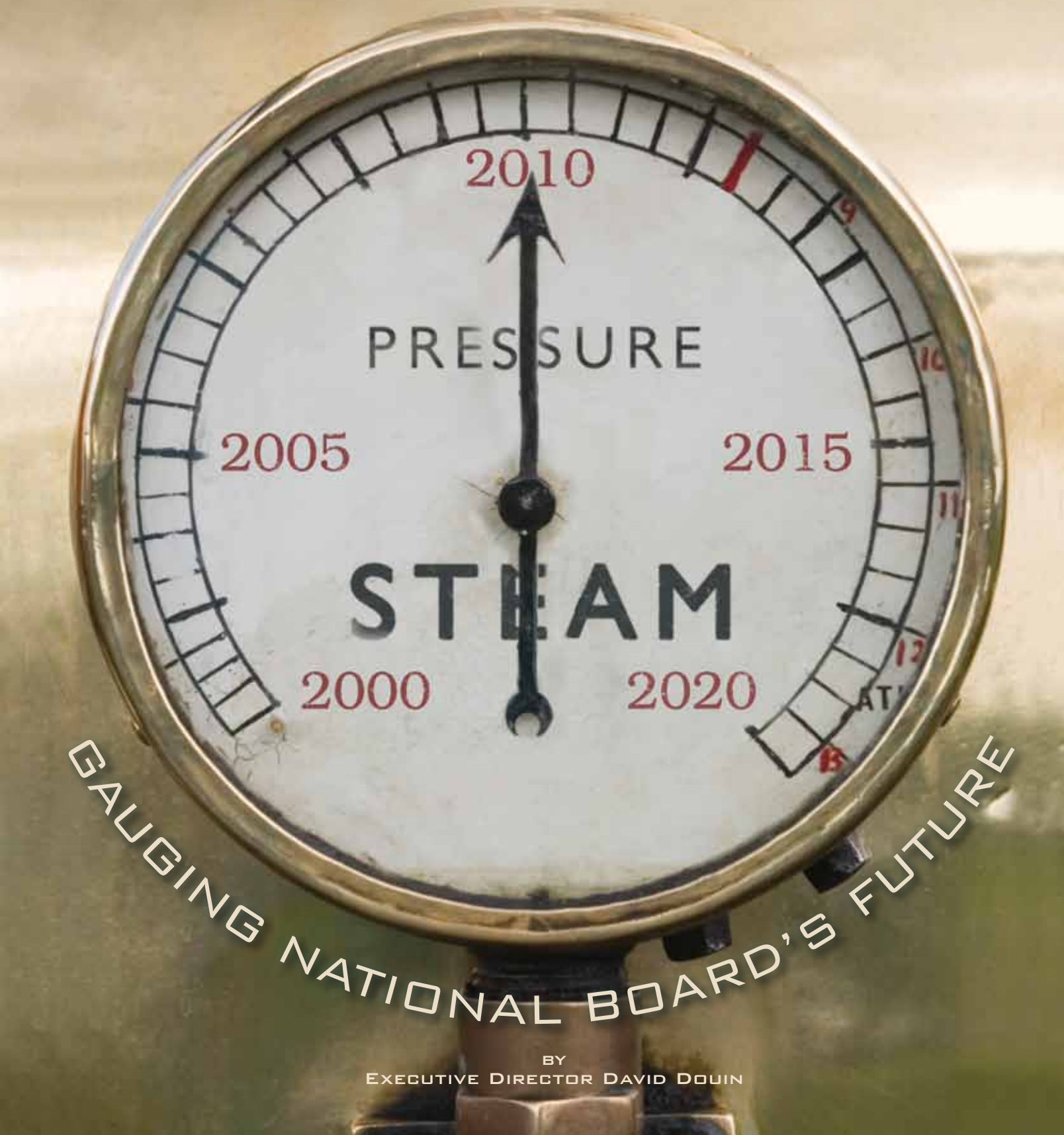
Technical Journal of The National Board of Boiler and Pressure Vessel Inspectors SUMMER 2010

NATIONAL BOARD BULLETIN



GAUGING NATIONAL BOARD'S FUTURE

BY
EXECUTIVE DIRECTOR DAVID DOUIN

THE NATIONAL BOARD

IMPORTANT 2010
NBIC NOTICE

In lieu of distributing a new 2010 National Board Inspection Code at the conclusion of this year (as has been the tradition every three years), the National Board will release in July the 2010 addendum to the 2007 edition. This latest addendum will become mandatory December 31, 2010.

The next complete NBIC edition will be published in July 2011 and will include – as with future editions – no addenda. The 2011 NBIC will commence a new two-year cycle for the NBIC. Next edition will be published in July 2013.

nationalboard.org

BULLETIN

SUMMER 2010 • VOLUME 65 • NUMBER 2

The National Board of Boiler and Pressure Vessel Inspectors was organized for the purpose of promoting greater safety by securing concerted action and maintaining uniformity in the construction, installation, inspection, and repair of boilers and other pressure vessels and their appurtenances, thereby assuring acceptance and interchangeability among jurisdictional authorities empowered to assure adherence to code construction and repair of boilers and pressure vessels.

The National Board *BULLETIN* is published three times a year by The National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, Ohio 43229-1183, 614.888.8320, *www.nationalboard.org*. Postage paid at Columbus, Ohio.

Points of view, ideas, products, or services featured in the National Board *BULLETIN* do not constitute endorsement by the National Board, which disclaims responsibility for authenticity or accuracy of information contained herein. Address all correspondence to the Public Affairs Department, The National Board of Boiler and Pressure Vessel Inspectors, at the above address.

79th General Meeting highlights
Read more on Page 8. *BULLETIN photography by Greg Sailor*

Features

Departments

Gauging National Board's Future

BY DAVID A. DOUIN, EXECUTIVE DIRECTOR

It is good practice every several years to assess an organization's position within the marketplace. Honest evaluation of past achievements and plotting a roadmap to accomplish future objectives go a long way in providing an un-retouched snapshot of reality.

In this, the year 2010, I thought I would share with you some of my personal observations on where I believe the National Board is headed. But to appreciate where we are going, we must acknowledge where we have been.

The past several years came and went – not fast enough for most of us. Challenging economic circumstances prompted a number of jurisdictions to reduce the size of staffs responsible for administering their pressure equipment safety programs. And some boiler and pressure vessel users were squeezed to the point of questioning the value of some maintenance procedures. Just about everyone in our business went through the required exercise of doing more with less.

While all of this was taking place, there occurred a quiet transformation of sorts. The number of inquiries regarding National Board training accelerated at a record pace. Expanded training offerings by the National Board met with new interest from not only industry veterans, but by neophytes who have also been drawn to our profession.

Attendance at National Board training courses grew. The number of training offerings performed at different locales around the country increased. And the amount of interest from outside North America did not go unnoticed. As witnessed by the increasing multicultural composition of National Board training students, the status of pressure equipment inspection continues to climb as a respected and essential industry discipline.

So what inspired this curious phenomenon? And why did it occur during one of the most vulnerable periods in world economic history?

Perhaps the most obvious answers can be found in global expansion of the ASME Code.

This Code's standing as the world's premiere pressure equipment is spawning an international expansion of new stamp holders. And with new stamp holders comes a thirst for training, knowledge, and additional inspectors.

I see this remarkable occurrence as the first wave of the future, that is, a precursor to where we as an industry are headed. Training is not only a tool, it is a harbinger. Students are generally not as concerned about what *is* as much as they are about what *can be*.

National Board is the gateway through which many pressure equipment professionals must pass: either to be trained or to earn their commissions.

What I am now observing is new interest in boiler inspection as a profession. This, along with ASME's international outreach and reduced staffing at the jurisdiction level, has combined to significantly ease what has been – for the *past* 10 years – one of our most difficult issues: a shortage of commissioned inspectors. Between 2008 and 2009, the number of jurisdiction job openings posted on the National Board Web site dropped nearly 40 percent. In the first four months of this year, there was only one posted jurisdiction opening. The number of inspectors commissioned by the National Board is now the highest in our 90-year history.

Another reason I am optimistic: the number of inspections conducted by the jurisdictions participating in the Violations Tracking program has grown consistently over the past three years. In 2009, our latest report (see opposite page), a record 827,420 inspections were performed.

It doesn't take a visionary to predict the direction of an industry that has existed for more than a century and a half. And while those early years proved deadly for hundreds of thousands of victims, the pressure equipment business of today reflects a sound underpinning of integrity, stability, and improved technology that is rare among industries of similar economic persuasion.

I credit this success to the dedicated people who toil every day in the name of public safety: commissioned inspectors, professional trade organizations and those who volunteer their valuable time, the insurance companies, repair organizations, manufacturers, labor groups, and, of course, professional consultants.

There is one additional, albeit very important, reason for my positive outlook: the harmony shared by the above groups in their commitment to safety. Rare is an industry that boasts all of its key stakeholders rowing in the same direction.

Finally, I am proud to acknowledge our profession's system of checks and balances as a model of efficiency and dependability. Instances of poor performance and integrity issues among inspectors are rare.

This *Executive Director's Message* is not a pep talk. While it may be an uplifting assessment, my assumptions are in no way assured. An international economic downturn or some unforeseen cataclysmic event could easily shatter even the most optimistic of expectations.

While an honest periodic evaluation of past achievements and future objectives are essential, many businesses and organizations will continue to rely upon strategic roadmaps that will – hopefully – guide them onward to prosperity. As for the National Board and the pressure equipment industry, I am proud to report we enjoy an admirable, most favorable set of circumstances.

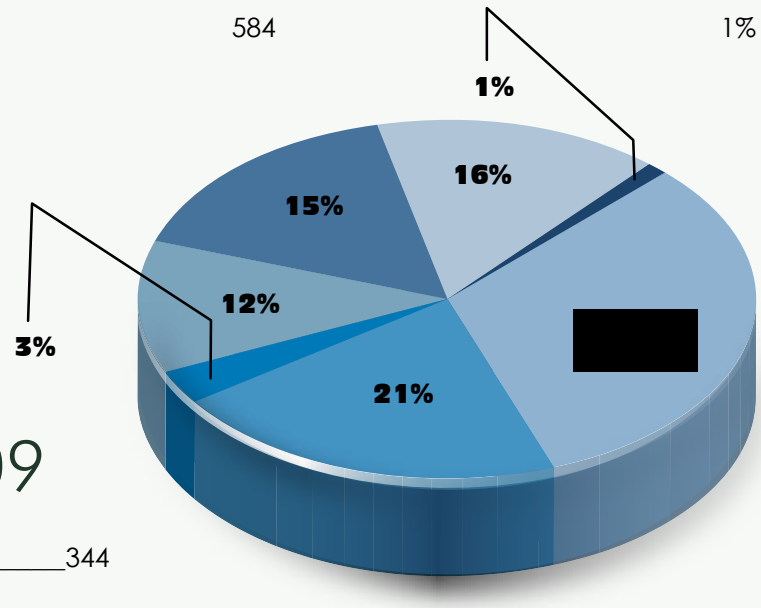
On our map, all roads lead to success.

2009 Report of Violation Findings

The National Board Annual Violation Tracking Report identifies the number and type of boiler and pressure vessel inspection violations among participating member jurisdictions. The chart below details violation activity for the year 2009.

Annual Report 2009

Category	Number of Violations	Percent of Total Violations
Boiler Controls	24,366	32%
Boiler Piping and Other Systems	16,149	21%
Boiler Manufacturing Data Report/Nameplate	2,637	3%
Boiler Components	9,508	12%
Pressure-Relieving Devices for Boilers	12,366	16%
Pressure Vessels	11,375	15%
Repairs and Alterations	584	1%



Summary for 2009

Number of jurisdictional reports: 344

Total number of inspections: 827,420

Total number of violations: 76,985

Percent violations: 9%

The Violation Tracking Report indicates problem areas and trends related to boiler and pressure vessel operation, installation, maintenance, and repair. Additionally, it identifies problems prior to adverse conditions occurring. This report can also serve as an important source of documentation for jurisdictional officials, providing statistical data to support the continued funding of inspection programs.

NATIONAL BOARD REGISTRATION:

In business, *everything* a company does reflects one way or another on its reputation.

But when it comes to the bottom line, perhaps nothing is more important than a company's reputation with its customers. And what it does to earn that reputation often determines profitability or the potential thereof.

In the pressure equipment manufacturing community, there are a number of things a company can do to establish and/or reinforce its reputation: product quality, service, and timely delivery are but a few. However, as with other products, there is yet another and it is perhaps the most important to be offered.

