CONTINUATION OF CONSTRUCTION OF HOT CELL FACILITY INCVR

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Since 2002, R&D organization developing ideas, technologies and solutions in power generation industry particularly focused at nuclear technologies

Member of the UJV Group
8 gamma hot cells, 2 alpha hot cells and 1 semi-hot cell will be constructed.

Thickness of steel shielding:
- perimeter shielding 500 mm
- ceiling shielding 400 mm
- floor shielding 300 mm

Max. source activity up to 300 TBq $^{60}$Co

Dose Equivalent Rates $\gamma = 1.38 \mu$Sv/h

In each hot cell will be hermetic, easily removable box from stainless steel
Detail of shielding modules

- All shielding will be built from modules (up to 25 tons)
- Every module is made from steel plate 100 mm thick
- All modules will be weld together on site
Hermetic Box of Hot Cell

- **Box inner size:**
  - 2700 x 2900 x 3000 mm (w x d x h)
- **Working underpressure**
  - -150 Pa (gamma) and -500 Pa (alpha)

**Features:**
Removable, hermetic, disconsctable, „only 3,5 tons“
Interconnection for all technologies

- All interconnection must be accessible, airtight, easily disconnectable and shielded.
Connections
Box in docking bay

- docking bay allowed us to simulate all conditions which will be in the hot cell

- Box could be prepared and tested outside hot cells and then when the shielding or the future place of the box is ready all could be transported and easily reconnected and immediately operational
Material transfer device

- Design of Material transfer device is based on “Lazy Susan”

- Its design has to be modified for removable hermetic box
Material transfer device with collar
Material transfer device in wall of shielding
The pre-chamber has:
- Electrical circuit
- Active ventilation
- Connector for the fresh air
- Entrance doors
- Protective suits
- Tools (active)
- Crain for lifting
- Decontamination place (shower)
- Window
- Communication channel
Pre-chambre on hot cell

- During operation on hot-cell all communication of all workers will be cared out by open communication channel.

- Visual control of workers and work will be done by shielded window in hot-cell, pre-chamber and set of cameras.
Sample transportation device

- Irradiated samples will be transported to the hot cell via a transportation device.

**Known operation:**
- Opening of shielding part of hot cell
- Airtight connection to box
- Opening of transportation device and box
- Delivering of irradiated sample to box
- Closing of transportation device and box
- Disconnection of transportation device
- Closing of shielding part of hot cell

**Difficulties:**
- Access from above
- Airtight connection
- Heavy shielding
- Precise position of device
- Time-consuming
- To complex for one device
Transportation device have to work even with open ceiling and pre-chamber as obstacle in trajectory.

For that reason container part of device will be manipulated by suspension crane.
Temporary sample storage
Equipment inside hot cells

- The hot cells will be equipped for manufacturing of the specimens (cutting, welding, drilling, machining) with:
  - Electrical discharge machine (EDM)
  - CNC machining center
  - Electron beam welding machine (EBW)

- The hot cells will be equipped for mechanical testing with:
  - Universal tensile test machine loading up to 250kN
  - Tensile test machine for combined axial-torsional
  - High frequency resonance pulsator up to 50kN
  - Electromechanical creep machine up to 50kN
  - Fatigue machine
  - Autoclave with water loop

- The microscopes (SEM, LOM) will be placed in the semi-hot cell also with nanoindentation device.
Prototype Box
Prototype Box
Glas windows for Box – radiation test
Piping under the hot cells
Test – disconnection of Box
Summary

- Construction of new hot cells is carrying out within the project SUSEN

Facts

- 10 hot cells and 1 semi-hot cell
  - Technologies for a complex samples processing
  - Experimental devices for testing of mechanical and corrosion properties
  - Experimental devices for metallography and microscopy
- 2000 tons of steel for the construction of the shielding will be use
- Unique design and properties – removable Box

- Operational in 2016
Thank you for your attention

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