

FOSAR SG

Remote-Controlled Foreign Objects Search and Retrieval on Steam Generator Secondary Side

With regards to Foreign Material Exclusion Programs, our remote-operated Foreign Objects Search and Retrieval (FOSAR) provides fast and reliable identification, localization and retrieval of foreign objects, which is essential in order to maintain steam generator (SG) integrity.

Challenge

Foreign objects (for example, welding rods, wires, screws, nuts, gasket material) which are introduced by the secondary system are flushed into the lower SG area, “filtered” by the tube bundle and deposited at the tube sheet.

Metallic objects of a certain size can endanger the integrity of SG tubes. Foreign particle evaluation and determination of potential for endangering neighboring tubes (risk level) must be performed immediately to avoid further damages.

Appropriate retrieval of detected foreign objects in a precise and reliable manner without causing any damage to SG tubes is therefore essential.

Solution

The integral FOSAR concept considers all relevant steps for reliable foreign object search and retrieval:

- Remote-controlled visual inspection of all tube aisles in tube bundle area up to the tube support plate – mapping
- Evaluation of indications of primary side non-destructive examination, loose part fretting, wear, pitting, etc.
- Risk assessment, planning of retrieval sequence and route
- Foreign object retrieval by use of specific tools.

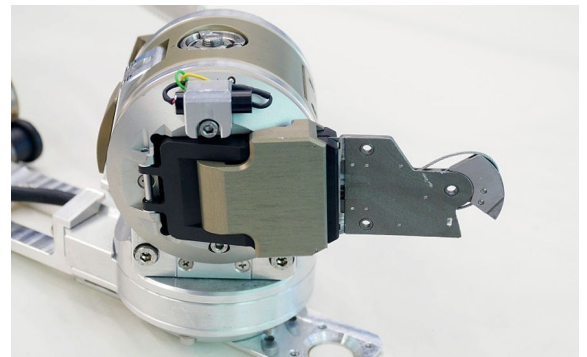
The system contains visual inspection manipulators, FOSAR positioning unit/feeding manipulator for tape deflection combined with specific cameras, lighting and flexible modular retrieval tools. It allows high manoeuvrability as well as rapid assembly and disassembly with low set-up times.

A set of easily exchangeable grippers for different foreign objects search and retrieval requirements (for example, type, size, location of particles) covers a wide range of applications. Additional suction devices and magnets are available on specific demand.

Special, highly qualified personnel with up-to-date knowledge and long-term experience ensure optimum performance.



Exchangeable gripper



Tape feeder unit with gripper

Customer benefits

- Time savings thanks to rapid and highly reliable performance
- Enhanced efficiency in foreign objects search and retrieval
- Reduction of radiation exposure
- Ensures SG integrity
- Outage optimization and therefore cost savings
- Support to component lifetime extension programs
- Field service worldwide

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

Technical information

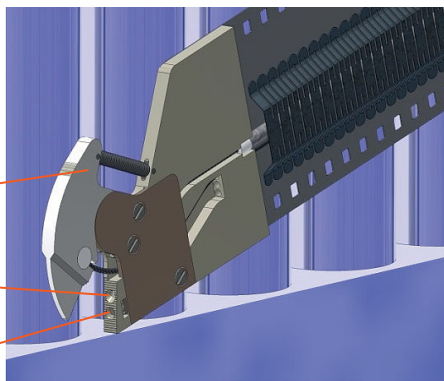
Magnetic crawler with additional magnetic bowls

- Drive unit containing two rotary drives
 - Positioning of tape head in front of the tube gap
 - Swiveling the feed tape inside the tube bundle
- Integrated rescue tools
- Laser pointer to facilitate tape positioning and feed
- CCD camera for observation of tape movement

Remote-controlled retraction tools

- Enhancement of gripping forces
- Simultaneous control of gripping and retracting

FOSAR tape with exchangeable grippers



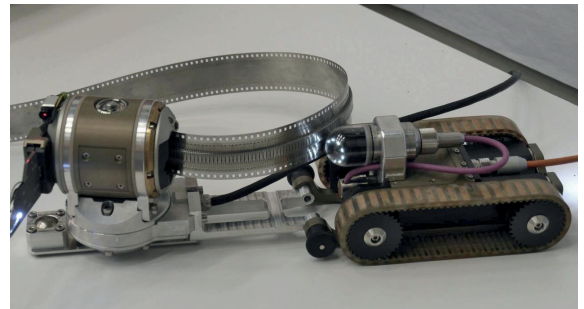
Gripping mechanism

LED light

Integrated 1.6 mm camera



Remote FOSAR control unit with monitor



Magnetic crawler with tape feed drive unit

Key figures

More than **25** years of experience in foreign objects search and retrieval

About **165** successful FOSAR SG secondary side applications worldwide

References

FOSAR is applied regularly as an integral part of SG services to ensure it is ready to use for ad-hoc tasks without delay.

Furthermore, Framatome performs FOSAR activities in nuclear power plant (NPP) primary circuits within recurrent outage services.

Reactor types/ designs:

- KWU pressurized water reactor (PWR)
- Framatome PWR
- Westinghouse PWR

NPPs in:

- Europe (Germany, Switzerland, France, Belgium, the Netherlands, Spain, Finland)
- Brazil

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