National Board Executive Director David Douin sums it up in one word: "Value." And he points to National Board registration as an ideal example.

So how important is registration to pressure equipment manufacturers?

"Very," says Mr. Douin. "Most manufacturers would never seriously entertain the thought of *not* registering their products."

The executive director explains that unlike consumer registration, which generally involves submitting contact and purchasing information for warranting a product, the purpose of National Board registration is to promote safety and document specific equipment design and construction details for future use.

Registration takes place when the manufacturer submits data reports to the National Board for items stamped with National Board numbers.

Many in the pressure equipment industry liken a data report to a birth certificate. Among the information included are: date of manufacture, materials of construction, specific details regarding design, and certification statements by both the manufacturer and inspector.

"Putting manufacturing in perspective, registration is the last step certifying the manufacturing, testing, and inspection process," Mr. Douin adds. "This certification acknowledges to owners, users, and public safety jurisdictional authorities that registered items have been inspected by National Board-commissioned inspectors and built to required standards."

In order to register a pressure-retaining item, certain standards – set forth in *Criteria for Registration of Boilers, Pressure Vessels and Pressure-Retaining Items* (NB-264) – must be met.

As such:

- the boiler, pressure vessel or other pressure-retaining item must be manufactured in accordance with the ASME Code;
- the manufacturing organization must implement a quality system; and
- the manufacturing organization must provide for third party inspection as required by the Code of Construction.

A MATTER OF VALUE

Mr. Douin states that over recent years, registration has been made easier, more efficient, and less expensive as a result of electronic data transfer, or EDT. Launched in 1999, the interactive document management system conveniently simplifies and expedites registration of data reports through the Internet.

"Easy-to-complete electronic forms make the process simple enough for anyone to use. And for those who have questions, we offer personal one-on-one assistance," comments the National Board official. "EDT users have told us they appreciate the ability to automatically complete a data report within minutes and with minimum errors." With no software to purchase and install, electronic registration also results in considerable savings involving paper and postage.

"Because registration is for all purposes eternal, those needing fabrication data for say, repairs or alterations, can easily access that information by contacting the National Board." The executive director adds that data reports are also of considerable assistance to the Jurisdiction when required to evaluate equipment alterations and repairs.

Mr. Douin stresses the manufacturer can access its data reports at any time at no cost. "More important, the National Board provides a convenient and easily accessible data report filing system that requires no expensive storage space commitment by the manufacturer."

Since the registration process began in 1921, there have been over 45 million data reports filed with the National Board. And those data reports are forever.

"This means a manufacturer registering a data report, in effect, provides an essential form of customer service over the life of the equipment – a value-added quality of significant worth to the owner or user." Mr. Douin emphasizes this is particularly important if the original manufacturer should go out of business or if a nameplate becomes lost or unidentifiable.

The National Board official says that in addition to promoting uniform quality standards, registration is required by most US jurisdictions for the installation of equipment within their respective cities and states.

Additional information on National Board registration and EDT can be accessed under REGISTRATION via the National Board Web site.

SUPER BOILER: THE NEXT GENERATION

By Curt Bermel and Dan Willems, Gas Technology Institute (GTI), and Steve Rendos, Cannon Boiler Works, Inc.

The First Generation Super Boiler

Back in 2000, a development program initiated by the US Department of Energy (USDOE) and dubbed the "Super Boiler" project focused on designing a boiler that was significantly more fuel efficient, smaller in footprint, and lower in NOx emissions. Not only would boilers of this design have a notably positive impact on the environment, they would also save US industry employing boilers over $5 billion per year in energy costs.

In April 2006 the project team began the first industrial field demonstration of the Super Boiler heat recovery system installed on a boiler incorporating the new convective pass design while using a conventional ultra-low-NOx burner. The system has been in operation at a manufacturing plant in Alabaster, Alabama, supplying all of the facility steam needs since July 2006. Fuel-to-steam efficiency has been confirmed in the range of 93 to 94 percent, and NOx in this case is maintained below 9 ppmv.

Since then GTI engineers have designed a compact firetube boiler system that can achieve 94 percent (HHV) efficiency simultaneous with NOx emissions below 6 ppmv (corrected to 3 percent oxygen). This performance was proven first in a laboratory test boiler of 90-horsepower capacity and later in a 300-horsepower boiler in a manufacturing facility in Ontario, California. This boiler is equipped with GTI's special two-stage combustion design, minimizing emissions while improving the fuel-to-steam efficiency. The reduced NOx emissions result from a staged

combustion approach with inter-stage cooling that is integral to the boiler design. The approach can achieve this unprecedented NOx reduction at very low excess air for additional efficiency gain while still maintaining excellent CO burnout, all without external FGR or steam injection.

The predominant contributor to increasing fuel-to-steam efficiency is the HPE/TMC/LPE system, which removes sensible and latent heat, while also recovering approximately 40 percent of the water vapor from the exhaust gas. This system increases energy efficiency by 12 to 15 percent over a typical firetube boiler. The firetube Super Boiler also uses an advanced convective pass design with extended heat transfer surfaces which, together with the compact intercooled furnace design, delivers a 30 to 40 percent smaller footprint than conventional boilers of similar output. The California host reported a net savings in fuel consumption of 20 percent with their Super Boiler.

The Next Generation in Heat and Water Reclamation

After successful demonstration of two first-generation Super Boilers, advancements in materials and the market penetration prompted development of a second generation heat recovery system, implementing value engineering techniques. The patented Transport Membrane Condenser (TMC) was re-engineered, resulting in a size reduction of ~60 percent, with the same level of water vapor and heat recovery. This second generation TMC system comes standard with a bypass so that parts of the equipment can be isolated without affecting the boiler during its operation. The result is a durable, proven, cost-competitive system, retrofitable on existing high-pressure steam boilers.

GTI has contracts for five second-generation advanced heat recovery systems on boiler applications as well as a contract for the TMC to be deployed in a non-boiler effluent application. The contracts for AHRS deployment include a manufacturing facility in Oregon, a manufacturing facility in New York, another for Oak Ridge National Laboratory, and one for the US Navy at its facility in China Lake, California. The most recent commissioning was at Baxter Healthcare's facility in Thousand Oaks, California (see photo).

AHRS Installation at Baxter BioScience

In late 2009, GTI signed an agreement with Cannon Boiler Works, Inc., which has produced heat recovery equipment since its founding in 1972, for the commercialization of the advanced heat recovery system, including the transport membrane condenser (TMC). The advanced heat recovery system is the most significant component in the efficiency gains demonstrated in the results of the Super Boiler Program.

Specific to this agreement is the design, fabrication, manufacturing, and integration of the transport membrane condenser as commercially available standard packages for boiler size ranging from 100-1,000 HP.

The advanced heat recovery systeming will be available as an installer option to enhance performance of new boiler installations and as an upgrade to existing boiler installations as a retrofit. It will also be available for use by original equipment manufacturers as an option for their standard product line.

Cannon Boiler Works will market the advanced heat recovery system including the TMC under the trade name of Ultramizer®. The company is currently developing its manufacturing technology and marketing plans, anticipating units to be commercially available in the fourth quarter 2010. It currently produces several models of boiler heat recovery equipment as standard products along with custom design specialty systems for use in unique applications. The Ultramizer® system will become a part of the standard product line.

Impact on US Industry Employing Boilers

GTI engineers have calculated that nationwide application of the Super Boiler could potentially save 600 trillion Btu and 62,000 tons of NOx annually. At a natural gas price of $8 per million Btu, this would save US industry $5.6 billion per year, in addition to avoiding 23 billion tons per year of greenhouse gases.

The 79th General Meeting Highlights

This year's National Board General Meeting, held in San Antonio, Texas, was once again a perfect blend of technical insight and entertainment.

On Monday morning, The Drum Café kicked off the Opening Session, with its featured speaker, Al Jardine – a founding member of the Beach Boys who was inducted into the Rock and Roll Hall of Fame in 1988. The General Session included industry speakers such as June Ling, associate executive director of ASME Standards and Certification; George W. Galanes, P.E. and manager at Midwest Generation EME, LLC; and Kenneth Stoller, executive director of AIA.

After the Opening Session, guests were treated to a leisurely barge tour along the San Antonio River as well as a tour of San Antonio and "The Shrine of Texas Liberty" – the Alamo. On Tuesday guests explored the Natural Bridge Caverns and tested their shooting skills at the National Gun Club. On Wednesday all guests visited the Rio Cibolo Ranch, where they were offered opportunities to participate in a variety of activities, including horseback riding, catch-and-release fishing for catfish, and line dancing. The day concluded with a concert by the all-female pop group Wilson Phillips, who kicked off their comeback tour at the Wednesday Evening Banquet.

Bulletin photos by: Greg Sailor

Board of Trustees Chairman Bob Aben opens the 79th General Meeting.

Wilson Phillips member Chynna Phillips performs at the Wednesday Banquet.

David Douin presents the 2010 Safety Medal Award to Robert Wielgoszinski.

79TH GENERAL MEETING HIGHLIGHTS


THE NATIONAL BOARD OF BOILER AND
N
B
REGISTRATION
CHECK-IN

Inspector Ethics

BY TERRY PARKS, MANAGER OF FIELD SERVICES

An inspector will make a myriad of ethical decisions throughout the course of a career. How can an inspector know if these decisions are ethically correct? This is a difficult question to answer. There are no absolute rules of what is ethical or unethical. In order to begin to answer the question, we must define ethics as it pertains to our lives and occupational field.

Ethics is often defined as a moral philosophy which seeks to address questions about morality; that is, about concepts such as good and bad, right and wrong, justice and virtue.

Codes of ethics are developed by professional organizations to define acceptable or approved behaviors and to promote high standards of practice. They also provide a benchmark for individuals to use for self-evaluation and in establishing a framework for professional responsibilities. Codes of ethics can be used as a means for occupational identity and as a mark of professional maturity.

Socrates, one of the first Greek philosophers to encourage ethical behavior, believed people will naturally do what is good if they know what is right. He felt evil or bad actions were the results of ignorance. He also believed any person who knows what is truly right will automatically do it. Many professional organizations have developed codes of ethics or codes of practice to help their members know what is right within their industries. The expectation is, when given the choice, an individual will automatically follow the ethical standard set by the organization.

These rules and values in a professional setting promote a sense of worth and trust which in turn can help the industry succeed. Managers and supervisors set the standard for ethical behavior by being honest, showing respect, and promoting trust among their employees. Inspectors in the boiler and pressure vessel industries are given authority and power to act on behalf of a jurisdictional authority to ensure rules, laws, and code requirements are met. They are also commissioned by the National Board to perform the required code work associated with new construction, repairs and alterations, and inservice inspection of pressure-retaining items. The public and our clients place trust in the inspector to provide services that promote public safety and health. Unethical behavior exploits this authority and power, undermining the trust given to all inspectors. Following ethical codes and practices not only benefits those we serve but also benefits those belonging to the profession.

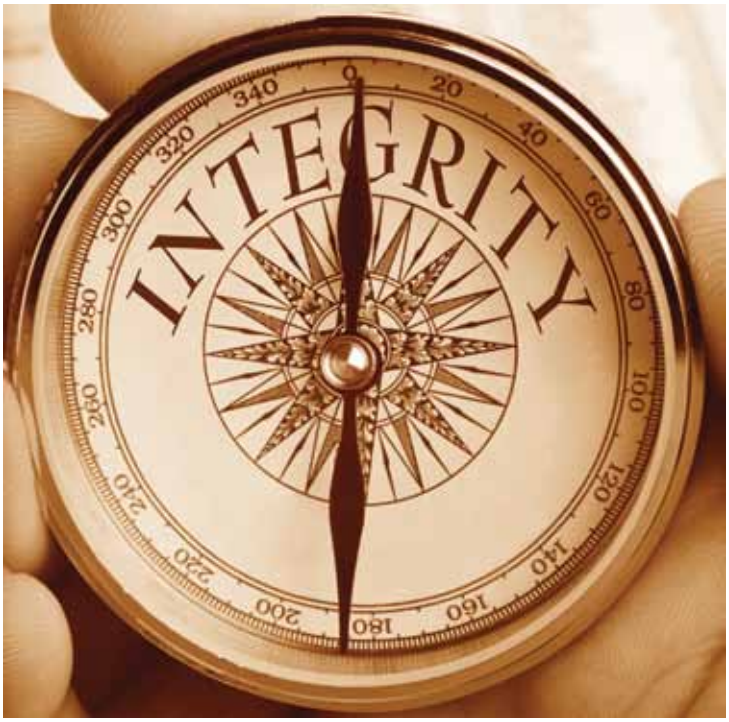
The need for inspector ethics is the same as the need for ethical principles in any society as a whole; they are mutually beneficial. A profession's ethical standard must be compatible with a society's common morality. They interpret our common morality for the specific work details of our profession. A professional organization is a voluntary, cooperative society; those members conforming to its rules are the ones who benefit from the conformity of others. Each is a stakeholder in maintaining compliance and can enhance the sense of community among members – of belonging to a group with common values and a common mission.

