Stainless Steel Applications for Today’s Pressure Vessels
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Presented to Stainless Steel World

by

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Biography

John R 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