Common Problems in Metal Material Testing and Solutions

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[Abstract] Metal materials are the most important material materials for human development and progress. In major scientific and technological fields such as industry, agriculture, and national defense, corresponding metal materials are used according to different functions and uses. This paper analyzes the common problems in the detection of metal materials, in order to provide suggestions for the related application of metal materials.
[Keywords] Metal materials; Testing; Common problems; Solutions

1. Introduction

Metal materials are a large family with a certain degree of gloss, ductility, easy conductivity, heat transfer and other basic characteristics. According to different functions and uses, it can be divided into two types: ferrous metal and non-ferrous metal. Iron, manganese, chromium, etc. are ferrous metals. Steel is the basic structural material and the backbone of industry. With the continuous development and advancement of science and technology, various new metal materials have been continuously discovered, developed and applied, providing a wide space for the wide application of metal materials in China.

2. The Significance of Metal Material Testing

Metal materials are widely used in various fields of social and economic construction, and their role and significance are beyond imagination. Taking the manufacture of mechanical products as an example, more than 90% of the materials of various mechanical products are made of metal materials. If these metal materials are not subjected to strict quality inspection, and then metal materials meeting the quality requirements are selected to enter the product manufacturing process, the metal materials may be improperly selected or used improperly, which will cause premature failure of the material, and even more will lead to major safety incidents. As a key link to ensure product quality control, metal material testing is very important and urgent for the strict and effective testing of raw materials, semi-finished products or finished products before they are manufactured and used to meet the quality requirements of product materials.[1]

2.1 Effectively Eliminate Raw Materials, Semi-finished Products and Finished Products that Do Not Meet the Quality Requirements to Improve the Quality of Metal Products

In the production process of metal products, the quality requirements of each product for metal materials are different, which is determined by the role of the product. Some products require extremely hard metal materials, while others require metal materials that are more ductile. In today's economic society, the quality of products is mixed, and some metal materials that are similar or similar and whose quality does not meet the requirements are flooding the market. In general, we cannot use the eyes to identify the quality of these materials. Therefore, it is necessary to perform detection by an effective detection means. To identify and identify the quality of metal materials, only in this way can we guarantee the quality of the products from the source.

2.2 Metal Material Testing Can Effectively Prevent Corruption in the Procurement of Metal Materials and Establish a Social Quality Credit System

For a project, such as bridge engineering, it uses almost half of the metal materials used in the project. Metal material components are important components that determine the quality of a bridge project. It does not have to be a slight mistake in the technical quality requirements of the metal materials used, which requires that the quality of the metal material should not be false.

At present, some metal materials procurement and supply companies use unfair means to gamble purchasers for the sale of products, and to sell metal materials that do not meet the quality requirements as high-quality materials to demand enterprises. The quality of the engineering products is impaired or the quality requirements are not met. Some even turned into a bean curd project. Therefore, strict metal product testing and testing is one of the fundamental measures to prevent corruption and combat social unhealthy winds and effectively guarantee product quality.

3. Metal Material Detection Means

As an important means to ensure product quality, the inspection and inspection of metal materials is an essential part of product manufacturing. At present, the detection of metallic materials is mainly carried out from the following aspects.

3.1 Metallographic Examination

The internal structure of the metal is seen by a microscope, called metallographic structure. The metallographic structures commonly found in steels are ferrite, austenite, cementite, and pearlite. Metallographic examination and testing of metallic materials specifically includes the composition and distribution of various phases and related casting and welding defects. The more commonly used detection devices are stereo microscopes and metallographic microscopes.

3.2 Testing of Mechanical Properties of Metallic Materials

The mechanical properties of metal materials refer to the behavioral laws of deformation, damage, fracture, and physical properties of metal materials under the action of external forces and environmental factors. The mechanical properties of metal materials are mainly measured in the mechanical manufacturing industry: tensile properties, impact properties, bending properties, and Blowell hardness testing, wear resistance testing, and fatigue testing of metallic materials.

3.3 Environmental Simulation Test of Metal Materials

Environmental simulation tests of metallic materials are primarily used to evaluate the performance of metallic materials in exposed environments exposed to corrosion. Finished equipment can be subjected to conventional tests as well as special corrosion tests to determine the corrosion resistance of the metal material. The response of the metal material is objectively evaluated by accelerating the exposure time or simulating the environmental condition test based on the potential life of the product, the appearance, the associated stress, and the corresponding effects of the metal material. The methods currently used are tested for salt spray and weatherability tests.

