

Olympus NDT Training Academy

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Abstract. When portable phased arrays first appeared on the market, one of the first questions asked was “Do you have training?” Initially with only a small number of units sold, Olympus (or R/D Tech as it was then) performed all the training. However, the load factor rapidly became so high that an alternative solution was required. The Olympus Training Academy was conceived, with half a dozen selected members based on their enthusiasm for the new technology. This had the major advantage that now professional trainers were doing the training – in appropriate languages. Olympus NDT supplied and checked initial course material and courses.

In exchange for low cost company equipment and free training kits, each company was obligated to prepare specific courses, depending on expertise, demand, code requirements etc. The initial two day “Introduction to Phased Array” course rapidly developed into a series of specialized courses, which now dominate the training program. As predicted, each training company has specialized in their own technical and geographic areas. With a significant investment from both Olympus NDT and the training companies, the ONDT Training Academy PA training program has mushroomed to several times the specified course load. Besides the required courses, some courses are specifically aimed at qualifications, e.g. PCN and EN. Other courses are given as “private” courses within a company; this has advantages to the corporations as the training companies can tailor their courses to the requirements. Other training companies that have been interested in joining the Academy can join as Associates, which offer different conditions and requirements. One problem with these courses, which applies to all training, is that the operator’s capability at the end of the course depends on their initial capability, and also how much they practice.

1. Portable Phased Arrays

Portable phased arrays (PA) are a major leap in the NDT market [1]. They combine the portability of manual units with the capability of large automated systems (arguably a bit slower and more limited), and the price is significantly less. The advantages of portable PA over radiography (RT) and manual ultrasonics (MUT) are summarized below.

- No radiation, safety hazards, licensing or chemical waste (cf. RT)
- Better detection of critical planar defects (compared with RT)
- Faster inspection (up to a factor of ten vs. MUT for welds)
- Full data storage (compared with MUT)
- Better imaging, using S-scans, E-scans, “top, side, end” views
- Flexibility: all set-up files are electronic for easy recall and modifications

- Reproducibility: operators get the same results each time, using the same procedure. (This quality is yet to be demonstrated by third party trials)
- “Specials”; phased arrays can perform unique inspections, e.g. bolts, turbines.
- Improved operator productivity: portable PA offers a real solution to the global shortage of inspectors.

Not surprisingly, there has been considerable interest in portable PA, especially as these units can address a wide variety of industrial problems.

2. Training Background

Prior to the arrival of the OmniScan portable phased array unit in 2003, R/D Tech had sold hundreds of high-end, dedicated phased array (PA) systems to a wide variety of industries and countries. Each advanced PA unit required dedicated training on the specific application, and this was typically supplied on a one-on-one basis from Québec, Canada. Typically, users were well informed about ultrasonics, particularly automated ultrasonics, and many had advanced university degrees.

With the arrival of OmniScan, everything changed. Typical OmniScan purchasers were small privately-owned companies who saw great potential for making a profit from phased array units. However, they were typically not experienced in AUT or phased arrays. At exhibitions, visitors would typically ask the following questions about OmniScan:

1. What can it do?
2. How much does it cost?
3. Is it code approved?
4. Do you have training?

The answers to the first two questions were relatively straightforward. Due to a major push by Olympus NDT (originally R/D Tech), the codes are being addressed.

The training issue was highly significant. During the early stages, training was primarily performed by the top Olympus NDT operator from Houston. However, he rapidly became overloaded, and further solutions were required. Operators from Quebec were used, but again, this presented further supply problems. In addition, none of these operators were professional trainers, and in some cases, language was not as good as desired. Another solution was needed.

3. Olympus NDT Training Academy

The ONDT (originally R/D Tech) Training Academy was conceived.

There was no off-the-shelf training program, with established courses for standard certifications. The only course available was a short introductory program; there were no

long term or specialized courses; no PA certifications; and initially no training companies.

4. Training Academy Members

The first move was to find some professional training companies. These were selected partly on geography, but mainly on the company's interests in advanced technology.

