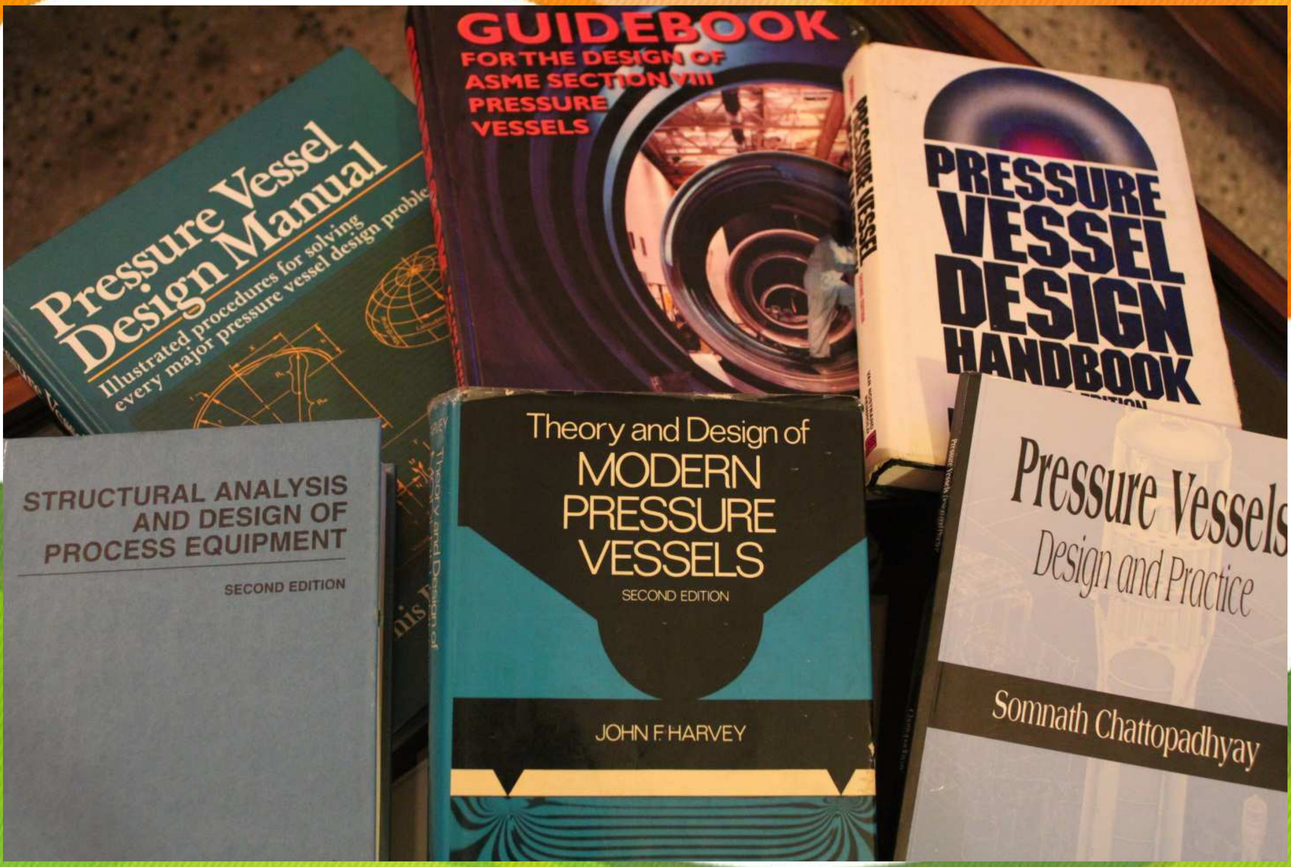
Pressure Vessel Newsletter

Volume 2014, August Issue



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In this issue…

REGULAR FEATURES

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From The Editor's Desk:

India celebrated its 68th independence day on 15th August. Looking back, it is indisputable that great advances have been made in all fields since independence. However, one can almost sense the disappointment that the potential has been only partially realized. Especially in the manufacturing sector. A good friend in the process equipment industry places the blame for the ills facing the manufacturing industry on the purchasing community. The terms of contract are not honoured, the manufacturer is forced to stock material much ahead of schedule, the finished product is lifted several months after the contract date, the payment is held up for no or flimsiest of reasons.. the list is indeed long. Make no mistake – these are world class manufacturers. The quality of their products are second to none. Sooner or later they will find markets overseas that will pay for their products; meanwhile, however, the domestic industry will suffer if they do not realize their folly soon enough.

How often have we heard the expression, "A system is only as strong as its weakest element"? Not surprisingly, the expression is equally applicable to pressure vessels as well. SomnathChattopadhyay in his book "Pressure Vessels: Design and Practice" (see the cover page) writes "… 80% of all pressure vessel failures are caused by highly localized stresses associated with these "weak link" construction details. It is therefore apparent that the stress concentrations at vessel nozzle openings, attachments, and weldments are of prime importance, and methods for minimizing them through better designs and analyses are the keys to a long pressure vessel life. Control of proper construction details results in a vessel of balanced design and maximum integrity."

We would be well advised to heed the author's sermons, and seek out the weak links and strengthen them through proper designs. They are all too often either overlooked or improperly analyzed as the Code provides very little guidance in this matter.

EN 13445: UNFIRED PRESSURE VESSELS

The Pressure Equipment Directive (PED) of the EU sets out the standards for the design and fabrication of pressure equipment generally over one litre in volume and having a maximum pressure more than 0.5 bar gauge. Pressure equipment means steam boilers, pressure vessels, piping, safety valves and other components and assemblies subject to pressure loading.PED has been mandatory throughout the EU since May 30, 2002. The set out standards and regulations regarding pressure vessels and boilerssafety is also very close to the US standards defined by the American Society of Mechanical Engineers (ASME). This enables most international inspection agencies to provide both verification and certification services to assess compliance to the different pressure equipment directives.