Conflicts of interest or other activities that compromise, or appear to compromise, independence, objectivity, or inspection integrity must be avoided. It is imperative inspectors maintain independence from outside influences and interests, which could hinder their ability to render a fair and impartial opinion on any inspection. The honor and dignity of our profession depends on avoiding situations which place our professional standards and best practices in question. Boiler and pressure vessel inspectors must strive to uphold, maintain, and improve the integrity and reputation of our profession. They are required to act in good faith to all constituents and other interested parties, only performing services and expressing opinions within their areas of competence, education, training, and experience. Inspectors should steer clear of any activity that may harm the public, discredit themselves, or reduce public confidence. All substantive and willful violations must be reported objectively; care should be taken to avoid overstating or understating the significance of reported conditions.

An area often overlooked concerning inspector ethics is the need for continued professional growth. Opportunities for continuing education should be sought to ensure the inspector is aware of changes to code requirements and jurisdictional regulations. New technologies can also aid inspectors in performing required inspections more effectively. Keeping abreast of changes to codes, regulations, and developing technologies can prevent

an inspector from making an unethical decision based on ignorance.

National Board-Commissioned Inspectors violating code requirements, jurisdictional regulations, and National Board rules are subject to disciplinary action, depending on the severity of the violation. The National Board Peer Review Board may be convened when an evaluation reveals a National Board-Commissioned Inspector has been negligent in his or her duties or has made a false statement on forms used to document duties. Peer Review Board members participating in the review evaluate all facts impartially and without conflicts of interest. Over the years a number of inspectors have made the journey to Columbus, Ohio, to answer to their peers for unethical actions or behavior (i.e., unknowingly in violation, neglect, or willful violations of code, regulation, or policy).



Sometimes inspectors may neglect to perform their required duties because of pressure from the manufacturer or repair organization to meet a delivery deadline. Other times the pressure may come from a supervisor or manager from the inspection agency by requiring a minimum number of activities to be performed each day by the inspector which may be difficult or impossible to meet. These situations may cause them to forget or willfully omit required actions. Not only does this put their commission in jeopardy, but, more important, it could jeopardize someone's life, cause injury, or damage property.

One of the most grievous ethic violations an inspector can make is accepting monies or other compensation to look the other way or accept an item that does not meet code requirements or jurisdictional regulations. This includes pressure by a government entity to accept items the inspector knows do not meet the requirements of the construction or repair code in order to meet production goals or other governmental goals. When an inspector accepts compensation or allows a governmental entity to dictate what may or may not be acceptable, it negates the concept of an independent third party inspector. The checks and balances of our code of ethics become compromised, and the objectivity and inspection integrity are voided. Ethical violations of this nature diminish the trust and confidence the public has in the process and our ability to protect them.

Sometimes making the right choice can be a difficult decision for inspectors when faced with loss of employment or other sanctions levied on them by their employer or a governmental entity. Cultural differences – especially in undeveloped countries emerging into the boiler and pressure vessel industry – can hinder this process. Oftentimes what may be ethically acceptable in one country may not be so in another country or in this industry. In these situations the inspector must maintain objectivity and inspection integrity to the extent that is possible.

Not all ethics violations made by an inspector jeopardize public health or safety. There are other unethical behaviors which impact trust and confidence employers and constituents have in the inspector. Falsifying inspection documents, padding expense reports, selling services or products in conjunction with an inspection, which are a clear conflict of interest, or misrepresenting abilities, knowledge, and experience – these are all ethical violations which diminish trust and confidence.

It is complicated but not impossible to answer the question, "Am I making an ethically correct decision?" Consider all the factors: if you are still asking yourself if it is ethical, it probably is not. Construction and post-construction codes, jurisdictional requirements, National Board rules, employer policies, and organizational codes of conduct all give specific guidelines and rules that govern our ethical behavior. Any deviation from these guidelines constitutes unethical behavior and must be avoided. At the end of the day one's own conscience will be the determining factor in making the right decision. The expectation is you will. We are all counting on you to keep us safe and out of harm's way.

Repair or Alteration of Pressure Vessels

BY JAMES C. KEENAN, SENIOR STAFF ENGINEER

FEATURE

The purpose of this article is to briefly identify some of the special requirements applicable to the repair or alteration of pressure vessels fabricated of quenched and tempered (UHT) materials and, in particular, the additional rules that should be utilized when repairs or alterations are made to these items.

The most frequent contact with these vessels as a repair organization or inspector is the repair or alteration of over-the-road liquid petroleum gas (LPG) transport vessels. The information contained in this article pertains to vessels fabricated utilizing Code Case 1204-11 or Section VIII, Div. 1, Part UHT, depending on the year built.

Repairs or alterations to these vessels should follow the rules of Part UHT of Section VIII, Div. 1, and the *National Board Inspection Code* (NBIC).

The following paragraphs include a summary of areas to be considered when repairs or alterations to quenched and tempered materials are encountered.

Design of Nozzles and Other Connections (UHT-18)

UHT-18 requires all nozzle welds to be full-penetration design. There are also specific requirements for nozzle materials, geometry, and attachment details.

Materials (UHT-5, UHT-6, UHT-18, UHT-86)

All materials listed in Table UHT-23 shall be impact-tested as required by UHT-6 in the final heat-treated condition. In some cases additional drop weight tests may be required based on minimum design metal temperature.

The thickness limitations of the material specification shall not be exceeded.

Prior to the 1994 addendum, only UHT material could be used for head and shell sections joined to each other. However, addendum 94 revised UHT-5 (b) to now permit the joining of UHT materials to UCS or UHA materials in the head and shell sections.

Nozzles and reinforcement pads shall be made of material with a specified minimum yield strength within ± 20 percent of that of the shell to which they are attached; however, pipe flanges, pipe, or communicating chambers may be carbon, low-, or high-alloy steels welded to nozzle necks of the required material provided the rules of UHT-18 (b)(1 thru 4) or UHT-18 (c)(1 thru 4) are satisfied.

In general, UHT-28(a) requires all structural attachments and stiffening rings which are welded directly to pressure parts shall be made from materials of specified minimum yield strength within ± 20 percent of the materials to which they are attached. UHT-28 (b) modifies this requirement for certain materials. It's important to note that this includes all attachments, permanent or temporary, that are welded to the pressure boundary.

Welding & Welding Procedure Qualification (UHT-17, UHT-20, UHT-30, UHT-82, UHT-83, UHT-84, UHT-85 & Section IX)

Section VIII, Div.1, Part UHT, identifies the rules for welding quenched and tempered materials. Section IX also has additional requirements for welding these materials:

- All category A, B, & C and all other welded joints between parts of the pressure-containing enclosure which are not defined by the category designation shall be Type 1 of Table UW-12 unless otherwise exempted by UHT-17.
- Maximum joint offset values shall meet UHT-20 rather than UW-33 (a).
- UHT-30 requires the attachment of stiffening rings to be in accordance with UG-30.
- UHT-82 contains the specific requirements regarding the performance of welding and qualification of welding procedures for these materials. Repair organizations are cautioned to review these requirements and become familiar with them prior to performing any repairs or alterations.

Any surfaces cut by metal melting methods (i.e., torch cutting, arc gouging) that are not to be rewelded shall have 1/16-inch removed by grinding or other mechanical means and be inspected by the MT or PT method after grinding (UHT-83).

The requirements of UW-35 (a) and UW-51 (b) shall be met except for SA-517 material. The maximum weld reinforcement shall not exceed 10 percent of the plate thickness or 1/8-inch (3.0mm), whichever is less. Undercut or abrupt transitions are not permitted on groove, fillet, and butt welds (UHT-84).

Temporary welds shall be removed after they have served their purpose and shall be made using qualified welding procedures and welders. The base metal shall then be restored to a smooth contour. The removal area shall be examined by the MT or PT examination method for the detection of cracks. Repair welds, if required, shall be accomplished utilizing qualified welding procedures and welders and reexamined by MT or PT upon completion (UHT-85).

As stated in the introduction, the repair organization and inspectors' involvement with these materials is generally with over-the-road LPG transport vessels being repaired or altered. In many cases the manufacturer's data report identifies the head and shell material as T-1 or Code Case 1204 when stamped prior to 1968. After 1968, this material is identified as SA-517 Grade E or Grade F.

One final note: When selecting a WPS to perform a repair or alteration, it is necessary to perform a thorough review of the WPS to ensure it addresses all of the essential and supplemental essential variables required by both Part UHT and Section IX.

Nondestructive Examination (NDE) UHT-57

All welded joints of Type No. (1) Table UW-12 shall be radiographed for their full length in accordance with UW-51 after any corrosion-resistant alloy cover weld has been deposited.

Nozzle attachment welds shall be RT, PT, or MT examined as specified in UHT-57 (b). Corrosion-resistant overlay weld deposits shall be examined by the PT method.

All welds, including welds for attaching nonpressure parts to heat-treated steels shall be examined for cracks by the MT or PT method after the hydrostatic test, except as permitted by UHT-57 (d) and (e). If using MT, a method that will avoid arc strikes shall be used.

Postweld Heat Treatment (PWHT) UHT-56

All vessels or vessel parts constructed of steels listed in Table UHT-23 shall be post-weld heat-treated when required by Table UHT-56.

All welding of connections and attachments shall be postweld heat-treated whenever required by Table UHT-56 based on the greatest thickness of material at the point of attachment of the head or shell [(see UHT-56 (b) & (c)].

Caution: Even though UHT-82(g) may exempt these vessels from PWHT requirements, the Department of Transportation (DOT) may require PWHT of tanks constructed in accordance with Part UHT (Ref: DOT, NTTC Spec. MC-331). If this is the case, welding procedures and welders must be qualified with PWHT. Some minor repairs may be exempted by DOT; in this case special bulletins have been issued by DOT that further exempts PWHT.

Nameplates (UHT-115)

Do not stamp repair nameplate information directly on vessels with shell thicknesses less than -inch (13mm). Nameplates are preferred on vessels constructed by this part in all thicknesses in preference to stamping.

Summary

It is hoped that this information will make both the repair organization and inspector aware of the additional or different requirements when repairing or altering vessels made of quenched and tempered steel. This information is not intended to be used in place of the Code. Individuals using this information must consult the Code for the specific requirements pertaining to these materials.

For all repairs or alterations to these vessels, it is essential the materials and heat treatment requirements be known. To accomplish this the repair organization must obtain a copy of the original manufacturer's data report or ascertain the material type through testing. In most cases the data report will be available from the vessel owner. If National Board registered, it will be available from the National Board.

With safety in mind, repair organizations and inspectors are urged to become familiar with the additional code requirements prior to performing or authorizing repairs or alterations on these types of vessels.

NURSE TANKS

By Greg McRae, Trinity Industries, and Stan Staniszewski, US Department of Transportation

For more than 60 years, anhydrous ammonia nurse tanks have been the most cost-effective method for the delivery of fertilizer to the field. These tanks can range in size from 500-gallon water capacity to 3,000-gallon water capacity.

Tanks filled offsite and transported on public roads are under the jurisdiction of the US Department of Transportation (DOT), Pipelines and Hazardous Materials Safety Administration. Nurse tanks by definition are considered non-specification cargo tanks and must meet and be marked in accordance with ASME Section VIII (Ref, Title 49 of the Code of Federal Regulations, 173.315(m)). After these tanks are placed into service the responsibility for operation and maintenance of the tanks has traditionally shifted to each state to enforce the requirements of ANSI K-61.1/CGA G-2.1 – *Safety Requirements for the Storage and Handling of Anhydrous Ammonia*.

Should it become necessary to repair a nurse tank, the ANSI/CGA document requires nurse tanks be repaired to restore the tank "without deviation" to the original code of construction, which is similar to the requirements for the larger DOT Specification MC-331 Cargo Tanks.

To repair a tank, the "R" stamp holder should start with a review of the manufacturer's data report (MDR) to determine the methods used in the design and fabrication of the tank. Particular attention should be directed to the type(s) of materials used for the head and shells and joint efficiency for the longitudinal and circumferential seams. The stamping on the manufacturer's nameplate will also provide useful information, such as material thicknesses for the head and shell and the degree of radiography used in the original construction of the tank. If the MDR is unavailable, it may be necessary to perform design calculations based on the current information known about the tank to establish its maximum allowable working pressure (MAWP).

