D&D Technology
for Activated and Contaminated Components
in Primary Circuit Developed by Doosan
for the Preparation of Kori Unit 1
Decommissioning

DHIC, Nuclear BG, Nuclear Service Division
Nuclear Power Plant Decommissioning Technology & Business Development Team
Contents

- Decommissioning Experience
- Decommissioning Technology (Applied on Service Business)
- Decommissioning Technology Development (Completed)
- Decommissioning Technology Development (Ongoing)
- Decommissioning Technology Mockup Center
Decommissioning Experience - Research Reactor Dismantling

- Decommissioning PJT: TRIGA MARK II & III Research Reactor
- PJT Period: 1997 ~ 2014
- Performed dismantling the research reactor, peripheral facility and concrete and so on

<table>
<thead>
<tr>
<th>Model</th>
<th>TRIGA MARK-II</th>
<th>TRIGA MARK-III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Research Reactor</td>
<td></td>
</tr>
<tr>
<td>Power Output</td>
<td>250 kW</td>
<td>2 MW</td>
</tr>
<tr>
<td>Work Performance</td>
<td>Dismantled the research reactor, peripheral facility, concrete, etc.</td>
<td></td>
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</tbody>
</table>
Decommissioning Technology - SGR(SG Replacement) Experience

- SGR PJT : Hanul nuclear power plant unit 3, 4
- PJT Period : June 2013 ~ June 2014
- Main Activity
  - Templating
  - Clamping
  - Cutting
  - Decontamination
  - Machining
  - Welding
  - Rigging/Handling
Decommissioning Technology - SGR Experience

- OSG Cutting, Lifting, Carrying out and Storage

- Clamping Installation
- Cutting & Beveling
- OSG Lifting
- Sealing Plate Welding
- Fixture installation & OSG DOWN-ENDING
- OSG DOWN-ENDING
- Crane Setting
- OSG Lifting
- OSG Carrying
- OSG Storage
Decommissioning Technology - SGR Experience

- SG Lifting and Installation
  - RSG Carrying
  - RSG Storage
  - Lifting Device Preparation
  - Lifting Device Installation
  - RSG Lifting
  - Fixture & Cart Connection
  - Keyhole Plate hookup
  - RSG UP-ENDING
  - RSG descending
  - Skirt Flange
Decommissioning Technology - SGR Experience

- SGR Video (Play on July 26)
Decommissioning Technology - RVH Replacement Experience

- RVH Replacement PJT: Kori nuclear power plant unit 1 / Hanbit unit 3, 4
- PJT Period: April 2013 ~ December 2015
- Main Activity
  - Activated metal component cutting and radioactive waste disposal
  - Radiological evaluation and transfer licensing
Lots of equipment, facility and system development to perform nuclear service work and decommissioning

Applying remote control system

BMI Nozzle Laser Pinning

BMI Nozzle NDE Inspection

Milling Contamination for Activated Metal

Wire Saw

Circular Saw

CEDM Nozzle Repair Manipulator

SG Primary Head Robot
Decommissioning Technology - Handling & Installation Experience

- Heavy component construction and handling – Reactor Vessel, Reactor Vessel Internal, Steam Generator, Reactor Cooling Pump, