Project Finding Program for "Feasibility Study for Applying Guided Wave Inspection to Oil & Gas Pipelines (Indonesia)"

This project finding program is being implemented in Indonesia as a JCCP Technical Cooperation Project funded by the subsidy of the Ministry of Economy, Trade and Industry (METI) for projects in oil-producing countries. PT Pertamina Gas is JCCP's counterpart in Indonesia, and Hitachi Power Solutions Co., Ltd. is the main participating company from Japan.

1. Background

Pipeline security is a priority issue to oil companies in oil-producing countries. Thus, various safety measures are taken in compliance with strict laws and regulations on the planning, design, installation, operational functions and inspection of pipelines. As any corrosion that occurs on the inner or outer surfaces of pipes could develop into a leak accident, environmental pollution, productivity decline, or other such serious matter, pipeline managers have an important responsibility to inspect pipelines regularly and confirm their strength and soundness.

Pipelines are not always easy to inspect, since many segments are buried underground or suspended overhead and allow only restricted access. Conventionally, such pipelines were inspected by digging up areas where they are buried underground or installing a scaffold where they are suspended in the air, and using an X-ray or ultrasonic wave from the outside to inspect both the inside and outside of the pipes. However, this method simply allows a spot check of restricted locations, and does not allow accurate assessment of entire pipeline conditions.

Kick-off meeting with Pertamina Gas executives

To supplement the above issue, an inspection pig is commonly used to perform pipeline inspections, with good results. However, using an inspection pig entails shutting down a plant and installing a pig launcher/receiver and slag catcher, removing sludge and other contamination from inside the pipeline using a cleaning pig, and verifying the passage of the inspection pig using a profiling pig. Even after running an inspection pig through the pipeline, leak and pressure testing needs to be performed.

The guided-wave inspection introduced in this project eliminates such troublesome tasks, and allows a wide range of inspection that includes the conditions of buried, aerial and insulation pipelines from a single location. It can provide high-speed screening of pipelines without shutting down a plant.

2. Guided-Wave Non-destructive Inspection

Non-destructive inspection using guided waves allows pipelines to be simultaneously inspected over a wide range by transmitting guided waves at a frequency of one to several kilohertz around entire pipes in the axial direction. In the project finding program, this technology was used to examine and locate pipe-wall thinning along a pipe approximately 100 meters long.

Fig. 1 shows a guided-wave non-destructive inspection apparatus. A ring sensor is attached to the circumference of a pipe to generate and transmit guided waves along the pipe. If any thinning is detected, the waves are reflected back to the sensor, and the sensor identifies the location of the thinning from the reflected signal.

Fig. 2 shows a measuring example. It is the result of an

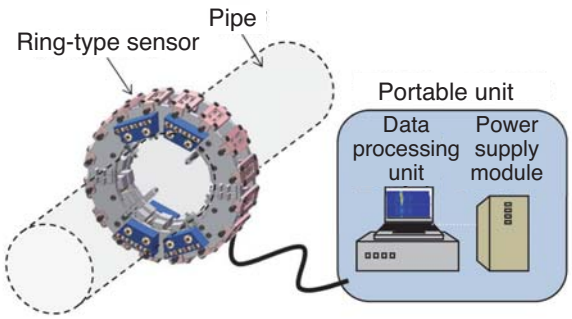

Fig. 1: Guided-wave non-destructive inspection equipment

inspection test performed on a pipe that has a bend in one location and artificial scratches in various directions and shapes. The result shows that the locations of scratches A, B and C after the bend have been accurately identified by guided-wave inspection. This inspection method can also identify the angle of a scratch along a pipe.

3. Progress of the Project

This project was initially launched last fiscal year as a basic project finding study, and began by introducing the guided-wave non-destructive inspection technology to Pertamina Gas last December. At the same time, hearings were held to assess issues Pertamina Gas faces in regard to pipeline inspection technologies, with the result that (1) only the important parts of submarine and buried pipelines are inspected, because a complete inspection requires time and is costly; (2) there are obstacles to inspection of pipelines in high places, as a scaffold needs to be erected and heavy inspection tools must be carried up; and (3) it is difficult to inspect pipelines that are in operation at high or low temperatures. The project verified that there is large, potential demand for guided-wave non-destructive technology, and members of Pertamina Gas realized that the technology could be extremely beneficial in addressing their pipeline inspection issues.