For an internal repair, it may be necessary to cut an access opening in the shell or head to make the repair. The "R" stamp holder must consider the degree of radiography used in the original construction. If the tank was constructed after 1989 with 100 percent radiography performed on the shell, a joint efficiency of 1.0 is applied to the design calculations. The weld joint efficiency used to close the access opening for the repair must be no less than that used

TITANS OF THE AGRICULTURAL INDUSTRY

on the shell longitudinal seam to preserve the tank's original MAWP. In this case, it may be necessary to cut the access opening in the head followed by 100 percent radiography of the weld repair joint or if seamless elliptical heads are used; additionally, removing the head would be advisable.

If the tank was manufactured prior to 1989 with spot radiography performed on the longitudinal seam, a joint efficiency of .85 would be applied to the design calculations, In this case, it would be possible to weld in an access plate in the hemispherical head with a backing ring followed by 100 percent radiography to meet the original code of construction design calculations, preserving the tank's original MAWP.

Inspectors should note nurse tanks are designed without a corrosion allowance; any interior or exterior corrosion is not permitted on the tank. Additionally, dents or gouges in head or shell material are not permitted. When the "R" stamp holder has determined the type of work to be performed – routine-in-nature, repair or an alteration – the *National Board Inspection Code* (NBIC) shall be used to determine the involvement of the inspector in the repair or alteration and the correct NBIC forms documented.

If a repair or alteration is performed, a repair or alteration nameplate shall be attached to the tank in accordance with the NBIC. The manufacturer's nameplate should remain legible at all times. If necessary, contact your state jurisdiction for the proper procedures to replace the nameplate if it is deteriorated and no longer readable or if the nameplate has become detached or misplaced. Nurse tanks without nameplates or with unreadable nameplates must not be transported offsite or offered for transportation without prior authorization from the DOT, Associate Administrator of Hazardous Materials Safety. The DOT's special permit program provides a method to allow these tanks to continue in service on a case-by-case basis. Contact the DOT at http://www.phmsa.dot.gov/hasmat/regs/sp-a.

Proven Wisdom Meets New Technology

By Stephen Kleva, President and CEO, Insparisk

XPLORE IX104C3

THE FIRST INTEL PENTIUM-M 733 PROCESSOR WITH CENTRINO TECHNOLOGY, THE INNOVATIVE ALLVUE LCD TECHNOLOGY, AND UP TO FOUR MULTI-MODAL WIRELESS DEVICES IN A RUGGED, PORTABLE TABLET PC.

The new millennium promises boundless leaps in technological advances, some being realized already and some still being developed. Today, we see technology once only dreamed about influencing every aspect of our professional and personal lives. Could anyone have imagined a "talking map" in our car dashboards just 10 years ago? Did anyone expect the massive scale and influence of the Internet?

Many of the advances we see have a tremendous positive impact on our lives. But for every revolutionary piece of medical equipment developed, there is a product like hair-in-a-can. That may seem like an extreme example, but the point is technology is only as good as its usefulness. Great technology lends itself to problems that need to be solved or enhances a process in a significant way.

The scope of work that many National Board members encounter every day is in many ways no different from their forefathers': inspecting equipment as a means to ensure public safety. Yes, it may have been a steamship in yesteryear as opposed to a gas boiler today, but the role is largely the same.

Where and how has technology come into play in our industry? How does it add value to our profession and mission? What is its ultimate role in our industry? Are we needlessly dressing up a tested standard and established process? These are some questions I would like to address.

At least one aspect of our industry has seen tremendous inroads when it comes to technology. This is a direct result of our heavy reliance on accurate data collection and tracking. As we look around, jurisdictions from coast to coast are turning to proprietary software for exactly those purposes. What was once the domain of paper and pen is quickly turning to computers and servers. Many choose to go the route of purchased software while others may choose to develop and implement their own solution.

The accuracy of a vessel's information and the ability to instantly track its inspection history are vital components to ensuring it operates safely. On the administrative side, there are significant efficiencies in reducing the number of staff and/or hours required to process inspection information. Lastly, this new method of data collection and storage is used to enhance the customer experience by offering easy online access to inspection reports and facility history.

The complement to this "backend" data management is field software and hardware. Though still in its infancy and with a relatively low adoption rate industry wide, mobile applications will forever change the inspectors' data collection and reporting methods. An inspector armed with this equipment is forced to offer consistent inspections through intuitive forms and fields that cover every aspect of the process. Built-in error checking constantly monitors the inspector's findings and sounds an alert for any inconsistencies or neglected criteria. Access to select historical data also allows special attention to be given to areas noted in previous inspections.

The reason for only allowing access to select historical data as opposed to data in its entirety is to build "checks and balances" into the mobile application. For instance, an inspector may be required to collect boiler plate information on each visit. Once the report is submitted, the "backend" software compares the boiler plate information from each visit to ensure consistency and, thus, a visit to a location did occur. Customers aware of these checks can rest easy knowing their equipment is undergoing a comprehensive inspection process.

Mobile software also offers the option of attaching digital photographs to an inspection. These photographs serve as the perfect complement to noted deficiencies and offer a new way to review a vessel long after the inspector has left the facility. Access to these photos for the customer also serves as a tremendous tool in educating them on their equipment and offering an additional assurance that an inspection did occur. In some cases, these photos are even shared with repair technicians in preparation for service work.

Technology has also taken information and education to a whole new level, enabling much greater and easier communication of safety information and education amongst industry stakeholders. Savvy businesses and institutions have taken everything from spec sheets to operating manuals and put them online. What was once a tedious process of manual research that discouraged many has been transformed into 24/7 online, at-your-fingertips ease. Progressive organizations like the National Board offer Web site e-publications, forms, and other information to assist their members.

These new forms of communication run the gamut from Web sites to blogs to Twitter and Facebook. It is no longer accurate to assume people get their information from

newspapers or TV. While those are still valid venues, most Americans now get their news from up to five sources, according to CNN. It goes without saying these are the same Americans who make up the majority of our customer base.

So why wouldn't we try to reach our audiences in as many ways as possible? And this is not only a domestic phenomenon; the Internet is a global force. For our industry to remain relevant we must increase the awareness of vessel safety and spread the word via any means that garners a substantial audience. Ours is a vital message and service that must be shared.

An example of how radically our industry news dissemination has changed can be viewed with the example of boiler explosions. In the past, these unfortunate incidents were primarily available in local news outlets and perhaps some trade publications. Unless you had a subscription to every newspaper and trade magazine, you were sure to miss some incidents. At best, you got word of them at some point, usually well after the accident had occurred. With the advent of the Internet and search engines, these accidents can be tracked and explored almost simultaneous to their occurrence. One can even set up parameters that automatically search for and send pertinent news articles to an email account on a daily basis. This quick discovery of details and facts may very well enable someone to make equipment adjustments and avert disaster.

Even as we adopt new products and procedures today, the technology of tomorrow is being developed. What other technology developments can we expect? Ours is an industry with some very interesting things to look forward to. One of these is the advent of RFID (radio-frequency identification) chips. Already in use in some industries, these chips can store product data and be accessed from several meters away. For our purposes, vessels equipped with these chips or "tags" will be able to store information like manufacturing data and an ID number. As the tags improve, we could see this information grow to include everything from inspection history to facility contact information.

For the field inspector, imagine walking into a building and each vessel's tag waking up to "talk" to your mobile device. Immediately you would have a listing of all the equipment in the facility and access to any additional stored information. Perhaps the company that serviced the vessel left information on a recent repair. Perhaps a newly installed vessel pops up on your screen alerting you of an equipment change. The possibilities are endless in ensuring proper attention to vital data and the inventory of objects. The best news is the tags are rapidly advancing in technology as the price declines.

After the inspector has completed an inspection, the data will be sent via wireless Internet, in real-time, to a designated central server. Once in the server, the data will be inserted into the appropriate reports and forms to be filed electronically with the jurisdiction or governing body. This streamlined process will ensure the accuracy and integrity of the information collected by the inspector. The very real possibility of human error when transposing information from written reports will be gone. Also gone will be the mountains of paper that lead to inaccuracies and lost reports.

As with any technology, the few examples discussed above will be embraced by a small group of early adopters while others will watch to see how it all unfolds. Still others will resist at all costs, preserving their current methods. Many in that last group would say all the new technology is no substitute for a good inspector conducting a quality inspection. To them I say "You are absolutely right." None of these methods are intended to replace a good inspector. Rather, they are meant to enhance the inspector's ability to be more efficient and thus spend more time at the facility and less time writing reports. No technology will ever replace the expertise of a National Board inspector or AIA, nor should it.

If we continue to strive for excellence in vessel safety we must embrace technology that looks to improve inspection processes and awareness. It would be negligent to assume just because many of the basics of pressure vessels have remained static that the accompanying procedures should also remain the same.

The same can be said of educating both our current and potential customers. We cannot assume they understand what equipment they possess. Most have no idea of the deadly hazard their pressure vessels pose. Educating them can only lead to a greater appreciation of our role in ensuring their safety and validate our role in their facility.

Whether or not our industry will move to the next level of technology is still unclear. It is up to all of us to embrace and foster technology as an asset and not a foe. Reluctance to act could very well result in a loss of our sphere of influence. Conversely a concerted and communal effort to move forward could further cement our role as a progressive industry and the authoritative body for pressure vessel safety.

Technology should be embraced and harnessed for every benefit we can garner from it. Progress is a natural and fantastic process of humankind that has seen us go from invention of the wheel to horse-drawn buggies to sports cars – a perfect example of why those that resist should lose their fears and join the revolution.

Tonight, as you drive home from work listening to satellite radio and eventually sit down to your computer after dinner, consider how technology has transformed your life in so many ways. On a note that hits closer to home, think about the boiler in the basement keeping you and your family nice and snug in January or the chiller system in your local supermarket keeping your food fresh. None of that would be possible without pressure vessel technology developed by our industry's predecessors. The least we can do for their legacy is continue to refine our craft and strive for an accident-free world.

Stephen Kleva is President and CEO of Insparisk, a national safety inspection and risk assessment company. For more information, visit www.insparisk.com.

National Board Technical Scholarship

Each year, the National Board offers up to two $6,000 scholarships to selected students who meet eligibility standards and are pursuing a bachelor's degree in certain engineering or related studies. Scholarship checks are sent directly to the college listed on the recipient's application and distributed by the scholarship office. The award, which may be split and evenly distributed throughout the year, can only be used for tuition, college fees, or books. The next application period will begin on September 1, 2010, and continue through February 28, 2011.

To be considered for the scholarship, a student must:

- be currently enrolled full-time in an accredited four-year college or university in the United States or Canada;
- plan to be enrolled as a full-time student for the upcoming academic year with sufficient college credits to be classified as a sophomore, junior, or senior;
- major in mechanical, manufacturing, electrical, industrial, welding, or chemical engineering, or other closely related engineering major;
- possess a cumulative college GPA of 3.0 or higher on a 4.0 scale;
- be a citizen of the United States or Canada; and
- be a child, step-child, grandchild, or great-grandchild of a past or present National Board member (living or deceased), of a past or present Commissioned Inspector (living or deceased), or of a past or present National Board employee (living or deceased).

In addition to these requirements, the student must obtain a letter of recommendation from a current National Board member. The member may be from any jurisdiction and may or may not be related to the applicant.

For any questions or further information, please contact National Board Scholarship Coordinator Connie Homer by email at chomer@nationalboard.org.

2009 Scholarship Recipient

One of the recipients of the 2009 National Board Technical Scholarship was Rhean Demirkan. Recently the National Board talked with Mr. Demirkan about the award.

1. **Where do you attend school?** *I am currently in my second year at the University of Michigan – Ann Arbor.*

2. **What's your major?** *My major is bio-medical engineering.*

3. **When do you plan to graduate?** *I plan to graduate in May 2012.*

4. **Do you plan to go to graduate school? If so, where would you like to go and what do you plan to study?** *Yes, I plan to attend graduate school – hopefully at the university I am currently attending; however, I would like to first gain experience through internships in bio-medical-related fields.*

5. **Do you have any interest in working in the boiler and pressure vessel industry?** *If given a chance, I would like to work in the boiler and pressure vessel industry. Throughout my high school years, my father sometimes brought me to the boiler rooms he inspected for the City of Detroit. This somewhat piqued my interest in the way boilers and pressure vessels were built, operated, and chemically treated with the proper care and training through the ASME and the National Board.*

6. **How did you hear about the scholarship the National Board offers?** *I heard about the scholarship through my father, who read about it in the National Board BULLETIN.*

7. **How has the scholarship benefited you?** *The scholarship has greatly benefited me by covering some of the costs of the increasing tuition rates within the state of Michigan. This has given me the means to continue pursuing higher education and training. I am very grateful to have been awarded the 2009 National Board Technical Scholarship.*

TOP TEN Boiler and Combustion Safety Issues to Avoid

By John R. Puskar, P.E.

