

Status of the Thai Society for Nondestructive Testing and NDT in Thailand

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Abstract

The objective of this paper is to present the status and development of the Thai Society for Nondestructive Testing (TSNT). In addition the state of NDT in Thailand is briefed. TSNT was established in 1983. Consequence, the training of the NDT personal in four major methods which are MT, PT, UT and RT were conducted under the support of the Office of Atomic Energy for Peace (OAEP). Since then, the number of NDT personnel has been trained and qualified are consistency increasing. In 2007 TSNT created an agreement with The Thai Industrial Standard Institute (TISI) in order to produce the Thai standard in Non-Destructive Testing - Qualification and Certification of Personnel. The standard is in accordance with ISO 9712: 2005. It was proved and accepted to be used as the National Thai Standard in March 13, 2008. Moreover the supported budget from The Thai government to move forward TSNT to qualify ISO 17024 and TSNT's training center to qualify ISO 9001 has been approved. For the state of NDT in Thailand, most of NDT works were implemented in the area of petrochemical, aerospace, construction and various types of manufacturing industry. Implementation of advanced NDT technology was progressing increased especially in petrochemical industry. For NDT research and education, the number of research paper was significantly increased for the past decade. NDT subjects were contained in curriculums and NDT research topics were focused in a few reputation universities in Thailand.

Keywords: Thai Society for Nondestructive Testing (TSNT), Nondestructive Testing (NDT), Status, ISO 9712

1. Historical Background

The development of Nondestructive Testing is making a steady progress in Thailand. Most government, state enterprise and private sector organizations seem to be well aware of the needs for inspection, testing and quality control by using NDT methods. The activities in the field of NDT were introduced to Thailand in 1969 by International Atomic Energy Agency (IAEA) through the Office of Atomic Energy for Peace (QAEP). At that time Gamma-ray and X-ray radiographic testing was the major technique for industrial applications.

In 1972, the industrial development started in Thailand and NDT techniques have since been increasingly important. There were various industries using NDT techniques as part of their operations, namely airlines, shipyards, oil refineries, constructions and manufacturing of compressed gas containers, and automotive tires and large engine blocks. In order to increase the number of qualified NDT personal for implementing NDT techniques in industries, it was believed that more training course would be essential.

In 1980, the national NDT training program started under the RCA/UNDP industrial project OAEP with the cooperation of the Thai Committee on Nondestructive Testing.

In 1983, the Thai Society for Nondestructive Testing (TSNT) was established after the First National NDT Conference on "Role of Non-Destructive Testing", which was held in Bangkok and under the patronage of "OAEP" and Engineering Institute of Thailand (EIT). It was expected to become a permanent registered society within a few years.

In the early stages of TSNT establishment, training of the NDT personnel for some major techniques such as RT, UT, MT,PT and other NDT technologies were undertaken with the support of OAEP and the project conformed with the ISO 9712 guideline draft. Since then, various national training courses and seminars/workshops have been organized, and increasing number of NDT personnel have been trained and qualified.

TSNT has established NDT permanent society in Thailand on October 4th 1994 with the principal objective being to promote and to support the technical knowledge transfer to NDT personnel and their associated managerial persons. Members of the TSNT comprise of government, state enterprise, private sector and persons from related fields. There are about 200 members, which will conduct the future program activities; for example, training personnel, seminar/workshop national Qualification and Certification standards, etc.

2. TSNT current status

Thai Society for Nondestructive Testing (TSNT) was established for distributing academic knowledge and promoting support including testing and certifying NDT knowledge and skill. It also acts as the center for members to exchange academic knowledge and coordinating with agencies or associations both domestic and abroad. Currently, TSNT has developed NDT personnel training and certification as the national standard based on the international standard framework. The Board of Director is made of individuals elected by the members. The individuals are from public sectors, educational institutes, NDT operators, and companies that employ NDT personnel. The Board of Director holds the post for 2 years. The society is made up of 2 principal sections; training center and personnel certification section. Each section has the following duties:

- (1) Training center has the duty in public relating, arranging plans and trainings for members and interested individual and issuing Certification of Nondestructive Training.
- (2) Personnel certification section has the duty to plan for offering tests and examination of the applicant qualification, arranging for test, result consideration and issuing Certification of Nondestructive Competency.