In North America, three companies were selected:

- Davis NDE, Inc. in Alabama
- Eclipse Scientific Products in Ontario, Canada
- TEST NDT in California.
- Olympus NDT still has the right to give courses, and typically does so if the risk is high, e.g. in new markets.

In Europe, three more companies were selected:

- Lavender International in the UK
- Vinçotte Academy in Belgium
- DGZfP in Germany.

The Asia-Pacific region being addressed separately.

5. Training Courses

The next move was to require the training programs to develop and give courses. Initially, all Training Companies were supplied with material to give the "Introduction to Phased Array" course, normally two days long. However, in exchange for reduced-cost PA units for the companies, and for free use of OmniScan training kits (three units plus accessories), the Training Companies were required to develop special courses.

The special courses were tailored to the Training Company's skills, geographic area etc. For example, in North America Davis NDE produced PA courses on crack sizing, Eclipse courses on other crack sizing techniques and ASME code approvals, TEST NDT on aerospace applications. In Europe, Lavender produced courses with PCN approval, Vinçotte courses with EN approval, and in other languages, and DGZfP gave courses in German.

Table 1 gives a sample list of courses from the ONDT web site [2]:

Table 1: Partial list of courses available

- **Introduction to Phased Arrays**
- **OmniScan UT and Phased Array Course**
- **PCN Level 2 in Ultrasonic Phased Arrays**
- **Advanced Weld Inspection and Crack Sizing**
- **Ultrasonic Phased Array Inspection for Aircraft and Aerospace Applications**
- **Eddy Current Array Inspection for Aircraft Applications**
- **Ultrasonic Phased Array Inspection of Welds**
- **TOFD Applications**

There are several notable features about these courses. First, there is a wide variety of courses, and this range is still expanding – several courses are not listed yet, especially if they are incomplete. Second, as predicted, each company is specializing in their own area(s). Third, the original contracts required giving six two day “Introduction to PA” courses per year. It was rapidly realized that the two day courses were adequate as an introduction for engineers and managers, but not adequate for serious training. Consequently, there has been a trend away from the mandated two day courses to five day or two week courses.

Two other trends are worth noticing. First, companies rapidly realized that it would be cheaper to run courses in house, and that is now common practice. Second, demand has mushroomed. Most of the training companies have doubled or tripled their PA training capability.

Initially there was some conflict in “territories”, as expected. This was aggravated by some companies being more prepared for take-off than others. Ultimately, R/D Tech (now Olympus NDT) decided that any company could give a course anywhere, on the expectation (correctly) that there would be more training than any one company could handle.

6. Equipment

Part of the original agreements between Olympus NDT and the various Training Companies was that ONDT would supply a limited amount of equipment – free of charge. This was in compensation for the several courses that the Training Companies were to develop. In principle, this worked well, but there were many equipment conflicts (particularly in the early days in North America when equipment was more limited), and also the usual damage, wear and tear etc. in the equipment. The early wear problems were traced primarily to customs checks, so photos of the equipment packing were stuck to the insides of the Pelican cases to aid re-packing.

Now, most of the training companies own their own equipment, and use ONDT training kits as additional.

7. Course Approvals

Some of the required courses were developed to fulfill specific code requirements. These are briefly mentioned below:

1. **ASNT:** TEST NDT developed a weld inspection course that fulfills the specific requirements of SNT-TC-1A in terms of hours and workload.
2. **ASME:** ASME does not require training credits as such, but does require inspections to be performed to defined procedures with qualified operators. Eclipse Scientific Products has prepared a weld inspection course based on experience with ASME Section V Article 4 and Article 14 [3], plus the specific calibration requirements of phased arrays.
3. **EN:** Vinçotte Academy in Belgium has prepared a course that fulfills the requirements of EN 473 (and ISO 9712) for ultrasonic training.
4. **PCN:** Lavender International has developed a phased array training course to PCN guidelines. The 80 hours Level 2 Phased Array course is accredited to the British Institute of NDT training accreditation program. The Level 2 Phased Array exams are accredited to BINDT PCN examination program (which meets EN 473 and ISO 9712).

