

Stainless Steel Applications for Today's Pressure Vessels



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Presented to
Stainless Steel World
by
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Of STI/SPFA

Biography

John R Curry

Founder of major fabrication firm
& company President for more than 37 years

International Lecturer &

Recognized Authority on

ASME Boiler & Pressure Vessel Code,

Metallurgy,

Pressure Vessel Design and Fabrication

Stainless in Early Pressure Vessels

- Early part of twentieth century, carbon steel inexpensive relative to all types of stainless steels
- By 1950's, labor rates only an average of \$1.60/hour
- Process Design Engineers exploited low wage rates by using as little steel and as much labor as possible
- Typical refinery Vacuum Tower of 1950's was made of SA-285C with .109" cladding of 405 stainless

Gradual Changes in Clad Vessels

- During 1960's and 70's, use of 410 stainless cladding for reactors and crude columns was design of choice
- As sulfur content of crude feedstock increased in 1990's, process engineers specified thicker and higher alloy cladding
- *Process engineers were slow to realize changes were taking place in steel and fabrication industries*

Gradual Changes in Clad Vessels

- During last two decades:
 - trace of sulfur, SA-304L specified
 - slightly sour crudes, SA-316L specified
 - moderately sour crudes, SA-317L specified
 - super sour crudes, Inconel 625 was cladding of choice

Steel Industry Changes

- Clad metals improved in longevity with introduction of explosion cladding in late 1960's
- Unlike roll bonded clad, explosion cladding cannot be separated from backing material
- Within last decade major users have switched to explosion clad
- With limited capacity explosion clad manufacturers raised prices and extended deliveries

Clad Vessel Construction

- Fifty years ago, clad vessels were constructed of roll bonded clad shells and heads but nozzles were “sleeved” with cladding material
- Years of thermal cycling produced problems at weld point of sleeves to the inside of vessel
- Weld overlay of even small nozzles has replaced “sleeved” nozzles
- Weld overlay of nozzles is effective but extremely expensive

Clad Vessel Construction

- Finally became apparent to fabrication industry that solid stainless pressure vessels are competitive to comparable clad vessels with carbon steel backer
- *Process engineers were slow to realize these changes*
- Took several years to convince process engineers that solid stainless is a more cost effective product than traditional clad

Advantage of Solid Stainless Construction

- Using solid stainless need for PWHT eliminated
- Multicoat paint systems eliminated
- Welding simplified by using single chemistry filler metal throughout vessel
- Stainless has higher tensile strength than carbon, thus thinner vessel at ambient temperatures
- Impact tests eliminated

Advantage of Solid Stainless Construction

- In general, cost of clad plate and heads slightly below solid stainless
- Greatest cost savings is not having to do expensive weld overlay on inside diameter of nozzles
- Long term maintenance costs substantially lower than carbon steel

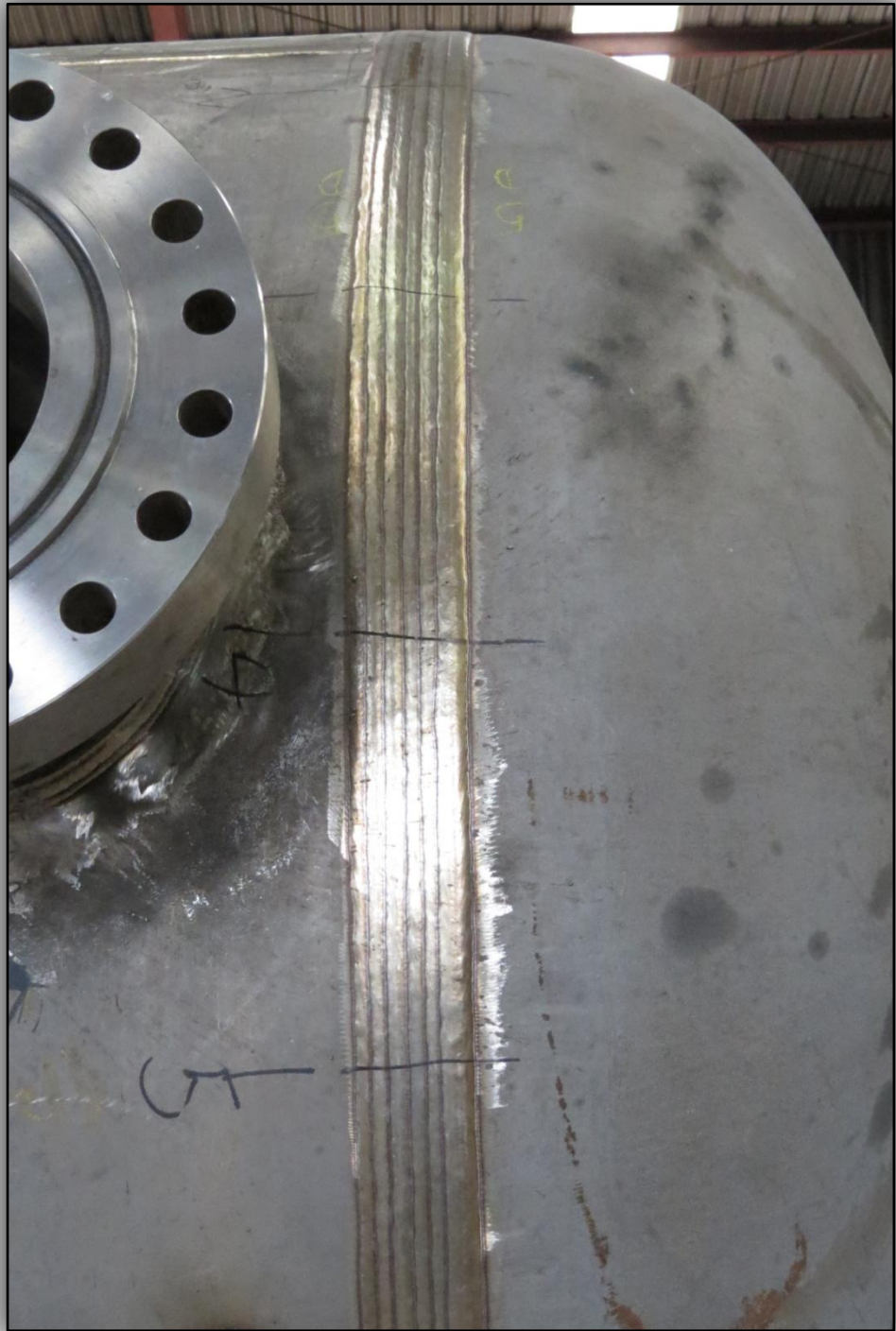
Solid Stainless Steel High Pressure Separator

- Presentation of Stainless Pressure Vessels
- Offshore Platform Separators in solid SA-316 dual certified stainless
- First Offshore Platform in the Gulf of Mexico to use solid stainless vessels instead of clad











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