Nondestructive Examination Services

CoolMan Manipulator

Background

In some boiling water reactor (BWR) designs, the emergency core cooling and boron injection are designed with stand pipes to the reactor pressure vessel (RPV) lower dome penetrations. Since the stand pipe contains a sleeve, the Inconel® 182 fillet weld is only accessible from the outside of the pipe. CoolMan is a manipulator **WesDyne®** designed for this kind of inspection.

CoolMan in scanning position

Description

CoolMan consists of a lower part, the scanner, and an upper part, the extension unit. The scanner contains rotational and vertical driving systems, the probe arm and the ultrasonic testing (UT) and/or eddy current testing (ET) probes. The extension unit reaches from the top of the scanner to well above the core grid. On top of the extension unit are the connections for the handling poles and for the cabling.

CoolMan is handled from the service bridge by means of handling poles. To get access to the inspection area, the riser tube must be removed. CoolMan is then lowered down through the core grid and the riser tube braces. CoolMan's maximum diameter, 142 mm, allows for this. Once in position CoolMan rests on the upper riser tube brace and is centered in the stand pipe nozzle. In this position the upper end of CoolMan is well above the core grid. After installation, the poles can be detached to allow for other activities in the RPV.

A retractable arm at the lower end of CoolMan carries the UT and/or ET probes. This arm is folded out and moved down to reach the inspection area at the weld. Vertical and circumferential movements of the arm cover the area to inspect.

Besides inspection tools the retractable arm can also be fitted with tooling for light machining (trimming) of the weld surface or profilometry measurement of the weld surface and nearby parts of the nozzle.

Benefits

The CoolMan concept is a straightforward way to test these hard-to-reach welds. The inspection is fast, and once the tool is in position, the bridge and poles are available for other uses.

Experience

CoolMan has been qualified through the Swedish Qualification Centre (SQC), an independent qualification body for nondestructive testing. CoolMan has been used at several outages for UT and ET inspection of Inconel 182 fillet welds.

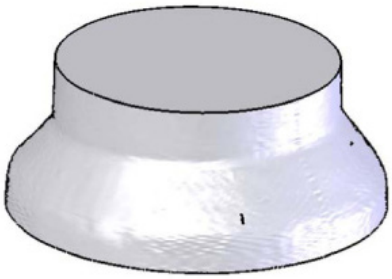
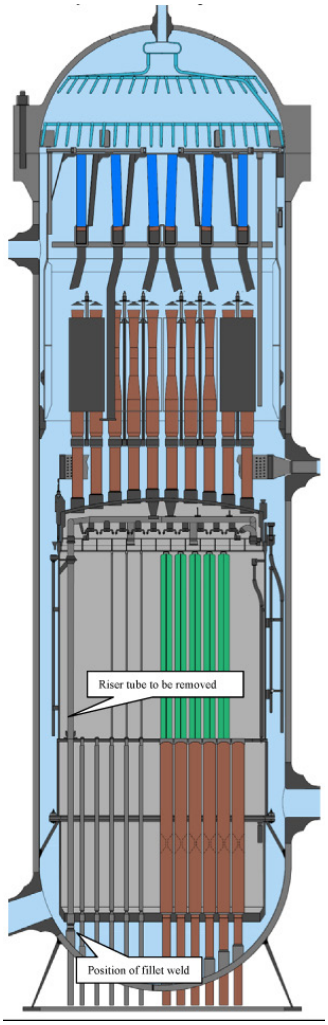


Image of fillet weld and adjacent nozzle part as result of profilometry measurement



Weld to inspect at RPV bottom region

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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