PRESSURE POINTS

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ANNOUNCEMENTS

New Website

HSB Global Standards is pleased to announce the launch of its new interactive website, *www.hsbglobalstandards.com*. The HSB Global Standards' website is the only site to include: code synopses, electronic quick reference guides, and code interpretations. In addition to features that are tailored towards clients' needs, the site provides up-to-date code changes that may impact businesses, thus helping clients avoid costly rework or redesign.

By providing a wealth of information on ASME boiler and pressure vessel codes and other national code requirements, HSB Global Standards new website plays an instrumental role in providing clients and professionals valuable insights into the pressure equipment industry.

Visit *www.hsbglobalstandards.com* today to fully experience the benefits of being an HSB Global Standards client. If you are not a current client, please visit our website to learn more about the information available.

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Online features requested by clients:

- *Annotated Code Interpretations*
- *Automated Inspection Requests*
- *International Import Requirements*
- *PED Updates*
- *Online Bookstore*
- *Technical Bulletins*
- *Code Synopses*
- *Quick Reference Guides*
- *"Ask The Expert"*
- *Online Training*

Synopses Are Now Online

The Synopsis of the 2003 ASME Addenda is now available to clients as a downloadable pdf file on *www.hsbglobalstandards.com.* HSB Global Standards in the past has printed and distributed the Synopses as a free service to clients. We are committed to maintaining this service and will now provide future Synopses on our website instead of by mail.

Final Issue of Pressure Points

This issue marks the final issue of *Pressure Points*. We would like to thank all who have contributed to the newsletter since its first printing in January 1994 as the *HSB Quarterly*. We especially want to thank you, our readers, for your support and feedback over the years. ASME Codes and associated topics will now be placed on the company's website.

ASME CODE NEWS

By Thomas P. Pastor, Vice President, Codes and Standards Group

Questions & Answers

Q My shop fabricates vessels that include some parts for which design rules are not available in Section VIII, Division 1. Depending on the part, we sometimes opt to run a burst test per UG-101(m), and in other cases a displacement measurement test per UG-101(o). Someone recently told us that not all proof test methods [brittle coating test, burst test, strain measurement test, displacement measurement test] can be used with all materials permitted for construction. Is this correct, and if so, which materials are restricted with which tests?

A This statement is correct. The proof tests which are qualitatively based on determining when a part or vessel has yielded [brittle coating test (UG-101(l), displacement measurement test (UG-101(o)] are restricted to materials which have a definitely determinable yield point and the ratio of minimum specified yield to minimum specified ultimate strength is 0.625 or less [$S_y/S_u < 0.625$]. An example of material that has a definitely determinable yield point is the carbon steels [e.g. SA-105, SA-516, etc.] Conversely austenitic stainless steels and nonferrous alloys do not have a definitely determinable yield point, and therefore are restricted to the burst and strain measurement tests only.

ASME Section VIII approved the following interpretation, which will appear in a future volume:

Q May the MAWP of a vessel or vessel part constructed of materials that do not exhibit the type of yield behavior indicated by a "sharp-kneed" portion of the stress-strain diagram (e.g. austenitic stainless steel), be determined by proof tests based on either paragraph UG-101(l) or UG-101(o) of Section VIII, Division 1, when both test methods require the materials of construction to have a definitely determinable yield point?

A No.

FRAUDULENT MATERIALS IN CODE CONSTUCTION

By Jay Cameron, Senior Consulting Engineer, Codes and Standards Group & Daniel Cheetham, Regional Supervisor, Code Services

Introduction

The primary issue is fraudulent material – material that is not what it is stated to be. For the purpose of this article, "fraudulent material" is defined as material that is certified to a particular specification, grade and class/condition/temper, but does not meet the specification requirements for such. Of ultimate concern is safety of the pressure equipment. This article is intended to propose actions to identify potentially fraudulent material and prevent fraudulent material from being used in ASME pressure equipment.

The problems with fraudulent material have not gone away since the "Chinese flange" episode 10 years ago. In fact, the issue may be getting worse. With the global economic pressures to produce the cheapest product quickest, pressure equipment manufacturers (Manufacturers) may be succumbing to the "lowest price supplier" syndrome – where the supplier that gets the contract is decided only on the price of the product.

