

INSIDE THIS ISSUE

INDUSTRIES LINEMEN
PAGE TWOCALIFORNIA UPDATE
PAGE THREELANDING GEAR
PAGE FOURTHE SOLAR
SPOTLIGHT

ELECTION 2008

Every election is important and everyone voting should be informed on the issues and vote. Many countries do not give their citizens the privilege of a free and private vote as we do here in the USA. Since the founding of our country in 1776, we have paid a high price in blood to preserve this right.

There is a bill before the congress to consider abolishing the the National Labor Relations Board's (NLRB) supervision of private election voting for a union to organize a business like Solar. The NLRB election process has been in force for some 70 years.

In place of the NLRB election the Democratic position eliminates the government supervised private election process and replaces it with a simple unsupervised "card signing" arrangement. The way this would work, union organizers would simply pass out cards to be signed by employees desiring to unionize or organize a business. The business could be as small as two employees like a gas station, drug store, dry cleaner, etc. All that would be needed is card signatures, unverified and unsupervised, and not private as in an election booth. If 50% plus one of the cards are signed, a union would organize the company.

Speaking for Solar management, we are firmly committed to a non-union company in our free enterprise system. If there is to be a union drive at Solar, we want a NLRB supervised election. The Democratic position is to push this card signing process through congress in 2009. If elected, Mr. Obama has stated numerous times he will sign this legislation. I say No!

William R. Jones, CEO



MOON, MARS & BEYOND!

Going to the moon and beyond is on the drawing boards of NASA. The project's centerpiece is the Aries I rocket, described on the NASA web site as, "the essential core of a safe, reliable, cost-effective space transportation system -- one that will carry crewed missions back to the moon, on to Mars and out into the solar system. In addition to the vehicle's primary mission -- carrying crews of four to six astronauts to Earth orbit -- Ares I has a 25-ton payload capacity to deliver resources and supplies to the International Space Station, or to 'park' payloads in orbit for retrieval by other spacecraft bound for the moon or other destinations."

To fulfill the safety objective, the Orion crew vehicle has a launch abort system. A large titanium manifold was fabricated by Metalex Manufacturing, a NASA contractor. The large manifold housing "is designed to move future astronauts away from the main rocket in case

of a catastrophic explosion or unexpected event. Once fired the manifold will impose 10-15g's and blast the astronauts away from the main rocket. If all goes well with the launch and the manifold is not needed, it will be discarded like the main rocket only to burn up or possibly fall into the ocean." Solar Atmospheres of Western PA was chosen by Metalex, Cincinnati, OH as the heat treater for the manifold.

The manifold weldment is made of Ti 6 Al 4 V ELI and is 43 inches tall x 70 inches wide. The heat treating process, a duplex anneal, was performed in accordance with AMS-H-81200. The initial anneal cycle was processed at the beta transus temperature range. Therefore, secure fixturing supports were made of similar titanium material, designed by Solar and Metalex.

(continued on page two)



SOLAR
ATMOSPHERES



LINEMEN OF INDUSTRY

Heat Treating services are like linemen in a football game. Both roles are essential for success, but are rarely known or recognized, unless, of course, there is a missed assignment. Then there is plenty of recognition! Vacuum heat treating is one of the numerous unseen and unknown processes that the manufacturing of surgical devices, automotive parts and aerospace components require.

Sometimes there is a surprising relationship between heat treating and manufactured products. Although known for metals processing, Solar's heat treating is essential for manufacturing synthetic rubber products such as tires, fan belts, hoses, and window seals used in cars and trucks. Stratcor Inc., a subsidiary of Strategic Minerals Corporation, a Solar customer, makes a material used as a catalyst to manufacture these products. Solar's thermal processes trigger a chemical conversion to produce a vanadium compound as part of a complicated series of processes. Solar's larger furnaces will heat treat 3,000 lbs of vanadium compounds to produce a very small quantity of the catalyst. Without this catalyst, tire production would become very difficult.

Matt Laper, Halide Supervisor at Stratcor's vanadium facility in Hot Springs, Arkansas, is very appreciative of the Solar workforce that keeps the processing on track with excellent quality and turnaround. There are many unknown and unseen contributors at Solar for the high standards Stratcor requires. Furnace operators, data entry, maintenance, shipping, and others all play a critical role in keeping the process going. Ken Bauhof, Vice President for Special Projects, who oversees this work, commended all those involved for their consistency and attention to detail.

