

## In Vessel Visual Inspection (IVVI)

### Remote Visual Examination Tools

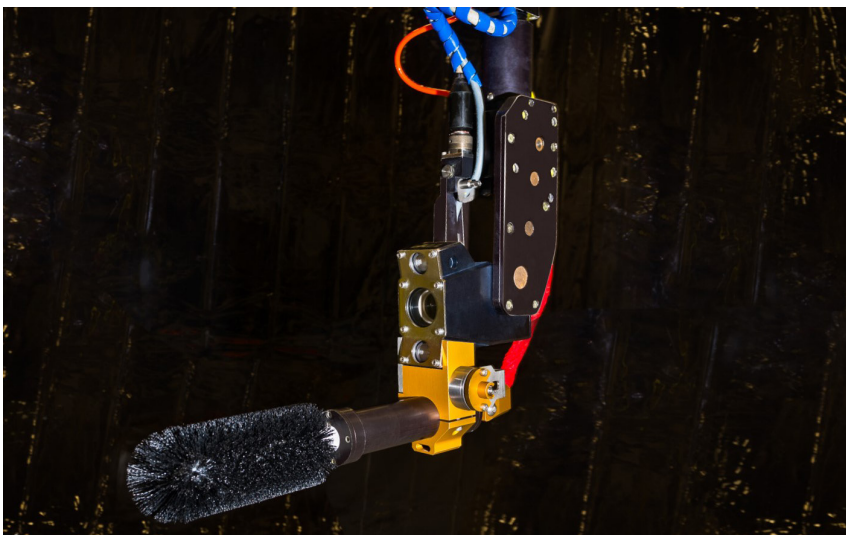
Framatome's remote visual examination tools perform high-quality cleaning and High Definition (HD) examinations, reducing safety risks, costs and dose impacts while driving schedule efficiency to provide In Vessel Visual Inspection (IVVI) skip outages.

#### Challenge

To meet the challenge of long-term operation, today's nuclear industry demands better quality control and inspection documentation for all plants. Higher-quality remote examination tools are necessary for additional traceability and reporting as well as driving efficiency and accuracy, ensuring IVVI does not impact critical path.

#### Solution

Using global resources, our non-destructive examination (NDE) services team responded quickly with advanced innovations for visual examinations, developing an array of tools to ensure quality compliance, shorten the overall outage schedule and provide the opportunity to perform IVVI skip outages. Complementing a large portfolio of HD and high radiation tolerant cameras, Framatome provides fully remote automated tooling, HD camera technology and advanced reporting software to make data acquisition and final reporting efficient and simple. With these advances, Framatome increases the quality of examinations while decreasing schedule impact.



#### Customer benefits

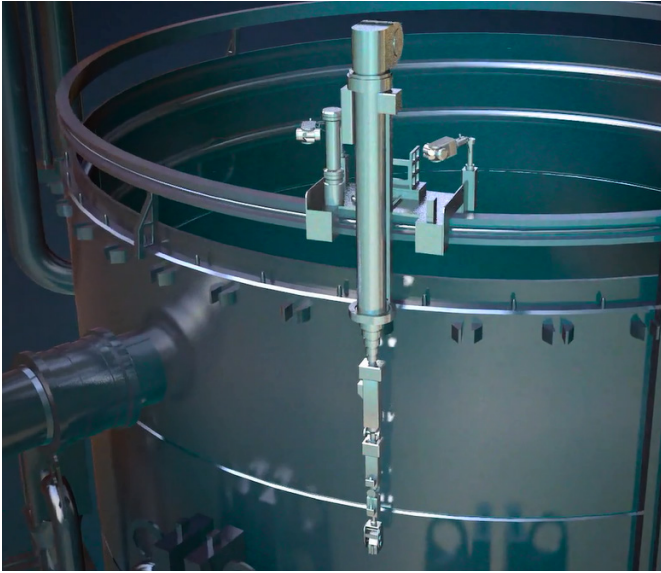
- INPO-recognized high-quality HD examinations
- Reduced examination schedule
- Significant dose savings and component examination coverage compared to traditional manual pole-manipulated examinations
- Enhanced nuclear, industrial and radiological safety
- Safely perform cleaning and examination throughout operational jet pump loops
- Invisible to site management and off the Outage Control Center (OCC) radar
- Accurate HD IVVI software facilitates quality final reports

#### NEI TIP Award for Innovative Practices

**2018** - Hawkeye recognized by NEI, received a Top Innovative Practice (TIP) award.

**2019** - Framatome recognized by NEI for its deployment of remote IVVI tooling in conjunction with executing an IVVI Skip Outage.

