

Myanmar uses nuclear techniques to improve industrial processes

By Miklos Gaspar

A researcher at Myanmar's Department of Atomic Energy is testing equipment to be used for non-destructive testing at the country's oil refinery.

(Photo: M. Gaspar/IAEA)



Experts are rolling out the use of nuclear technology in industrial testing across Myanmar, following successful implementation of the technique in the oil and gas sector.

Non-destructive testing (NDT) using nuclear techniques involves ionizing radiation to test the quality of materials and products (see The Science box). The technique used in Myanmar is called gamma process tomography and is based on the differential absorption in different materials of gamma rays emitted from a radioactive source. Since 2013, the IAEA has helped Myanmar's Department of Atomic Energy to purchase the necessary equipment and build the expertise of its staff in using the technique. Department of Atomic Energy experts regularly perform NDT in the Thanlyin oil refinery near Yangon to inspect the quality of the pipes and of the products flowing through them.

"Nuclear science and technology play a major role in bringing innovation and efficiency to industrial processes," said Meera Venkatesh, Director of the Division of Physical and Chemical Sciences at the IAEA. "Myanmar

provides a great example of how low-income countries, too, can take advantage of this technology."

Oil pipes, boilers, pressure vessels, buildings, aircraft equipment and ships are just some of the products being quality tested using this technique around the world, and Myanmar's Department of Atomic Energy is taking steps to spread its use, said Ingyin Phyu, the scientist in charge of the Department's NDT laboratory. "NDT inspections, including those using nuclear applications, are crucial for quality control in a variety of industrial fields in Myanmar," she said.

Technical staff of Myanmar Railways, Myanmar Shipyards, Yangon Technological University and private companies have recently received training in the use of the technique and have already begun to employ it in a wide range of activities, including on construction sites, in dockyards, on locomotives and at the country's largest amusement park.

"The use of NDT is greatly enhancing the shipbuilding and ship repair sector," said

"NDT inspections, including those using nuclear applications, are crucial for quality control in a variety of industrial fields in Myanmar."

— Ingyin Phyu, NDT researcher,
Department of Atomic Energy,
Myanmar



This NDT device emits radiation from the radioactive source (left). The radioactive particles react with the substance in the light blue pipe in the middle. The detector on the other side of the pipe measures radiation. This measurement provides information about the quality and quantity of the material going through the pipe.

(Photo: M. Gaspar/IAEA)

U Myint Zaw, Deputy General Manager and senior NDT inspector at Myanmar Shipyards. “It is essential for the improvement of our industrial processes and products and we use it extensively for quality control.”

In 2017, the IAEA developed a new project to use NDT to support the preparation and

recovery of civil infrastructure after natural disasters for countries in Asia and the Pacific. This project builds on experience gained following the devastating earthquake in Nepal in April 2015, when NDT was used in the aftermath to test the integrity of critical buildings such as hospitals, schools and historical attractions.

THE SCIENCE

Non-destructive testing

Industrial testing using nuclear technology involves using ionizing radiation — along with other methods — to test the quality of materials, without causing any damage to them or leaving behind any radioactive residue. This technique is called non-destructive testing (NDT).

NDT methods include radiography — a type of radiation technology — and gamma tomography, which is based on the differential absorption in different materials of gamma rays emitted from a radioactive source. Measuring the rays that pass through the material without being absorbed allows the make-up and structure of the material to be determined. These techniques are able to identify structural defects that cannot be discovered through traditional testing methods.

Industrial radiography is used to inspect, for example, concrete and a wide variety of welds, such as those in gas and water pipelines, storage tanks and structural elements. It can identify cracks or flaws that may not otherwise be visible.

Other commonly used NDT methods include:

- ultrasonic radiography, which uses mechanical vibrations similar to sound waves;
- liquid penetrant inspection, which can locate surface-breaking defects in non-porous materials;
- magnetic particle inspection, which can detect surface and slightly subsurface discontinuities in ferromagnetic materials; and
- eddy current testing, which uses electromagnetic induction to detect flaws in conductive materials.