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THE SPOTLIGHT

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A Solar Atmospheres Publication

The American Entrepreneurial Spirit

As with any economic system American entrepreneurialism has its considerations. Recognizing that economic suffering is ever-present, "you will always have the poor among you", the question is what economic system allows the most good for the most people. What does this economic observation have to do with Solar Atmospheres – everything.

Solar Atmospheres exemplifies one of the best entrepreneurial spirits. That is, the results provide the most good for the most people possible. Free enterprise enable American entrepreneurs to have a vision, take the risks, bear the burdens, succeed and create capital for the most good have been demonstrated at Solar Atmospheres over the past 25 years. The following description of Solar Atmospheres is as an example of what has made American entrepreneurialism, even with its flaws, the best system.

Vision – marrying skills with understanding the market and developing a "vision" on how to best accomplish the delivery of goods and services is the fruit of individual and economic freedom. Solar Atmospheres, as with all manufacturing concerns, started with such a vision. In 1978 the vision, based on past education and experience, developed with manufacturing the best and most efficient vacuum furnace. After establishing Vacuum Furnace Systems (VFS) manufacturing plant, local companies asked if VFS if the would heat treat a few parts.



izing in vacuum thermal processing. Solar Atmospheres was born in 1983 and was very successful by seeking out new vacuum work and taking advantage of every opportunity. The business grew with the building of new 10 and 12 foot furnaces. New titanium markets opened up and then the vision developed into a second plant in 2000, Solar Atmospheres of Western PA. The new plant specialized in large furnace processing and has become the center of that work in the country and perhaps the world. With freedom, visions of opportunity never stop.

Risk – Assembling and investing capital in order for the manufacturer to produce services and make a profit is a risk. The management team had the skills and guts to start and build a company. Putting everything on the table and trusting in their knowledge and skills and to manage people, and most of all, faith in the Lord's guidance, they set forth on the journey to build the business. With each successive development, risk is present, however, moving ahead is the philosophy of doing business at Solar. This is not only true for starting new plants, but also in developing new processes and new furnaces to accomplish the work.

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Solar was a start up heat treating venture born out of an R&D need. A new vision was born, that is, establishing a commercial heat treating facility special-

Surface Treatments

Solar's *Specialized Services* (see web site for complete listing) include a number of options for the vacuum furnace surface treatments of parts. Improved part wear life and minimal distortion are the primary benefits. The Technology Center has been developing both vacuum carburizing and nitriding process applications which give manufactures a number of surface treatment choices.

Surface treatment alternatives offered at Solar include ion (plasma) nitriding, vacuum gas nitriding, and vacuum carburizing. New developments have added low temperature nitriding and low temperature carburizing for further decreasing distortion potential.

Increased processing alternatives are possible because of the advances in vacuum furnace technology and capabilities for surface treatments. Furnace capabilities include a lab furnace for cycle development and small part processing. Solar's longest experience is with four ion nitriding furnaces with capability up to 54" in height. Two small vacuum carburizing furnaces, one in Souderton and *Continued on page 5*



Large Load of 4340 for vacuum carburizing

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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Corporate President
Roger A. Jones

President, Hatfield Facility
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President, Western PA
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Entrepreneurial Spirit

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Engineering – Advancing furnace technology and processing skill is an ever-present, daily motivation for all the workers at Solar. The leadership has set the tone, and improvements, awareness and thought is the unifying theme of not only Solar engineers, but office and plant workers. The resource and expertise of Solar Manufacturing (the successor of VFS) as an affiliate company, has enabled Solar Atmosphere to have the best in vacuum furnaces, the knowledge on how to use them, and to be on the cutting edge of vacuum furnace technology. This ranges from furnace maintenance and repairs to new processes such as the vacuum carburizing (see the article on Solar's latest patent) and the development of vacuum / gas nitriding, that keeps the technology and applications moving forward.

Commitment to people is the fourth leg of the Solar's development. A people centeredness has numerous implications for training, safety, personal opportunity and not the least, compensation. Freedom and power can lead to abuse, which has been a caricature of business. It is the moral commitment to people that restrains the abusiveness by business. That commitment has been an underlying ethos at Solar, and to an impressive degree, worker for worker. Team efforts, are a key to each day's tasks and Solar's success.

American businesses fail for a number of reasons. Joseph Schumpeter, defined the dynamic of the free enterprise as "creative destruction", the need to replace old technologies with the new, so that, businesses that do not progress will fail. However, where free enterprise exists, entrepreneurialism has risen to create new opportunities and capital. This system is imperfect, but where moral foundations are present, "to do unto others as you would have them do to you", wealth is not only created, but does the most good for the most people, both customers and employees. This is what best describes the good of what Solar Atmospheres has done in its 25 year history.