Like Solar's role as a heat treater in the manufacturing process, the workers at Solar are the company's linemen, fulfilling important assignments every day. Although unrecognized in the world of tire and fan belt manufacturing, Solar people are essential to help keep our nation rolling.

TEACHERS AT SOLAR

This past summer, Bob Hill and staff from Solar Atmospheres of Western PA set aside a day to introduce high school science teachers to the value and methods of heat treating metals. ASM Materials Camp sponsored 36 science teachers from Ohio and Pennsylvania to visit various manufacturing facilities and learn about the science required by industry.

At Solar an overview of vacuum heat treating furnaces, processes, and metallurgy was given to impress upon the teachers the abilities and skills needed to work in a modern manufacturing facility. Discussions on vacuum, pressure, time and temperature were all pertinent to the teachers' curriculum and helped them to see the relevance of science in industry. Solar instructors were impressed with the quality of the questions and interactions they had with the teachers.

In addition to the "science teaching", educational objectives needed by industry from high school graduates were discussed. This included reading and mathematical skills that pay attention to detail. This point was illustrated by a heat treating process cycle where the material, worth \$500,000, could be destroyed with incorrect readings or communications. Having good writing and mathematical skills were emphasized as a requirement for plant operators. One physics teacher from Reynolds High School, 10 miles from Hermitage, told Bob Hill that she can now go back to her students and tell them, "if you want to work at Solar Atmospheres, you need to know your 3 R's."

Tours were given of the plant with an emphasis on technology development. The

furnaces, microprocessor controls, and the new alloys for aerospace, medical and other critical applications helped make the point. The message for the teachers is that Solar and manufacturers are looking for employees with a good educational foundation plus mechanical and technical training. The interaction between educators and manufacturing is critical to match industry needs and our nation's education of young people. Thanks to ASM leadership in this effort.



Teachers on tour at Solar

MOON MARS & BEYOND

Continued from Page One

The titanium supports were machined to match the maximum cross-sectional thickness of the manifold nozzle. This fixture served a dual purpose – preventing the nozzles from creeping and providing drilled holes so that inconel type S thermocouples could be inserted. The thermocouples would enable precise temperature profiling of the actual part during the duplex anneal. The furnace vacuum level was 5×10^{-5} torr to keep the weldments free of alpha case.

The duplex annealing is done on a horizontal loading, 12 foot Solar Manufacturing furnace with a 65 inch chamber diameter. The 2,000 lb weldment was well within the furnace's 75,000 lb capacity and would enable Solar to process numerous manifolds for the many trips planned to the moon and beyond.

Freedom's Risk

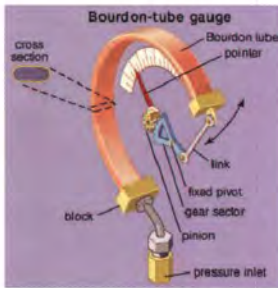
With freedom comes risk. This, ironically, is the context when thanksgiving is most often offered: The Pilgrims at Plymouth, Washington at Valley Forge and Lincoln at Gettysburg. When people are sacrificing for freedom, hearts are often humbled and thanks are given to the Creator.

Solar is expanding. This venture is a risk in challenging economic times, but we are thankful for the freedom to move ahead. We are especially *thankful to you*, our customers, for your continuing business. May God bless us with the wisdom to maintain the freedom necessary for doing business.



VACUUM — PART III MEASURING DEVICES

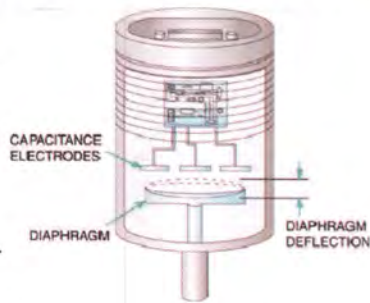
[This is the last of three articles describing the importance of vacuum, the effects in heat treating, and lastly, the measurement instruments. In this article Mike Moyer describes the instruments used to measure vacuum and their relative principles. The two previous articles can be found on Solar's web site, www.solaratm.com / What's New / Spotlight Articles, in the May and August issues].



