

NDT certification procedure at hazardous production facilities

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Abstract

NDT System at hazardous production facilities was established and is currently operational within the framework of Comprehensive Compliance Assessment System for facilities under supervision of the Federal Service for Ecological, Production and Atomic Inspection. NDT System is intended for the following purposes: development and enhancement of organization, practices, research and technology support in NDT; improve training of personnel and competence of laboratories; execution of methodical documents and upgrade NDT tools; harmonize NDT rules and procedures to make them compliant with international and European requirements and standards; certify personnel, laboratories, methodical documents and NDT tools; create database of certified personnel, laboratories, methodical documents and NDT tools; provide information support of NDT System.

Keywords: laboratory, personnel, instructional document, NDT tool

1. NDT organization support

Effective and reliable organization of nondestructive testing as a method of facility condition assessment that preserves its integrity and availability for further operation is one of the ways to ensure industrial safety. Robust assessment of equipment remaining life, risk analysis of equipment operation at hazardous production facilities have become a national priority, and nondestructive testing methods are critical in addressing this issue. The role of NDT in equipment production has also increased, which can be explained by the fact that new calculation approaches in equipment design are being used on a wider scale making it possible to reduce strength margins, high-strength and defect-sensitive materials are being extensively introduced placing stricter demands to manufacturing processes.

Application of most advanced NDT methods in itself can in no way guarantee high quality of items tested if such NDT methods are used by an incompetent specialist, if inadequate instructional guidelines and NDT tools are applied, and if there is no independent supervision over agencies and departments engaged in nondestructive tests.

Organization, reference and information support play an important role in raising efficiency and credibility of NDT applied to technical devices, buildings and structures used in hazardous production facilities. All this has called for establishment of NDT System at hazardous production facilities. Such NDT System at hazardous production facilities is functioning within the framework of Comprehensive Compliance Assessment System for facilities that are under supervision of the Federal Service for Ecological, Production and Atomic Inspection (hereinafter sometimes referred to as Rostekhnadzor).

Basic mission of the NDT System is to increase operational safety of technical devices, buildings and structures used at hazardous production facilities. This goal is achieved through higher accuracy and credibility of NDT results, their capability for reproduction, comparability of NDT data, timely and adequate solutions with regard to industrial safety.

NDT System management is based on certification of personnel, laboratories, instructional documents and NDT tools^[1]. Promyshlennaya Bezopasnost (Industrial Safety)

Scientific and Technical Center is a central licensing agency of the System providing accreditation to independent certification organizations.

Documentation of the System includes a range of requirements that embrace a host of activities in facility manufacture or construction, assembly, maintenance, preservation, improvement and redesign, operation and expert examination using different NDT techniques such as radiation, ultrasonic testing, sound emission, magnetic flaw detection, eddy current detection, electrical testing, optical method, visual and gaging technique, vibration survey, heat and penetrant application technique.

2. Personnel certification

Personnel certification is done in compliance with Personnel Certification Rules in NDT (PB 03-440-02)^[2]. Personnel certification procedure is mandatory. Personnel Certification Rules include the whole range of NDT methods, technical devices, buildings and structures used in hazardous production facilities. They have been worked out in compliance with NDT System requirements and international standards as regards NDT personnel certification. Certification is done by authorized Independent agencies responsible for NDT personnel certification. Their main task in this respect is to conduct unbiased and independent personnel certification for compliance with qualification levels as required by PB 03-440-02 Rules.

System register incorporates over 34000 certified experts. For distribution of certified NDT experts by facilities, NDT methods and qualification levels see Figures 1-3. Most often NDT experts get their certifications for inspection of boiler facilities, fire, explosion and chemically dangerous production equipment, oil and natural gas industry equipment, gas supply and gas distribution systems as well as hoisting and elevating facilities. Most common NDT methods are UST (ultrasonic testing), radiation, penetrant application, magnetic testing, visual inspection and gauging. An overwhelming majority of experts have qualified as Level 2 specialists.

