17th World Conference on Nondestructive Testing, 25-28 Oct 2008, Shanghai, China

NDT PERSONNEL CERTIFICATION IN ACCORDANCE WITH EUROPEAN AND INTERNATIONAL STANDARDS

Gerogy P. BATOV, NAdezhda P. BIRYUKOVA;
STC ”Kachestvo” LTD; Moscow, Russia
Tel./ Fax.: +7(495) 7447052; e-mail: kachestvo@umail.ru

Abstract

More than 12 years of experience in the field of NDT personnel certification conducted in accordance with EN 473, ISO 9712, ISO 17024 made it possible to workout accurate and clear certification procedure, which is now functioning in Scientific –Training Center (STC) “Kachestvo”

Education and training of specialists are based on the syllabuses approved in compliance with existing requirements by the Certification Body.

The procedure of qualification exams is improved in such a manner that evaluation of candidates’ qualification level is impartial, unprejudiced, and reliable and any mistakes are excluded.

The candidates take written general and special exams. Special examination software has been developed. The software has following special features:

- Each candidate has questions of the same level of difficulty selected from each form each topic chapter,
- Questions and examination results are printed out as well as all incorrect answers

In additional to the before mentioned software the program for statistical processing and evaluation of questions and answers has been developed as well. Obtained results are used for question database update that performed at least once a year.

To confirm a candidate’s knowledge of equipment, testing technology and ability to detect different types of defects the technology of test specimens’ fabrication has been developed and a set of test specimens of welded joints with standardized flaws has been fabricated. Also a detailed protocol of results evaluation with weight coefficients for each parameter has been worked out.

The Certification system developed and implemented at STC “Kachestvo” does not violate any of requirements of standards EN 473 and ISO 9712; on the contrary it makes certification process considerably more clear and provides impartial and unprejudiced confirmation of specialists’ qualification level.

The STC “Kachestvo” continuously keeps abreast of the new editions of standards relevant to certification issues. For a example, the certification procedure was introduced for method of structure materials strain testing introduced by ISO 9712:2005.

The relevant documentation has been developed and certification on this method has been started. Obtained results show the actuality and timeliness of introduction of this course.

Key words: Certification, Personnel, EN 473, EN 4179,EASA AMC 145.A.30.(f), ISO 9712, ISO 17024, SPNK RONKTD, Strain testing

The monitoring of technical state of objects provides the reliability of technical state evaluation and industrial safety, no-failure operation of industrial facilities and is based on the well-known methods of non-destructive testing (NDT).

Despite the computerisation and automatisation of testing procedures, the developing market of testing instruments and NDT means, the role of an NDT operator as a specialist is dominant in the quality evaluation of objects.

The professional training and certification are given much attention. There are two functioning certification systems in Russia – "System of voluntary NDT personnel certification in the field of NDT and Technical diagnostics" established by Russian Society for Non-Destructive Testing and Technical Diagnostics (RSNTTD) and "Mandatory NDT personnel certification system within the frames of the Unified System of conformance evaluation at the objects supervised by the Rostekhnadzor -State Agency responsible for Industrial, environmental and atomic power safety" that covers operation of the hazardous industrial facilities.

Both systems are developed in compliance with international standards ISO 9712 and EN 473.

The Scientific Training Center "Kachestvo" (Moscow) is accredited in these systems and its competence was approved on accordance with ISO 17024, EN 473 and ISO 9712 and EN 4179 and was acknowledged by EFNDT for the right to certify NDT personnel for Ist, IInd and IIIrd qualification levels in a wide range of methods.

The 12 years experience in the certification of personnel in the field of NDT according to the requirements of standards of EN 473, ISO 9712, ISO 17024 allowed us to establish a clear procedure of certification that is currently functioning at STC "Kachestvo".

STC "Kachestvo" employs the organizational framework that provides the independence and impartiality when evaluating specialists for a qualification level, independence from the partners and contractors. We have developed and followed strictly the strategy and the order of the certification process according to the effectively functioning system of quality management certified in the system of ISO 9001.

In the Center there are enough highly qualified employees to perform the duties.

The specialists from all over Russia and other countries come to the Center for training and certification. Due to the wide extension of Russia and the need for significant expenses for remote regions of Russia to let the candidates to come to the Center, we have regional (from Khabarovsk to Kaliningrad, from Severodvinsk to Sochi) and industrial examination centers and laboratories, with a number of them being internationally accredited.

According to "The regulations for the examination center and examination laboratory" organised at STC "Kachestvo", they function in a strict adherence to the regulatory documents of STC "Kachestvo".

The education and training of specialists for various NDT methods is carried out at training centers by the Programmes agreed with the requirements of Certification Agency. According to the Programmes, a questionnaire for the general and special exams was made up for each method. The number of hours for training was set maximum that is not in conflict with any of the acting standards. Following the result of the training, a candidate is to be issued the state certificate according to the license of STC "Kachestvo" for the educational activities. The procedure of examination is arranged so that it provides the objectivity and accuracy and eliminates the mistakes when evaluating the qualification level of candidates. The general and special exams are to be passed in a computerized form. For this purpose, a special programme was designed with the following distinguishing features:

- every candidate is provided with the questions of equal complexity from each section;
- the examination record with the listing of incorrect answers is provided for each applicant so that they could study it deeper;
- examination results storage.