Safety in Small Things

Safety is a priority for the Solar Atmospheres Maintenance Department. Pictured is Don Jacobs as he prepares to use the scissors lift in the heat treat shop to perform the simple task of changing a light bulb. Note that Don is following the guidelines, wearing a full body fall restraint harness, safety glasses and approved hard hat. Solar Atmospheres puts safety first, even for small jobs.



*“Optimism is the faith that leads to achievement. Nothing can be done without hope and confidence.”
I believe this with all my heart.*

Helen Keller



Braze Joint Quality

There are a number of key characteristics that make up a quality braze joint, but first and foremost is the design of the joint. Specifically this means the *braze gap* and the fit of the *faying surfaces*. The faying surfaces are the adjacent surfaces that will be joined, and the space between them is the braze gap. The optimum braze gap varies with the filler metal that will be used.

When brazing, the work-piece and filler metal are heated to a temperature where the filler metal becomes liquid while the base materials remain solid. At that point, the force that draws the filler metal into the braze gap is called capillary action. This is the same action that causes paper towels to soak up liquid. Different liquids have different viscosity (thickness) and surface tension (does it spread out or stay in droplets) affecting the way the capillary action will behave. For instance, in brazing with copper filler metal an interference fit is the optimum braze gap because copper has very low viscosity and surface tension while in liquid form. It has a tendency to run all over the place and gets into small nooks and crannies. For brazing with nickel filler metal a .001" to .003" gap is preferred because the nickel filler metal has a much higher viscosity and surface tension when liquidous.

So what happens when the gap is too large or too small? Large gaps can cause voids and brittle microstructure in the braze joint, in turn, raising the potential for leaks and mechanical failures. Small gaps can cause the filler metal to stop its migration into the joint causing leaks and lack of joining. Below are two photomicrographs. Photo #1 is a braze joint with too much gap, photo #2 is a joint with just the right gap. The difference is obvious. Photo #1 shows a huge void that compromises the quality of the joint, while photo #2 has no void and this joint is stronger than the base metal.

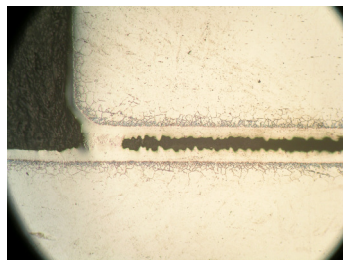


Photo #1

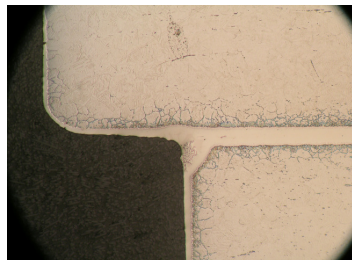


Photo #2

Other key characteristics of a quality braze joint include clean, non-oxidized faying surfaces prior to assembly, a high quality protective atmosphere (vacuum) during brazing to prevent oxidation of the faying surfaces, and proper selection of the filler metal appropriate to the base metals and the application. The first step, however, in achieving a quality braze joint is to include the braze processor early-on in the development phase of a project to minimize costly design changes and project delays.

Mike Moyer, Corporate Quality Manager



USS New York “Never Forget”

A real Legacy! The USS New York amphibious assault ship is not your typical run of the mill vessel. It has made history by being built with 24 tons of scrap steel collected from the World Trade Center. In fact, 7.5 tons of steel was treated and smelted for use as the ship's bow stem, which is the part of the ship that slices through the water, leading the way.

An account of the foundry work was recorded. “Steel from the World Trade Center was melted down in a foundry in Amite, LA to cast the ship's bow section. When it was poured into the molds on Sept 9, 2003, 'those big rough steelworkers treated it with total reverence,' recalled Navy Captain Kevin Wensing, who was there. 'It was a spiritual moment for everybody there.' Junior Chavers, foundry operations manager, said that when the trade center steel first arrived, he touched it with his hand and 'the hair on my neck stood up. It had a big meaning to it for all of us. They knocked us down. They can't keep us down. We're going to be back.'”

The USS New York is the fifth in a new class of warship designed to transport and land troops, supplies, and equipment such as amphibious vehicles and helicopters. A crew of 360 sailors and 700 combat-ready Marines are ready to go, defending freedom and combating terrorism around the globe.

