framatome

In-Pipe Manipulators

Remote-Operated Solutions for Inside Piping Applications

In-Pipe Manipulators are a flexible technology for different applications inside piping. In addition to performing visual inspections and non-destructive examinations (NDE), our In-Pipe Manipulators can also execute foreign object search and retrieval as well as tailored repair interventions.

Challenge

There are several piping systems in nuclear power plants or other industrial sites which are hard or impossible to access from the outside. This can be, for example, buried pipes but also piping inside penetrations.

When visual inspection or surveillances, along with foreign object removal or repair is required, these interventions must be performed inside the piping.

There are high dose areas which do not allow manual interventions and require alternative methods.

Solution

Framatome's in-pipe manipulators are remote-controlled devices for performing different inspections and repair tasks inside piping of nuclear power plants or industrial sites.

In practice – subject to the pipe ID – our in-pipe manipulators are used for non-destructive examinations such as: visual testing (VT), liquid penetrant testing (PT), ultrasonic testing (UT), and eddy current testing (ECT).

They can also be used for cleaning and foreign object removal as well as repairs including grinding, milling, welding, polishing, brushing or removal of indications.

Main fields of application are:

- Main coolant/recirculation pipes
- Safety injection lines
- RPV/SG nozzles and connecting pipes
- Seawater pipes

In-pipe manipulators can operate either in horizontal or vertical pipes with an ID as small as 50 mm, including elbows. Due to their design they can pass pipe diameter deviations (in a specific range) which increases the flexibility of use. Powerful driving units ensure safe movement and application in dry or filled pipes is possible depending on the manipulator configuration.

Your performance
is **our** everyday **commitment**

Customer benefits

- Time savings on outage schedule thanks to rapid and highly reliable performance
- Improvement of plant safety and reliability
- Reduction of radiation exposure, contribution to ALARA principles
- Outage optimization/Cost Savings
- Increase of piping system lifetime
- Solution for regular application within inspection/surveillance programs but also ad-hoc interventions

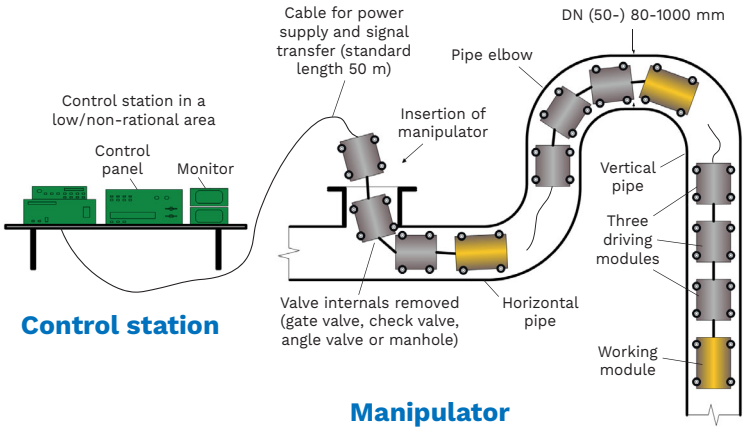
In-pipe manipulator for visual inspection of pipe ID 75 mm

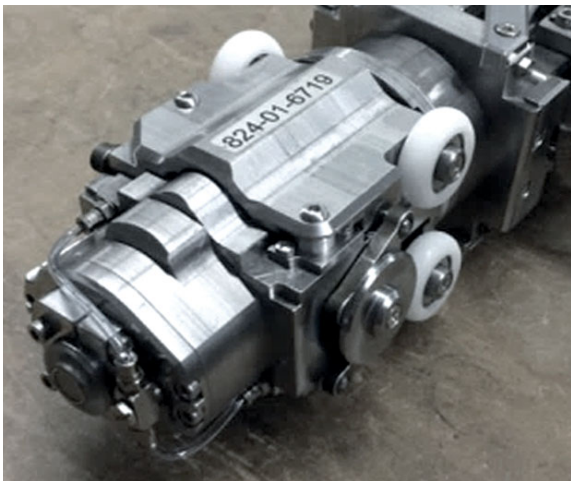
Key features

Main features:

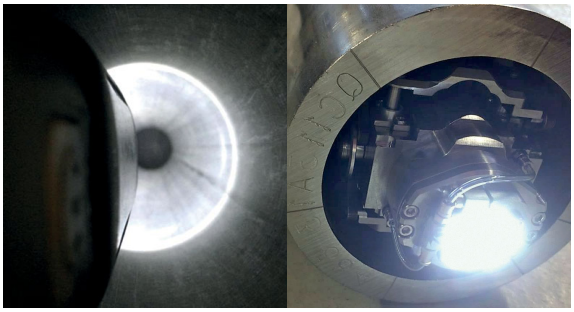
- Different configurations for pipe ID 50 up to > 1000 mm
- Applicable in horizontal and vertical piping including elbows (> 1.5 ID)
- Use in dry pipes as well as under water
- Fully remote-controlled operation with high operating safety through redundant systems and modules
- Specific design containing a working module and different driving modules connected by flexible couplings for easy movement inside pipes and insertion via removed valve internals
- Qualified for application in nuclear power plants

General equipment arrangement:





UT / ECT in-pipe manipulator



Application inside piping

Key figures

More than **100** successful applications in NPP world wide

About **30** years of experience in development and operation of in-pipe manipulators

References

In-pipe manipulators have been developed and successfully applied for various applications according to customer needs, e.g., dedicated non-destructive examinations or tailored repair interventions.

Reactor types / designs:

- KWU BWR / PWR
- Framatome PWR
- Westinghouse PWR
- GE BWR

NPPs in:

- Europe (Germany, Switzerland, Belgium, France, Sweden, Finland, Spain)
- USA
- Brazil
- Japan

BWR: boiling water reactor PWR: pressurized water reactor

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