To achieve the efficiency of questionnaires updates we have developed a programme of the statistical processing of answers the candidates give for each question. As a result, the questions for which 100% of candidates give correct answers are to be excluded from the questionnaires because of their evidence and simplicity. In case a number of correct answers for certain questions is less than 50%, the questions are to be amended or changed. The

questionnaires are annually enlarged with questions about new equipment, technology, regulatory and procedural documents.

To demonstrate a wide knowledge of the equipment, the instruments, the technology of testing and the skills to detect flaws of various types at the practical exam, we have a collection of specimens with natural defects for every industrial sector. To enlarge the number of examination specimens with thoriated defects, we have developed the technology of manufacturing of test specimens and manufactured a set of specimens of welded joints with normative defects.

The practical exam for level II includes a compulsory design of a technological chart (instruction) that would allow each candidate to show the detailed knowledge of test technology.

The objectivity and impartiality in knowledge evaluation of technology and practical experience is ensured by the design of examiner's protocol of results evaluation on the basic parameters of both technological process and practical work with the weight coefficients for each of them.

Even if all the exams are successfully passed it would not guarantee a qualified work of the specialist. To eliminate the mistakes of qualification level evaluation we introduced the final part for the exams – an interview with two specialists of IIIrd level and one specialist of IInd level as an assistant. During the interview they discuss the peculiarities of testing and potential hazardous places of industrial objects under consideration and the candidate's practical experience is to be confirmed. In a number of cases the candidates are recommended to be re-evaluated for a lower qualification level.

The developed certification system that is functioning at STC "Kachestvo" does not violate any of the requirements of standards of certification, but significantly clarifies the procedure and provides the objective confirmation of the specialist's qualification level.

The center attentively follows the new versions of the certification standards. So, we have realised the certification procedure for the evaluation method of stress and strain state (SSS) of materials introduced in ISO 9712 in 2005.

In spite of the large amount of scientific literature, there are no certified specialists providing an accurate evaluation of the true stress and strain state mode of constructions that causes the significant influence on the safe operation, residual life evaluation and the possibility to develop the measures to reduce the loading.

To carry out the training and certification procedures for the specialists, STC "Kachestvo" has developed the course "Stress and strain state evaluation" that consists of three parts:

1. The requirements for the specialists of the Ist, IInd, IIIrd qualification levels.
2. Training programme that includes all necessary theoretical questions, software, calculation procedure, practical classes, the review of all regulatory and procedural documents. The programme is agreed with the leading specialists and organisations, and is approved by Klyuev V.V., the president of the Russian Society for Non-Destructive Testing and Technical Diagnostics,
3. Examination questionnaires both general and special corresponding to the first and the second paragraphs of the Programme. There are the tasks to measure and calculate SSS. The Programme consists of three paragraphs:
    1. General (corresponds to the knowledge for the general exam);
    2. Special;
    3. Practical.

The first paragraph includes the objectives of the SSS evaluation as a decisive procedure of technical state evaluation (diagnostics) and objects residual life evaluation and supposes the consideration of the following questions:

- SSS parameters and requirements;
- Review course on the theory of strength of materials (basics);

- Calculation of stress and strain, construction reaction on loading and effects;
- Influence of stress raisers on SSS, limit states of deflection, strength criteria;
- Calculation procedure for residual life;
- Evaluation of influence of cracks and slit-shaped defects;
- Aspects of analytical and numerical methods for SSS evaluation;
- NDT methods for SSS evaluation;
- Computational methods for SSS evaluation;
- Comparative analysis of advanced computational means.

The second paragraph offers to learn the regulatory documents on the SSS calculation and evaluation for various objects including the basics of the SSS modeling as well as the documents on the residual life evaluation and the prolongation of safe operation life of technical devices, equipment, facilities at hazardous industrial objects.

The applied questions of the SSS evaluation for a certain type of objects.

The SSS calculation, the durability and residual life evaluation on the example of gas mains as well as the influence of chemical composition and manufacturing technology, mechanical properties of steels under the influence of technological and operational factors of embrittlement, the examples of cracking in operation and the detection methods of destruction mechanisms.

Regulatory provision for risk analysis and evaluation when designing and operating gas mains.

The third paragraph is a practical course that consists of two parts.

The first part – the SSS measurement that includes the demonstration of the SSS evaluating instruments by various methods as well as the measurement itself at the task-specific bench used for the testing of the SSS evaluation equipment and for the training of the personnel of diagnostics divisions.

The test bench is equipped with the strain-gauge instrumentation to measure deformation. The test bench allows the test and measurement with the use of various methods as well as the knowledge test of certified personnel.

One lesson is devoted to the study of basic physics and the practical application of magnetic memory method.

The second part – solution of specified tasks for the SSS calculation. The comparison of theoretical and experimental results.

After finishing of the second course, the specialists are to be examined according to the requirements of ISO 9712.

The course was approved in June 2007 and was proved positive. At present there are about 100 certified specialists in Russia.