EN 13445 is a standard that provides rules for the design, fabrication and inspection of pressure vessels. It was introduced in 2002 as a replacement for national pressure vessel design and construction codes and standards in the European Union, and is harmonized with the Pressure Equipment Directive (PED). New updated versions of all parts were published between 2009 and 2012. The standard consists of seven parts as listed below:

EN 13445-1: Unfired Pressure Vessels – Pat 1	General
EN 13445-2: Unfired Pressure Vessels – Pat 2	Material
EN 13445-3: Unfired Pressure Vessels – Pat 3	Design
EN 13445-4: Unfired Pressure Vessels – Pat 4	Fabrication
EN 13445-5: Unfired Pressure Vessels – Pat 5	Inspection and Testing
EN 13445-6: Unfired Pressure Vessels – Pat 6	Requirements for Design and Fabrication of Pressure Vessels and Pressure Parts Constructed from Spheroidal Graphite Cast Iron
EN 13445-7: Unfired Pressure Vessels – Pat 7	Additional Requirements for Pressure Vessels of Aluminum and Aluminum Alloys

Parts 7 and 9 do exist but they are merely technical reports.

Part 3 of EN 13445 gives the rules to be used for design and calculation under internal and/or external pressure (as applicable) of pressure bearing components of Pressure Vessels, such as shells of various shapes, flat walls, flanges, heat exchanger tubesheets, including the calculation of reinforcement of openings. Rules are also given for components subject to local loads and to actions other than pressure.

For all these components the DBF (Design by Formulae) method is generally followed, i.e. appropriate formulae are given in order to find stresses which have to be limited to safe values. These formulae are generally intended for predominantly non-cyclic loads, which means for a number of full pressure cycles not exceeding 500.

However general prescriptions are also given for DBA (Design by Analysis) which can be used either to evaluate component designs or loading situations for which a DBF method is not provided, or, more generally, as an alternative to DBF.

Methods are also given where a fatigue evaluation is required, due to a number of load cycles being greater than 500. There are two alternative methods: a simplified method based on DBF (valid mainly in case of pressure variations) and a more sophisticated method based on a detailed determination of total stresses using, for example, FEM or experimental methods. This can be used also in the case of variable loads other than pressure.

For certain components (such as flanges and tubesheets) also an alternative DBF method (based on limit analysis) has been provided; the choice of which method has to be used in each particular case is left to the Designer.

Part 3 is organized as follows:

1) Scope
2) Normative references
3) Terms and definitions
4) Symbols and abbreviations
5) Basic design criteria
6) Maximum allowed values of design stress for pressure parts
7) Shells under internal pressure
8) Shells under external pressure
9) Openings in shells
10) Flat ends
11) Flanges
12) Bolted domed ends
13) Heat exchanger tubesheets
14) Expansion bellows
15) Pressure vessel of rectangular section
16) Additional non-pressure loads
17) Simplified assessment of fatigue life
18) Detailed assessment of fatigue life
19) Creep design
20) Design rules for reinforced flat walls
21) Circular flat ends with radial reinforcement ribs

The standard also includes several normative (mandatory) and informative (nonmandatory) annexes that address additional topics not covered in the main body.

<u>Comparison of EN 13445 with ASME Section VIII Code</u>

1) Thickness differences in most cases are due to different allowable stresses. These thickness differences result in small material cost differences.

2) Thickness differences due to different allowable stresses occur mainly in the cryogenic, ambient, and medium temperature regime (up to approximately 200^{o}C).

3) Thickness differences sometimes result in different PWHT requirements; and can result in possibly decisive cost differences.

4) Savings in the material cost from EN 13445 is partly offset by the increase in destructive testing requirements.

5) Non-destructive testing requirements are similar for EN 13445 and for ASME Section VIII; and the related cost differences are small.

6) Destructive test (test coupons) requirements are higher for EN 13445 design.

7) ASME fatigue results are considered un-conservative for welded regions. They are not in conformity with PED requirements.

Source: Wikipedia; Comparative Study – EN 13445 and ASME Section VIII, Division 1 and 2 *by Reinhard Preiss and Josef L. Zeman*

CONTROLLING VESSELS AND TANKS

Introduction

It would seem that controlling a vessel should be a very simple matter -- They don't really do anything! But then, if they didn't do anything why are there so many of them? And why do they have so many different names? Going through a typical set of Piping and Instrumentation Diagrams (P&IDs),we see the following vessels:

- Degassing Drum
- Gas Separator
- Storage Tank
- Feed Flash Drum
- Reflux Accumulator
- Day Tank
- Surge Drum
- Suction Scrubber
- Slug Catcher
- Lube Oil Separator
- Head Tank
- Deaerator

Although each of these is essentially a simple vessel or tank without any special internal structure, each serves a different purpose. Once it is clear what the purpose of a piece of equipment is, and how it functions, it will also be clear how to control and protect it. Different purposes require different controls. In this article, we will discuss surge tanks, suction scrubbers and steam drums.

Surge Tanks

The most common function of a vessel or tank is to match two flows that are not identical in time but are expected to average out over the long run. Take a feed surge drum, for example. Flow into the unit is more or less steady but is subject to interruption. The flow to the processing unit should be as constant as possible, avoiding sudden change. Nevertheless, it, too, may be subject to interruption due to downstream conditions.

The purpose of the surge drum is to maintain sufficient inventory to feed the process and to maintain sufficient void capacity to continue receiving feed as it arrives. Clearly the tank must be large enough to accommodate any normal discrepancies between input and output over a reasonable period of time. Between the upper and lower bound, the exact value of the level does not matter.