An industrial explosion from a gas piping project kills four workers in North Carolina. A boiler-related explosion at a nursing home in Michigan kills five. An explosion from a power plant gas piping project in Connecticut also kills five. These tragic stories may have made national headlines, but every year hundreds more go overlooked. These incidents prove that regardless of their size or scope, when fuel systems and combustion equipment are at issue, the devastation can be massive. Many of these tragedies could have been prevented if guidelines and standards already in place were better understood and enforced.

Certainly safety in industrial plants and manufacturing facilities where fuel-fired equipment is used has dramatically improved from 100 years ago when boiler explosions and the related carnage were an almost everyday occurrence. However, incidents related to fuel systems and combustion equipment still occur far too frequently. It seems we have hit a plateau with fuel and combustion equipment safety. Maybe it's because of aging infrastructure or a lack of enforcement of existing codes and standards. Or it might be related to the economy – economic downturns often take a toll on safety, training, and maintenance dollars.

Regardless of the reasons, it doesn't have to be this way. When lives are literally at stake, the excuses don't matter. Combustion equipment safety is critical to the daily operation of all facilities and the safety of every employee. This area of safety is complicated and often misunderstood, but by taking a look at these Top-10 fuel and combustion equipment issues, you will better understand how to protect your employees from combustion-related incidents before you end up making a national headline.

1 Fuel Systems

One of the biggest issues related to natural gas explosions is that in the industrial world, people just don't understand natural gas piping repairs are different from other piping repairs. There is an appalling lack of training and understanding on this subject. If you are in charge of a maintenance crew or have any of this activity at your site – whether your own people do the work or not – you must get a copy of *NFPA 54: The National Fuel Gas Code* (www.nfpa.org) and read it cover to cover. This document describes safe gas piping and repair practices.

There are six major steps to a gas piping repair. Each of these steps can be the subject of a separate paper and hours of discussion.

Pre-Repair/Planning

1. **Planning**
2. **Isolation**
3. **Pre-repair purge**

Making the Repair

4. **Pressure testing**
5. **Post-repair purge**
6. **Reintroduction and light-off (the most dangerous part)**

The importance of the pre-repair/planning phases cannot be overlooked. You don't just wake up one morning and decide to do a gas piping project. There's a lot of important planning and tasks that need to take place first for the job to be safe. This includes asking the following questions:

- Where are isolation points and how will isolation be safely achieved?
- Does the utility have involvement and what are their requirements?
- Is there an overall plan and does everyone understand it?
- Is there enough nitrogen? Does everyone understand nitrogen hazards?
- Where will we purge to? (It must be outside of the building.)
- Has reintroduction and start-up been discussed, including the unique hazards surrounding this activity?

The most dangerous part of gas piping projects is the reintroduction and start-up of the equipment. This seems to be related to a number of accidents. When you're purging, there's a limited amount of hazardous material (it's just the pipe volume). When you're reintroducing, there's an unlimited amount of gas that can make for horrible tragedies.

2 Equipment Issues

Most facilities do not have personnel properly trained in combustion equipment maintenance, start-up and shut-down procedures, or equipment operations. Most sites also do not follow proper fuel train interlock and safety testing guidelines even though they are mandated by law.

Boiler safety laws passed by a number of states have helped more owners operate with safer equipment by mandating inspections and testing. Boiler inspections are mandated to be carried out in states and municipalities having boiler safety laws. These are called jurisdictional inspections. In most states these laws call for inspection of water-side systems (water level controls and pressure-retaining devices), but not testing of fuel train safety devices.

In 26 states ASME CSD-1 *(American Society for Mechanical Engineers, Controls and Safety Devices Code for Automatically Fired Boilers)* is an adopted code. It mandates actual operational combustion safety systems testing for units up to 12.5 million Btu/hour input (MMBTUH). Some states have also adopted NFPA 85 (*National Fire Protection Association, Boiler and Combustion Systems Hazards Code*) for units over 12.5 MMBTUH. This code also requires fuel train safety systems testing. In these states, jurisdictional inspectors may ask to see evidence of the required fuel train and safety interlock testing. Remember, it is beyond their work scope to do any of this testing. They might ask about it. If someone says yes, it's being done, they most likely don't ask any details about how completely it was done.

3 "But It Was Just Inspected!"

People involved in boiler explosions or fires commonly say, *"But it was just inspected!"* In their hearts they believe everything humanly possible was done to avoid a catastrophe because they just got a jurisdictional inspection and probably a state certificate to operate. People think a jurisdictional boiler inspection is the magic bullet against problems. Very few people realize what a typical mandated jurisdictional boiler inspection is and is not.

Many large industrial clients now have fuel and combustion equipment safety programs that go well beyond minimal legally mandated requirements. These "self-audit" combustion system programs usually include an analysis for code compliance but then go further into installation deficiencies, interlock testing, screening for maintenance practices that can be impacting safety, and assessing technological advances that can improve safety.

4 Grandfathering Old Equipment

Jurisdictional inspectors often have their hands tied when it comes to what they can ask someone to do. What they are inspecting is often limited by exactly the letter of the law. For example, in many cases they can only evaluate equipment based on its code compliance for when it was installed. *Code compliance is not retroactive*. Codes usually change on three-year cycles, but compliance with new versions is optional. Safety codes have committees and evolve for a reason. It's because the technical world finds out how to do things better over time. The difference between what is installed and what the current code requires is called a gap. Conducting a gap analysis on equipment as it is installed can provide a road map for getting current and maximizing safety.

When a jurisdictional code inspector walks away saying everything passed, managers and others in a position of authority have a certain peace of mind – even about 40-year-old equipment that requires many manual steps to operate safely and puts their site at serious risk of improper manual start-up or shutdown daily. These managers need to learn that being technically "in compliance" – but nowhere near the current code's level of safety – is not a moral victory.

Consider also that unless you are in a state that mandates ASME CSD-1 or NFPA 85 compliance, inspections rarely address gas trains and/or fuel system issues. Interlock and gas train testing is usually assumed to be a responsibility of the owner in these states. You can imagine the level of compliance with these

little-known testing requirements is much less in states where the issue of combustion control testing is not even on the table.

When it comes to process ovens, space-heating equipment, furnaces, and other industrial thermal processing equipment, there are very specific guidelines for levels of fuel train protection, safety, and testing. These are spelled out in NFPA 86 (*Standard for Ovens and Furnaces*). Unfortunately, very few people know about the NFPA 86 document. Often, industrial ovens and furnaces are custom pieces of equipment with safety controls assembled from components and not pre-engineered catalog systems. Unlike boiler systems, there are no mandated jurisdictional inspection programs for ovens and furnaces.

5 Interlock Testing

Burning fuel can be useful to mankind as long as it is done as a controlled process. Control means that combustion takes place where we want it, when we want it, and at the rate we want it. Fuel trains are the complicated-looking series of valves, piping, wires, and switches that provide this control.

Fuel trains regulate the amount and the pressure of gas to burners. They also keep gas out of the combustion chamber whenever equipment is shut off. This is accomplished with a series of regulators, flow control valves, and special shutoff valves. The special automatic shutoff valves are designed for low leakage and are spring loaded to close. These are called safety shutoff valves. Larger gas trains require dual safety shutoff valves in series. Some are also assembled into a piping arrangement that includes a vent between them for added safety. The vent and its piping are provided to allow any leakage past a shutoff valve to go outside the building when the equipment is off. The specific configuration that your equipment has depends on your insurer and local code requirements.

Fuel trains also have components and sequences programmed in to ensure safe light-offs happen. Some devices also make sure fuel flow is immediately stopped if anything goes wrong during the operation of the equipment. Shut downs can occur from gas pressure switches, which attempt to make sure the gas pressures past the regulator are not too high or too low. Fuel trains also have air-flow proving switches to make sure the proper amount of air for purging fire boxes prior to light-off is happening. These air-flow purge switches then verify air is also flowing while the burner is operating.

Flame-sensing components also must exist to make sure flames are present whenever fuel valves are open. Other safety components include gas valve position switches for sensing the fuel valve is at low fire prior to light-off. Your system could also include furnace pressure switches, high temperature limits, high-steam pressure limits, and/or low-water level cut-offs.

All of these safety devices are logically linked or interlocked to a BMS (burner management system) safety controller. The BMS is the brain that supervises and sequences all of the light-off efforts, including the timing and adequacy of the purge prior to light-off and the time intervals allowed for getting pilots and main flames lit. The BMS then acts as your sentinel of safety and monitors all of the switches and safety conditions while waiting to direct the fuel valves to close if a problem occurs.

All the safety interlocks and switches are supposed to be checked on a regular basis by law, but with maintenance budgets among the first to be cut, proper checkouts and testing are seldom performed. Codes and manufacturers define what the testing frequencies should be for different types of components and safety systems. Frequencies of required inspection/testing range may be daily for some items like observing flames or annually for safety shutoff valve tightness testing.

In our experience, when we come to a site where regular testing has not occurred, there is likely to be at least one switch or device that has failed on each piece of equipment. This is like having the brakes out on one wheel of a car.

When we do find sites engaged in some type of regular service or testing, they usually are not doing everything – or at least not doing everything well. It varies depending on who is in charge and that person's knowledge of the equipment or systems. And even if someone knowledgeable is doing the right thing, we often find job rotations and turnover don't guarantee this diligence will be in place for many years at a particular site. Because of this we have not found much consistency among sites under anyone's corporate umbrella.

6 Passing the Buck – Even New Equipment Can Be a Problem

In many of the examples above, unsafe conditions developed over time from lack of upkeep or oversight. But how do things end up going wrong on newly installed equipment?

Consider a new facility being built that includes furnaces and a boiler heating system. The project could have been conceived and directed by someone who was part of your corporate staff. It may give you an underlying sense of confidence to think degreed professionals designed the facility. The plans were then most likely reviewed by a number of people, including the city's building department, the local fire department, and an architect. A licensed contractor probably did the equipment installation. You may expect that since a dozen skilled professionals have been involved, all has to be well.

But all may not be well. Here are some disturbing issues about this everyday scenario.

City Building Departments

City building departments often farm out review of plans to architects or engineers since they usually don't maintain enough staff to handle anything more than houses being built. The reviewers probably do a few projects a year and have done some commercial projects with gas piping or combustion equipment, but they, too, are usually far from being experts. They look for very significant and obvious local code-related issues. This is most likely not a detailed examination of how your system was selected or installed, and it has *nothing* to do with how it is operated.

Building departments will then most likely send an inspector out to see your equipment after it is installed. He will certainly know about residential work since that is probably 90 percent of what he sees. It's very unlikely that this person would know much about industrial fuel piping, ovens, or boilers.

Corporate Project Engineering Staffs

Before starting CEC, I was a corporate staff engineer for a major oil company. We managed projects. We relied on specialized consultants for giving us advice on equipment selections. In most cases, the firms we used relied on vendors to tell them what they needed. This information was translated to drawings, and a conceptual specification was generated. Rarely did this level of design include detailed gas train piping drawings and wiring schematics. In most cases this was not possible to develop until a specific equipment vendor was selected.

If the design process works correctly, the successful vendor provides detailed drawings for insurance approvals. This is then followed by a very detailed and thorough commissioning at the site to verify all was installed and working properly. If these steps happen, then you are likely to be starting off with safe equipment. However, our experience shows that many times crucial information gets lost between the corporate specifications, the approved shop drawings, and what actually shows up on the job. Purchasing is always looking for the low bidder, which never helps this situation.

Project Architects

Architects receive little or no formal training in building mechanical or combustion systems. It is simply not usually in their scope. Most likely they will rely on the city's code officials, a hired consulting engineer, and/or a contractor or vendor to make this happen. The hired consulting engineer is often no longer involved in the project after the project is bid, so there is no reason or incentive for the architect to show up and see what got installed.

Project Managers

These are usually general contractors hired to handle scheduling and budgeting. Once again, it is not typically in their scope of work to spend much time or effort focused on meeting fuel, combustion, or boiler safety codes. They usually assume others will address those issues.