In the mid-to-late 19th century, boiler explosions were a common occurrence. This unfortunate fact is what led to the development of standards for the safe construction of boilers, such as The Hartford Standards and ASME Section I Power Boilers. In these early standards, it was identified that material quality was the first and foremost issue that was at the root of the boiler explosions that were killing up to 50,000 people per year. Thus, ASTM International (originally called The American Society for Testing and Materials) was organized in 1898. ASME included material specifications in their original boiler code in 1914. The premise was that there is no amount of subsequent effort that can correct an inherently defective material – one must start with the right ingredients in order for the "recipe" to work out right.

Actions to prevent fraudulent material

In a perfect world there would be no such thing as fraudulent material, and therefore no need to spend resources trying to detect and correct such material. Unfortunately, history teaches us that we do not live in a perfect world, and short of making the material themselves, the only recourse for the Manufacturer is to be more vigilant in the purchasing of their materials. This is accomplished through the following means: specific and explicit purchasing documents, discriminating selection of suppliers, and/or vendor audit.

The first step in proper material quality control is embodied in the adage, "You get what you ask for." The purchaser has to be specific and explicit in the purchase requisition and purchase order. Engineering's purchase requisition and Purchasing's purchase order must state the material specification(s) and grade(s)/class(es)/condition(s) that are acceptable for the job.

Fraudulent material is defined as material that is certified to a particular specification, grade and class/condition/temper, but does not meet the specification requirements for such.

As far as the explicit part, most specifications or their general specifications have non-mandatory "ordering information" in the beginning of the specification. It would be beneficial to both purchaser and supplier to use as much of this information as is appropriate for the job.

Many manufacturers in many industries will have a select list of approved vendors for products or services. This practice should be encouraged. Another method quite frequently used to minimize material fraudulence is a vendor audit. The purchaser can conduct the vendor audit, but more commonly it is done by a third-party organization. This audit can be on a contract basis for an individual supplier or can be formalized in an ASME Quality System Certificate for Nuclear Material Organizations, ISO 9000 certification, or equivalent.

Actions to identify fraudulent material

Since, as stated in the Introduction in this article, fraudulent material can be paraphrased as material that does not conform to the specification's requirements, identification of fraudulent material can be performed by checking against the specification. This can be done by one or more of the following ways: paper certification, marking certification, or purchaser check analysis.

For those materials for which paper certification is required by the material specification or requested by purchase order, a review of the paperwork may reveal fraudulent material by checking all the minimum information that must be on the certification.

In those cases where the material specification does not require paper certification, marking certification should be used as a method for potentially identifying fraudulent material by checking all the minimum information that must be marked on the material.

A semblance of reasonableness needs to be injected here also. There are many more instances of honestly incorrect paperwork or marking than there are fraudulent cases. The improper information can be due to misunderstanding of the specification requirements, failure to use the requirements of the general specification, omission or a variety of other quite honest

mistakes. The normal NCR (non-conformance report) procedures would be followed assuming there would be a reasonable response from the supplier.

A secondary method of segregating fraudulent material is a purchaser product check analysis. This check is done with varying frequency and thoroughness at the option of the purchaser. Almost all requirements of the material specification can be checked at the purchaser's option.

Conclusions and Recommendations

This article has itemized three methods to proactively minimize the possibility of fraudulent material: specific and explicit purchasing documents, discriminating selection of suppliers, and vendor audit. Three methods of verification have also been suggested for use at material receipt: paper certification review, marking certification review, and purchaser product check analysis. It is strongly recommended that Manufacturers consider a combination of these preventive and verification methods to minimize the possibility of fraudulent material being installed in pressure equipment.

HEAT RECOVERY STEAM GENERATORS

By Nino Olivares, Senior Code Consultant, Codes and Standards Group

Over the past year, heat recovery steam generators (HRSGs) top the list insofar as the number of technical calls we receive. This is not surprising, since approximately 98% of new power plants in the U.S. will be a combined cycle unit. The driver behind this surge in HRSG are efficiencies in the range of 55 - 58% and the relatively short lead-time from project start to commercial operation. Typical projects are going commercial in 18 - 24 months after project start and sometimes quicker. Another aspect that makes this type of plants attractive is its design, operating flexibility and low environmental impact. Many plants are being set up with the larger steam turbines that can accept steam output from 2 - 4 HRSGs. This plant setup gives owners the ability to take GT/HRSGs off line based on demand without having to go through steam turbine warm up time when bringing the unit back on line. For the same reason that utility owners are attracted to combined cycle plants in the first place (operating flexibility), unique engineering challenges arise for the manufacturer's of HRSGs.