## HawkEye – Multi-Axis Visual Inspection Manipulator



The HawkEye visual inspection manipulator operates on a standard ring platform and performs visual examinations in parallel with shroud UT examinations. It delivers video cameras to target examination areas with full-position feedback integrated into the video record.

### Benefits:

#### HD Cameras:

- Image quality and Field of View (FOV) is much better at any comparable resolution distance (HD display is 6.75x larger); enhanced resolution and increased viewing area significantly reduces exam times

#### Remote Cleaning:

- No manual or bridge support required; no personnel needed on work cavity platform
- Used for cleaning above the steam dam and remote cleaning in the annulus; eliminates multiple personnel working over the reactor vessel and reactor core
- Field proven

#### “Hawk Box” – Modular Equipment Control Unit (MECU):

- Enables rapid mobilization of equipment with a reduced shipping and operating footprint
- Reduces personnel and experience needed for set up
- Provides equipment reliability and reduced costs for customers

#### Loop/SDC Independent:

- HawkEye reduces the impact of “SDC” and “No Flow” windows with a robust design that allows the tool to perform examinations on operating jet pump loops

## Remote Dryer/Separator Inspection Tool

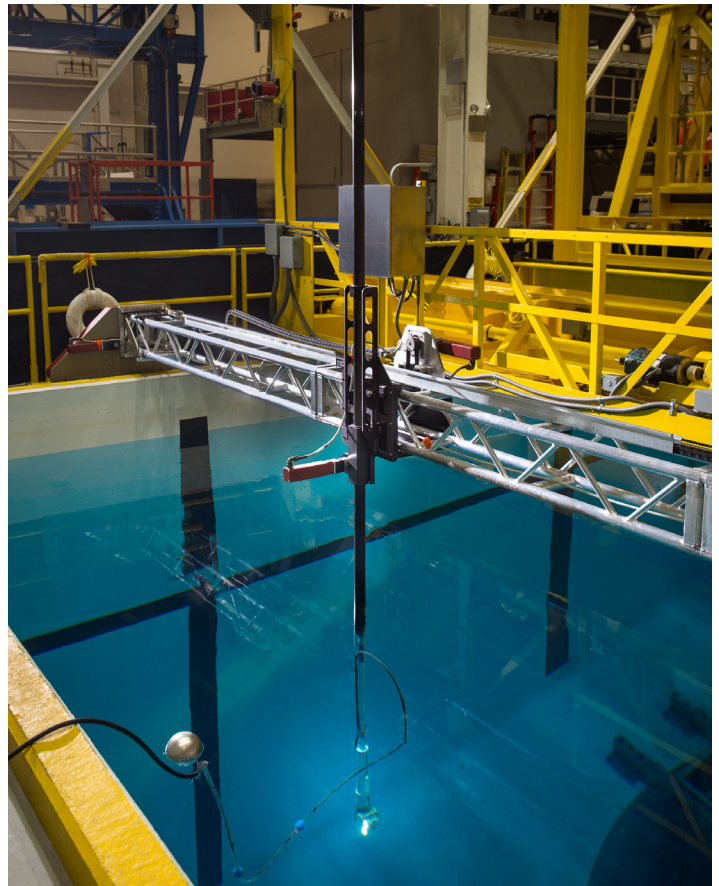
The Remote Dryer/Separator Inspection Tool, a simplified automated X, Y, Z scanner, reduces schedule and dose associated with existing IVVI manual inspections.

### Benefits:

- Performs efficient and high-quality examinations in HD
- Reduces site dose by eliminating manual IVVI from aux bridge
- Examinations conducted remotely from office or Framatome onsite trailer
- Rides on existing refueling equipment bridge rails or trusses

### Technical features:

- Designed, tested, qualified and implemented in three months
- Completed over 500 Dryer/Separator examinations with 100% tooling reliability
- Adaptability — able to span any width/length D/S Equipment Pit



**Contact:** [outage@framatome.com](mailto:outage@framatome.com)  
[www.framatome.com](http://www.framatome.com)

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is our everyday **commitment**