

The background of the cover features a large industrial facility with a high ceiling and complex piping. In the foreground, a large, flat, metallic surface, likely a vessel or a walkway, is shown with a central longitudinal seam and a small square access panel. The lighting is bright, coming from overhead fixtures.

Equipment Expertise eBook

Inspecting Vessels - Part 2

Carbon Steel, Stainless Steel, & Hastelloy Vessels

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Introduction

Part II of this eBook series will focus on the tips and techniques that will help you properly inspect a carbon steel, stainless steel, or hastelloy vessel. These three materials of construction (MOC) represent the full gamut of quality when it comes to vessels.

Carbon steel, known for its heightened susceptibility to corrosive materials, represents the lower end of quality. Stainless steel is the sturdy and resolute industry standard, representing the middle-ground MOC, while hastelloy, included in the class of “superalloys”, is the extremely corrosion-resistant MOC that sits atop all other options.

Whether the vessel is jacketed or single walled, the MOC is important to note, since you will receive different levels of durability from each. It goes without saying that the more durable a vessel is, the more likely it is to be in great condition, despite having been used for a period of time.

Who We Are

EquipNet is a global leader of surplus asset management solutions. We’re recognized for our proprietary asset management platform, our revolutionary industrial equipment marketplace, and our results-driven project management services. Our diverse roster of clients include Fortune 500 multi-national corporations, leading regional manufacturers, financial institutions, and corporate renewal professionals.

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Gather Relevant Information

As stated in the first series on how to inspect a vessel, the first critical step is to gather all of the documentation associated with the vessel in question from the seller.

This includes access to the vessel's nameplate, which provides critical information, such as:

- Serial number
- Model number
- Date of construction
- Confirmed operating pressures (if the vessel is pressurized)
- ASME (American Society of Mechanical Engineers) number
- National Board Code number
- Original maintenance and service documents
- Documentation confirming the vessel's material of construction

Visual Inspection of Carbon Steel, Stainless Steel and Hastelloy Vessels

Performing a visual inspection of a carbon steel, stainless steel, or hastelloy vessel is identical to the process detailed in the first article of this series, focused on inspecting a glass lined vessel, either jacketed or single wall.

If you are looking for advice on how to inspect a jacketed tank, please read through the details provided in Part I of this eBook series. The only difference with regard to performing a visual inspection is that carbon steel is not as corrosion-resistant as stainless steel and hastelloy, so you have to inspect it far closer for signs of rust formation or corrosion spots. Aside from that, the only differences in the inspection of a glass lined tank, carbon steel tank, stainless steel tank and hastelloy tank is that you can perform different advanced inspection tests for glass lined than you do for the other three vessel types. Once you have gathered as many of the documents and pieces of information mentioned as you can, you will then want to move onto visually inspecting the vessel, paying special attention to the exterior, interior, manway, outlets and inlets.

External Inspection

Carbon Steel:

An external inspection is especially important for vessels made of carbon steel. As mentioned, this is the least corrosion-resistant MOC used for vessels. It is also the least expensive, so companies who opt to purchase carbon steel vessels are likely to use them until they are beyond the point of repair, and simply purchase a new one once the original is spent.

When you look over the exterior of a carbon steel vessel you want to keep an eye out for the following:

- Signs of any repairs. Repairs usually entail patchwork or welding. If there were repairs performed on the vessel, make sure you review the documentation, and confirm that the repairs were conducted by a code shop so the vessel's certification is not forfeit. Also check for any signs of rust or corrosion around the point of repair.

External Inspection

When you look over the exterior of a carbon steel vessel you will want to keep an eye out for the following:

- Signs of rust or corrosion. If there are any signs of rust or corrosion on the exterior of the carbon steel vessel, this can indicate the extent to which the vessel has been used, and what type of materials were inside or around the vessel during its use.

Stainless Steel & Hastelloy:

The external inspection process for carbon steel vessels is identical for stainless steel and hastelloy vessels. The only difference being that stainless steel and hastelloy vessels are more durable and will generally display fewer signs of repairs, corrosion and rust if they were maintained properly throughout their usage.

Internal Inspection

After performing a visual inspection of the vessel's exterior wall and/or jacket, you will want to then divert your attention to the vessel's interior.

Start from the top opening, the manway or port:

- Determine whether or not the vessel is pressurized – is it designed to be used with and maintain a specific internal pressure? If it is pressurized, inspect the mechanical seal located at the vessel's topmost opening. Signs of any past problems will be indicated by hydraulic fluid or oil stains around where the seal is supposed to clamp shut. If you see any indication of leakage, you will need to ensure that the seller took some documented action to rectify the problem; otherwise, this could end up being a hidden repair cost if you decide to purchase the vessel. Lastly, there is one more component that you should inspect before diving into the interior of the vessel – that is the agitator, both the blade and the motor.

Internal Inspection

- As you know, an agitator is simply a long blade that comes in different shapes and sizes, attached to a motor of varying horsepower that is used to mix the vessel's contents. In order to really make a judgment on the condition of the agitator, you will require access to electricity. If you have access to power, turn the agitator on, and note if the blade maintains a tight radius as it turns. If it does not, this is a sign that the blade has endured large amounts of stress or long hours of usage. Again, this could end up being a hidden repair cost in the near future, should you purchase the vessel. If you do not have access to power, you will need to base your assessment of the agitator on how well maintained the equipment appears. Bad signs to watch out for are rust, blade disfigurement, and signs of leaks coming from the agitator's motor.

Advanced Inspections

Ultrasonic Thickness Test:

In order to be absolutely sure the vessel you are inspecting is in great condition, without having to run the risk of relying on a visual inspection, you will want to conduct an ultrasonic thickness test. Conceptually, this non-destructive test is fairly simple; you must have the right equipment and the expertise to use it. The equipment consists of what is commonly referred to as an ultrasonic thickness kit, and is composed of an ultrasound transducer and a diagnostic machine. By placing the transducer on the vessel's exterior surface, sound waves will be used to determine the thickness and consistency of the metal. Aside from letting you know the relative thickness of the metal, this test will also identify hairline cracks in the metal, which indicate the durability of the metal with regard to how much duress it has been under during its past usage.

XRF Guntest:

This particular test is especially helpful with regard to performing an alloy analysis, or in other words, for identifying which type of metal or alloy the vessel is composed of. To conduct this test, you will need a portable, handheld XRF gun. When you aim the gun at a vessel, it will be able to detail exactly what type and grade of metal or alloy the vessel is made of.

Below is a list of the materials most commonly used in vessel construction:

- Carbon Steel
- 304 Stainless Steel
- 316 Stainless Steel
- C-22 Hastelloy
- C-276 Hastelloy

To learn more about inspecting and purchasing pre-owned vessels, contact EquipNet:

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