The ship's name, “USS New York”, was requested by Governor George E. Pataki. He requested that the Navy revive the name in honor of September 11's victims and the war on terror. Two sister ships, USS Arlington and USS Somerset, are also named in commemoration of the places two planes used in the attack came down: Somerset County, Pennsylvania and Arlington, Virginia.

September 11th was a turning point for our nation...and it will never be forgotten. A shield with two gray bars symbolize the Twin Towers and a banner with the words “Never Forget” is embedded on the bow made from 7.5 tons of steel from the site. The vessel was officially christened “New York” on March 1, 2008 at Avondale Shipyards in New Orleans, Louisiana. She is scheduled to become an active unit of the US Navy on November 7, 2009 when she will be officially commissioned in a ceremony held in New York City.

Anne Conolly, Marketing Assistant

Senator Specter Listens, We Hope!

Les Teal, Corporate HR Manager and Mike Johnson, WPA Sales Manager, attended a private luncheon with US Senator Arlen Specter sponsored by the Ellwood Group at their corporate offices in Ellwood City PA. Senator Specter made it very clear that he has groups in his district that are concerned about their jobs going overseas, pensions being lost or renegotiated, and losses in their 401K's. He is also aware that he could be the deciding vote concerning the card check bill. With that said, the Senator opened up the floor for comments and concerns that the business leaders in the room had concerning card check.

Les was the third person to comment about "card check" bill and made some of the better points throughout the whole meeting. Les not only brought up many of the negatives for our business, but some of the devious actions that are taking place currently even before the bill has been considered. Les represented Solar and the heat treating industry company well with his understanding of the bill. Points he made included:

- One—Secret ballot elections are a cornerstone of our democracy. They are how fair elections have always been held in our country, and are how our congressional representatives got their jobs, including you, Senator Specter.
- Two—The EFCA could be the death knell for smaller companies that are already struggling in our rapidly failing economy. The restrictive work rules that accompany unionization would make it impossible for some to survive.
- Three—The passage of the EFCA would encourage intimidating organizing tactics on the part of unions, including visits to employees homes.

Senator Specter has come out since the meeting stating he would not vote for the "Card Check" act. The bill may not come up for a vote due to lack of support because it violates the basic principle of American democracy of private voting.



Why is only Senator Specter Smiling?

Even with Senator Specter's party switch, he reiterated his commitment to not vote for the "Card Check" act. We will see if he continues to listen. *Mike Johnson, Sales Manager, Solar Western PA, Les Teale, Corporate Manager Human Resources*



WOW! FLP

A frightening thought was a heat treater setting up a Florescent Liquid Penetrating (FLP) non-destructive testing line for welded parts up to 32 feet long. The NADCAP auditor scheduled to visit Solar Atmospheres of Western PA confessed his fear prior to visiting Hermitage, PA. Freighting because the auditor expected dozens of findings to write-up that could take days.

After the audit, all the people involved with the project were gathered into the conference room in Hermitage to hear the verdict. The auditor had one word in response to his two day inspection, Wow! Two minor findings and one major was all that was found instead of the expected 20 or more. Impressed with the

the auditor praised the FLP set-up as the best set up he has ever seen at any non-destructive testing facility. Equally pleasing was that customer, Boeing, was present for the audit and the review. The Boeing quality supervisor was very pleased, expressing confidence in Solar's capabilities.

Many are to be congratulated on the construction and perfecting a process that Solar knew nothing about a year ago. Those who contributed to effort include: Tim Sloan, Dale Wilds, Mark Carper, Bob Sandora, Rod Schilling, Lloyd Ramsay, Keith Carpenter, Mike Moyer, Suzi Generalovich, and Vince Rodding, Level III consultant. Bob Hill made the point that the effort and work accomplished in this period of time testifies to the team culture at Solar.

Picture of FLP Line

The Experts in Retrospect

"A "consensus" among correct-thinking scientists and environmentalists during the 1970s was that the world's oil reserves would soon run dry, possibly by the 1980s and surely by the 1990s. The novelist Kurt Vonnegut, worried about the resource drain, told college students that getting married and having babies was immoral. *Newsweek* ran a story on the latest bogeyman: global cooling."



Rich Karlgaard, Forbes, April 2009

LPC Patent Received

William R. Jones, C.E.O., announced the receipt of US Patent No. 7,514,035 B2 issued April 7, 2009 for a "Versatile High Velocity Integral Vacuum Furnace". Imbedded in the patent description is Solar's **low pressure carburizing (LPC)** process using acetylene and hydrogen gas ratio's at pressures less than 15 torr and preheating in a hydrogen atmosphere for surface activation. The fast gas quenching furnace is essential for many of the carburizing alloys for correct metallurgical properties. Because the furnace process has no residual carbon residue in the furnace, heat treatment of other metals following will not result in product contamination. For additional process information contact Don Jordan, Solar's Vice President and Corporate Metallurgist.