Two separate control parameters are implied: Level and flow. Level control is no problem. A high gain, level controller connected to a valve at either the inlet or the outlet will maintain the level very accurately at its setpoint. The only problem with this approach is that it absolutely defeats the purpose of the vessel. The same effect would be achieved by blocking in the vessel and bypassing the inlet directly to the outlet.

To control flow alone is also quite simple. A flow controller at the outlet, properly tuned, will maintain a steady flow to the process. Unfortunately, there is nothing to make this flow equal to inflow. It will not even equal the average inflow unless there is something to make it do so.

What we need is an instrument that measures the accumulated error between inflow and outflow. The tank itself is that instrument!

$$\text{Level} = \text{Starting level} +$$

$$\text{Level} = \text{Starting Level} + \int (\text{Inflow} - \text{Outflow})\, dt \,/\, \text{Tank Area}$$

(To a process controls engineer, every piece of equipment is just a big, non-tuneable instrument!) The level transmitter only transmits the process value to the control system. If we now cascade the output of the level controller to the flow controller, we have a system that has one process variable: Accumulated flow imbalance. It has only one point of control: Outflow to the process.

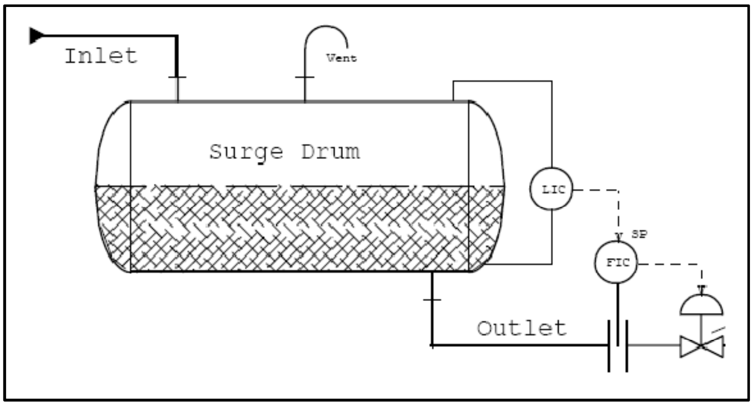


Figure 1: Surge Drum Control

To start this simple process:

- Fill the tank about half full.
- Give the level controller the current level as its set point. (PV tracking does this automatically.)
- Switch the flow controller to automatic with an estimated average flow as its setpoint.
- Switch the flow controller to cascade.
- Switch the level controller to automatic.

The control system will keep the flow "constant" but that constant varies in response to the imbalance between outflow and inflow. It is not important that the initial estimate of average flow be exact. A low guess will result in the tank level rising a little. A new, higher, estimate will result and the outflow will be adjusted accordingly. In the long term the average flow out is not an independent variable at all. It will be exactly equal to the average flow in. This can be accomplished at any arbitrary tank level. The level setpoint is based on the operator's estimate of the nature of the flow interruptions and whether the most probable upset will require additional flow or void capacity.

Should a pump be necessary to transfer the liquid from the vessel to its destination, it should be placed between the vessel and the flow measurement.

Surge drums are sometimes used for gas. The abrupt flow variations of a Pressure Swing Absorption (PSA) unit, for example, often need to be smoothed out before the tail gas can be introduced into a down-stream process. In these cases, pressure takes the role that level has in a liquid process. That is, a pressure/flow cascade is the appropriate solution.

Tuning Surge Tank Controllers

Since the exact level of a surge drum is not important, the controller can be tuned very loosely allowing the level to rise and fall in response to any short term imbalances. This exactly serves the purpose of the surge tank; tight tuning defeats it. There is a non-linear control algorithm which specializes in the type of loose control required by surge tanks. One common name is the "gain on error squared" controller. Figure 2 shows its characteristic. The controller responds to small errors with a small gain; it responds to large errors with a large gain. This means that in the vicinity of the setpoint, the controller allows the level to drift freely and the flow to remain almost constant. With luck, the level will average out again before the deviation from setpoint is too great. If the level changes far from the setpoint so that the danger of running out of capacity exists, the controller responds with a strong signal and rapidly brings the level back to near setpoint.

Another form of non-linear controller is also available: The notch or gap controller. This algorithm has the gain divided into three segments by two break points. The middle segment, on either side of the setpoint, has a low gain to avoid excessive action while the outer segments have a higher gain for a rapid return. It has the advantage of allowing the user to set the breakpoints and gains below the setpoint differently from those above. Its disadvantage is that it has four tuning constants instead of only the one found in the gain-on-error-squared controller. Some gap controllers have a zero gain in the centre segment. This is totally useless as the controller will never bring the level back to the setpoint. (No gain, no action.) Instead it will tend to use either the upper or lower breakpoint as its effective setpoint and return the level with a high gain.

It should be noted that for a controller using a velocity algorithm an abrupt change in gain does not imply an abrupt change in valve position, only a change in the rate of movement. This function is more difficult to implement with controllers using the position algorithm as the controller has to be re-initialized with every gain change.