Currently, the society is offering personnel training and certification by implementing 4 methods; UT, PT, MT, and RT in both level 1 and 2 with the plan for level 3 in the future. Both sections offer performance certification in compliance with personnel certification standard ISO 17024 and administration quality standard ISO 9001. Additionally, the society has past successful results; NDT standards draft and personnel certification Mor Or Kor 9712, in cooperation with Thai Industrial Standard Institute (TISI), Ministry of Industry. The standard and the certification are used as Thailand standards and were announced in the Royal Gazette on March 13th 2008. The society implemented a policy in cooperating with the industrial sectors in pushing and developing NDT to be the international standard and leading the NDT in the better direction.

3. Public and industrial sectors NDT in Thailand

3.1 Industrial sectors

Currently, Thailand has increased demand for NDT, which can be seen from the increase number of those who participate in the training and the increase number of the NDT agencies, the increased number of research, the increased number of NDT equipment importation and tools, and the NDT service acquired abroad. The details are as following table:

Industrial sectors	Testing	NDT method
1. Petrochemical Industry	Pipeline, piping, Boiler tube, pressure vessel, storage tank and steel structure fabrication and erection	PT, MT, UT, AE, ET, VT, RT, IR, VA and advanced NDT
2. Airline Industry	Airplane parts maintenance	
3. Large Project Industry	Bridge structure, Power Plants, Factories, Process Buildings and Tank Farms	
4. Other Industries	Vehicle parts, agricultural products, medical and production industry raw material and product quality	

In the early phrase, advanced NDT service was acquired from abroad; however, currently, the advanced NDT is afforded to inspect by domestic labors. Sample of advanced NDT are phase array UT, RT real time, Internal Rotating Inspection System (IRIS), Long length UT, and application of AE in various fields.

3.2 Public sectors

Concerning public sector, Thai Industrial Standards Institute (TISI), Ministry of Industry, has given support the personnel certification standard and pushing such standards to be implemented and there is also a long term support plan.

In the aspect of education, NDT has been implemented in the university level curriculum e.g.:

- King Mongkut's University of Technology Thonburi is offering NDT elective courses in Bachelor, Master and Doctorate degrees levels.
- Chulalongkorn University, King Mongkut's University of Technology North Bangkok, and Suranaree University of Technology are offering NDT elective courses in Bachelor degree levels.

Additionally, education institutes or research agencies have done numerous researches on the subject of NDT that can be used to advance the industrial sectors. The research works are separated into the following testing methods:

Ultrasonic Testing research (UT) has been implemented in the residual stress measurement in metal^[1-3], in the agricultural field such as measuring the ripeness of fruit^[4,5], measuring Vulcanization of Para rubber^[6] and biology such as yeast growth stimulation^[7].

Magnetic Flux Leakage research (MFL) to test for the relationship between the parameters that affect the leakage signals^[8] and construction of equipment for discontinuity detection such as in cable^[9] and in plate.

Radiographic Testing research (RT) has improved the analysis of inconsistency in welding works by applying the mathematical systematizing^[10]. Neutron radiation has been used with film in NDT and it is also used in Silviculture by using X-ray in tree seed quality testing of *Dalbergia cochinchinensis* Pierre^[11].

Acoustic Emission research (AE) has been used in the corrosion monitoring and severity classification^[12-15], valve leakage measurement^[16-18], the detection of cracks in objects^[19] such as pressure vessel and the detecting the completeness of the welding process^[20], machining process^[21-26] and false monitoring in rotation part and position locator by using FPGA^[27,28] system.

Research concerning creating artificial faulty in the weld specimens to use in practice examination for level 1 and 2 personnel certification.

Research concerning the construction of NDT equipment and accessory for example UT and AE sensor, MT stationary equipment, Value leakage rate Measurement, Magnetic Flux Leakage measurement for Cable and Steel Plate etc.