Insurance or Mandated Jurisdictional Inspectors

When it comes to boilers and the insurance world, you first need to understand who's covering what. A boiler is normally covered by two different insurance policies. One is the boiler / machinery (B/M) coverage for the pressure side, meaning the tubes, drums, water level controls and safety relief valves. The second part of a boiler's insurance is the property coverage, which covers the fire side, such as the fuel train, firebox, and refractory-related issues. There are some companies who cover both the B/M and the property side and others that handle only one or the other. This is a matter you should investigate and understand.

Those on the property side may make recommendations to have safety controls and interlocks tested or have other fire side recommendations in their reports. These reports, and reports related to pressure side issues from B/M inspectors, can be seen by many other insurance companies and can lead to some companies not bidding on insurance coverages and/or coverages becoming mvore costly for sites where more risk is perceived. In many cases, jurisdictional insurance B/M inspectors have their hands tied. They are only supposed to review pressure vessel and piping issues, including air tanks, water tanks, and boilers. They are not supposed to focus on issues like the gas piping at the site, the gas train component settings, control logic, and/or the burner flame pattern. It has been our experience that many property insurance - related inspectors spend more time looking at sprinkler and fire suppression issues than they do combustion equipment matters.

Local Fire Departments

Many local fire departments conduct fire prevention efforts including compliance inspections of local businesses. These usually address fire doors, sprinkler systems, and general housekeeping issues. It would be rare for a fire department to have a boiler or gas equipment expert on its staff. Besides, boilers usually do not fall under any fire code.

So where does this leave us? It makes for a case where it seems like a lot of people may be involved in the new combustion equipment installation, yet no one may have specifically

been focused on combustion safety or fuel system issues. We inspect and test many newly installed systems only to find things wired wrong, safety devices that don't work, and/or equipment that doesn't comply with applicable codes. This makes people very upset, delays starting facilities, and costs companies a lot of money.

7 Human Factor

Let's assume that despite everything above, you ended up with a properly installed and commissioned system. The staff, consultants, and vendors have all left your site. Who is now qualified to operate and maintain the equipment?

Operations, maintenance, and people issues are by far your biggest combustion equipment safety issue. Statistics for boiler incidents show that nearly 40 percent of all deaths and accidents are caused by human error or poor maintenance. A lot of your success will now depend on the safety culture at your site.

The day after everyone has gone, and you're alone with your officially blessed equipment, one poorly trained person with a well-placed screwdriver can reduce your building to rubble and kill everyone around in less than five minutes.

8 Training

Too many facilities assume training is something that happens on the job in an informal sense. To them, it's information passed on from person to person over coffee or in between baseball scores. There may have been more formal training years ago when the equipment was new. Now, maybe only half of those people are still around.

Codes offer very little specific direction regarding training other than to say training is absolutely required and it should be done regularly. The ASME boiler code Section VII, Subsection C2.110, says "safe and reliable operation [of boiler] is dependent…upon the skill and attentiveness of the operator and the maintenance personnel. Operating skill implies knowledge of fundamentals, and a suitable background of training and experience. Regularly scheduled auto-manual changeover, manual operation, and mock emergency drills to prevent loss of these skills are recommended" (ASME 2004). This kind of training – particularly troubleshooting techniques and emergency mock drills – are ignored in most training programs we have encountered, even though they are clearly among the most important things operators and maintenance staffs should understand.

NFPA 85, Section 4.4.2, also identifies requirements for boiler operator and maintenance training (NFPA 85, 2004). This information is helpful, but again rarely ever finds its way into boiler operator training programs. Even more peculiar is that where boiler operator licensing is required, licensing exams have very little to do with fuel train safety or maintenance. Instead, these exams and the training for them focus almost exclusively on water level and pressure vessel issues.

9 Preventive Maintenance

A comprehensive preventive maintenance program is your biggest defense against accidents and another vital part of staying safe.

If not properly maintained, combustion equipment can become less safe with every minute of operation. Dust, dirt, and debris accumulate in combustion air fans and burners. This changes air/fuel ratios. Some gas control valves get a little more sloppy every time they are cycled. Pressure switch diaphragms and contacts age. Water level controls accumulate sludge.

These are all examples of possible operational or maintenance issues that could spell trouble for you and your site. The problem is very few sites maintain the specific expertise required for proper combustion systems maintenance. The skills and knowledge required to do this work safely are considerable. These people must do this work regularly to stay sharp – not once or twice a year. They also need frequent training and specialized tools like flue gas analyzers. Most sites lack people with these skills and don't have them properly equipped. In many cases these people know enough to be dangerous. Don't let your people try to do things like tune burners, change out firing rate control valves, or replace burner management systems unless they have been properly trained.

Sites not wanting to have these problems with in-house staff sometimes blindly rely on outside contractors. Certainly there are many fine contractors out there. However, you'll want to be very careful before letting someone touch your combustion equipment. If you own and operate combustion equipment, you and your staff must have some core level of knowledge regarding safe practices before you can even hire the right contractor. You must ask a lot of questions about the specific level of training and experience the person coming to the job has had. Make sure this person is not going to learn on your equipment. Remember, it's not the reputation of the company that matters; it's the specific expertise of the person it sends.

10 Proper Documentation

Regardless of who does your equipment maintenance, another issue you must closely monitor is maintaining your documentation. This means panel drawings, switch set points, purge times, and even component model numbers and operational manuals. Many incidents have occurred from improper troubleshooting of problems because information was not readily available.

Gas Piping and Combustion Incidents Can Be Avoided

Natural gas and combustion equipment safety continues to be considered a mystery by many. Most sites have personnel not adequately trained in either the safe start-up/shutdown of equipment, daily operations, or proper testing and maintenance. Our firms' survey of industrial users found less than 10 percent actually perform manufacturer-or code-required preventive maintenance, including testing of critically important safety interlocks. The combination of these two circumstances can spell disaster – and it has in numerous facilities.

When assessing your site's level of combustion equipment risk, remember the following:

1. Most explosions and fire incidents, by far, are due to human error. All of the safeties and interlock equipment in the world won't help if someone has bypassed or jumpered-out safety controls. There is no possible substitute for proper training. Training has to include mock upset and hazard recognition drills. Your people need training even if you will have contractors heavily involved at your site.

2. Start-up and shutdown are your biggest risks. You need clearly written procedures everyone understands and agrees with so that consistent safe practices are in place with every shift and every employee.

3. Make sure you do regular and complete interlock and fuel train valve tightness testing. Jurisdictional inspectors, even where they are mandated to be around, cannot be at your facility every day. Combustion equipment safety testing needs to be part of your organization's culture regardless of what it costs and what the perceived hurdles are. You should comply with code requirements for testing even if an inspector is not forcing you to.

4. Create corporate guidelines for third party combustion equipment reviews and commissioning for newly acquired equipment or for major upgrades. Now that you see how little review and attention combustion equipment may receive from the time it's specified to when it's really operating, you may want a dedicated professional review of the design and what you are getting by a qualified, experienced third party.

5. Upgrade equipment for safety's sake. There's no peace of mind in being grandfathered. Do not wait for a problem and let attorneys dictate upgrades needing to happen because of a lawsuit. Do a gap analysis proactively and have a long- term plan to be compliant with the most recent codes.

It takes a lot of effort to change culture and practices that have evolved over decades. In the beginning, you will probably get a lot of the same old, "Gee, we have been doing it this way for years." Our clients have found the first year of having a comprehensive combustion equipment testing and training program to be painful. It takes a lot of effort and faith to fix things that "ain't broke" to some people. Certainly the financial wizards will need to be convinced to upgrade equipment for the sake of safety, even though the upgrade may not increase throughput. (Although in many cases it will.)

Start with a gap analysis of your equipment's state of protection relative to current codes. Prioritize your needs and address them at a comfortable pace. Conduct a "human gap analysis" to identify the state of knowledge and skills regarding your operations and maintenance staff. Make training a regular and serious effort. The bottom line is that implementing comprehensive combustion equipment safety programs saves lives. The right thing to do is to be proactive. This is not the thing to do under the duress of catastrophes and death.

Once an incident occurs, it means years of court cases, job losses, higher insurance rates, and maybe even criminal litigation. It also takes years to overcome the loss of safety credibility to your employees and the community. Taking the right steps ahead of time-and equipping your plant and employees with the training, knowledge, and tools they need to do their jobs-saves lives.

About the author:

John R. Puskar, P.E., is principal and owner of CEC Combustion Services Group, located in Cleveland. For more information, e-mail JPuskar@combustionsafety.com, visit www.combustionsafety.com or call 216-749-2992. ♲

GARY R. MYRICK

Chief Boiler Inspector, State of Arkansas

Arkansas Chief Boiler Inspector Gary Myrick has spent a significant portion of his professional career trying to get away from . . . boilers.

Well, kind of.

"I've spent quite a few years as a boiler operator working the swing shift," he explains. "And although I love working with boilers, the swing shift thing has always been something I've tried to avoid. At all cost."

With two parents who were bookkeepers, Gary says it never entered his mind as a youth to follow in their footsteps.

It was in his hometown of Monticello, Arkansas, about 100 miles south of Little Rock, where the state chief inspector spent the first five years of his life. "We then moved to Tennessee and finally to Colorado before moving back to Arkansas and the suburbs of Little Rock," he adds. Of the places he has lived, Gary identified Colorado as the most memorable of his childhood.

"Growing up in Colorado allowed me to develop interests in a number of activities I still enjoy today," Gary says with a smile.

Such as archery hunting. "Started when I was 12 years old."

And motorcycles. "I was only 14 when I began riding."

Two years later back in Little Rock, Gary's mother decided her 16-year-old son needed some professional focus. A series of jobs that included laying sod, performing clerical work at H & R Block, and a stint at the local drive-in theater did little to provide any career direction.

Bulletin Photograph by Dixie Knight

Following high school in 1968, Gary married and found himself with new responsibilities. And a compelling need to earn an income.

"I went to work as an errand boy at an insurance agency," the Arkansas official recalls. "I was only there about six months before I took a job as a plant helper for Arkansas Power & Light. I worked at the Lynch Steam Electric Station right about the time the company's Arkansas Nuclear One went on line."

Because the company moved most of its plant operators from the Lynch Steam Electric Station to its nuclear facility, the new water treatment plant helper would soon discover his career was about to accelerate. "The lack of operators at Lynch allowed me to become a senior boiler operator in just five years . . . a very rare occurrence in the utility industry!"

Now in the boiler operator field, Gary figured he finally was on a career path. Or at least he thought.

"I really didn't like rotating shift work," he states with resolution. When he was unable to obtain another job at the plant guaranteeing him day work, the National Board member resigned and headed to Florida with his wife and young daughter.

"I was told by an associate at Lynch that Florida was beautiful, had the best weather, and the beaches . . . the beaches were also outstanding." While it seemed a great idea in 1974, there was a small yet significant problem: he had no prospects in the Sunshine State.

"I thought I might want to do something in construction. But that didn't work out," he admits with a wrinkled brow. The Arkansas native finally took a job as a stationary engineer at a Tampa hospital. In 1979 and after five years in Florida, Gary moved back to the Little Rock area and went to work in pressure equipment sales. "It was something I enjoyed and something I thought would get me away from shift work!"

Now single, the state official's route took in the entire state of Arkansas. "I traveled everywhere by car," he explains. And then it happened.

"I broke my back riding a mechanical bull," Gary admits with a nervous chuckle.

Laid up for three months, Gary subsequently found he could no longer drive for long periods of time. "That was the end of my brief sales career," he smiles.

But it was the beginning of a new phase in his life. With a renewed interest and resolve in getting back into boiler operations, Gary retook Arkansas' boiler operator exam in 1981.

At the exam, the future National Board member was approached by then Arkansas Chief Inspector John Crosby. "He asked me why I was taking the exam. I told him point-blank, 'I wanted to eat.'"

Gary was somewhat surprised when the chief inspector asked him if he was interested in becoming a boiler inspector. "That same day, I received a job offer from a local hospital," he recalls. "That job actually paid more money than the state position. But . . . it would require me to work the swing shift." As far as Gary was concerned, it was no contest.

Passing the National Board Commission exam in December 1981, Gary decided he liked inspecting boilers "a lot." Of course, as the state department's "new guy," he was not immune to the occasional hazing directed toward the recently hired.

"I was inspecting a 250-horsepower boiler at a service company when their employees decided to lock me in the man-way . . . I mean they actually bolted it down!" he recalls. "I guess they were waiting for me to panic. But I just laid down and waited the 15 minutes or so until the joke was over. We all had a good laugh . . ."

In 2001, Gary met his wife Nancy at an airport. "She was on a traveling assignment as a registered nurse," he recollects. "Because she was having a hard time obtaining a connecting flight – it was shortly after 9/11 – we were able to spend some time together." They married in 2002.