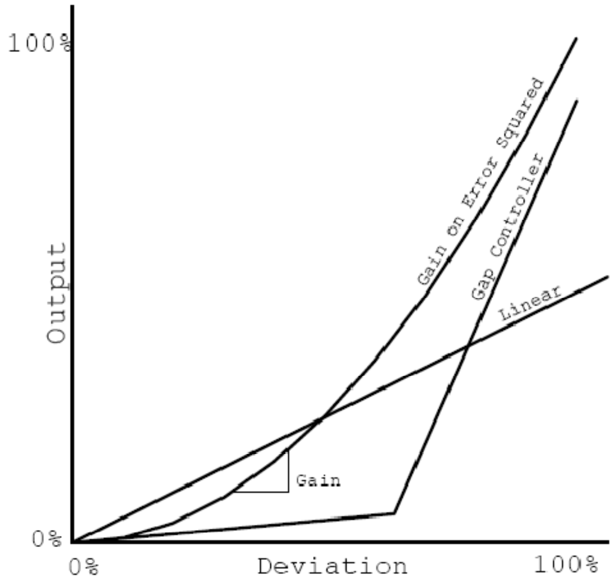


Figure 2: Gain vs Deviation for Three Types of Controllers

A simple proportional mode controller is sufficient for many surge drum applications. A slow integral may be used to bring the level back to the setpoint during a prolonged change in flow rate, but it should be turned off if cycling results. Do not use the derivative mode! Besides amplifying noise, derivative provides tight control by cancelling out the integrating capacity of the tank and thus defeating its purpose. A tuning rule I have heard of, but have not tested myself is

$$K = \Delta F/F * \Delta L/L$$

Where K = Controller proportional gain

$\Delta F/F$ = Proportion of flow variations in the uncontrolled flow

$\Delta L/L$ = Proportion of level available for surge. This is the distance between the level setpoint and the nearest alarm.

This formula attempts to put the loosest level control consistent with keeping the level away from the alarms. There is a catch, however: It is necessary to predict the amount of flow variation to be expected in the future. Of course it is also necessary to do this to a certain extent when the vessel is sized.

Suction Scrubbers

A compressor suction scrubber is an example of a vessel whose purpose is to separate, collect, and dump relatively small quantities of liquid from a gas stream. The following conditions generally apply:

- Precise level control is of no value.
- The liquid flows to some form of drain.
- Smoothness of liquid flow is of no value.
- The average liquid flow is quite small.
- The pressure differential across the valve is high.
- Relatively large slugs of liquid occur occasionally.

The last three conditions would result in a valve that is usually operating near its seat with a high ΔP. It would experience severe erosion resulting in a short, unhappy life. The solution is to control the valve in on/off or "snap acting" mode. There are several ways to accomplish this. The simplest is to tune the controller to a very high gain. This would cause the valve to spend almost all its time in the full open or closed position. Unfortunately the high-gain controller would also try to maintain accurate level control by rapidly switching the valve between these extreme positions. Any saving in seat erosion would be cancelled by a high rate of stem and packing wear. The same response can be achieved by using a simple level switch connected to the control valve via a solenoid.

Selecting a switch with a broad deadband results in a great improvement. The valve now remains fully open until a significant reduction in level is achieved. It then remains fully closed until the level substantially rises. With this arrangement it is possible for the valve to have both long life and peak capacity. Transmitters are more reliable instruments than switches and also demand less maintenance. If a transmitter is used the deadband function is accomplished through logic in the control system. This would have the added advantage of allowing the operator access to the high and low setpoints. In some ways the suction scrubber acts as the exact opposite of a surge drum -- it collects slow dribbles of flow and releases them as intermittent surges.

Sometimes there is a third option -- specialized liquid dump valves. These behave somewhat like steam traps in their ability to pop open in the presence of liquid and snap shut in the presence of vapour. Since they are not general purpose instruments, it is best to use them only when there is an opportunity to test their performance; the vendor should be consulted. These devices might be very cost effective in packaged equipment such as on the discharge receiver of an instrument air compressor.

STEAM DRUMS

The purpose of a boiler steam drum is to provide space in which the water and steam may disengage. Since the drum serves at high pressures and temperatures, perhaps up to 3600 psi and 1000ºF (25 MPa and 540ºC), it is expensive to manufacture and there is considerable economic incentive to keep it as small as possible. The techniques of boiler feed water (BFW) control can be applied whenever extremely tight level control is a requirement.

The level of the feedwater in the steam drum must be kept above the bottom of the drum or a catastrophic explosion may result. It must also be kept below the steam outlet or liquid water will be carried over. Water droplets will damage superheater tubes, turbine blades, and other equipment. The diameter of the steam drum, and hence its cost, is determined largely by the ability of the control system to keep the water level within bounds.

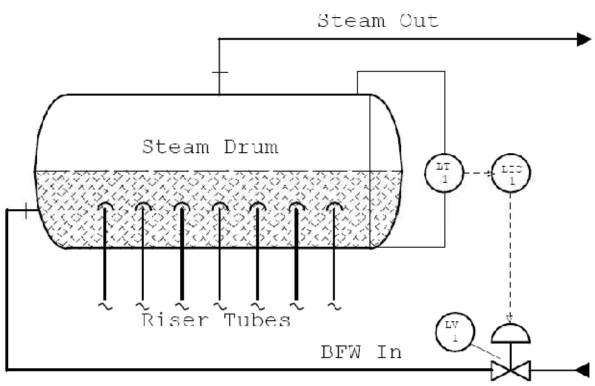


Figure 3: Single-Element BFW Control

Thus level control of a steam drum has exactly the opposite purpose of that of a surge drum: The water level must be kept within an extremely narrow band and tight control is of essence. It is a simple matter to maintain tight level control... use both the proportional and integral modes and turn up the gain! Figure 3, Single-Element BFW Control, shows this very simple arrangement. As always, there are problems. Firstly, high gain means extremely rapid swings in flow rate. The BFW pumps suffer under that type of abuse. There is a second problem, peculiar to boilers, called "swell". Swell is the phenomenon in which a rise in steam demand causes a drop in pressure. This in turn results in a rapid boilup within the tubes which causes the water level to rise. Paradoxically, an increased steam removal rate causes a rise in level due to the swelling of the steam bubbles. The level controller responds by reducing BFW flow at the very moment it is needed most. The swelling water soon collapses as the steam rises to the surface. Now the controller reverses its response and adds a large amount of essentially cold BFW into the system. This causes the water temperature to fall. The cooler water shrinks, lowering the level further. The use of single-element control is not very highly recommended for boilers!

