ABSA THE PRESSURE NEWS

Alberta Boilers Safety Association

Volume 7, Issue 2, June 2002

ABSA will be hosting the 2002 Annual Conference of the Canadian Standards Association and the Association of Chief Inspectors this year. The conference will be held at the Mayfield Inn & Suites in Edmonton from August 12-16, 2002. Further details will be available from the website.

National Board Seminars Successful

ABSA hosted seminars on heating boilers and the National Board Inspection Code in Edmonton and Calgary this past April. Dr. Ken Lau, Administrator and Chief Inspector opened the sessions which a total of two hundred and twenty-six people attended. We wish to acknowledge the support for these seminars from the National Board of Boiler and Pressure Vessel Inspectors for providing the speakers Mr. Chuck Walters and Mr. Robert Schueler as well as supplying the seminar materials. The presentation on heating plant supervision requirements was given by ABSA power engineer examiner, Mr. Tom Leming. The intent of these seminars was to improve inspection expertise and to promote better safety with respect to heating boilers in our province. Participant response indicated there was a high overall level of satisfaction with the seminars.

Advance Notice

TEMA vs Proposal for Mandatory ASME Requirements for Tubular Heat Exchangers

Shell-and-tube heat exchangers are used in great numbers in the pressure equipment industry. The mechanical integrity of the pressure-carrying components of shell-and-tube heat exchangers is typically determined by the ASME Boiler and Pressure Vessel Code (typically ASME Section VIII Division 1) while the tubesheets and other related components, are designed to the TEMA (Tubular Exchanger Manufacturers' Association) standard.

Since the early 1980's, ASME has been developing Non-mandatory Appendix AA

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Recall

Low-water Cutout Control

As a consequence of an a recent boiler incident, an article on the National Board of Boiler and Pressure Vessel Inspectors web-site, www.nationalboard.org, reminds us of a recall and repair safety notice issued by McDonnell Miller. We wish to acknowledge the National Board for making the information available and the article is reprinted as follows:

"Recently, a low-water condition caused considerable damage to a Scotch Marine-type boiler. This condition may be related to a failure of a McDonnell Miller low-water cutout control. The device is equipped with a manual reset and identified as a McDonnell Miller 150S-M-HD. McDonnell Miller issued a recall and repair safety notice for this and several other models on Nov. 5, 1998.

A complete listing of the recalled items may be obtained on the McDonnell Miller Web site at www.mcdonnellmiller.com. If one of the McDonnell Miller 150S-M-HD recall items is discovered during an inspection, Steve Mueller, McDonnell Miller customer service manager, should be contacted at 773.267.1600.

This recall applies only to the manual reset versions. The standard versions of 150S and 157S are unaffected. All products with a date code of September 1998 or later are also unaffected.

In addition, a simple field repair was performed for units built between September 1997 and August 1998. Those units bear a label attesting to the repair, and are no longer subject to this recall. "

Pneumatic Test

On May 22, 2002, a fatal accident occurred in Singapore involving the failure of a refrigerant receiver during a pneumatic test. Details of the incident may be found at the Singapore Ministry of Manpower's web-site, http://www.gov.sg/mom/newsrm/newsr/news02/020522.htm. In light of this incident, it is appropriate to again remind our readers of the hazards involved in pneumatic tests and to review the precautions that must be taken in conducting such tests.

Due to the large amount of energy stored in compressed gas and the potential hazard of a sudden release of this energy, pneumatic testing should be avoided if at all possible. The data in Table 1 illustrate the comparative risk of a pneumatic test versus a hydrostatic test:

Relative size of pressure vessels containing approximately 2,000,000 ft-lbs of stored energy *(see (b) below)*	
Vessel filled with air at 500 psi; requires a volume of **~18 cu. ft.** e.g. **2 ft. diameter X 6 ft. long**	Vessel filled with water at 500 psi; requires a volume of **~31500 cu. ft.** e.g. **20 ft. diameter X 100 ft. long**
[1]Energy of a pound of three common explosives is: Black powder 960 ft-lbs Smokeless powder 1,260 ft-lbs Nitroglycerin 2,000,000 ft-lbs	
[1] National Board Bulletin, January 1979	

