Non-Destructive Testing: What You See May Not Be What You Get

How to Ensure You Get What You Pay For

When you buy expensive metals, you might be getting something you don't want and not know it. You could be buying defects that you would rather not have, and your supplier may not realize he sent you defective material. The only way to know for sure is to test the parts nondestructively (testing without destroying the end use of the product).

We could say that today's materials, machines, and tooling fabrications are so complex and expensive that they dictate the use of nondestructive testing procedures to ensure maximum reliability, but that isn't the only case that demands testing. Even simple constructions may call for such testing.

The truth of the matter is that nondestructive testing makes sense for any part that serves a critical function. It is good practice for you to review your designs and determine where failure of a part would negatively impact the function of your design and make provisions to have it tested nondestructively to be sure it does not fail in operation.

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Where Could a Failure Occur?

The equipment and part designer understands the stresses that are applied to a part, and can probably estimate where a defect (discontinuity) would cause the most problems. For a critical part, the designer should go one additional step and calculate what size and type of discontinuity would most likely cause failure. How to find the discontinuity becomes the next challenge.

Finding What's Wrong Is a Good Start

Finding the defect is the most important step, and the testing method chosen will determine WHICH kinds of defects can be identified. After a defect is found, a determination must be made whether it adversely affects the use of a part. There are five basic nondestructive testing methods used to discover defects in materials:

- Radiographic (X-Ray)
- Magnetic Particle
- Liquid Penetrant
- Eddy Current
- Ultrasonic

In every case, a visual or electronic image objectively proves that there is a defect.

Don't Ruin the Part In Testing

Many tests can show defects in a part. Unfortunately, many of them would ruin the part. The list of test methods above has the advantage of not changing the piece under test. These methods also identify the nature of the defect or discontinuity. Knowing the most likely cause and location of failure, the part designer will identify the appropriate test to use.

What Is Good Material?

Separating acceptable and unacceptable material is a matter of deciding beforehand what measurement standards to use. If a generally accepted standard is specified by the end customer, then the choices are defined by that standard. Otherwise, the defects most likely to cause failure must be identified by the designer, and he must establish a size and type criterion that recognizes which defects will cause failure and those that will not.

How Much Testing Is Needed?

As much testing as it takes to be sure that the part will perform its function. No, that isn't a copout. Initially, how much testing is necessary will not be known. So, a plan to determine how much is needed must be developed. We will assume for discussion purposes that the part is correctly designed. An initial sampling plan must be chosen that incorporates the probability of a defect. Comprehensive testing will initially confirm (or contradict) the premise and can establish both the production-sampling plan and the test method to be used. This sequence of actions makes sense if you are determining the test plan; and if you did not determine the test plan, it is likely that these steps were followed by an engineer in determining the tests and sampling necessary.

When You Don't Choose Test Methods

Sometimes the test methods are given to you by your customer, or their customer. Most often, the test plans are suitable to the application and material, but occasionally a communications error creeps into the process. Unfortunately, those errors are often discovered after a problem makes itself known. At Weldaloy, we are familiar with most test methods. If we find what appears to be an inappropriate test method or sampling plan, we will call you to discuss it.

With These Four Standards You Can't Go Wrong – Or Can You?

Many drawings cite excerpts from the following:

1. AWS D 1.1
2. ASTM Standards
3. MIL Standards
4. NavShips Standards

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Are you safe with these standards? You are, only if they are called out correctly. There are so many subsets and exceptions that it is easy to get confused. If we at Weldaloy identify a potential conflict in the standards called out, we will call you. We had an occasion where it was necessary to discuss such a case with both the customer AND the customer's customer before we could resolve the issue. In the final analysis, the only solution is to discuss it together, consider the options, and come to an agreement.

In Summation

Nondestructive testing (NDT) is an important tool for any part that serves a critical function. It becomes nearly mandatory if the value of the part is a large portion of the assembled cost. The five NDT methods shown above are valuable tools in identifying defects (Discontinuities) and grading them to determine which of them are detrimental to the function of the part, and which are benign. Unthinking application of testing, and unquestioned use of standards, helps no one. We can all produce quality parts if we are actively involved in deciding which tests make sense, and test parts to the appropriate standards.

Call Us for a Free Consultation

We can discuss your design challenge and recommend a process that will simplify your concepts and give your product the elegance of a superior design.

Call 1 (888) WELDALOY (935-3256) or email **engineering@weldaloy.com**

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