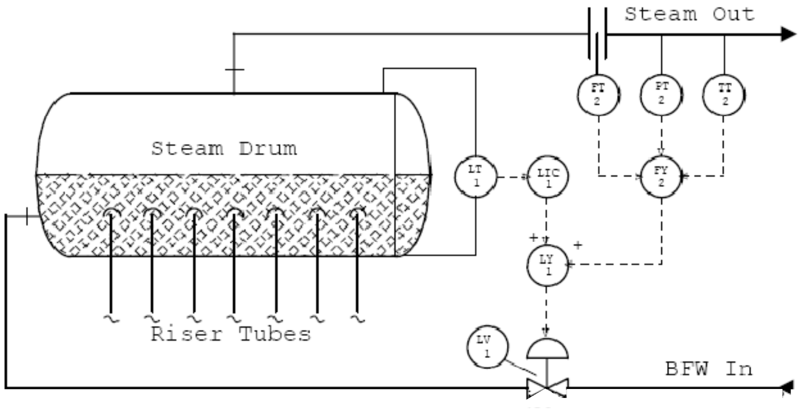


Figure 4: Two-Element BFW Control

The disturbance to the level is caused by a change in steam withdrawal rate. Since this is a measurable quantity, feed forward can be applied to the level controller output. Figure 4 shows how this is accomplished. The compensated steam flow is added to the output of the level controller. Thus a rise in steam withdrawal and the swelling of the water is accompanied simultaneously with a surge of cold BFW. Ideally the two cancel out exactly and the controller sees no change in level at all. They will not cancel out exactly for two reasons: Firstly, there is no reason why they should. One effect or the other will predominate. They won't even be simultaneous. Secondly, the BFW flow can only equal the steam withdrawal if the range of the valve is exactly equal to the range of the compensated steam flow. Since these two functions must be exactly equal over the entire operating range, it means that the valve must be perfectly linear and that its ΔP is absolutely constant. Not likely! So the level controller still has some work to do to keep the accumulated error at zero.

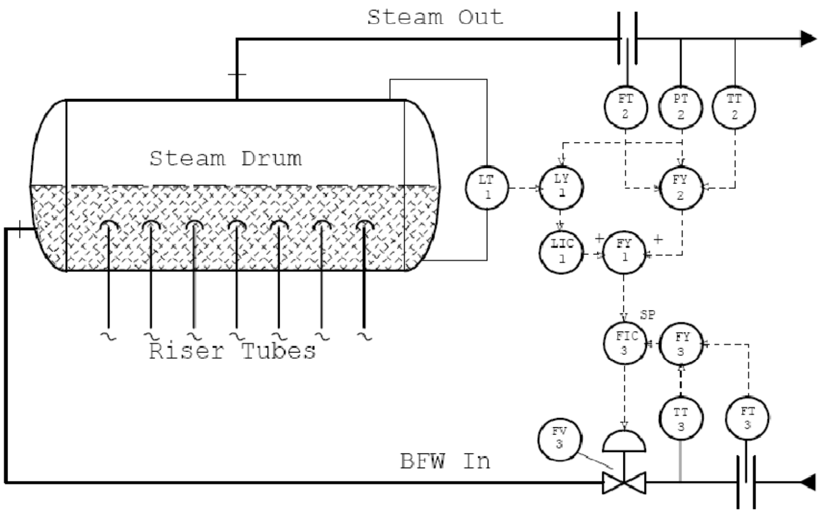


Figure 5: Three-Element BFW Control

The rather farcical suggestion in the previous section, piping the inlet to outlet and bypassing the vessel, suggests a solution to the valve linearity problem: Use the measurement of the steam leaving the boiler as the setpoint to a BFW flow control loop. The level should remain constant once the shrinking and swelling have reached the new equilibrium. This simplistic solution overlooks a basic principle of process control: No two measured quantities are ever identical. In other words, the two flows will never be the same and the level will rise or fall at a rate proportional to the difference. Since level is a measure of the accumulated difference, a level controller is used to correct the BFW flow. This is the classic three-element boiler level control arrangement as shown in Figure 5.

The diagram also illustrates a few other features. Compensation has been applied to account for the effect of pressure on the steam density and its effect on the level transmitter. BFW flow is sometimes temperature compensated since it is most probably preheated and its temperature may vary. For a temperature change from 0ºC to 300ºC (32ºF to 572ºF) the specific gravity changes from 1.000 to 0.712 and a measurement error of 15% will result.

Source: *Controlling Vessels and Tanks* by Walter Driedger. This article was first published in Hydrocarbon Processing in March 2000.

IDENTIFYING PRESSURE VESSEL NOZZLE PROBLEMS

Pressure vessels of “thin” shell construction that are fabricated from 1/2” thick orless steel plate material are routinely used in the power generation, chemical,petroleum, and food processing industries. Some of these vessels are subjected torelatively severe operating conditions that include chemical attack, rapid pressureand temperature fluctuations, and steam/water hammer. As a consequence, manyowners or operators perform scheduled nondestructive testing of the units todetermine a vessel’s mechanical integrity.

Many of these pressure vessels act as an accumulation point, requiring the units tobe equipped with one to two dozen nozzles that penetrate the shell and/or heads.

These nozzles are often secured to the pressure vessel with fillet welds on both theID and OD surfaces of the unit. An acceptable vessel examination procedureincludes testing the circumferential welds, the longitudinal welds, and all thesenozzle welds.

The most common form of weld nondestructive testing is visual examination, but anincreasing number of owners or operators are testing their pressure vessels by thewet fluorescent magnetic particle technique, which is a more sensitive testprocedure. This examination technique can detect surface and slightly subsurfaceindications in the material. It is not unusual to find many more indications by wetfluorescent magnetic particle than by visual examination. However, because wetfluorescent magnetic particle examination is not required by the original codeconstruction, the integrity of the code still remains. A vessel’s perceived integrityonly becomes questionable after cracking is found in a vessel that has beenexamined by the wet fluorescent magnetic particle technique for the first time in itsoperating life. A more complete resolution of the vessel’s mechanical integrityassessment should be performed by evaluating the indications or cracks foundduring testing.

