

VIPER Inspection system – VT/ET/UT

Lehard Kastre¹, Mark Coaster²

¹NDE Engineering, WesDyne Sweden AB, Sweden, ²NDE Solution Manager, WesDyne Sweden AB, Sweden

WesDyne Sweden AB has in a short time designed and developed an equipment, VIPER, for Visual inspection of small dimension pipes ID from inside the reactor in Westinghouse 2-loop plants. Example of inspection object – Upper Plenum Injection, UPI – Lines. The VIPER is complemented with stand by UT and ET capabilities for augmented evaluation of detected indications that was designed and developed in the same time frame. The project started mid April 2019 and the equipment, procedures and personnel were demonstrated in early August the same year. The VT system (personnel. procedure and equipment) passed an ENIQ qualification and the UT/ET passed a Factory Acceptance Test. Due to the short time the design is focused on modularity and uses in-house 3D-printing capabilities to facilitate testing and fine tuning of the equipment during the development phase. The equipment is based on an advanced push rod system with customized centering devices for the camera. The VIPER is a Close Up High magnification Visual Inspection system with a HD Pan & Tilt camera with focus range from 1 mm to infinity. It is qualified for Inspection – Detection, Characterization, Sizing and Positioning of defects - of the ID including welds with a detection target = Arbitrarily oriented surface breaking defects $\geq 20\mu\text{m}$ of width and 5 mm of length. A calibration/calibration check set up with $10\mu\text{m}$ reference defect is integrated in the system. The calibration target is placed in the “camera garage” where a hydro washing station for the camera lens also is placed. The inspection is performed with “Semi automated scanning” with circular scanning and small axial steps - 7 mm steps in the straight parts of the pipe, 4 mm in the curved to assure coverage with sufficient overlap for 5,5 m of inspection length. The camera lighting is optimized by adding custom designed LED -lights set up with sectoral adjustable light intensity for accurate evaluation of findings. The whole system can be disconnected from the insertion lifting device which allows other parallel activities in the RT to take place. The VIPER is developed with a mindset on Modular Design in multiple levels which makes it adaptable to other dimensions and to other plant designs.