Introduction of PB 03-440-02 Certification Rules has made it possible to specify and regulate the following: personnel expert knowledge and certification under three experience and skill levels (1, 2, 3); standard requirements regarding general and special training of candidates applying for certification (their education and minimum work experience), standard exam content and procedure; common approaches, procedures and conditions for all stages of examination, including issues of organization, composition of examining boards, standard requirements to special exam topics and samples, system of integrated assessment on the basis of all examination results and the form of certificate of competence.

3. Certification of laboratories

Certification of laboratories is subject to Certification Rules and Basic Requirements to NDT Laboratories (PB 03-372-00)^[3]. These Rules are also mandatory like PB 03-440-02, and they comprise all NDT methods and the whole range of technical devices, buildings and structures used in hazardous production facilities. Presently, over 3000 NDT laboratories have been certified.

Such certification has made it possible to standardize the following:

First, format of laboratory organization, their structure, subordination, relationship with other internal divisions and outside agencies, provision of independence in NDT operations both for NDT departments and personnel;

Second, documented procedures that govern laboratory operations, including those below:

- documents on NDT organization and methodology, documented procedures ensuring high quality of NDT;
- methodical documents regarding NDT and fabrication documents for facilities subject to NDT. They make a basis for NDT procedures and quality assessment of

technical devices and structures by methods and techniques included in lab certification;

- NDT personnel documentation - job descriptions and documents in support of pertinent qualifications and NDT certification by types of technical devices and structures that have been included in lab certification, certification in safety rules;
- laboratory record and archive keeping; availability of NDT operating procedures, including presentation of NDT results, expert opinions and their maintenance; guarantee of confidentiality;

Third, availability of NDT equipment and its condition – inventory, maintenance, repair and measurement assurance; its adequacy for NDT testing of technical devices and equipment included in lab certification.

Certification of laboratories gives ample opportunities for comprehensive assessment of all elements in NDT System subject to certification, because lab certification includes inspection regarding appropriateness, relevancy and adequacy of technical tools and instructional documents, as well as compliance of NDT personnel certification to existing requirements.

Lab certificate is a figure of its merit, of its technical and organizational preparedness to perform efficient and credible NDT of technical devices, buildings and structures implementing all capabilities of up-to-date test tools and methods, standard requirements to personnel training and certification, as well as to management and control of departments engaged in NDT at hazardous production facilities.

4. Certification of NDT tools and instructional documents

Certification of NDT tools and instructional documents is done in compliance with NDT Tools Certification Rules^[4] and NDT Documents Certification Rules^[5]. These Rules also apply to all NDT methods and to the whole mix of technical devices, buildings and structures used in hazardous production facilities. Certification of NDT tools and instructional documents is voluntary.

Certification of NDT tools may prove insufficient. Confidence in compliance of properly identified NDT tool to a standard or any other regulatory document is not yet sufficient proof that such tool can be used for testing a particular facility manufactured from a particular material that has a distinct type design. Certification of NDT tools became necessary in order to validate their usability for testing technical devices, buildings and structures used at hazardous production facilities.

A number of agencies are currently involved in developing instructions and manuals with regard to NDT. Often such agencies do not possess sufficient experience in this field. In order to ensure required scientific and technical level of instructional documents it is advisable to introduce procedures of their certification. Certification of NDT instructions and manuals is intended for verification of their compliance with regulatory technical documentation (first and foremost, rules of organization and safe operation of technical devices, buildings and structures) that contains requirements with regard to industrial safety.

Currently, a network of Independent agencies has been created for certification of NDT tools, as well as for certification of NDT documents.

5. Information and analysis support

Work in information and analysis support is focused on the following domains:

Preparation of information and reference database;

Information support of Rostekhnadzor regional offices and interested organizations with regard to NDT System organization and operation phases;

Counsel, advice and procedural assistance to organizations involved in NDT.