Supervisor Training

Solar Atmospheres strives to be a leader when it comes to vacuum thermal processing. Solar is vigilant in our objective for continuous improvement, and this includes training of our operations personnel. In the past few years, to meet the demands of a 24 / 7 operation, Solar has realized that front line supervisors of furnace operations needed additional skills and empowerment. Since the plants in eastern and western Pennsylvania operate three shifts Monday through Friday, plus two weekend shifts, there is a training need for each plant's five shift supervisors, and for additional employees to step up when a shift supervisor is out.

About two years ago, Solar contracted with Delaware Valley Industrial Resource Center (DVIRC) to embark on training and hands-on work regarding Lean Manufacturing principles with the aim of reducing waste in many aspects of our business. DVIRC is a not-for-profit corporation with the charter of providing business growth type training for companies in the Greater Philadelphia area. We started the Lean Manufacturing process with classroom and hands-on training for office and shop organization. Known as Five-S, the program instilled a highly visual methodology of organizing work areas to be more efficient. This provided a systematic and logical approach to neatness and a more efficient work atmosphere.

At the beginning of 2009, DVIRC started working closely with Solar management and the shift supervisors to better define their roles, including the responsibilities and accountability aspects of the position. Jim Crawford, a DVIRC consultant and trainer, spent significant time in a fact-finding mode with the shift supervisors *without* Solar management present. He then worked with the management team to determine the key areas needing attention for the shift supervisor to be more effective as front line leaders. Jim then met jointly with the group of supervisors and the management team.

The results of the fact-finding showed a number of issues needing to be addressed. Two key areas were selected as top priority,



the need for better communications, and effective training. Specifically, technical cross training of furnace operators and supervisory skills for the shift supervisors are the focus. Plans were developed to conduct in-house technical training for the furnace operators enabling the furnace operators to be cross trained on all aspects of their work. In addition, actual leadership skills training has been started for our shift supervisors. This is conducted by Vivienne Bezushko, a senior business consultant from DVIRC. The leadership skills training consists of thirteen sessions, and is conducted over four months.

Solar is proud of our shift supervisors and the way they have stepped up regarding this Lean Initiative. That will surely benefit our customers in order to provide the best possible heat treating service.

Ken Bauhof, VP Special Project and Jamie Jones, Operations Manager

Surface Treatments

Continued from page 1

one in Hermitage, have serviced orders for several years. Last year the six foot long vacuum carburizing furnace came on-line and is used for larger loads. The newest processing development is vacuum nitro-carburizing that offers ...

These new furnaces have up-to-date micro-processor controllers which ensure temperature and time accuracy. Processing capabilities include rapid convection heating for ... Forced gas cooling allows for rapid quenching ...

Materials that can be surfaced hardened include carbon steels, alloy steels, tool steels, ultrahigh-strength steels, austenitic stainless steels, ferritic stainless steels, martensitic stainless steels, cast stainless and cast PH stainless steels.

Growing a Furnace

Occasionally a company will need a little more length than Solar's 36 foot furnace can provide, "The pipe is 40 feet long, can you help me?" or in EPA, where 12 feet is the longest furnace, "Can you heat treat 16 foot long lengths? Well, for certain processes, the answer is "YES".

Solar Atmospheres of Western PA's response was to have a furnace extension built that would add 6 feet in length to extend the 36 foot furnace to 42 feet. This extra length has fit the bill for a number of customer's requests. The extra furnace length is available for work done in Western (up to 42") and Eastern PA (up to 18").



Six foot Furnace Extension



1969 Clearview Road
Souderton, PA 18964

Return Service Requested

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

Murrieta, CA

29970 Technology Drive
Suite 207
Murrieta, CA 92563
951 304-3790
Fax: 951 304-3773
derek@solaratm.com

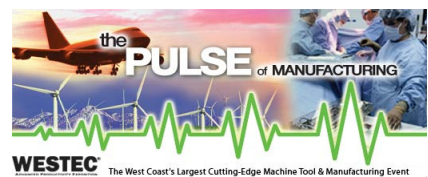
UPCOMING TRADE SHOWS



Houstex, February 24-26
George Brown Convention Center
Houston, TX
Booth 1034



Design2part Show, April 21-22,
Valley Forge Convention Center, PA



Westex, March 30-April 2,
Los Angeles Convention Center
Booth 2222



Interwire Trade Exposition
April 27-30
I-X Center, Cleveland, OH