Finding indications in the welds and plate material often presents the dilemma ofwhat to do next. If the indications are cracks and not plate defects, (such as laps,which compromise the minimum wall thickness of the vessel, or are long andrelatively deep) then the obvious answer is to repair the cracks. Many times,cracking in a weld is interpreted as a poor quality weld. To minimize furtherproblems, the old weld is removed and replaced by a new weld.

Regrettably, many cracks are either repaired or new welds are installed withoutknowing the cause that initiated the cracking in the first place. This lack ofknowledge can sometimes result in further cracking of the same area. Repairingcracks without eliminating the cause of the cracking can be a short term solution to along-term problem. The following three examples demonstrate how the crackingpattern around the smaller nozzles (less than 2”) in a pressure vessel can helpidentify the source of the problems. These examples are used only as an illustrationof the evaluation process and are not to be implied as the only causes resulting innozzle cracking.

Cracking Due to an External Load

Cracking as the result of abnormally high nozzle loads that have exceeded theanticipated or designed nozzle loading is generally characterized by the appearanceof “stretch marks” around the weld in the base metal as shown in Figure 1. Thecracks usually follow the contour of the weld and tear the surrounding base metaldue to the weld filler metal having a higher tensile strength than the base metal.Prior weld repairs to the same area indicate a persistent problem and are identifiedby the arrows in Figure 1.

The most common cause of a high external load is the result of a poorly designed ora poorly functioning support system. This deficiency occurs when the loads aretransferred from the support system to the nozzles. These types of loads can resultfrom adding a piece of equipment to the nozzle or connecting piping withoutmodifying the existing support arrangement. In addition, high loads can result from amalfunctioning pipe support or added restraint. A visual examination of the supportsystem within the first 30 feet of the nozzle or pressure vessel will usually identifythis sort of problem.

Many vessels are subjected to thermal expansion because of the temperatureincrease that occurs under normal operation. Thermal expansion causes the vesselto increase in size which means the equipment and piping connected to the nozzlesmust also be able to move with the vessel. Vessels that are supported and fixed atone end should have a sliding support on the other end that enables the vessel toslightly expand and contract. The “stretch mark” pattern around the nozzle shown inFigure 1 was caused by the addition of a fixed restraint to the hi-lo water level drainpiping. This fixed restraint was the result of the piping being routed through anundersized hole in the floor plate. Because the movement of the piping wasrestricted by the floor plate, eventually it caused the drain pipe to bend whichresulted in frequent cracking of the nozzle in the ID of the unit as shown in Figure 2.In other cases that resulted in a similar crack pattern, restraints had been added tostand pipes, level transmitters, and chemical feed lines because of either vibrationor long pipe connections to the vessel.

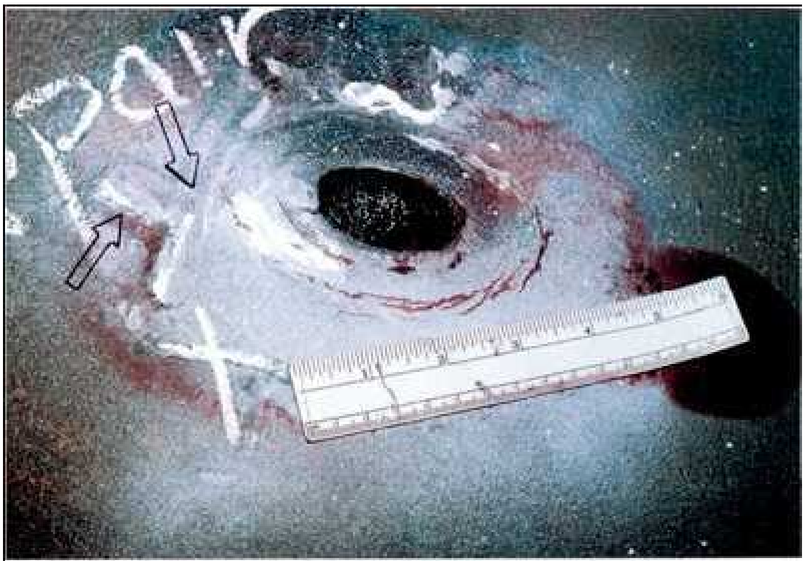
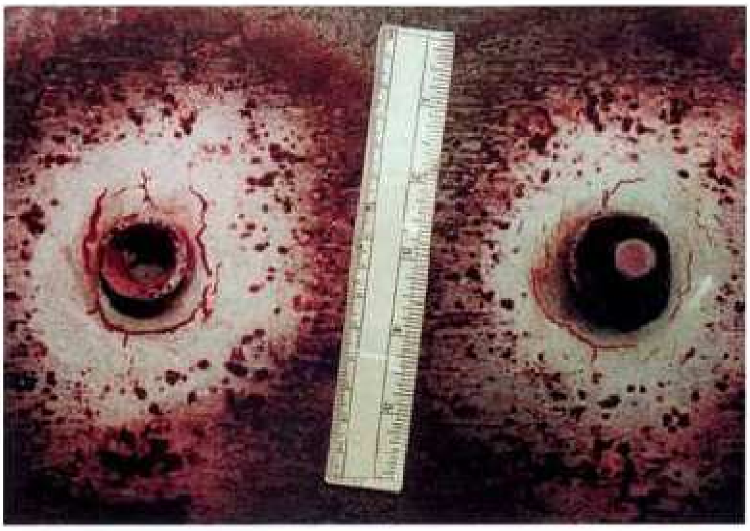


Figure 1: Cracking is generally characterized by the appearance of "stretch marks" around the weld in the base metal. The arrows identify prior weld repairs in the same area.