4. The cooperation by both public and private sectors in pushing NDT

Due to the continuous expansion of the demand for NDT, the growth of both domestic and foreign companies concern NDT is also increasing. A few ten of NDT companies work in NDT testing and consultant. There are 3-4 large Thai Nondestructive Testing companies and two of them have turned into public company in 2007.

A mentioned previously, the public sectors (TISI) have been assisting in the construction of NDT standards. The private sectors also provide supports in research by creating new technologies in order to reduce the dependence on foreign countries, especially the large petrochemical companies because the NDT in Thailand is mostly used in the industry.

5. NDT Standard

Most of the NDT conducted in Thailand referred to American standards (ASME, API, ASTM, ASNT, etc), European standards (ISO, EN, DIN etc), Japanese standard (JIS) and other standards such as AIS. Some of Thai Standards were established in Thai language as shown in details are as following table:

Standards	Details
Mor Or Kor. 9712-2551	<ul style="list-style-type: none"> • NDT standards: Personnel qualification and certification
Technician standard B.E. 2542 Mechanical Engineering work (testing standard)	<ul style="list-style-type: none"> • Ultrasonic Testing research standard Mor Yor Tor (Tor) 802-2542 • Magnetic Flux Leakage research standard Mor Yor Tor (Tor) 803-2542 • NDT standard for gas tank tester and inspector
The 28th Revolutionary Group Announcement;	<ul style="list-style-type: none"> • Gas tank tester must be certified by the Department of Public Works

Fluid petroleum gas storage	<ul style="list-style-type: none"> • Requirement for NDT in gas tank test and inspection
Mor Or Kor 1324-2539	<ul style="list-style-type: none"> • NDT by using Penetrant Testing
TSNT-PC-4101	<ul style="list-style-type: none"> • NDT personnel certification standard by the TSNT
Fuel Storage Statute B.E. 2474	<ul style="list-style-type: none"> • Requirement concerning gas tank test by NDT

6. NDT research and training agencies

The agencies that are responsible for researches are usually education institutes and the trainings are usually provided by education institutes and associations. The details are as following table:

Agency	NDT works
Thai Society for Nondestructive Testing (TSNT)	<ul style="list-style-type: none"> • Arrangement of academic NDT trainings and seminars including providing test for personnel certification according to ISO 9712
Thai Welding Society	<ul style="list-style-type: none"> • Arrangement of trainings and seminars
King Mongkut's University of Technology Thonburi	<ul style="list-style-type: none"> • Arrangement of trainings, seminars and research in using advanced NDT technology
Chulalongkorn University	<ul style="list-style-type: none"> • NDT research for industrial works
Chiang Mai University	<ul style="list-style-type: none"> • NDT research for agricultural works
King Mongkut's University of Technology North Bangkok	<ul style="list-style-type: none"> • Arrangement of NDT trainings, seminars and research for industrial works
The Office of Atom for Peace	<ul style="list-style-type: none"> • Arrangement of trainings and seminars
NDT private companies	<ul style="list-style-type: none"> • Arrangement of trainings and seminars and personnel testing according to SNT-TC 1A

Most of trainings arranged by the central organization according to the above Table are based on recommendation ISO practices; however, the private companies would certify according to SNT-TC 1A.

7. Conclusions

This article states the history of Thailand NDT development and Thai Society for Nondestructive Testing (TSNT) development. The society has received financial support from the Office of Industrial Standard in order to draft and enforce the standard for the personnel certification according to ISO 17024 and administration quality standard according to ISO 9001.

The demand for NDT is increasing. The industry that uses NDT at the highest rate is the petrochemical industry. The second most is the industry with large structure and airline industry. The usage of NDT also increased in the production industry such as steel plate industry, pipe fitting production industry, etc.

The cooperation between the public and private sectors along with education institute has also increased in the aspect of testing and research in order to reduce being depending on foreign countries. The research funding from private sectors also increased.

Education institute are motivated and designating academic NDT as a course in the curriculum. The researches have been done in various methods but mostly the emphasis is on implementation in the field and construction of equipment and accessory.

There are still few self-draft standards. However, currently, support from the government has started in the designation of standards to be implemented including personnel certification standards for Thailand, which were announced this March 2008.

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