NDT System keeps registers of authorized and independent NDT certification agencies, laboratories, personnel, instructions and manuals. A database of international and state NDT

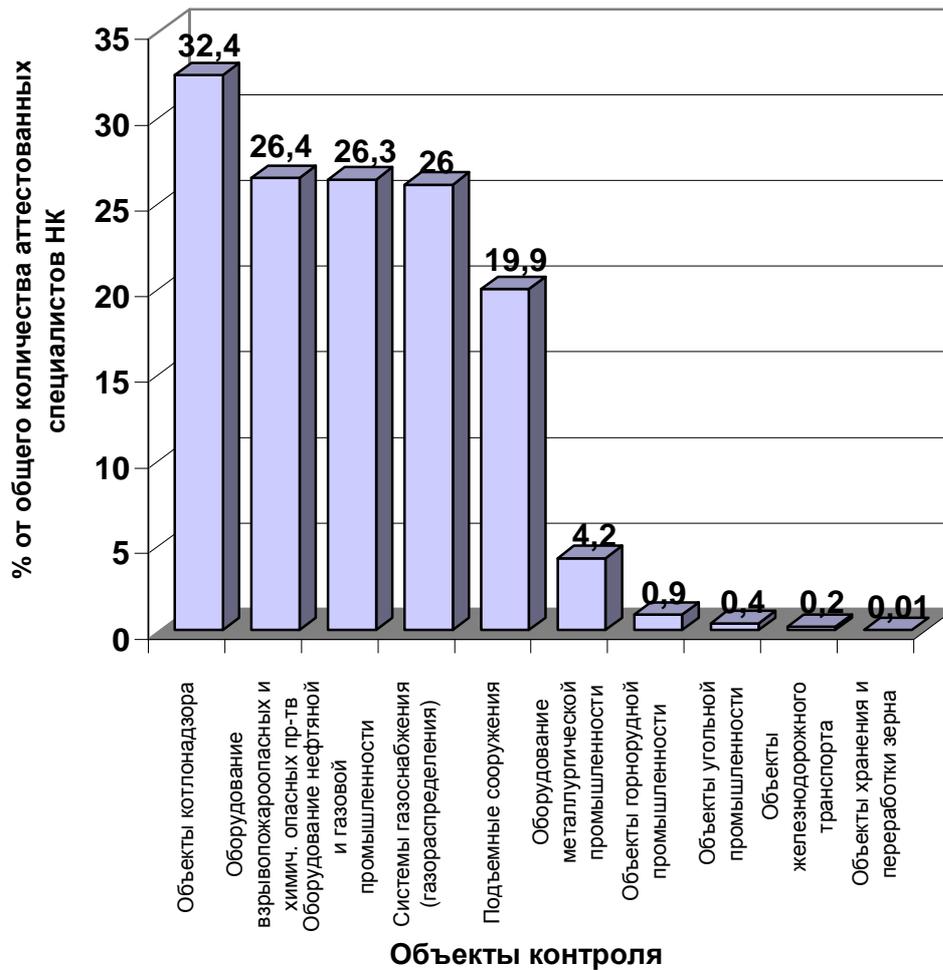
standards has been created, which is constantly updated. A catalogue of NDT tools that are applied for testing technical devices, buildings and structures used in hazardous production facilities has been drawn up. Standard NDT personnel training programs have been prepared; reference aids (i.e. glossaries) and NDT instructional documents are being worked out. For information updates regarding NDT System operation and for data regarding regulatory technical and instructional documents, see www.safety.ru.

7. Conclusion

- (1) Organization, information and analysis support is essential in enhancing efficiency and credibility of NDT testing of technical devices, buildings and structures used in hazardous production facilities. This called for creation of NDT System at hazardous production facilities.
- (2) NDT System documents contain requirements regarding facility manufacture or construction, assembly, maintenance, preservation, improvement, redesign, operation and expert examination employing various NDT methods and techniques such as radiation, ultrasonic testing, sound emission, magnetic flaw detection, eddy current detection, electrical testing, optical method, visual and gaging technique, vibration survey, heat and penetrant application technique.
- (3) NDT System management is based on certification of NDT personnel, laboratories, instructional documents and tools.
- (4) NDT System at hazardous production facilities has provided certification for 34000 experts and 3000 laboratories, currently proceeding to certification of instructional documents and NDT tools.

