Are we ready for the switch over?

Sadasivan Narayana

Materials Evaluation Services (Mumbai) Pvt. Ltd.

sadasivan.n24@gmail.com

Abstract:
The increasing demand for delivering the goods at a shorter time makes it imperative on manufacturers to explore all the possible measures to reduce the production time. UT in lieu of RT can save the production time and enhance the delivery schedule. This can also help in avoiding the radiation hazards associated with RT. Qualified and experienced personnel are essential for implementing this testing. Author discusses about the demand and supply gap which exists today. Concerted effort is required to bridge the gap and switch over to UT. Some remedial measures are being discussed in this paper.

Key words:

1. Introduction

In the coming years, India will emerge as a manufacturing centre in line with our PM’s motto “Make in India, market abroad”. Increasing demand on short delivery time will make it more imperative on Manufacturers to explore the options of hastening the production cycle time and quality control checks.

Non-Destructive Examination (NDE) plays an important role in ensuring the quality and safety in the manufacturing Sector of Pressure Vessels, Heat Exchangers, Boilers, Piping, Nuclear Equipment, Heavy machineries for various industries.

In service, Ultrasonic Testing (UT) is widely used to monitor the condition of the welds in critical equipment. For example, Reactors with refractories inside, Ammonia Converter with catalysts inside are some of the examples where examination of weld joints with Radiographic Testing (RT) is not possible due to thickness and accessibility restrictions.

ASME Code Section I, VIII Div.1, 2 & 3 permits UT in lieu of RT for weld thickness ≥13mm. UT needs to be semi or fully automatic and recordable type. Time of Flight Diffraction (TOFD) Fig.1 & Phased Array Ultrasonic Testing (PAUT) Fig.2, which are the options, are software based and capital intensive UT techniques.
RT has been widely accepted as a simple and well documented NDT method. But it has its own limitations such as radiation hazard, thickness limitations, film processing cycle time, difficulty in detecting unfavourably oriented planar flaws etc. Disposal of the used processing chemicals also poses a problem.

2. Analysis and Survey

A case study revealed that Medium type Heat Exchangers -08 nos. - manufactured in accordance with ASME Section VIII Div.2 would have consumed 24 days exclusively
for completing RT. When Auto UT was adopted, Manufacturer could cut his delivery time by 24 days.

Details pertaining to orientation of flaw, through thickness dimensions and location are main advantages of UT as compared to RT. Unlike RT, parallel activities such as set up, grinding and welding can be carried on shop floor, while UT is being done.

Some manufacturers are of the view that Auto UT is more sensitive and causing more repair than RT. Better welding technology and improved workmanship should be able to overcome this problem.

Manufacturers such as Larsen & Toubro Ltd. (L&T) have already got equipped with these advanced NDT facilities and qualified personnel for executing the testing.

Atomic Energy Regulatory Body (AERB) can also play an important role in encouraging auto UT in place of RT which needs lot of safety norms to be complied with. In Europe, conventional UT shear wave technique is being widely used for examining full penetration welds in fabrication activities.

A] Are we ready for the switch over from RT to UT?

Recordable UT means:

a) Capital intensive investment on equipment, software and accessories
b) NDE Personnel with good educational background, knowledge of computer & experience
c) Expensive training and qualification
d) Fabrication of demonstration blocks (weld joints with introduced defects simulating the actual conditions)

Manufacturers and NDT Service providers with good financial strength can only now afford to invest in these capital intensive instruments and softwares. Computer based system is likely to develop breakdown which necessitates to have spare instruments as stand by. At present it costs about ₹ 5 million for an instrument with minimum TOFD and PAUT softwares and accessories.

NDE Personnel, operating these instruments, need to have good educational background and computer knowledge. This will increase the overheads such as good remuneration and incentives to woo the personnel and retain them.

Training and qualification will be essential. Demand-supply gap exists today for well-equipped training institutions and trained personnel. Needless to mention the importance of Faculties with good experience for imparting training.

B] Statistics of BINDT authorised Training institutes within India:
There are 8 institutes imparting training in 4 NDT methods i.e RT/RTFilm Interpretation, UT, PT and MT. Only four of them are imparting training in TOFD and PAUT techniques. Except in U.K, there are only countable institutes in other countries.

Based on the above information from BINDT’s website, it appears that there is definitely a scope for institutes who can provide similar training in these two advanced techniques.

There is no substitute for experience. NDE personnel need to have good experience in addition to meeting the qualification requirements. **How many of us will be ready to undergo surgery in the hands of inexperienced surgeons?**

It is worth recalling an article “A Cautionary Tale” by Ronald T. Nisbet published by ASNT in the journal “the NDT Technician”. While carrying out in-service inspection of a Pressure Vessel using PAUT technique, Indication was interpreted to be crack in all six welds at identical locations. TOFD & Conventional shear wave UT did not show any such indication. Detailed review of the construction drawing revealed that it was caused by the internal attachment welds. Supportive supervision, careful data analysis and decision making are important responsibilities which NDE Level III needs to shoulder.

Fabrication of demonstration blocks (Fig.3) is expensive and time consuming process. RT does not require any such blocks. A good library of blocks need to be developed for meeting the Customer and Code requirements so that production cycle time can be reduced.

**Figure 3. Schematic sketch of demonstration block:[1]**

3. **Discussions**

A concerted effort is required by Indian Society for Non-Destructive Testing (ISNT), Pressure Equipment Manufacturing Industries and NDT Service providers to overcome these problems. We need to ponder over some of the remedial measures suggested below:

a) Setting up regional institutions for imparting NDE training in at least 4 or 5 NDT methods and leading to diploma in NDT. These institutions need to be well equipped in all respects. Probably, ISNT can liaison with established regional Engineering colleges as
a centre for providing training. This may reduce the capital cost of setting up infrastructural facilities.
b) Training need to be full time for about six months with emphasis on hands-on practice. This will necessitate facilities such as sufficient no. of instruments, accessories, flawed specimens for practical sessions.
c) Periodic visit to manufacturing industries for giving an exposure to ground realities. Testing on the Shop floor will give a good insight into all activities from calibration to evaluation.
d) Training fee need be subsidised and affordable for the candidates who come out of college. Roping in some Banks may be a solution for providing loan facilities to the candidates. Placement assurance on successful completion of training can woo the candidates. Campus selection by interested industries will boost the participation. Suitable remuneration is essential for preventing the brain drain of such qualified and experienced candidates.
e) Manufacturers of NDT instruments need to explore the possibility of reducing the cost and making them affordable for such institutions. They can have a discounted tariff for training institutions.
4. Acknowledgement:
a) BINDT website
b) Mr. P. Raghavendra (L&T, NDT In-charge, Hazira Works)
c) NDTS-Mumbai
5. References:
1) ASNT Journal “The NDT Technician”
2) ASME Codes Section I, VIII Div.2 & 3