A pneumatic pressure test should only be considered if a hydrostatic test has been carefully reviewed and determined not to be feasible. When pneumatic testing is necessary, there are many critical safety precautions that must be considered. Some important considerations are:

a) Code of construction requirements for pneumatic test (e.g., UW-50 for ASME Section VIII Div. 1).

b) A determination of the energy stored in the test fluid. Calculations may be made based upon the isentropic expansion of a confined gas. This process is described at the University of California/Lawrence Livermore National Laboratory web address:
http://www-training.llnl.gov/wbt/hc/5060/LiquidGas.html

c) Test site preparations and related precautions including removal of unauthorized personnel, isolation of test site and a determination of the restricted distance for the pneumatic pressure test. The restricted distance is the distance from the item(s) under test at which barriers are placed to prohibit access, and the distance at which the test is monitored. A "pdf" file describing a method of determining restricted distance is available from the NASA Glenn Research Center web address:
http://microgravity.grc.nasa.gov/drop2/pdf/restricted_dist.pdf

For the example cited above, with approximately 2,000,000 ft-lbs of stored energy (equivalent to one pound of nitroglycerine) the restricted distance using the NASA Glenn Research Center methodology would be 80 feet.

d) Test medium, pressure source and pressure and temperature ranges during testing.

e) Provision of pressure relief valves, which must be sized to handle the maximum output of the pressure source, to avoid excessive testing pressure.

f) Material specifications of the vessel or system involved in the test. For materials whose resistance to brittle fracture at low temperature has not been enhanced, a test temperature above 60 ºF (16 ºC) should be used to reduce the risk of brittle fracture during the pneumatic test.

g) Precautions taken to prevent gas expansion temperature drop and thermal stresses due to temperature gradients.

For pneumatic testing of pressure equipment within the jurisdiction of the Alberta Safety Codes Act, unless an ABSA-accepted standard pneumatic test procedure is being followed, a job-specific pneumatic test procedure must be submitted to the Alberta Boilers Safety Association before any pneumatic test can be carried out. Guidelines for the preparation of a pneumatic test procedure may be obtained from any ABSA office and completed job-specific pneumatic test procedures have to be submitted to the ABSA Design Survey Department for review and acceptance.

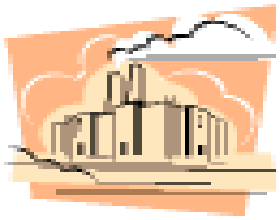
Training Seminar for Pressure Equipment Safety Legislation

Certification of In-Service Pressure Equipment Inspectors will be a mandatory requirement on January 1, 2003 as detailed in the Directive issued by Dr. K. T. Lau, Administrator of the Safety Codes Act for Pressure Equipment. This certification includes successful completion of the Pressure Equipment Safety Legislation (PESL) examination as well as other specific training and experience requirements. Details of these requirements are available on our web site, **www.albertaboilers.com,** under Information Bulletin IB02-002 and under Newsletters Volume 7, Issue 1 and Volume 6, Issue 3.

In response to requests from industry, ABSA has developed a training seminar to assist people who wish to enhance their knowledge and understanding of Alberta legislation governing pressure equipment safety. While this three-day program does not specifically focus on the PESL examination, it does provide instruction on relevant elements of the legislated requirements for pressure equipment safety. It includes presentations providing overviews on the Safety Codes Act, CSA and ASME codes, legislative governing bodies, quality systems, construction, inspections, accident investigations, repairs and alterations and other topics.

The original intention was to offer the seminar at the end of May as previously reported. This was done in April in the form of an internal prototype session. We regret that we were unable to offer the seminar at the end of May, but are pleased to announce the seminar is scheduled for July 3 to 5, 2002 for a selected review group, followed by a session open to the public September 24 to 26, 2002. It is our intent to offer this seminar to the public at the Edmonton office 3 times each year. The course may also be available for custom in-house delivery at your site with sufficient advance notice. Call our Education & Certification group at 780-437-9100 for information on this and future seminars and check our web site for additional information.