8. Where are we now, and where do we go?

Right now, ONDT is well pleased with the Training Academy. The initial start up presented some friction, equipment problems and content issues. Now the program is running relatively smoothly, except that it is expanding exponentially, more equipment is needed, and we are scheduled for over 110 courses globally in 2007; this number will increase as the remaining 2007 equipment slots are filled. These include listed courses, some private courses, advanced courses.

There are even three and four week courses run by an affiliate of Davis NDE, Inc. [4] for less trained UT operators. The University of Ultrasonics is a combined Ultrasonic Training program to accelerate UT inspectors from Basic Skills (UT Level I and Level II; 120 Hours) Ultrasonics Training to Advanced UT Skills for Detection and Flaw Characterization, Crack Sizing, and Phased Array for Weld Inspection and Crack Sizing using Creeping Waves and Tip Diffraction methods; (160 hours). Compare this with the half a dozen courses given initially in 2003.

The ONDT Training Academy has also moved into more advanced techniques, specifically TomoView training. Again, ONDT supplies the basics, while the training companies develop the actual programs. OmniScan was specifically designed to be compatible with TomoView; both the Focal Law files and data files are compatible, so data can be sent either way. For example, Focal Laws can be prepared on TomoView for more demanding inspections, e.g. 2D arrays, and downloaded to OmniScan. The scan data can then be transferred back to TomoView for more detailed analysis, data merging

display etc. Alternatively, OmniScan can be driven directly from TomoView using an external laptop.

One significant aspect of this training program is that it acts as a wonderful marketing tool; people who take the course typically buy or promote phased arrays.

So, where are we really going? Phased array courses are undergoing exponential growth. This will likely continue for a while until the global market is finally saturated. At this time it is unlikely that we will add any more new Training Academy members as most of the required courses have been prepared. However, there is plenty of room of Associate Members, and some have already been adopted, e.g. TWI. Associate Members typically get educational reductions on their equipment, a starter kit, and other support.

As for the trainees, how do they do? The answer is simple, and we all know this beforehand. “It depends.” Specifically, it depends on the person’s skill set at the start, how adaptable they are to new concepts and technology, and how much they work on PA’s afterwards. Not surprisingly, the operators range from impressive to essentially non-starters. Their progress also depends on the trainer, of course.

9. Conclusions

1. The Olympus NDT Training Academy was set up to train operators on portable phased arrays due to demand, and limited training resources inside Olympus NDT.
2. The ONDT TA consists of six training companies under special conditions to develop and give phased array courses.
3. The program has evolved in a few years from half a dozen two-day courses to over one hundred courses of dozens of types, from formal classroom settings to on-site settings and custom courses, to courses weeks long.

Acknowledgements

The six ONDT Training Academy members are (in alphabetical order):

- Davis NDE, Inc, Birmingham, Alabama, USA
- DGZfP, Germany
- Eclipse Scientific Products, Kitchener, Ontario, Canada
- Lavender International, UK
- TEST NDT, Los Angeles, California, USA
- Vinçotte Academy, Belgium

In addition, many of these trainers have been actively involved in development of various techniques and programs.

Internally, a number of people have been actively involved in this program: Noël Dubé, Steve Berube, Philippe Cyr, Chris Magruder, Carl Mercier, Simon Labbé, Vincent Pasquer – to name a few.

References

- [1] R/D Tech, “Introduction to Phased Array Ultrasonic Technology Applications – R/D Tech Guideline”, published by R/D Tech, August 2004, www.olympusndt.com
- [2] See www.olympusndt.com/training.
- [3] R.K. Ginzel, E.A. Ginzel, J.M. Davis, S. Labbé and M.D.C. Moles, “Qualification of Portable Phased Arrays to ASME Section V”, Proceedings of ASME Pressure Vessel and Piping Conference 2006, July 23-27, 2006; Vancouver, B.C., Canada, ASME paper number PVP2006-ICPVT11-93566.
- [4] www.universityofultrasonics.com, University of Ultrasonics by Davis NDE, Inc.