Framatome’s approach to CFSI issues

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Framatome at a glance

For 60 years, Framatome's teams have been involved in developing safe and competitive nuclear power worldwide by:

- designing nuclear power plants, and supplying nuclear steam supply systems,
- designing and manufacturing components and fuel assemblies,
- integrating automation systems,
- and servicing all types of nuclear reactors.

Original Equipment Manufacturer
of 92 nuclear power plants
14,000 employees
servicing more than 250 reactors worldwide and generating a turnover of € 3.3 billion in 2017.
Framatome’s ambition and values

Framatome has the ambition of being a recognized manufacturer and supplier of safe, competitive nuclear solutions to help its customers meet global energy challenges.

High performing people and technologies for safe and competitive nuclear plants worldwide.
Le Creusot quality topics timeline

1. **Carbon segregation: a technical topic**
   - Fall 2014: Non ESPN-compliant mechanical tests on vessel head used to validate FA3 heads
   - March 2015: Cause identified as high carbon segregation in the center part of the head
   - Sept. 2015: Risk assessment of presence of carbon segregation on other parts: one-piece heads, SG channel heads supplied by a Japanese forge
   - Nov. 2015: Carbon measurement launched on several EDF steam generators
   - High carbon content measured on SG channel heads supplied by a Japanese supplier
   - March 2016: Further methodological deviations identified on tensile tests performed in Vulcain laboratory
   - Sept. 2015: Identification of "marked files"
   - March 2016: Second external audit by Lloyd’s Register Apave + Internal inspection on manufacturing files
   - April 2016: Audit extended to Jeumont and St Marcel factories
   - August 2016: Extension of the files inspection to all manufacturing files (~6,000 for nuclear parts)

2. **Tensile tests: a methodological deviation**

3. **Marked Files: Deviant QA practices**
   -> link with CFSI
Past manufacturing files review status

- **Methodology**

  - **Files Digitalization**
    - Review of the documentation
    - Report the findings

  - **Inspection Review**
    - Complete the technical analysis
    - Release the FTT (Sheet for Technical treatment) and FQ (Quality treatment)

  - **Technical Review**
    - Validate technical deviations

  - **Technical Committee**

  - **Deviation Management**
    - Release deviations notice and discuss treatment
    - Notify the affected customer of the situation

  - **Deviation Closure**

  - **EOMR update (option)**

- **Classification in 3 categories:**
  - No deviation
  - Deviation to a Creusot Forge internal requirement
  - Deviation to a Customer’s requirement or a Code requirement

In case of a deviation to an internal, a Customer’s or a Code requirement, two types of conformity reports will be issued:

  - Internal NCN (Non Conformance Notice) provided for information to the customer
  - Non Conformance Report to be reviewed and discussed by the customer
Past manufacturing files review status

**Milestones**

- **2016**
  - Inspection

- **2017**
  - Technical review

- **2018**
  - Non conformances treatment
  - Up-date of manufacturing files
Improvement Plan – Levers and Axes

Axis A
Processes industrial control and deployment of standard quality and monitoring tools

Axis B
Development of new processes to meet the most recent global regulations requirements

Axis C
Strengthening organization and skills by taking into account past experience

Axis D
Strengthening safety culture at each level of the plant

Axis E
Surveillance over the complete value chain

Le Creusot
220 people involved in

315 Activities
for improving safety & quality
Current status

- Dealing with the past
  - 6000 files from the 1965 to 2016 period have been reviewed.
  - There are today NO (zero) power plant stopped due to technical (carbon segregation) or quality (past practices) issues in le Creusot
  - Extent of Condition: Audits in St Marcel (Heavy components) and Jeumont (Mobile equipments) have shown NO deviant practices

- Looking forward to the future
  - ASME certificate has been renewed.
  - Following thorough implementation of the action plan in Le Creusot, French and UK safety authorities have given greenlight for production in Le Creusot.
  - Internal inspection/surveillance practices reviewed and reinforced. -> Framatome extends it to its own supply chain.

- Framatome dealt with the incident in line with its value of Integrity, however high the costs were.
Framatome action plan on CFSI
1/3: Sensitization and training

- **Training of key Framatome people on CFSI risk:**
  - Auditors
  - Inspectors
  - Buyers
  - Management

- **Communication toward suppliers**
  (supplier convention March 2018)
  - Of the necessity to put in place a system to prevent and control CFSI in house and on the supply chain
  - Of the importance to report any deviation
Framatome action plan on CFSI 2/3: Capabilities reinforcement

- **Operational Excellence program**
  - Implementation of quality tools such as FMEA, 8D..
  - Control key manufacturing processes capabilities in factories (SPC, ...)

- **Technical depth** of the inspectors, to better detect abnormal situations during inspections
  - Training reinforcement to mechanical tests, forging technics
  - High qualification training (International Welding Engineers..)
  - Recruitment of experts (level 3)

- **Accreditation** of internal and external laboratories (17025)
  - Inter-laboratories testing, mechanical tests new directive
Framatome action plan on CFSI 3/3: Control and Alert system

- Supply chain CFSI risk evaluation
  - Through audits, inspections
  - Through performance assessment

- Adaptation of inspections and update of guides
  - Unexpected (without notice) inspections
  - Contradictory inspections by inspectors:
    - Comparison of final certificates to the original
    - Product contradictory inspection

- Alert system
  - Weak signals detection and reporting
  - Compliance officers network
  - Whistleblower protection
  - Independent Safety oversight
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