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**INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

DL/T 884-2019

Replacing DL/T 884-2004

**Power plant metallography inspection and assessment
guideline**

火电厂金相检验与评定技术导则 清晰版

(English Translation)

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009 "Guidelines for Standardization Work Part 1: Standard Structure and Compilation".

Compared with DL/T 884-2004 "Technical Guidelines for Metallographic Inspection and Evaluation of Thermal Power Plants", this standard has major technical changes except for editorial changes.

Change as follows.

- Made some adjustments in the content and arrangement of chapters;
- Added the interpretation and definition of the terms "microstructure aging" and "metallographic complex";
- Increase the macroscopic grain size inspection method and evaluation, and macroscopic defect evaluation of welded joints in the macroscopic structure inspection;

- Delete the contents of the "General Guidelines and Requirements" section and re-formulate the contents of the new "General Requirements" clauses;
- Added microscopic inspection and analysis. polished state inspection morphology characteristics, post-etching inspection organization and morphology characteristics, image acquisition, quantification Metallographic survey items, etc.;
- Delete the entire content of "4.3 Quantitative Metallographic Method" (4.3.1 Image Analyzer, 4.3.2 Main Measurement Parameters, 4.3.3 Grain Size Measurement Fixed), adding the content of measurement and analysis using image analysis software;
- Delete "Embrittlement Analysis" and "Creep Hole Damage Rating" in the "Qualitative Analysis" section of the "Power Plant Metallographic Analysis" chapter, and "Define the whole content of "Quantity Analysis";
- Add the general rules of microstructure aging assessment);
- Add all levels of groups for bainite microstructure aging evaluation, martensite microstructure aging evaluation, and austenite microstructure aging evaluation Texture aging characteristics;
- Delete the original Appendices B T91 steel structure aging assessment grade chart and appendix steel creep damage assessment grade chart;
- Commonly used low-magnification etchants as Appendix A, adding low-magnification etchants for cast aluminum alloy and deformed aluminum alloy;
- Chemical etching reagents commonly used in microstructure are listed as Appendix C, and 9-12% Cr steel and other materials are added to show delta ferrite, 700 °C electricity Chemical etching agent for the microstructure, austenite structure of nickel-based and nickel-iron-based superalloys, aluminum and aluminum alloys, copper and copper alloys for station use;
- Added Appendix E. Preparation and use of metallographic complex materials;
- Added Chapter 8 Records and Reports.

This standard was proposed by the China Electricity Council.

This standard is under the jurisdiction of the Power Station Metal Materials Standardization Technical Committee.

Drafting organizations of this standard. Xi'an Thermal Power Research Institute Co., Ltd., Thermal Power Research Institute of China Datang Group Science and Technology Research Institute, North China Electric Power Science Research Institute Co., Ltd., State Grid Shaanxi Electric Power Research Institute, China Datang Group Science and Technology Research Institute Co., Ltd. Central China Branch, Zhejiang Zheneng Technology Research Institute Co., Ltd.

1 Scope

This standard specifies the basic requirements, main operating steps, basic processes and evaluation standards for the metallographic inspection of thermal power plant components.

This standard applies to the metallographic inspection and evaluation of high-temperature components in thermal power plants. The metallographic inspection and evaluation of other metal parts can refer to this standard.

Row.

2 Normative references

The following documents are indispensable for the application of this document. For dated reference documents, only the dated version applies to this document.

For undated references, the latest version (including all amendments) applies to this document.

GB/T 224 Steel Decarburization Depth Measurement Method GB/T 226 Steel Macrostructure and Defect Inspection Method GB/T 1979 Structural steel macrostructure defect rating chart GB/T 4236 Steel Sulfur Mark Inspection Method GB/T 6462 Metal and oxide coating thickness measurement microscope method GB/T 6394 Method for determination of average grain size of metals GB/T 10121 Steel tower-shaped hairline magnetic particle inspection method GB/T 10561 Determination of the content of non-metallic inclusions in steel, grading chart, microscopic inspection method GB/T 13298 Metal Microstructure Inspection Method GB/T 13299 Steel Microstructure Evaluation Method GB/T 13305 Metallographic determination of alpha-phase area content in stainless steel GB/T 15711 Test Tower Shaped Hairline Acid Leaching Method for Non-metallic Inclusions in Steel GB/T 15749 Quantitative Metallographic Determination Method GB/T 20410 Steel for high temperature bolts of turbines DL/T 439 Technical Guidelines for High Temperature Fasteners in Thermal Power Plants DL/T 674 No. 20 steel pearlite spheroidization rating standard for thermal power plants DL/T 773 12Cr1MoV steel spheroidization rating standard for thermal power plants DL/T 786 Carbon steel graphitization inspection and rating standard DL/T 787 15CrMo steel pearlite spheroidization rating standard for thermal power plants DL/T 999 2.25Cr-1Mo steel spheroidization rating standard for power station DL/T 1422 18Cr-8Ni series austenitic stainless steel boiler tube microstructure aging rating standard DL/T 1603 Austenitic stainless steel boiler tube inner wall shot blasting quality inspection and acceptance technical conditions

3 Terms and definitions

The following terms and definitions apply to this standard.

Microstructure aging when steel is operated for a long time under certain high temperature conditions, its microstructure gradually disperses, its orientation gradually disappears, alloy elements migrate, carbides precipitate and aggregate it gathers, grows, and gradually assumes a spherical shape, tends to be evenly distributed in the crystal (inside the slats), and slowly gathers at the grain boundary (the gap between the slats), and is in a chain the process of shape distribution. These changes in the microstructure reduce the performance of materials and reduce the safety of parts.

Metallographic surface replica A method of copying the microstructure with the prefabricated replica material and the metal surface.

4 General requirements

4.1

The metallographic inspection personnel shall undergo corresponding professional skills training and have the ability of metallographic inspection and evaluation.

4.2

The micrometer scale of the metallurgical microscope should be verified according to the measurement requirements, and within the validity period; the eyepiece scale and the microscope equipped with image analysis software Mirror, the scale and the system scale of the image analysis software need to be verified and calibrated regularly. The portable metallurgical microscope used for field observation should meet Observe the requirement of clear image.

4.3

The metallographic samples should be representative, and the sample interception (including the interception direction, position, quantity) should be based on the metal manufacturing method, inspection purpose, Relevant standards or the provisions of the mutual agreement.

4.4

Where sampling is difficult or unsuitable, and where sampling will affect the integrity of components, on-site metallographic inspection or metallographic replication should be used Method for testing. During on-site inspection, the impact of vibration, dust, temperature, humidity and other environmental factors on the inspection results should be minimized.

4.5

Samples and replica samples should be kept clean and dry. Samples to be retained should