Nondestructive Examination Services

# NEMO Inspection System

## Background

**WesDyne**® developed the NEMO manipulator and inspection system for performing visual test (VT), ultrasonic test (UT) and eddy-current test (ET) inspections on core shroud support legs at boiling water reactor (BWR) nuclear power plants.

The NEMO's ability to be inserted through an open position in the core grid/top guide, and then to travel circumferentially around the core shroud while inspecting the support legs, allows for removal of a minimum number of control rod guide tubes, significantly reducing the risks normally associated with removal operations.

## Description

The NEMO is inserted in an open core grid/top guide position using lightweight handling poles and then lowered through the core and placed in position on the core shroud support beneath the fuel bundle support plate. The handling poles are then released.

The manipulator is designed to climb on the core shroud support using either a clamping system or suction cups, depending on the geometry of the component. Buoyancy tanks with air control the manipulator buoyancy.

A horizontal unit, with a curved rail to follow the core shroud radius, is mounted between the gables. A vertical unit is mounted to the horizontal unit. Different inspection extensions, mounted to the vertical unit, are altered to cover all inspections needs.

The NEMO is naturally able to carry enhanced visual-inspection-capable camera systems for qualified VT in-service inspections, but can also be fitted with UT, ET or molding tooling (e.g., for verification of boat sampling), all depending on the inspection need at hand.

A high degree of documentation and inspection precision is possible due to the positioning feedback available from the mechanized movements used for positioning of the inspection devices (i.e., cameras and/or UT/ET probes).

| Technical Data | |
|---|---|
| Weight, in air (approx.) | 27 kg |
| Weight, in water (approx.) | -1 / +5.5 kg |
| LxWxT (excl. extensions) | 1,890x397x132 mm * |
| Vertical speed | 0 – 10 mm/s |
| Horizontal speed | 0 – 25 mm/s |
| Inspection tooling (typical) | Ahlberg N30, N480 UT, TOFD, ET |
| Radiation protection | Yes, resolvers for all electrical motions |

* Current design, adaptations for different component geometry possible

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## Benefits

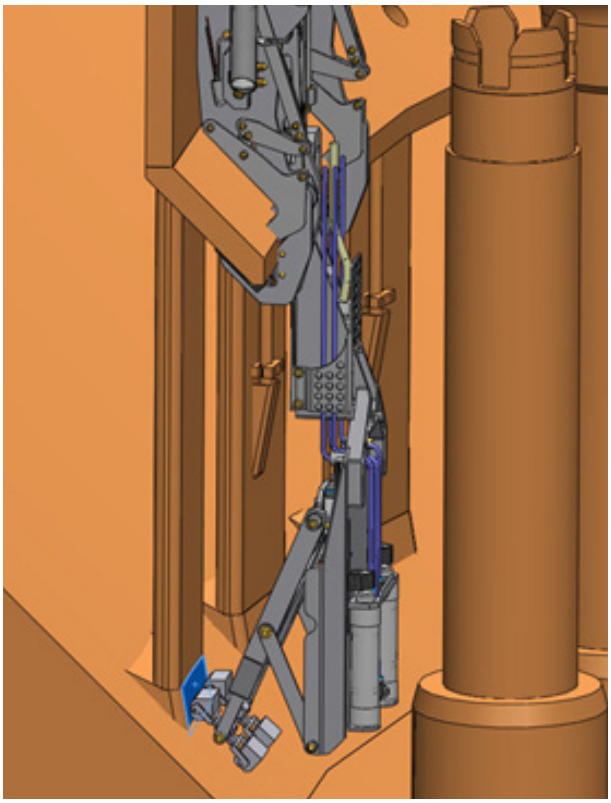
The NEMO offers the following benefits:

- Enables UT, ET and VT inspection of the support legs
- Allows for removal of a minimum number of control rod guide tubes, reducing risks normally associated with removal
- Manipulator can supply multiple inspection alternatives including repair support

## Experience

Since WesDyne developed the NEMO system in 2012, it has been used successfully at several outages at Swedish BWR plants.

NEMO with UT probe extensions



Configuration for sizing of defect using time-of-flight diffraction (TOFD)

*WesDyne is the nondestructive inspection branch of Westinghouse and a leading supplier of mechanized nondestructive examination (NDE) products for all inspection needs worldwide providing turnkey and one-off-type solutions with a focus on the nuclear market. WesDyne's expertise spans all aspects of remote and mechanized inspections, from problem analysis and solutions generation to development and manufacturing to field deployment of personnel and equipment. Inspection capabilities cover all key NDE areas such as ultrasonic, visual, eddy current, magnetic particle, dye penetrant and X-ray.*



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