Clark·Reliance CORPORATION e-news

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Welcome to the Clark-Reliance® August 2007 issue of e-news. This informational newsletter is designed to help you find solutions to your most difficult application and processing problems.

## Drum Level Safety and Section 1 of the ASME Boiler Code

*James W. Kolbus, Product Manager, explains what operators/users should know about drum level safety and Section 1 of the ASME Boiler Code.*

The recent trend of accidents and injuries has been on the rise. In 2003, the Incident Report issued by the National Board indicated 90 injuries from boilers and pressure vessels (a 300% increase from the prior year). Furthermore, most of the recorded accidents were due to low water conditions, poor maintenance practices, or operator error. This is due, in part, to the neglect or the lack of the drum level instrumentation installed at a growing number of plants. Over the years, my colleagues and I have observed many installations with code violations, and we have advised the personnel at these plants to make the necessary corrective actions.

Section 1 of the ASME Boiler Code has very specific minimum requirements for "Direct" and "Indirect" level indicating instruments, which must be installed on every Power Boiler that is manufactured to this code. In addition, all Boilers operated up to 400 PSI pressure must have at least one "Direct" reading water gage glass in service at all times. Boilers operated at pressures greater than 400 PSI may have either two "Direct" reading water gage glasses in service or one water gage glass (which may be "valved-off" and must be kept in serviceable condition), only if there are two Independent Indirect type level indicating devices on continuous display for the operator.

There seems to be increased confusion in the marketplace, between the various types of level indicating instruments and the minimum code requirements among users, specifying engineers and sales people with limited products to offer. The only types of "Direct" Indicating (Reading) devices are gage glasses, which display the water level for the operator to view through glass. The various types are as follows:

• Tubular Glass for pressures up to 250 PSI, which displays the meniscus (water level)

• Prismatic (also known as reflex) for pressures up to 350 PSI, which displays black color up to the meniscus (water level) and white above the level.

• Flat Glass (also known as transparent) for pressures up to 2000 PSI, which display the meniscus line (the water below and steam above the level both appear clear in color. For this reason, the Code requires gages with multiple sections to overlap by a minimum of 1 inch, in order to prevent the loss

of visibility of the actual water level

• Ported (Glass discs) gages display green color for water and red color for steam, by utilization of the principle of light refraction. This is accomplished by strategically introducing two color sources into glass discs that are opposed by 160 degrees. The Code requires this type of gage to be properly installed with the light fixture, in order to create the appropriate distinction, between indications for water and steam.

These Direct reading level instruments are designed to permit the operator to view the actual water level with no interface mechanisms or sensors, which could misrepresent the actual drum level. It should be noted that Tubular glass provides the least amount of safety, due to the industry standards for glass thickness. However, the Prismatic and Flat Glass types provide approximately a 3 to 1 ratio between the thickness of the glass and the width of the sealing gasket.

In addition, it is widely recognized that actual drum level may be slightly higher than a level indicated in a gage glass on high pressure applications. This is due to minor changes with the density of the water in the gage glass, when compared to the slightly higher temperature water in the boiler drum.

There are several types of "Indirect" Indicating devices, which include Conductivity Probe Type Level Indicators, Differential Pressure Transmitters, Magnetic Level Indicators, and Guided Wave Radar. Conductivity Probe and Differential Pressure type indicators have been the most widely specified technologies. While Differential Pressure transmitters provide a fine resolution of the drum level for input to control valve actuation, Conductivity probe systems provide multiple independent sensors in a chamber at specified locations, which provide reliable level indication with typical safeguards against single component failure. Operators report improved confidence with independent "stand alone" Conductivity type instruments with an LED level indicator, which brightly illuminates the level in typical control rooms.

An additional type of Indirect reading instrument is a Magnetic Level Indicator, which is based on float technology with magnetic coupling of the indicator. This type of instrument offers options for remote indication output and point level switches. Magnetic Level Indicators will be recognized in Subsection PG-12 in the 2007 edition of the Code, with an application pressure limit of 900 PSI. Users should consider the quality of their boiler water, if considering this type of instrument. Since the Boiler Code does not distinguish between new and old Boilers and their water chemistry, a high amount of iron particulate in the boiler water may cause operational inaccuracy, if an excessive amount of particulate builds up on the float. Magnetic Level gages are often applied to Feedwater heaters, which tend to be high reliability applications, due to the clean water environment of those applications.

Some users have mistakenly violated the Code by replacing water gage glasses with Magnetic level gages. While this is a common practice in the petrochemical industry, the ASME Boiler Code requires a Direct Reading Water Gage Glass on every Power Boiler that is manufactured to meet Section 1 of the Code. The decision to eliminate all Direct reading water gage glasses for this application becomes an immediate violation.

Guided Wave Radar technology is among the newest technologies, but is not yet widely accepted by the industry. This is due to operational irregularities among the various manufacturers, field application data programming requirements and mystical perceptions of an instrument that has to calculate the level, based upon the interpretation of measurement data.

In addition, proper maintenance procedures, as outlined by the original equipment manufacturer must be followed, in order to maximize the service life of the instrument, as well as maintaining any applicable regulatory agency approvals. The introduction of inferior components and the possibility of incorrect repair procedures may have a detrimental effect on the level indicating instrument. Cross training between shift personnel will also reduce the risk for maintenance errors.

To achieve the optimum safety for the operation of the boiler and plant personnel, any individual responsible for the selection, specification, and replacement of a level instrument on a Section 1 Power Boiler must understand the applicable Code requirements and the instruments that are being used and specified in their plant. It is always wise for management to consult with the insurance carrier for their plant, in order to verify if they require any additional instrumentation, beyond the code minimum requirements.

In summary, there are many plants that perform impeccable maintenance on these instruments, while others are in serious condition. By conducting a survey of the existing drum level indication instrumentation and consulting with the operators, the user can identify and rectify any instruments of concern for a safer operating boiler room atmosphere.

Reference: *ASME Boiler Code - Section 1*. National Board of Pressure Vessels.

# Visit Clark-Reliance at Upcoming Trade Shows


See Clark-Reliance products up-close at a 2007 trade show. Learn more about our company and our wide range of products from the expert staff on hand at our trade show booths. Clark-Reliance will exhibit at the following shows:

Turbomachinery Symposium, Sep.10-13 in Houston, TX. See Clark-Reliance at booths 301 and 303.

ISA Expo 2007, Oct.2-4 in Houston, TX. See Clark-Reliance at booth 2642.

POWER-GEN, Dec. 11-13 in New Orleans, LA. See Clark-Reliance at booth 4541.

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Clark-Reliance Corporation is a multi-divisional corporation serving the petrochemical, refining and power generating industries. Each of its product lines falls under one of three operating group names:Clark-Reliance Instrument and Controls Group, Clark-Reliance Filtration Equipment Group and Clark-Reliance Filtration Elements Group. Clark-Reliance Products and Brands include: Anderson Separator,Clark Steam Specialties, Clark-Reliance, HYCOA (Hydraulics Company of America), Jacoby-Tarbox, Jerguson Gage and Valve, Magne-Sonics, NFS (National Filtration Systems), Reliance Boiler Trim, Magnicator, Electro Eye-Hye, Simpliport, LevelStar, UniGlas, UniShield, Levalarm, Enduratrap, Levelmax and Hi-ef Separations.



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