The *Bourdon Tube* measures the deflection of a curved tube connected to an indicator, which is located in front of a faceplate. It is a gauge you see all the time and is very hardy and effective

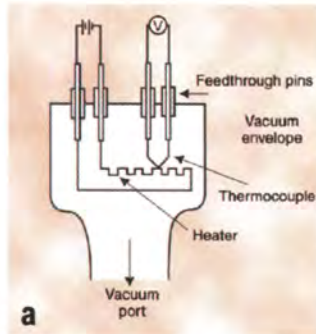
for "rough" measurements. Its calibration is not dependant on the gas species in the pressure tube. This type of gauge is useful from many times atmospheric pressure to about 1/30th of atmospheric pressure.

The *Capacitance Manometer* measures the deflection of a diaphragm translating it to vacuum. These gauges can be purchased for select ranges from atmospheric pressure down to about 1/1000th atmospheric pressure. The calibration



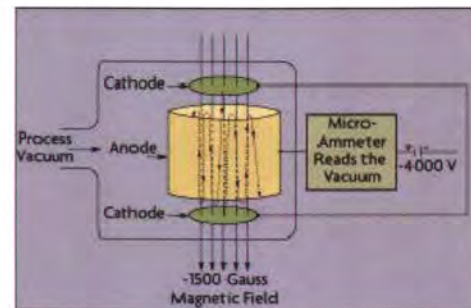
of this type of gauge is also not dependant on the gas species (present).

The *Thermal Conductivity Gauge (TC)* utilizes a thermocouple to measure the temperature of a fixed thermo-element. The gauge relies on the thermal conductivity of gas (present) which translates into a higher or lower pressure. More gas means a higher reading, less gas is a lower reading. Unfortunately since this gauge-type relies on the thermal conductivity of the gas, and gases have different thermal conductivity, the type of gas (present) affects the calibration.



The T/C gauge is only useful from about 1/1000th atmospheric pressure down to about 1/760,000th of atmospheric pressure.

The *Ion Cold Cathode Gauge* uses high voltage to create plasma that creates ions (positively or negatively charged atoms or molecules). These are in turn measured by the gauge: the more ions (present) the higher the pressure and vice



versa. This gauge is somewhat sensitive to the gas species (present). The ion cold cathode gauge is useful only from about 1/760,000th atmospheric pressure down to about 1/76,000,000th of atmospheric pressure!

In practice we must also measure *Positive Pressure*, which is pressure over atmospheric (760 torr). We must measure it as we use positive pressure to accelerate our gas cooling method. Two scales are used: *PSI* (pounds per square inch) and *bar* (from the Greek Baros meaning weight). One *bar* unit is simply the same "size" as atmospheric pressure (about 15 PSI), which is handy for measuring positive pressure in larger gradients. Two-bar simply means double atmospheric pressure etc. The confusing part for most people is that the gauge on the furnace reads in *PSIG*, (or "gauge") which means the "0" on the gauge is already at atmospheric pressure...or 1 bar.

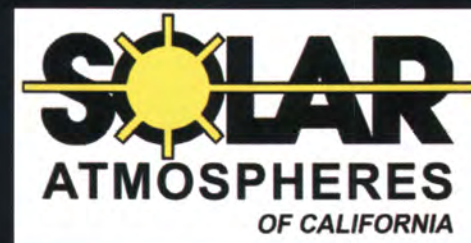
This need not be confusing if one simply remembers one of Torricelli's profound statements: "We live submerged at the bottom of an ocean of elementary air, which is known by incontestable experiments to have weight". Of course he was speaking of *his* experiments with the mercury barometer that *he* designed (a little pride in that statement may be assumed). Torricelli would be proud that almost three and a half centuries later we still use his science to define our practice.
Mike Moyer Corporate Quality Manager

California Update

Derek Dennis, President of Solar California, is working diligently to establish the new plant site. Securing a property is the primary responsibility and Derek is making excellent progress with a property in Solar's sites. Located in the Inland Empire area, the plant would be very suitable for Solar's heat treating requirements that include electrical, transportation, plant floor space, ceiling height and office space.

Negotiations are near conclusion and the hope is to begin the renovations needed to place the first furnaces by year's end. An optimistic projection is to have the plant doors open either in late spring or early summer.