Figure 2: The external piping restraint caused surface cracking inside the vessel.

Cracking Due to Lack of Penetration

Lack of penetration is the lack of adequate weld filler metal deposit at the root of thejoint. The root of a nozzle joint is the interface between the nozzle wall and the shellor head. This type of cracking will propagate through the weld in the same patternas the root, but will break the surface of the weld in a radial direction around thenozzle if the crack encounters a weld defect such as porosity, slag inclusions, orlack of fusion as shown in Figures 3 and 4. This orientation change in the crackingcan add confusion to the evaluation of the problem. The repair consists of removingall of the fillet weld and preparing the area for welding with a small diameter weldingrod such as a 3/32" diameter rod.



Figures 3 and 4: Lack of penetration is just one cause of this type of cracking.

Cracking Due to Chemical Attack

Chemical attack of the weld typically occurs in the heat-affected zone (HAZ) in thetoe of the weld. The attack occurs at this location because of the slightly differentmicrostructure created by the welding process. The general appearance of this typeof cracking is circumferential at the toe of the weld and around most or the entireouter diameter of the weld. The cracking pattern is similar to one that can result fromfatigue. However, because it is a chemical attack it will occur in nearly all the weldsin a particular zone of the vessel, such as the locations above or below the liquidlevel. The cracking pattern from chemical attack is different from fatigue crackingwhich usually occurs at specific locations that have a recurring or cyclic tensile loadapplied to the area. In the case of chemical attack, a solution would be to repair theweld and make adjustments to the chemical input.

Remember, any long-term repair should remove all signs of the defect anddiscourage other defects from returning.

Source: *National Board BULLETIN – Originally Published in Summer of 1999*

TRAINING ANNOUNCEMENT

DESIGN & FABRICATION OF PRESSURE VESSELS: ASME SECTION VIII, DIVISION 1

Pressure vessels, along with tanks, are the workhorses for storage and processing applications in the chemical, petroleum, petrochemical, power, pharmaceutical, food and paper industries. ASME BPV, Section VIII, Div. 1 Code is used as a standard for the design and fabrication of pressure vessels by most companies across the world.

Wewould like to announcetraining course for "Design and Fabrication of Pressure Vessels: ASME Section VIII, Div. 1" on September 11-13, 2014 at Pune. This course provides the information that will help you understand the ASME requirements for the design and fabrication of pressure vessels. The course material follows the contents of 2013 edition of the code, and is replete with worked examples covering important aspects of pressure vessel construction. This hands-on learning will allow you to master in 3 days what would otherwise take up to a year or more of on-job training.

The contents of the training course will be as follows:

- Introduction to Boiler and Pressure Vessel Code
- Materials of Construction
- Low Temperature Operation
- Joint Efficiencies
- Design of Components
- Openings and Reinforcements
- Fabrication, Inspection and Tests
- Markings and Reports
- Tall Towers and Pressure Vessel Supports
- Nozzle Loads
- Fatigue Analysis
- Introduction to ASME Section VIII, Division 2

The instructor, Ramesh Tiwari, is internationally recognized specialist in the area of pressure vessels, heat exchangers, materials, and codes and standards. He holds Bachelor's and Master's degrees in mechanical engineering from universities in India and United States. He is also a registered Professional Engineer in the State of Maryland in the United States. Mr. Tiwari is a member of ASME Boiler & Pressure Vessel, Section VIII Subgroup on Heat Transfer Equipment, and a member of ASME International Working Group on B31.1 for Power Piping in India. In this capacity, he has made invaluable contribution in resolving technical issues in compliance with the ASME codes for Code users. Mr. Tiwari has over 24 years of design engineering experience on a variety of projects spanning industries such as oil & gas, power, nuclear, chemical, petrochemical, pharmaceutical, food etc. He has provided engineering advice and code interpretations to senior management and guidance to several companies he has worked for in the US, India and Germany. He has initiated and implemented numerous innovative ideas to improve working process and quality,and developed and conducted training programs for peers as well as clients. Mr. Tiwari is an approved pressure vessel instructor at NTPC, a premier thermal power generating company in India and at several other companies, both public and private.

Registration fee for the training course is Rs. 25,300 for professionals and Rs 16,000 for students (inclusive of service tax). Discount of 15% is available for group registration of 2 or more participants. Additionally, early bird discount of 15% is available if registration is done on or before May 1st. Registration fee includes training, a collection of articles on design and fabrication of pressurevessels, copy of the presentation, certificate from CoDesign Engineering, and beverages and lunch on all days. It excludes travel to and from Mumbai, accommodation, and meals and beverages other than those provided during the course. We invite you to make nominations.

In case of any queries, including the registration process, please email atlearning@codesignengg.com, or call at +91 98109 33550.

FAQ – SINGLE CERTIFICATION MARK

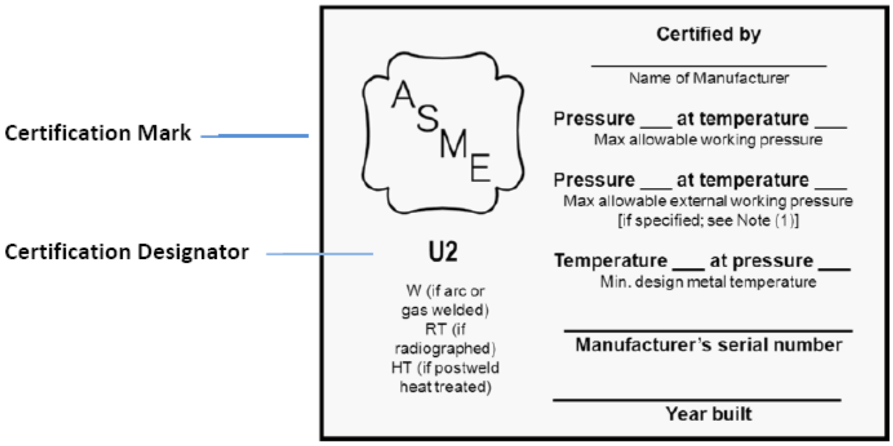
ASME's product certification programs have grown dramatically. Starting with just twocountries in the years prior to 1972, there are now 74 countries in which companies havebeen certified. The value of these certification programs has been widely acknowledged, and ASME is playing increasingly vital role in fostering productsafety and international commerce.