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Vertical subscriptions

Percentage of NDT experts' total number

Horizontal subscriptions

Boiler inspection

Fire, explosion and chemically dangerous production equipment

Oil and natural gas industry equipment

Gas supply and gas distribution systems

Hoisting and elevating facilities

Metallurgical industry equipment

Mining facilities

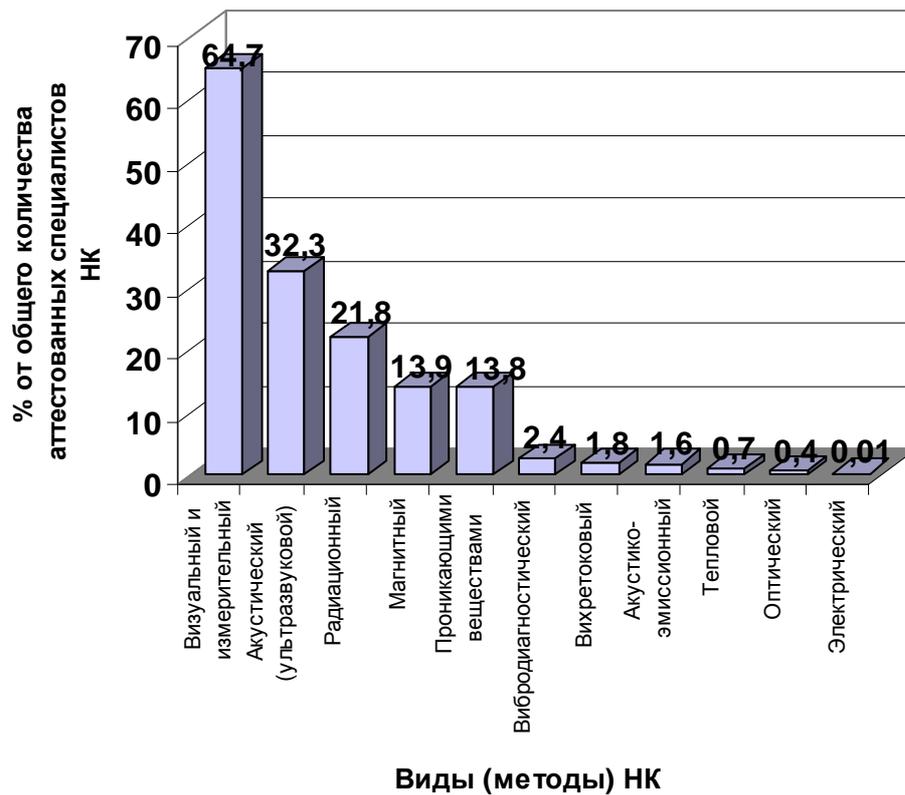
Coal mining facilities

Railway facilities

Grain storage and processing facilities

Inspected facilities

Fig. 1 Distribution of certified NDT experts by facilities

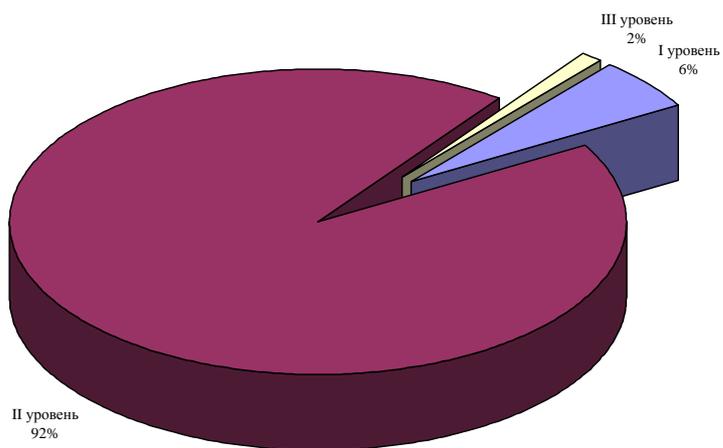


Vertical subscriptions
 Percentage of NDT experts' total number

Horizontal subscriptions
 Visual inspection and gauging
 Sound (ultrasonic testing)
 Radiation testing
 Magnetic testing
 Penetrant application
 Vibration survey
 Eddy current
 Sound emission
 Heat
 Optical
 Electric

NDT Methods

Fig. 2 Distribution of certified NDT experts by NDT methods



Level 1 6%
Level 2 92%
Level 3 2%

Fig. 3 Distribution of certified NDT experts by qualification levels