

X-rays for industry: Non-destructive testing helps Malaysia's competitiveness

By Brian Plonsky

"The Malaysian example shows that it is possible to build an internationally recognized testing system from scratch."

— Patrick Brisset, industrial technologist, IAEA

Technicians inspecting a PETRONAS pipe using NDT methods in order to test the quality of the pipeline.

(Photo: A. Nassir Ibrahim/Madani NDT Training Centre)



Industrial testing using nuclear technology has contributed to the competitiveness of Malaysia's manufacturing sector, industry players have said. The country has also built itself an export niche in South-East Asia, offering non-destructive testing (NDT) with nuclear devices to manufacturers in neighbouring countries.

"The fact that we can get NDT services of a good quality level at a very reasonable price allows us to spend more money on inspection, and thus improve our competitiveness as well as the level of safety of our plant," said Zamaludin Ali, senior engineer at oil company PETRONAS. Before the development of a local NDT industry and accreditation system for testing services, PETRONAS and other companies in Malaysia had to rely on foreign NDT providers, or local companies hiring operators certified abroad, he explained.

NDT using nuclear techniques involves the use of ionizing radiation to test the quality of finished products. It is based on the same

principle as X-rays used in hospitals (see box). Oil pipes, boilers, pressure vessels, aircraft equipment and ships are among the products whose quality is tested with the technique.

The IAEA has played an important role in helping Malaysia to establish accredited training agencies and a certification system, and to promote NDT technologies such as radiographic testing. As a result of this long-standing partnership, over 50 companies in Malaysia, employing more than 2000 technicians, are certified to carry out NDT testing.

Building local expertise

It all began in the 1980s, when Abdul Nassir Ibrahim, a junior official with Malaysian Nuclear Energy at the time, first attended a series of IAEA training courses on NDT. With support from his Government and assistance from the IAEA, he helped set up the National NDT Certification Board, from which he retired last year. Nassir Ibrahim

is currently managing the Madani NDT Training Centre near Kuala Lumpur.

Companies in the oil and gas sector account for around 70 per cent of all NDT inspection business in Malaysia, Nassir Ibrahim explained. Power plants, shipyards and the aviation industry are other important clients that benefit from this technology. The cost of local inspections is about one fifth of the cost of hiring inspectors and using technology from overseas, he said.

The IAEA helped to develop local expertise in the early years by supplying equipment and organizing training courses and scientific visits, explained Patrick Brisset, an industrial technologist at the IAEA. “Seeing the advances and success in Malaysia, we regularly call upon Malaysian experts to help the IAEA to set up training and certification centres in other countries,” he said.

Malaysia’s training system and National NDT Certification Scheme have become a reference point for many countries: Nassir Ibrahim and his colleagues regularly conduct training courses in Sudan, which has adopted Malaysia’s certification scheme. Prospective inspectors from the Philippines, Yemen and



Sri Lanka also come to Malaysia for training and certification, Nassir Ibrahim said.

The success of Malaysia’s NDT training programme can serve as a model and inspiration for other countries that wish to develop a domestic NDT certification programme, Brisset said. “The Malaysian example illustrates that it is possible to build an internationally recognized testing system from scratch and that the IAEA can help in the process.”

THE SCIENCE

Non-destructive testing

Art restoration in London, munitions manufacturing in Argentina, bridge construction in New York, and the oil and gas industry in Malaysia may appear to have very little in common. What connects them all is a quality control method using radiation, known as non-destructive testing (NDT).

The most important NDT technique on the market and the one most widely used in Malaysia is radiographic testing, which is based on the differential absorption of X-rays and gamma rays emitted from an X-ray machine and a radiographic source, respectively.

Radiographic testing works by using ionizing radiation (including X-rays or gamma rays) to create an image of the internal structure of solid and hard materials, such as steel or concrete. The radiation passes through the material and exposes a film placed on the other side of the material. The film’s darkness

varies with the amount of radiation reaching it through the test object: materials with areas of reduced thickness or lower material density allow more radiation to pass through. These variations in the darkness of the image can be used to determine the thickness or composition of a material, and also reveal any flaws or discontinuities inside it.

Radiographic testing plays a vital role in the production and maintenance of materials and structures, without causing any damage to them or leaving any radioactive residue. It is used to determine and improve quality, and thus ensure safety. Specific uses include flaw detection and evaluation, dimensional measurement, leak detection, structural characterization, stress and dynamic response measurement, structural integrity analysis, and material sorting, such as determining the conductivity and chemical composition of materials.