3.4 Non-destructive Testing of Metallic Materials

Non-destructive testing of metallic materials is an effective means of playing an important role in their related fields of application. To ensure the non-destructiveness and integrity of metal materials in related applications, non-destructive testing methods can detect many types of defects. Such as cracks, incomplete penetration pores, etc. Non-destructive testing methods include visual and optical inspection, X-ray detection, magnetic particle inspection, ultrasonic testing, and penetration testing.

3.5 Hardness Testing of Metal materials

There are many methods for detecting the hardness of metal materials. These common detection methods have different functions and uses. It is important to choose the appropriate test method, because the detection results obtained by different detection

methods are also different. The metal material's elasticity, plasticity, strength, and toughness of the metal material are different. Therefore, you must choose the appropriate test method to get accurate hardness values. The hardness of the metal material is divided into indentation hardness and non-indentation hardness. In the static test, the surface of the indenter is pressed, and the hardness of the metal material is evaluated according to the indentation depth and surface area.

It is worth noting that when testing the hardness of metal materials, the test parts must be fine, to ensure that the surface is flat, without bad marks such as grease, oxidation surface, crack pits. When processing the surface, the surface should be protected from heat and cold to change the properties of the metal. Secondly, the test surface, the support surface, the surface of the indenter, and the loading surface of the sample must be kept clean without foreign matter adhering. The sample loading platform should be stable, and the test should be separated by a certain distance to avoid mutual interference.

4. Common Problems in Metal Material Testing

The inspection of metal materials is a very complicated and technical job. In order to obtain accurate test results, the corresponding test means must first be used. In the process of metal material testing, various problems and conditions are encountered. Inspectors need to use different methods for analysis and judgment and judgment. Find the best solutions and solutions to make detection more complete and data more accurate.

4.1 The Detection of Metallic Materials is Susceptible to External Environmental Factors

Due to certain characteristics of the metal material, the metal material itself is susceptible to external environmental factors, Such as rusting. When we test it, we must reduce the influence of external environmental factors on the detection and effectively control the influence of external environmental factors. If there is interference from external factors in the test, the test results will be inaccurate or even invalid.

4.2 Errors in the Detection of Personnel During the Inspection Process

The detection of metal materials is generally done by machines and instruments. During the inspection process, the relevant personnel must debug and proofread the relevant testing machines and instruments. Slight carelessness and mistakes can also cause errors and inaccuracies in the test data. Some inspectors have been careless

about the testing work, and there are errors in the operation and inaccurate analysis and judgment, which affect the accuracy of the test data.

4.3 Impact on Metal Detection Errors

Effective detection of metal structures is a key measure to ensure the quality of metal products and engineering quality. If the metal detection is wrong, it will pose a major safety hazard to the quality of the product. A large number of unqualified metal materials have entered the production field, and the consequences are unimaginable.

5. Methods and Means to Solve Common Problems in all Materials

5.1 Metal Materials Are Tested in Accordance with Specifications

The correct method of operation is used to test the metal materials, which is an important part to ensure the accuracy of the test data. In the detection process, the correct method of clamping the metal detection sample has a certain influence on the detection of the metal material. If the clamping method is incorrect, the product sample may slip during the test or cracks or breakage of the sample may occur. In addition, it is also important to regulate the temperature during the stretching process during the tensile process of the test product. Metal products have the characteristics of hot-cold shrinkage. If the temperature is high or low, there is error and accuracy in the stretch data. Therefore, there must be a detailed record of the temperature range value during the stretching process. The detection of metallic materials is not an easy task. There are many factors to consider in the test so as not to cause incorrect test results. In today's market economy society, people are increasingly demanding the products they use. In the production process of products, enterprises must do a good job in testing raw materials. According to the testing procedures, the testing tools, testing environment, etc. must be strictly in accordance with the testing standards. Avoid errors that should not occur and minimize the occurrence of substandard products.[2]

5.2 Reduce and Eliminate the Impact of External Environmental Factors

Metal materials themselves are susceptible to external environmental influences. Such as steel, iron plates, etc. When the metal material is tested, the external environmental factors of the test sample are removed to ensure accurate data. Such as the cleaning of rust spots, the cleaning of oil and grease, the repair of surface cracks and uneven surfaces. When performing tensile testing, consider the effect of temperature on the test. All environmental impact factors must be reduced and eliminated. Only in this way can the detection error be controlled within the allowable range.

6. Conclusion

The accuracy of metal material testing results is of great significance to the quality and safety of products. In the process of testing metal materials, the inspectors must take the responsibility of ensuring product quality and safety, and operate cautiously, conscientiously and responsibly according to the regulations.

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