Starting up a plant requires numerous plans that are initially independent, but become very



dependent, particularly at furnace installation. Although Solar has started up four plants sites over the past 20 years, each new effort is different. Local government regulations and the industrial or market emphasis at a particular plant require different planning requirements. Looking at the California plant and the local aerospace market, the big need will be for big furnaces. Fortunately vacuum heat treating is a

relatively "Green" industrial process with minimal emissions and hazardous wastes involved with the processing. Solar has found the local government officials are friendly and will work with Solar to establish new employment opportunities in the area.

Derek as a Marine, has brought a "can do" attitude to the mission that weaves together a multitude of objectives and goals. This is critical in the beginning stages of the project, since he is often working alone at this stage of plant development. As a native and independent Californian, he is well suited for the challenges set before him.

Contact Derek at 951 304-3790 or derek@solaratm.com

“Through” Carburizing

Recently a specialized computer modeling company, Deformation Control Technology (DCT), approached Solar Atmospheres with a special vacuum carburizing, high pressure gas quenching project. DCT is an Ohio based company that specializes in process simulation and computer-based analysis of thermal and mechanical processes such as heat treatment, forging, rolling, extrusion, and powder consolidation. Tests are being conducted as part of a joint development program with Metal Improvement Company and Stanford University to develop a fatigue life prediction model for carburized, aerospace steels.

DCT's goal is to test for fatigue crack initiation and crack growth propagation behavior in two grades of aerospace transmission gear steels with varying amounts of carbon and compressive residual stresses. There were a total of five carbon levels needed for both alloys; 0.10, 0.30, 0.45, 0.60, and 0.80. The two alloys used in this testing were 93xx and 41xx series because both are common carburize and aerospace grade steels, and can only be purchased with a certain amount of low to mid levels of carbon at a reasonable cost. DCT tasks Solar to carburize through the entire thickness of these parts to simulate carburized case-to-core carbon levels. The parts used in this carburizing test run were thin enough in cross section (~0.100") that carburizing from both sides of the part resulted in a homogenous amount of carbon through the parts.



This is a very unusual request, as carburizing is typically performed only on the surface of the part and is not intended to carburize through the steel. DCT chose vacuum carburizing and high-pressure gas quenching because this project required a quality surface finish and minimal part distortion (particularly because of the extremely thin cross section of these parts).

The acquisition of material and time spent to obtain these test specimens was costly to DCT, therefore vacuum carburizing / high pressure gas quenching was the preferred method owing to its higher quality as a carburizing process over traditional atmosphere carburizing with oil quenching. DCT commented the results were successful and they were particularly pleased with the straightness maintained and the pristine surface finish as a result of vacuum carburizing and high pressure gas quenching.

Trevor Jones, Project Engineer ✨

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*

ASM History and Future

"The roots of heat treating run deep within ASM International. The society was founded in Detroit in 1913 as The Steel Treating Club. Over the decades, the society's technical scope (and its name) broadened from heat treating to metals to materials with the growth and expansion of membership interests. By 1969, the diversity of these interests resulted in the establishment of Technical Divisions, to focus on the needs of members with specific materials and process needs and to provide networking opportunities for those with similar interests.

In 1994, the heat treating constituency of ASM – in many ways, the first members of ASM and still one of the largest affinity groups within the membership – created the ASM Heat Treating Society, to provide focused leadership, communications and service development to this vital member group. Today, HTS continues to grow and prosper. HTS is the world's largest network of



heat treaters, and HTS members work to provide events and services to serve their worldwide membership of captive and commercial heat treaters, equipment manufacturers, researchers, governments and technicians.

Along with receiving the benefits of ASM membership, HTS members also have their own unique leadership and agenda to serve the global heat treating community. The membership of HTS is dedicated to:

- **Bringing heat treaters together to discuss heat treating challenges**

- **Providing the technical information, knowledge and education needed by all heat treaters**
- **Serving as a central clearinghouse for information of value to heat treaters**
- **Interfacing with all organizations that serve heat treaters."** [ASM Web site]

Roger A. Jones, Solar Atmospheres Corporate President, was elected to a second term (2008-2011) as a board member of HTS. Roger sees the future of heat treating as closely tied to the advancement of vacuum heat treating. The controlled environment and precise temperature processing of vacuum heat treating enables attaining the specifications of newly developed alloys needed for 21st century manufacturing. As a board member, Roger is able to present the need to support the advancement of vacuum furnace and processing technology. ✨

Landing Gear

New methods of metal thermal processing have been verified as Solar Atmospheres (Western, Pa.) and Metalex Manufacturing Inc. of Cincinnati, Ohio, teamed up to thermally process landing gear for a military version of the Boeing 737. Key landing gear components (made from 4340 and 4340M) which typically would have been oil quenched, were processed in a vacuum furnace utilizing inert gas quenching.