In our November 2000 Pressure Points, we pointed out that ASME had formed a new task group on heat recovery steam generators. This task group was primarily established to examine a number of technical and administrative issues unique to HRSG construction, and to make recommendations for possible code revisions. Some of the subject areas currently identified are: cyclic service requirements, materials, relieving devices, manufacturer's data report & stamping, jurisdictional issues, fabrication issues, definition for fired vs. unfired, operational issues, and water level indicators.

In this article we will attempt to explore some of the challenges faced by HRSG manufacturers in designing, fabricating and testing HRSGs and share some of our observations and experiences gathered from inspections of these units during fabrication and erection.

Design Issues

Cyclic Service

The majority of HRSGs will operate under cyclic conditions during startup, shutdown and load changes. These cyclic conditions will introduce thermal stresses, particularly where transitions occur in thick walled pressure parts, which could eventually lead to fatigue damage or failure. Section I of the ASME B&PV Code and on occasion Section VIII-1 are the standards commonly used to design and fabricate an HRSG. Section I does not explicitly address cyclic condition as a design consideration in its rules. Conversely, Section VIII-1 addresses the issue through paragraph UG-22. Although UG-22(e) of Section VIII-1 requires "cyclic and dynamic reactions due to pressure or thermal variations, etc." be considered in the design of a pressure containing parts, the shortfall is that it provides no guidance on how to address and evaluate the condition. Some manufacturers have opted to use Section VIII, Division 2 to initially assess the need for a fatigue evaluation (AD-160), and to perform the fatigue analysis when required. Any assumptions regarding the load cycles used in the fatigue evaluation need to be passed on to the owner/operator so that their operating procedures stay within these parameters.

Another approach employed to improve cyclic service is the use of high grade material that compliments the service condition. By using materials with higher allowable stresses, thermal stresses can be reduced as the wall thickness of pressure retaining parts become thinner. Restraint due to thermal expansion is another source of thermal induced stresses; this condition can be improved by incorporating in the design support system for hanging tube harp assemblies flexibility that minimizes stresses caused by thermal expansion.

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Heat Recovery Steam Generators *(continued from previous page)*

Attachment Welds

Many HRSG manufacturers incorporate features in their design that improve fatigue performance. One example would be specifying full penetration welds throughout the design with emphasis on weld profile with adequate thickness transitions and radii at sharp directional changes. Paying attention to weld joint design and workmanship goes a long way towards increasing the fatigue life of the unit. Partial penetration attachment welds, although acceptable for some applications, e.g., tube-to-header joint, are not advisable since they are poor performers in fatigue service.

One of the challenges with specifying full penetration welds, especially for tube-to-header joints, is the limited accessibility. With limited access to the joint, proper fit-up and welding of the components becomes a huge challenge. Absent of vigilant inspection and well-trained and properly qualified welders, these joints have proven to be one of the more problematic areas manufacturers face in fabricating harp assemblies for HRSGs.

Safety Valve Requirements

From our perspective there are numerous issues relative to complying with Section I safety valve rules for HRSG applications. For starters, HRSGs often have sections with operating parameters that may require different types overpressure protection devices, e.g., water relief, steam relief. One of the frequently asked questions according to one manufacturer is sizing relief valves. For example, HRSGs stamped Section I, sizing relief valves for an economizer is governed by PG-67.2.6 which has the sizing criteria based on steam. This is fairly accurate for low pressures but not high pressures. Typically when this valve lifts, it does not relieve steam but relieves water which flashes to steam. Water is not compressible so small changes in temperature can cause the valve to lift, pressure is relieved immediately and the valve closes. Without a cushion of steam, the valve slamming shut often damages the seat after a couple of lifts.

Another frequently asked question is may UV stamped relief valves be used in Section I stamped economizer. Unfortunately, UV stamped valves are not permitted for use in Section I applications per Interpretations I-92-38 and I-92-42. The only way to use a Section VIII valve would be to classify the entire economizer as a Section VIII component and then invoke Code Case 1855. The problem with this approach is that some Jurisdictions do not accept Code cases. As highlighted in the beginning, this is one of many issues that the HRSG task group will be exploring for possible technical and/or administrative solution to the problems inherent to HRSG. Future posting on our website, www.hsbglobalstandards.com, will provide updates on new developments to solve the challenges faced by manufactures and assemblers of combine cycle plants.

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