

In-Pipe Grinding Manipulators

Approved technology for pipe quality enhancement

» Remote controlled in-pipe manipulators for qualified grinding with remaining compressive stresses

The piping in nuclear power plants is an integral component for ensuring safe and reliable operation. Due to their long service life, the pipes must be inspected and repaired regularly to prevent and mitigate defects or indications.

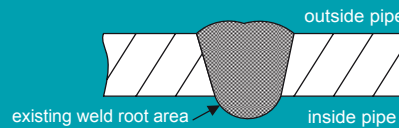
AREVA has developed remote controlled in-pipe manipulators which allow the removal of indications from the ID surface via a qualified three-step grinding process at the weld root. In most cases, the in-pipe manipulator can be inserted into the pipe system via existing openings such as valves or component hand/man holes, minimizing the need to cut pipes.

In the first step, the material is removed to a certain depth. During this step, defects in the existing weld root area, such as undercuts, can be removed in order to achieve clear ultrasonic test results from outside.

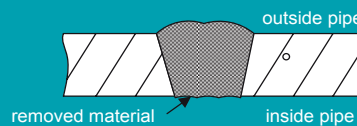
The second grinding step removes the affected material and prepares the surface for the third grinding step. The result is a superpolished surface with $Ra < 1 \mu m$.

Removal of weld roots by qualified three-step grinding with remaining compressive stresses

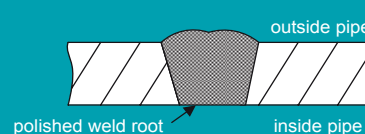
Before grinding - existing weld root area



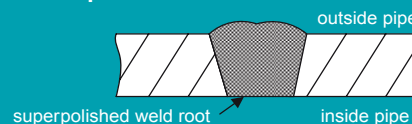
1. Grinding step - removal of material



2. Grinding step - removal of affected SS material



3. Grinding step - generation of remaining compressive stress



Features and Benefits

- Lifetime extension and quality improvement of pipes and pipe systems
- Generation of remaining compressive stresses in the ID weld area
- Simplified approval and planning process compared to replacement
- Lower costs for resources during the application
- Modular manipulator design for high flexibility (using openings such as gate or check valves for access)
- More than 30 years of experience in pipe system repairs

AREVA's Expertise

AREVA has more than 30 years of experience in developing, manufacturing and operation of in-pipe manipulators. In more than 100 grinding applications, customers have been highly satisfied with these remote controlled tools.

Typical applications are:

- Grinding of weld root sags during the erection phase
- Grinding of weld root sags during the replacement of pipe systems/components
- Elimination of unevenness and generation of compressive stresses
- Removal of cracks and flaws by grinding for lifetime extension of pipes
- Repair of dissimilar welds (Alloy 600) from inside the pipe

All of these operations have been performed with a qualified grinding process to obtain the optimal benefits for our customers.

Grinding Manipulators

Scope of application

- Main coolant/recirculation pipes
- Safety injection systems
- RPV/SG nozzles
- Horizontal/vertical pipes, elbows and cones

Applicable tasks

- Removal of cracks and flaws
- Repair of welds

Benefits

- Increase in quality
- Lifetime extension
- Generation of remaining compressive stresses in the ID weld area

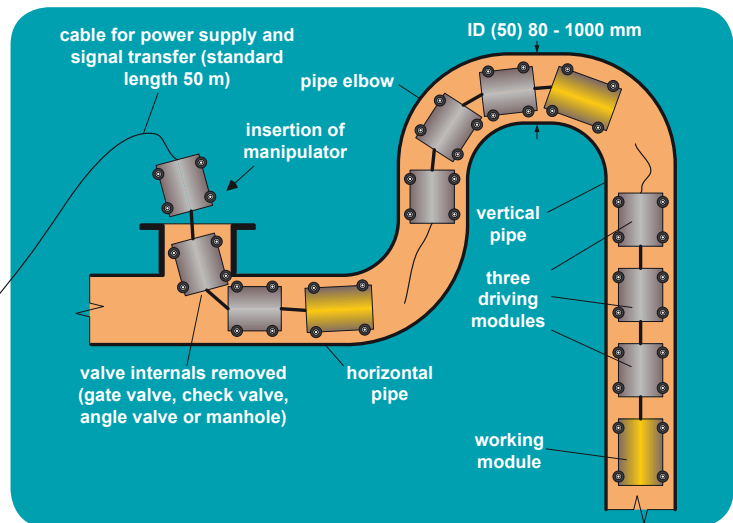
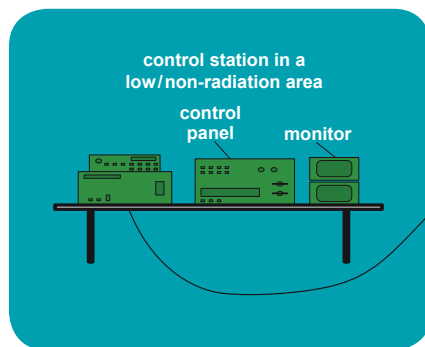
Insertion to pipe system via

- Check/gate valves
- Man/hand holes
- RPV/pump

Applicable range

- ID (50) 80-1000mm

AREVA's In-Pipe Grinding Manipulators - A Solution for Maximum Customer Benefits



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