After several successful progressions, Solar Atmospheres was able to replicate the exact results of an oil quenched process while keeping parts bright and clean, and limiting distortion to enable close or near net shapes. This was accomplished by helium quenching at 10 bar pressure with a 300 HP blower motor running in excess of 5000 RPM. The success of the inherently uniform vacuum thermal technology resulted in a process change of the landing gear after Boeing engineers confirmed Solar and Metalex's work with a series of mechanical, dynamic and fatigue testing results. "This process was a product of hard work and dedication by all parties involved." said Bob Hill, President of Solar Atmospheres (Western PA).

Solar Atmospheres twenty-five years of experience collaborating with research teams and companies to produce the best product results has been a work of passion. "We look forward to working with many other companies to create continued success with our vacuum thermal processing capabilities", Hill continued. Solar Atmospheres is currently working on new projects relating to new thermal development formulation and will continue to prove the vacuum thermal processing advantage.

Tim Williams, Marketing Assistant



Landing gear with vacuum heat treated 4340 and 4340M components

"The real source of wealth and capital in this new era is not material things...it is the human mind, imagination, and our faith in the future." Steve Forbes

CONTINUAL IMPROVEMENT

Even a Boeing strike has not slowed new process developments at Solar Atmospheres of Western PA. New certifications and processes are advancing the service possibilities for aerospace and other industries at the plant in Hermitage.

Congratulations are due to the Quality team for earning the AS 9001 certification in September. The plant already had the ISO certification, but serving Boeing and other aerospace primes require AS9100:2004. Susan Generalovich, Quality Manger in Western PA, who oversaw the AS9001:2004 certification process, also led the plants recertification audit for NADCAP registration for heat treating. Solar's quality certifications can be found under Quality System on Solar's web page www.solar.atm.com.

A new manufacturing process has been added to the scope of work that can be done at Solar's Western PA facility. In order to better service weldments heat treated for Boeing, *fluorescent liquid penetrant* (FLP)

testing is now done on site. This is a critical process for certifying weldments on the 787 floor tracking system that Solar is heat treating in its new 36 foot furnace.

Vince Roding, specialist in FLP testing, trained in this application of non-destructive testing in August. The purpose of the FLP inspection will be to ensure that there are no linear indications on the face of the longitudinal welds plus 0.050" on either side of the weld per BAC 5423. The welds being inspected run down both sides of the pi-box part over the entire 30' length.

The eight volunteers who stepped forward to implement this testing under Vince Roding's oversight were commended by Bob Hill. This training improves each employees skill level and capabilities, which is essential for continual improvement at Solar's facilities.

The Solar Spotlight is a quarterly publication of Solar Atmospheres

Chief Executive Officer
William R. Jones

President, Western PA
Robert Hill, Jr.

Corporate President
Roger A. Jones

President, California
Derek Dennis

President, Hatfield Facility
A. Bruce Craven

Spotlight Editor
Robert D. Lacock

Contact Information

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

California
29970 Technology Drive
Suite 207
Murrieta, CA 92653
951 304-3790
Fax: 951 304-3773
derek@solaratm.com

Web Site: www.solaratm.com



1969 Clearview Road
Souderton, PA 18964

Return Service Requested

PRST STD
U.S. POSTAGE
PAID
SOUDERTON, PA
PERMIT NO. 64050

1969 Clearview Road
Souderton, PA 18964
800 347-3236
215 721-1502
Fax: 215 723-6460
info@solaratm.com

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

29970 Technology Drive
Suite 207
Murrieta, CA 92653
951 304-3790
Fax: 951 304-3773
derek@solaratm.com

"The inherent vice of capitalism is the unequal sharing of blessings; the inherent vice of socialism is the equal sharing of miseries." Winston Churchill

Upcoming Trade Shows



December 11-13
Orlando, FL
Booth # 1936



February 24-26
Houston, TX
Booth #1034



March 30-April
Los Angeles, CA
Booth #5839