After 22 years as a state boiler inspector, the Monticello native became chief boiler inspector in 2003. This July, he celebrates 29 years with the state of Arkansas.

Currently overseeing six inspectors and five clerical staff, he is responsible for over 40,000 boilers and pressure vessels in Arkansas.

Gary spends his free time pursuing the activities he came to enjoy in Colorado. In addition to hunting and fishing, both he and Nancy traverse the Arkansas countryside on their own motorcycle.

The Myricks also enjoy travel outside the land of Razorbacks. "We particularly like the beaches of Mexico," Gary reveals with a grin of satisfaction.

In retrospect, the Arkansas official says he doesn't regret his career in boiler inspection. "Working for the state has really been a very satisfying experience," he notes with a smile.

And then there's that swing shift thing.

After years of being exposed to 125-megawatt power plant boilers, Gary admits the noise has adversely affected his hearing. But that, he emphasizes, is still not the reason he eschews swing shifts.

"Actually, there are very few workers around the second and third shifts. It can be quite lonely," Gary observes.

"Hey," he quickly adds, "I'm a people person!"

Welcome to the Inspection Room

BY KIMBERLY MILLER, MANAGER OF TRAINING

Over the last 18 months the National Board training department has been on a mission: create the optimal hands-on training environment. Given 8,000 square feet of space, we started with a very large, very empty room in our inspection training center that today is well underway to being the best hands-on training center for boiler and pressure inspectors in the world.

The Tour

▲ The new inspection room is outfitted with 16 workbenches allowing up to 32 students at a time to participate in a hands-on workshop.

▲ There are three nondestructive testing areas for the demonstration of several methods of NDE. Currently this has been included in the "IC" and "A" courses as well as the "VR" seminar.

◀ Under construction, a portion of the room is being designed specifically for use by the safety valve team. There, students will find two test vessels for air and water tests and multiple pressure relief devices.

For more information on the menu of courses currently offered, please visit Training at www.nationalboard.org.

One wall in the room has been designed as a reference "library" of sorts. Lined with shelving, students will find examples of failed materials, low-water fuel cut-offs, pressure gages, relief valves, pipe fittings, tube rollers and expanders, etc. During breaks students are encouraged to explore the items located within this area while instructors are nearby to answer questions.

Last, is the equipment area. Here students will be able not only to see but to touch items they will be inspecting in the field. Instructors are able to demonstrate inspection techniques and methods and point out specific areas of concern to the class. With nearly 25 items, students will discover a wide range of equipment: from a small jacketed kettle up to a 150-HP. boiler.

Training Courses and Seminars

ENDORSEMENT COURSES

(B) Authorized Inspector Supervisor Course
TUITION: $1,495
August 9 – August 13, 2010

(C) Authorized Nuclear Inspection (Concrete) Course
TUITION: $1,495
August 16 – August 20, 2010

(O) Owner-User Inspector Supervisor Course
TUITION: $1,495
August 9 – August 13, 2010

CONTINUING EDUCATION

(RO) Boiler and Pressure Vessel Repair Seminar
(Two-Day Course)
TUITION: $475
September 13 – September 14, 2010
Hilton Hobby Hotel (Houston, TX)
(Three-Day Course)
TUITION: $725
July 13 – July 15, 2010

(IC) Inservice Commission Course
TUITION: $2,995
August 16 – August 27, 2010

(WPS) Welding Procedure Workshop
TUITION: $795
September 15 – September 17, 2010
Hilton Hobby Hotel (Houston, TX)

TRAINING WRAP-UP *CLASS OF WINTER 2010*

JANUARY, 2010 "B" CLASS
NATIONAL BOARD AUTHORIZED INSPECTOR SUPERVISOR COURSE

FEBRUARY, 2010 "IC" CLASS
NATIONAL BOARD INSERVICE COMMISSION COURSE

JANUARY, 2010 "RO" CLASS
NATIONAL BOARD BOILER AND PRESSURE VESSEL REPAIR 3-DAY SEMINAR

Thirty-One Students Attend First IC Course

The National Board conducted its first Inservice Commission Course (IC) in February. Thirty-one students attended: 12 were owners/users; 10 represented jurisdictions; five were AIAs; and four were self-employed.

The IC course, also offered in August and November, was developed to focus on the duties, responsibilities, and activities appropriate for an inservice inspector. A blend of classroom and hands-on training, the two-week course focuses on the *Body of Knowledge National Board Inservice Inspector Commission Examination*.

Training in China

The National Board conducted two sessions of the New Construction Commission and Authorized Inspector Course (A) in Beijing from March 2 through March 22. The two-week course is mandatory for individuals seeking to perform inspections during construction of boilers and pressure vessels built according to ASME Code. It allows those passing the final exam to receive a New Construction Commission with "A" endorsement, provided all other requirements of NB-263 are also met.

The course in Beijing was taught by National Board staff engineers Bob Schueler and Bob Ferrell as well as by Todd Fleckenstine, a National Board consultant who lives in Shanghai. According to Schueler, 60 students took the course, with 57 passing the examination.

Anthony Scholl, Eben L. Creaser Join National Board

Anthony Scholl has been elected to the National Board representing Ontario. He is employed by Technical Standards & Safety Authority as senior technical specialist, boiler and pressure vessels.

Mr. Scholl served in the Canadian Coast Guard as marine engineering officer from 1980 to 1990. He began working for Technical Standards & Safety Authority in 2004.

He holds National Board Commission No. 11457 and resides with his wife Brenda in Ontario.

Eben L. Creaser has also been elected to the National Board. He works as chief boiler inspector for the province of New Brunswick.

Mr. Creaser has 18 years of experience in the fields of power engineering and industrial mechanics. He began working for the Province of New Brunswick in 1999 as field inspector and became chief boiler inspector in January.

He holds National Board Commission No. 12639 with "A," "B," "N," and "NS" endorsements. Residing in Upper Kingsclear, New Brunswick, he and his wife Heather have three children, Jason, Derek, and Hannah.

Jeff Church Appointed New PVMA Executive Director

On January 1 Jeff Church, who previously served as managing director of CM Services, Inc., The Association Partnership Company, was appointed new executive director of the Pressure Vessel Manufacturers Association (PVMA). PVMA, which has been an association partner of CM Services, Inc. for three years, represents manufacturers of pressure vessels made in accordance with the *ASME Boiler and Pressure Vessel Code* suppliers of materials and services to the pressure vessel fabricating industry.

Amato Re-elected First Vice Chairman; Burpee Elected Member at Large

National Board members re-elected Joel T. Amato as first vice chairman and elected John Burpee as member at large at the 79th General Meeting in San Antonio, Texas.

A US Navy veteran, Mr. Amato was elected to the Board of Trustees in 2006 as member at large. He holds National Board Commission No. 11907 with "A" and "B" endorsements.

Replacing Daniel Price as member at large is John Burpee, chief boiler, elevator and tramway inspector for the state of Maine.

Mr. Burpee holds National Board Commission No. 11667 with an "A" endorsement.

National Board Mourns William H. Dormer Jr. and Leonard P. Zick

With deep sadness the National Board announces the April 1 passing of former National Board member William H. Dormer Jr. and the April 20 passing of Leonard P. Zick.

Mr. Dormer, 83, represented the state of Massachusetts for over 20 years. In 1969 he received National Board Commission No. 6528 with "N," "S," "C," "I," and "B" endorsements. In 1979 he was appointed chief inspector and became a National Board member. He retired in April 1982 before joining National Board field staff.

Mr. Dormer is survived by his wife Ruth, a daughter, two sons, three sisters, two grandchildren, and several nieces and nephews.

Leonard P. Zick, 91, was a former recipient of the National Board Safety Medal Award. He was a retired chief engineer and vice president of the Chicago Bridge and Iron Company. He served two successive terms as chairman of the Boiler and Pressure Vessel Main Committee, encouraging inclusion of rules defining quality control and quality assurance requirements in the ASME Code. He was honored with the Safety Medal Award in 1988 at the 57th General Meeting.

Mr. Zick is survived by his wife of 68 years, Betty; two sons, Paul and Greg; a daughter, Nancy; a sister, Helen; eight grandchildren; and four great-grandchildren.

National Board Bulletin Index by Title

Do You Know...?:

Fall 2009

- Kristi Meriweather, Receptionist, Vol. 64, No. 3, p. 33

Executive Director's Message:

Fall 2009

- The Power of One, David Douin, Vol. 64, No. 3, p. 2

Winter 2010

- SAFETY: Assumed. Never Assured, David Douin, Vol. 65, No. 1, p. 2

Summer 2010

- Gauging National Board's Future, David Douin, Vol. 65, No. 2, p. 2

Feature Article:

Fall 2009

- 2009 Registrations, Vol. 64, No. 3, p. 3
- Basic Weld Inspection – Part 1, John Hoh, Vol. 64, No. 3, p. 18
- Distilling Whiskey in My Old Kentucky Home, Vol. 64, No. 3, p. 20
- "Fastest Kettle in the World" Breaks 103-Year-Old Record, Vol. 64, No. 3, p. 14
- Rayonier #2: The Last Willamette, Vol. 64, No. 3, p. 6

Winter 2010

- 2011 Las Vegas General Meeting Moved to Caesar's Palace, Vol. 65, No. 1, p. 23
- 79th General Meeting in San Antonio, Vol. 65, No. 1, p. 8
- A Day in the Life of Steve Donovan, Vol. 65, No. 1, p. 24
- Check Valve Sizing and Selection, Floyd A. Bensinger, Vol. 65, No. 1, p. 4
- Interview with Training Manager Kimberly Miller, Vol. 65, No. 1, p. 32
- NBIC Celebrates 65 Years of Setting Standards, Vol. 65, No. 1, p. 16
- The Importance of Quality in a Global Nuclear Renaissance, Chuck Withers, Vol. 65, No. 1, p. 20
- Update on Synopsis, Vol. 65, No. 1, p. 3

Summer 2010

- 2009 Report of Violation Findings, Vol. 65, No. 2, p. 3
- 2010 General Meeting Highlights, Vol. 65, No. 2, p. 8
- National Board Technical Scholarship, Vol. 65, No. 2, p. 21
- Nurse Tanks, Titans of the Agricultural Industry, Greg McRae and Stan Staniszewski, Vol. 65, No. 2, p. 16
- Super Boiler: The Next Generation, Curt Bermel, Dan Willems, and Steve Rendos, Vol. 65, No. 2, p. 6
- Proven Wisdom Meets New Technology, Stephen Kleva, Vol. 65, No. 2, p. 18
- Repair or Alteration of Pressure Vessels, Jim Keenan, Vol. 65, No. 2, p. 14
- Top-Ten Boiler and Combustion Safety Issues to Avoid, John Puskar, Vol. 65, No. 2, p. 22
- National Board Registration: A Matter of Value Vol. 65, No. 2, p. 4

Inspector's Insight:

Fall 2009

- Manufacturer's Data Report, Francis Brown, Vol. 64, No. 3, p. 12

Winter 2010

- Basic Weld Inspection – Part 2, John Hoh, Vol. 65, No. 1, p. 14

Summer 2010

- Inspector Ethics, Terry Parks, Vol. 65, No. 2, p. 12

Transition:

Fall 2009

- Call for Articles, Vol. 64, No. 3, p. 32
- Earl Everett Remembered, Vol. 64, No. 3, p. 30
- John F. Porcella and Gilles Lemay Elected New Members, Vol. 64, No. 3, p. 31
- National Board Members Meet in Columbus, Vol. 64, No. 3, p. 31
- NBIC Committee Meets at National Board, Vol. 64, No. 3, p. 32
- New Advisory Committee Member Michael J. Pischke, Vol. 64, No. 3, p. 31
- Translating NBIC into Chinese, Vol. 64, No. 3, p. 30

Winter 2010

- National Board Celebrates 90th Anniversary, Vol. 65, No. 1, p. 39
- New Brunswick Member Dale E. Ross Retires, Vol. 65, No. 1, p. 39
- Paul J. Welch Joins National Board, Vol. 65, No. 1, p. 39
- Ronald W. Spiker, First South Carolina Member Elected, Vol. 65, No. 1, p. 39

Summer 2010

- Anthony Scholl, Eben L. Creaser Join National Board, Vol. 65, No. 2, p. 35
- Jeff Church Appointed New PVMA Executive Director, Vol. 65, No. 2, p. 35
- Amato Re-elected First Vice Chairman; Burpee Elected Member at Large, Vol. 65, No. 2, p. 35
- National Board Mourns William H. Dormer Jr. and Leonard P. Zick Vol. 65, No. 2, p. 35

