Research on Visual Detection of Corrosion of Unmanned Steel Structure Based on Computer Intelligence

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Abstract. At present, the cost of raw materials, especially the proportion of metal materials is relatively high. Among them, the structural corrosion of unmanned steel requires overall visual detection. Based on computer intelligence, the visual detection effect can be explored more comprehensively. In this paper, the corrosion principle of unattended steel structure is analyzed, and the commonly used corrosion inspection, corrosion prevention and treatment methods are introduced. According to the analysis and comparison of different anti-rust methods, the practical operation requirements are put forward. This paper provides some reference for the anti-rust work of unmanned steel structure[1-3].

Keywords: Steel Structure, Rust, Degusting, Antirust Treatment Method

1. Introduction
With the development of the Times, more and more attention is paid to the design and construction of unmanned steel structures in the field of architecture. Therefore, reasonable selection of metal materials, optimization of material combination and quality control, application effect and reduction of intermediate maintenance costs are the focus of increasing attention in architectural design. At the same time, the durability, durability, wear resistance and maintenance protection of the material should be fully considered for the change of surface state of some steel structural parts in the process of use. The above is the foundation of the importance of steel material and anti-rust work in some structures of modern architecture[4-6].

2. Classification of Steel structure corrosion
Steel structure corrosion can be divided into two categories according to the surrounding environment, harmful components in the air (such as acid, salt and other gases) and the temperature, humidity and ventilation:

2.1. Chemical corrosion
The corrosion caused by direct chemical reaction between the surface of steel structure and surrounding medium is called chemical corrosion. Such as steel in high temperature environment and dry gas and o2, no, so2, h2s, etc and its corrosion degree increases with the increase of time and temperature, which can lead to chemical corrosion of steel structure (as shown in figure 1).
2.2. Electrochemical corrosion
The corrosion caused by REDOX reaction between steel structure and surrounding medium during storage and use is electrochemical corrosion. In humid environment, due to different microstructure, uneven distribution of impurities, stress deformation, surface roughness and other reasons, the electrode potential difference between local adjacent particles of steel structure is generated, forming many "micro-batteries".

2.3. Inspection of corrosion of unattended steel structures
The objects of corrosion treatment are usually the steel structures that have been protected, well coated or partly in good condition. To effectively deal with the corroded steel structures, the corrosion degree of the steel structures must be carefully checked before effective treatment can be made according to specific conditions.

The corrosion forms of steel can be divided into comprehensive corrosion (universal corrosion) and local corrosion; Overall corrosion is uniform corrosion on the surface, and clearance corrosion, whole corrosion, groove corrosion and contact corrosion paint film peeling corrosion are local corrosion. Corrosion inspection of steel structure should pay attention to the following 6 points:

- Buried in the ground near the part of the construction;
- Places where water may accumulate or be eroded by steam, especially places where water may accumulate;
- Often dry, wet alternate without concrete components;
- Easy to accumulate ash and humidity large component parts;
- Parts with a combined section beam clearance less than 12mm that are difficult to paint;
- Roof structure, column and roof joint, crane beam and column joint.

3. Steel structure rust, rust and antirust coating steel structure
the metal surface under the paint film will continue to rust and expand, so that the coating will fail to achieve the expected protection effect (as shown in Figure 2 below).
At present, steel structure commonly used derusting methods in the factory for manual derusting, such as sand blasting, shot peening. With the formulation of national standards and relevant industry standards, there have been corresponding provisions on the quality control of steel structure surface rust. For example, gb 50205-2001, the Code for Acceptance of Construction Quality of Steel Structure engineering, has divided corresponding technical requirements for jet, projectile or manual and power tools.

3.1. Derusting method
Manual derusting although low efficiency, poor working conditions, derusting is not complete, but because of its low cost of manual derusting, in the paint on the steel structure surface treatment requirements are not high, this method can still be used. But in the case of higher requirements for derusting quality, it is necessary to use sand blasting derusting. Sandblast derusting is a more advanced derusting method, for the same kind of paint, under the same conditions, sandblast derusting than manual derusting paint film life can be extended 3 ~ 5 times, it is not only more thorough derusting, and high efficiency, easy to operate, has been widely used. Although the pickling and pickling phosphate treatment is thorough and efficient, it is only suitable for complex shape and small and thin-walled steel structural parts. Due to the limitation of pickling tank equipment, large components are not used much at present.

3.2. Problems to be noticed in rust removal
Considering the overall layout of the workshop, isolate the area emitting corrosive media (i.e. improve the process equipment and production process), adopt the layout scheme that is conducive to natural ventilation to reduce the content of harmful substances (as shown in Figure 3);
3.3. methods to prevent corrosion of steel structure

3.3.1. Red antirust paint
In general steel structure engineering, often choose rust resistance ability is strong, have better tenacity, water resistance and adhesion of oil red antirust paint as antirust primer, alkyd enamel for finish paint. Red rust paint in the lattice of the outer lead ion and corrosion of the initial stage of iron ions generated ion replacement to form insoluble substances, red in the presence of water and oxygen and oil-based paint lead soap, its cracking lead monohydroxyl, lead hydroxyl salt has corrosion inhibition. Lead ion and many corrosive media form insoluble salts such as lead sulfate, and the sealing effect of lead soap becomes denser and stronger with time, which is the characteristic of oil red red paint.

3.3.2. Epoxy and Zinc-rich paint
Zinc-rich epoxy is an organic zinc-rich compound made of zinc powder, epoxy resin and curing agent. It is mainly used as a long-term general primer for the heavy anticorrosive coating system of steel structure, and also as an anticorrosive paint for galvanized parts. The suitable temperature for its application is 0 ~ 35℃ and it is not applied in rain, fog and snow. Inorganic zinc-rich paint is mainly made of sodium silicate, zinc powder, flotation agent and curing agent. The paint has the same cathodic protection effect as the galvanized layer.

4. Conclusion
In the use of steel structure, in addition to considering the project cost, steel components and anti-rust processing should be strengthened. In addition to coating, coating selection and the design and construction personnel, they must also clearly understand and master the construction technology of paint coating performance, coupled with the strict construction management system, in order to better complete the target set design and requirements. In view of the problem of corrosion in the process of use, timely inspection should be carried out according to the standard, and corresponding treatment measures should be taken according to the different degrees of corrosion. In a word, the key to prevent corrosion of steel structure is the preventive methods and treatment measures. In this way, the possible loss of steel structure can be reduced, the service life can be prolonged and the safety of steel structure can be improved.

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