Hot Oil Heater



In the fall of 2001, an incident occurred involving a " HOT OIL HEATER " explosion at a Gas Plant. The plant had been shut down for the installation of three new reboilers to the De-Butanizer, De-Propanizer and De-Ethanizer towers.

The reboilers are heat exchangers used to separate the different products (ethane, butane , and propane) from each other. On the tube side is the hot oil and on the shell side is the hydrocarbon product to be separated from the raw natural gas. The actual separation happens in the different towers and is done by temperature and pressure control in each tower. The hot oil and the gas should never come into contact.

The hot oil heater is an atmospheric vessel and not subject to the Safety Codes Act. This hot oil heater was re-started by establishing a flame and slowly heating the oil. This is done remotely from the plant control room. Shortly after startup, an explosion occurred, splitting the hot oil heater. The shell of the heater then hit the boot section of the de-propanizer and knocked over the propane accumulator and the propane ignited causing a second explosion and fire ball.

The ensuing accident investigation concluded that at the initial start-up, through leakage in a reboiler, hydrocarbon product got into the hot oil, expanded from the heat and overpressured the heater.

It has been recommended that any companies with the same or similar type of equipment should have a formal written procedure for the start-up of oil heaters to monitor items such as heater shell belly temperature which will control the heat gradient and show if there any are abnormalities in the process of start-up. Possibility of leakage must also be closely monitored. Sites with hot oil heaters should be inspected by the owners for proper installation and control.

Warning
Furnace Explosion

Furnace explosions continue to be a major contributing cause of boiler incidents in our province. Although the incidents in Alberta are relatively minor in nature, it should be remembered that annually, furnace explosions cause major disasters and fatalities.

A recently obtained report on a furnace explosion on December 9, 2002 which caused two death gives lessons learnt from the incident as:

1. *All personnel who are operating boilers must follow Safe Operating Procedures.*
2. *Authorization must be obtained before introducing changes to the boiler system or procedures.*
3. *Ensure all personnel who are operating boilers receive adequate training and supervision.*
4. *Ensure proper documentation.*

The report further concludes: "*Don't Neglect Your Boilers' Operation Just Because They Operate Automatically*"

We have previously reported on furnace explosions (see Volume 2, Issue 4, August 1997 and Volume 4, Issue 1, March 1999 of the Pressure News). Again, we want to remind our readers that all precautions must be taken to avoid the hazard of furnace explosions.

Notice

An Information Bulletin No. IB02-006 entitled "ASME Code requirements regarding the use of SI units in pressure equipment design registration and shop construction" has been issued. For detailed information please check our web site at: **www.albertaboilers.com**.

(Continued from page 1)
in Section VIII Division 1 in stages, beginning with requirements for tubesheets in U-tube heat exchangers and more recently adding requirements for fixed tubesheet and floating tubesheet heat exchangers. As Appendix AA is a non-mandatory appendix, heat exchangers have generally continued to have tubesheets and other associated components designed and constructed to the TEMA standards.

In addition to wide acceptance of the TEMA Standard by industry (both the users and the manufacturers), it must be noted that the TEMA Standard is adopted by regulation, forming part of Alberta's legislated pressure equipment requirements.

The ASME is now proposing to introduce a Code revision incorporating the Appendix AA requirements into a new Part UHX of Section VIII Division 1, thereby making the currently non-mandatory requirements of Appendix AA mandatory. This will result in the need for all shell-and-tube heat exchangers to be built to the ASME Code and to have to comply fully with all the provisions of the ASME Code for shell-and-tube heat exchangers.

The new Part UHX will likely be published as part of the 2003 ASME Section VIII Division 1 addenda, making the requirements mandatory January 1, 2004. We understand that a white paper is being prepared by the ASME Code Committee to detail the differences between Part UHX and TEMA. Also, a Code Case is being developed to allow for an extension of one year for heat exchangers to be constructed to the TEMA Standard instead of Part UHX under the Code Case

An Information Bulletin IB02-005 on this subject matter has been released. You may obtain a copy from any of the ABSA offices or through www.albertaboilers.com on ABSA's web-site. You may also wish to contact ASME directly for details and future developments on the proposed Code changes.

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