The project was upgraded to a project finding program this fiscal year, and kicked off on May 14 with meetings with executive officers and project managers at Pertamina Gas. In the kick-off meeting with corporate executives, Mr. Wahyudi Satoto, Operational Director, represented Pertamina Gas in extending his heartfelt gratitude to the Japanese side for its cooperation in paving the way up to the day's meeting, and expressed the company's strong expectations for the project and its successful completion. In the subsequent kick-off meeting with project managers, the Japanese side gave a general overview of the project plan for this fiscal year, and engaged the members in an active Q&A discussion.

On July 10, 2014, an onsite inspection tour was held to examine the actual natural gas pipelines in question. Of the 12-inch pipeline connecting Mundo LNG Plant and Balongan Refinery, a spot approximately 200 km east of Jakarta, where aboveground and underground pipes connect with each other, was inspected.

At the inspection site, a hearing survey was first conducted in the regard to the material, thickness, etc. of the pipeline and corrosion countermeasures, followed by a variety of measuring surveys (pipe thickness, welding build-up inside the pipe, etc.) and samplings of soil. As a result, it was found that the pipeline is not greatly different from those in Japan, and a good prospect was obtained for proper application of said technology.

Based on the data obtained, preparations are being made to reproduce the soil environment of the buried pipeline in a "mock-up test" and perform an economic assessment of whether or not the guided-wave non-destructive inspection technology would be effective.

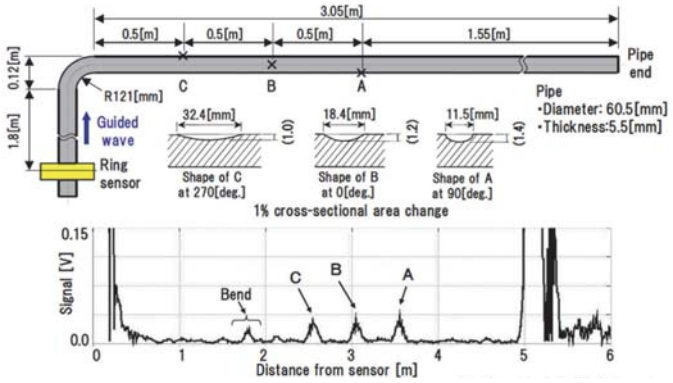

Fig. 2: Example of inspection by guided-wave non-destructive inspection

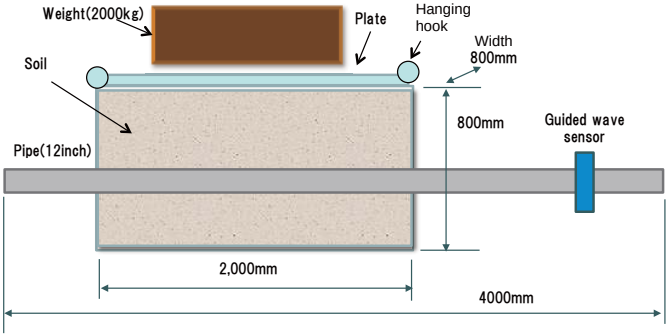

Fig. 3: Schematic diagram of the mock-up test

4. Future Outlook

Hereafter, a mock-up test will be performed at a Hitachi Power Solutions plant to measure the degree of attenuation of the guided waves transmitted along the pipeline, by passing the piping that was inspected onsite through a casing, filling the casing with soil similar to that found onsite, applying a load from above, and measuring the attenuation according to the difference in load (Fig. 3). The result will be used to obtain the measurement interval necessary for guided-wave non-destructive inspection, and based on the data obtained, the economic efficiency of applying the technology at the site of the onsite inspection will be assessed to determine whether or not to implement a joint project next fiscal year.

It is hoped that this project will measure up to the expectations of all parties involved and transition to a joint project next fiscal year. It is also expected to contribute to enhancing pipeline inspection technologies in Indonesia and to play a role in strengthening relations between Indonesia and Japan.

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