial work places that are well organized and clean are safer than cluttered and dirty work areas. The Solar Atmospheres companies are currently receiving training that will help each of us to work in a more organized way with less clutter. We are receiving training in an element of "Lean Manufacturing" that focuses on well organized and clean work places. The main thrust of the training is to provide a work place that is laid out to enable the work to be processed in a more efficient manner.

There is a very significant by-product of this training which will result in a safer work environment for all employees. This important by-product is more cleanliness and less clutter in the work areas. The training we are receiving, during this fall season, is referred to as Five S, and is the Lean Manufacturing term for the Visual Workplace Organizational System. The Five S System is a series of activities designed to improve

workplace organization and standardization. The activities and the S's are defined as:

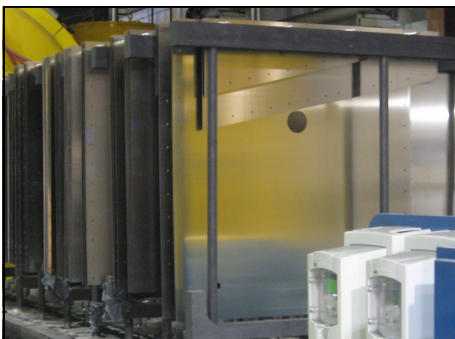
- **Sort** through and sort out all the tools, items etc., in the work area and remove the unneeded items.
- **Set** in order the remaining items, set limits, create temporary location indicators.
- **Shine** and inspect through cleaning.
- **Standardize** and share information by implementing visual displays and controls.
- **Sustain** the gains through self-discipline training, communication and total employee involvement.

By implementation of the Five S program, the Solar Atmospheres companies are continuing to work toward the goals of: improving quality, improving safety and improving the work place environment, resulting in enhanced employee morale.

To cover all Five S's, the training will be conducted to introduce one S each month. This provides time for the individual S topics to be implemented prior to moving to the next S. Clean and well organized shop and office areas will lead to a safer and more productive work place for all Solar employees. ✨

-Ken Bauhof, Vice President of Special Projects

Amuneal continued from page one...



Lastly, the fixturing would have to be affordable to meet Amuneal's cost objectives on the contract.

After a week of brainstorming, a solution developed. Solar would purchase 48-inch long, 1½-inch diameter graphite rods to re-

place our current 12-inch molybdenum load pins in HT-73. Additionally, single-piece graphite load rails would replace the three-piece rails that currently sit atop the 12-inch load pins. One-half inch diameter, 14-inch long TZM molybdenum rods were purchased to span the load rails to hang the sheets because TZM molybdenum has a lower rate of "creep" (gravity-induced sagging) than pure molybdenum at elevated temperature. The rods should last 24 runs without needing replacement or straightening. Amuneal would punch six 5/8-inch holes on the 60-inch edge of one side of each sheet to accommodate the TZM bars. Solar would purchase ceramic cylinders about 1.5-inches by 1-inch OD to place between each sheet to keep them from sticking. The challenges continued. How would we

hang six sheets, 8-feet high, by the TZM bars while placing ceramics between each sheet? The solution was to build a wooden rack with six slots that supported the sheets from the bottom, bolting it to the forks of the forklift. The sheets could then be racked, lifted, and driven into place as a unit.

Once that problem was solved, Solar began processing the materials and the fixturing has been very successful. The TZM rods have warped very little after about 12 runs, and the sheets are coming out with very little distortion. Through the formation of a partnership, Amuneal and Solar were able to deliver the annealed components on-time to meet the on-site installation schedule. ✨

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*



SAVING LIVES

It's the first four minutes that counts- give them air. Even people who have been trained in CPR sometimes panic and will wait the 8 minutes or more it takes the paramedics to arrive, and this is too long. After four minutes, those is distress, particularly children, can often be revived, but often with neurological damage. So the critical message is for parents or anyone present to give the best response possible – providing assisted breathing, ASAP.

Solar has been training its employees in CPR for several years to facilitate the best possible response in a non-breathing and / or cardiac arrest crisis. Our excellent teacher and trainer is Craig Coyne of Coyne First Aid.

Craig provides this service for small and large companies in Eastern PA. He is a trainer of trainers within larger companies, but will directly work with employees in smaller companies. As a special evening training event in September, Craig came to Solar not only to train employees but young wives, babysitters and grandparents on CPR for infants and children. Solar is very appreciative to Coyne First Aid and Craig, who helps our employees potentially save lives.

Visit Coyne First Aid's website at www.coynefirstaid.com for more information on how to have this training at your company. ✨



CERTIFICATES ON THE WEB

If you are an ISO-registered company you must only use suppliers that have been evaluated and deemed capable of meeting your needs. Many times an ISO company will simply maintain a current ISO or NADCAP cert from their suppliers to provide objective evidence of the evaluation. The idea is that if a supplier can meet the requirements of ISO and/or NADCAP, they are on a level playing field with you. Periodically, however, ISO and NADCAP certificates expire. Prior to that point, a new audit is performed and a new certificate is then issued. Companies that rely on suppliers to maintain their ISO or NADCAP status must maintain current certificates for those suppliers.

Since we know it is work to ask and receive updated certs from our suppliers, we have practiced the Golden Rule and placed our ISO and NADCAP certificates on our website for anyone to view. This way our customers may rest assured they will always have a current, high-quality copy of our information without needing to call us and ask for it. This is a win-win situation as it saves time and effort on both sides of the supplier-customer relationship.

Our ISO and NADCAP certificates, along with many other approval documents, may be viewed under the Quality System section of our website. ✨

VACUUM CARBURIZING SEMINAR AT SOLAR, NOVEMBER 16TH, SOUDERTON PA

A seminar will be held at Solar's Souderton plant on vacuum carburizing. An explanation of carburizing and the advancements and applications of vacuum carburizing will be explained and discussed. The class will begin at 9:00 am, Friday, November 16 and will conclude with a lunch provided by Solar. If you are interested in attending, please call 800.347.3236 and register with Anne.

Course outline:

- Carburizing 101: Traditional
- A New Approach - Vacuum Carburizing Furnace Development
- Benefits of Vacuum Carburizing
- Applications at Solar
- Advances and Challenges
- Q&A, Lab and Furnace tour, Lunch



The Solar Spotlight is a quarterly publication of Solar Atmospheres

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"May the favor of the Lord our God rest upon us; establish the work of our hands for us- yes, establish the work of our hands."

- Moses, Psalm 90

Upcoming Trade Shows...



Chicago, IL
November 11-17
Booth #18126



Anaheim, CA
January 29-31
Booth #TBA



Orlando, FL
December 6-8
Booth #1936