The growth of these programs has presented many new opportunities, but also somechallenges, especially regarding how to maintain the trademark registrations of ASME's 28separate product certification marks across the more than 100 nations in which these marks arecurrently used on products.

In order to streamline the multiple marking processes and more effectively manage numerous global relationships, ASME has introduced a newsingle product certification mark:

New ASME Product Certification Mark

Instead of 28 separate ASME product certification marks, there is now this singlecomprehensive mark. To maintain a link to the previous marks, the new mark is used inconjunction with a "certification designator" to indicate the applicability of the certification.The following is an example of how this new mark is used on a nameplate (in this casefor a vessel constructed to Section VIII, Division 2):



Sample ASME Product Certification Nameplate

Q: Since when has the new stamp been valid?

A: Certified companies were eligible to use the new certification mark once the 2011 Addenda tothe Boiler & Pressure Vessel Code was published.

Q: Which stamp(s) did a company receive if it was a new applicant with a Shop Review scheduled for September of 2011?

A: Until the end of 2011, companies received the old stamps (U, S, N, etc.) unless theyrequested the new stamp.

Q: When were the use of the old stamps discontinued?

A: The old stamps (U, S, N, etc.) were discontinued after December 31, 2012.

Q: What sizes do the new stamps come in?

A: They are available in ½ in. and ¾ in. sizes.

Q: Were the companies required to return the old stamps?

A: Yes. The stamps are the property of ASME and must be returned once you discontinue useof them. As of January 2013, all of the old stamps were to be returned to ASME.

Q: Are we required to return our certificate when we return the old stamps?

A: No. Your Certificate of Authorization authorizes the use of the Code symbol. The new Codesymbol is the Certification Mark as depicted in the sample nameplate above. As of January 1,2012, the Certificates was redesigned to show the new certification mark.

Q: I have applied for A, S, and U stamps. Will I receive one certificate or three?

A: You will receive three certificates. Certified companies will continue to receive a separatecertificate for each category of equipment.

Q: My company is currently certified. Will the certificate numbers remain the same when I getthe new stamp?

A: Yes.

Q: Will this have any effect on my scope of certification?

A: No.

Q: Must the certification designator be stamped on the nameplate?

A: No. The certification designator must appear directly below the certification mark, however itmay be printed rather than stamped. See the applicable Code rules for further information.

Q: Was it allowed to make assemblies with different code stamps (old "U"- as part + new "ASME"U2)?

A: Yes. During the 18 month transition period the old and new symbols were consideredequivalent.

Q: My company manufactures small valves which are too small to be stamped. We were currently permitted to use alternative marking processes if accepted by the National Board ofBoiler and Pressure Vessel Inspectors and authorized by ASME. Will this continue to be ineffect?

A: Yes. There was no change to this practice.

NEWS AND EVENTS

HSB Honored by ASME for Creation, Adoption, Support and Enforcement Support of National Pressure Vessel Code

Hartford, Connecticut, June 2, 2014

The Hartford Steam Boiler Inspection and Insurance Company (HSB), founded in 1866, was recently honored by the American Society of Mechanical Engineers (ASME), founded in 1880, for their contribution to the development of pressure vessel and boiler safety standards. The company was founded in Hartford Connecticut based on the idea that combining insurance with boiler inspections would contribute to the safe and reliable operation of pressure vessels, boilers and steam drums. HSB was one of the first companies in the United States to understand and address the destructive potential of boilers and pressure vessels. The largest provider of equipment breakdown insurance and related inspection services in North America was an original contributor to the ASME Boiler & Pressure Vessel Code.

2014 Abu Dhabi International Petroleum Exhibition & Conference

November 10-13, 2014
Abu Dhabi, UAE

This event is an opportunity for like-minded professionals to join and contribute to one of the largest industry shows in the Middle East. Providing a first-rate platform for exchanging knowledge and best practices, the conference brings together renowned international speakers, researchers, and experts with a carefully selected mix of technical presentations, executive plenary session, and panel discussions.

FABTECH

November 11-13, 2014
Georgia World Congress Center
Atlanta, GA USA
www.fabtechexpo.com

Get information about FABTECH, which will be conducted at the Gerogia World Congress Center in Atlanta, Georgia from November 11th to November 13th, 2014. The FABTECH web site notes that the exposition will host over 27,000 attendees and 1,400 exhibiting companies. FABTECH is the United States' largest metal forming, fabricating, welding and finishing trade show. People in the pressure vessel manufacturing and fabrication industry along with folks in the steel processing and fabrication industry who attend FABTECH will learn about metal forming, fabricating, welding and finishing products and developments.

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BUILDING A BETTER TOMMORROW

It is becoming less practical for many companies to maintain in-house engineering staff. That is where we come in – whenever you need us, either for one-time projects, or for recurring engineering services. We understand the codes and standards for pressure vessels, and can offer a range of services related to them.

Training & Development

Consulting Services

CoDesign Engineering

Pressure Vessels ● Heat Exchangers ● Piping Systems ● Welding

Oil & Gas ● Power ● Chemical ● Petrochemical ● Fertilizer ●Solar ● Biogas