Perspective:

Fall 2009

- Graft: The New Green Economy, Paul Brennan, Vol. 64, No. 3, p. 4

Profile in Safety:

Fall 2009
- Don Cook, Principal Safety Engineer, State of California, Vol. 64, No. 3, p. 28

Winter 2010
- Ralph Pate, Chief Elevator/Boiler Inspector, State of Alabama, Vol. 65, No. 1, p. 30

Summer 2010
- Gary R. Myrick, Chief Boiler Inspector, State of Arkansas,Vol. 65, No. 2, p. 30

Training Calendar:

Fall 2009
- Vol. 64, No. 3, p. 35

Winter 2010
- Vol. 65, No. 1, p. 37

Summer 2010
- Vol. 65, No. 2, p. 33

Training Matters:

Fall 2009
- Training for the NEW National Board Commissions, Kimberly Miller, Vol. 64, No. 3, p. 34

Summer 2010
- Welcome to the Inspection Room, Vol. 65, No. 2, p. 32

The Way We Were:

Fall 2009
- "Wrong from the First": The Boiler Explosion at Bingley, Vol. 64, No. 3, p. 36

Winter 2010
- The Rainton Boiler Explosion, Vol. 65, No. 1, p. 40

Summer 2010
- Explosion at Tucuman, July 24, 1894, Vol. 65, No. 2, p. 36

National Board Bulletin Index by Author

Bensinger, Floyd A.
- Check Valve Sizing and Selection, Vol. 65, No. 1, p. 4 (Winter 2010)

Bermel, Curt, Rendos, Steve, and Willems, Dan
- Super Boiler: The Next Generation, Vol. 65, No. 2, p. 6 (Summer 2010)

Brennan, Paul
- Graft: The New Green Economy, Vol. 64, No. 3, p. 4 (Fall 2009)

Brown, Francis
- Manufacturer's Data Report, Vol. 64, No. 3, p. 12 (Fall 2009)

Douin, David
- The Power of One, Vol. 64, No. 3, p. 2 (Fall 2009)
- SAFETY: Assumed. Never Assured. Vol. 65, No. 1, p. 2 (Winter 2010)
- Gauging National Board's Future, Vol. 65, No. 2, p. 2 (Summer 2010)

Hoh, John
- Basic Weld Inspection – Part 1, Vol. 64, No. 3, p. 18 (Fall 2009)
- Basic Weld Inspection – Part 2, Vol. 65, No. 1, p. 14 (Winter 2010)

Keenan, Jim
- Repair or Alteration of Pressure Vessels, Vol. 65, No. 2, p. 14 (Summer 2010)

Kleva, Stephen
- Proven Wisdom Meets New Technology, Vol. 65, No. 2, p. 18 (Summer 2010)

McRae, Greg and Staniszewski, Stan
- Nurse Tanks, Titans of the Agricultural Industry, Vol. 65, No. 2, p. 16 (Summer 2010)

Miller, Kimberly
- Training for the NEW National Board Commissions, Vol. 64, No. 3, p. 34 (Fall 2009)
- Welcome to the Inspection Room, Vol. 65, No. 2, p. 32 (Summer 2010)

Parks, Terry
- Inspector Ethics, Vol. 65, No. 2, p. 12 (Summer 2010)

Puskar, John
- Top-10 Boiler and Combustion Safety Issues to Avoid, Vol. 65, No. 2, p. 22 (Summer 2010)

Withers, Chuck
- The Importance of Quality in a Global Nuclear Renaissance, Vol. 65, No. 1, p. 20 (Winter 2010)

Explosion at Tucuman

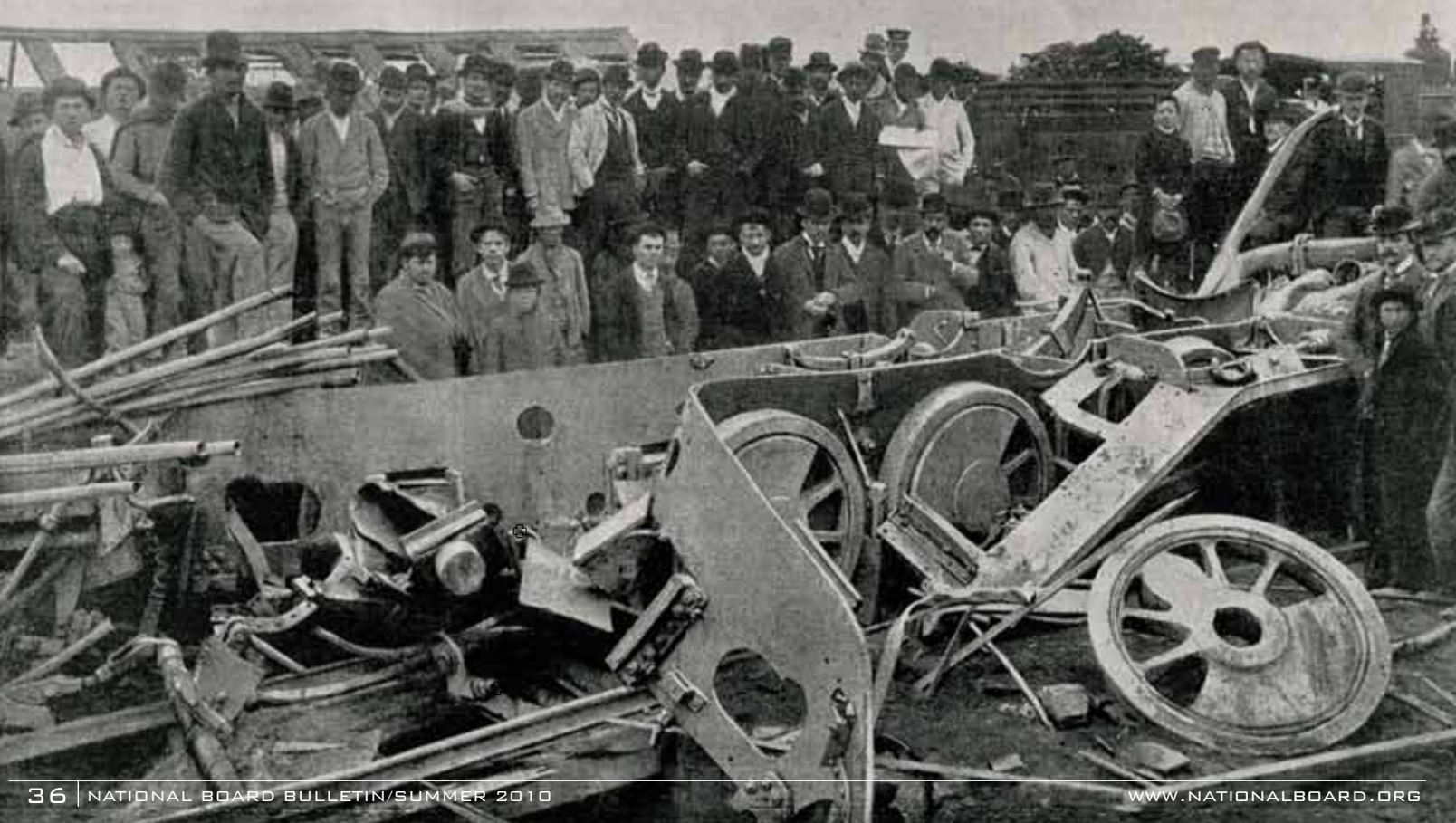
July 24, 1894

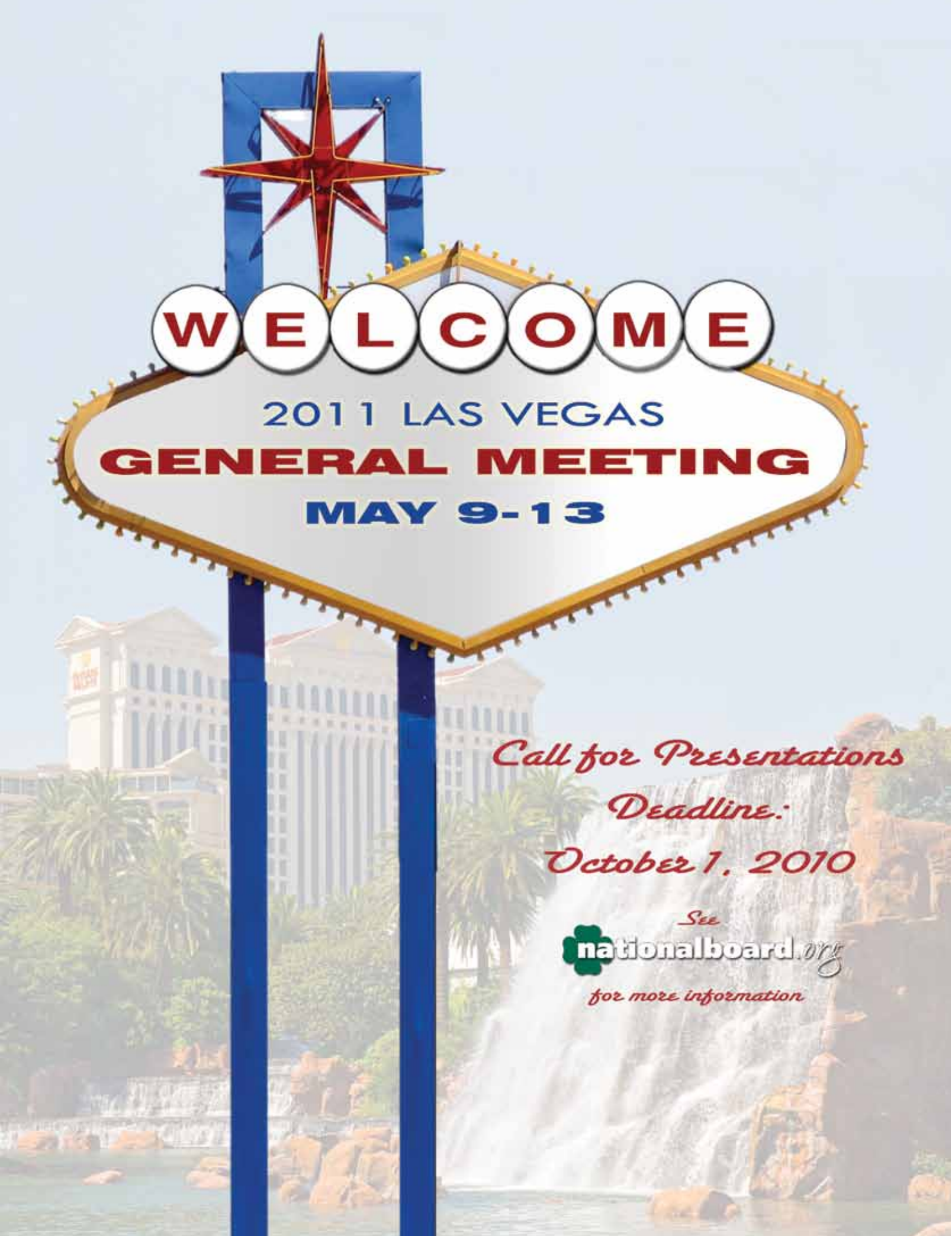
"Mangled beyond recognition"

The town of Tucuman sits in northern Argentina. In 1894 it was but two miles long and one mile wide, yet it held some 30,000 people. On July 24, at 7:20 a.m., a locomotive boiler explosion – which people in more distant parts thought was an earthquake – shook the town, jarring doors and windows and covering roofs with debris. The firebox shell doubled back the engine frame and took the right trailing coupled wheel off its axle before landing 80 yards away from the engine; a boiler plate, with dome attached, landed 250 yards away. Eight men working on the boiler were killed, including six who, as a correspondent wrote in *The Engineer*, "were mangled beyond recognition."

The engine, built in 1889 and "practically as good as new, and the materials [. . .] excellent," belonged to the Argentine government, which was in charge of the railway. Although a few copper stays in the boiler's bottom front sides, as well as the stays joining the firebox to the barrel, had previously given way, the boiler still "easily carried" a normal working pressure of 175 lbs.

An investigation made within an hour and a half after the explosion – "when the boiler plates were still hot" – found the fracture had started at the side bottom corners of the firebox. The accident called into question the government's control of the railway – at the time of the accident only four of 46 locomotives were working – as well as its concern for safety.




WELCOME
2011 LAS VEGAS
GENERAL MEETING
MAY 9-13
Call for Presentations
Deadline:
October 1, 2010
See
nationalboard.org
for more information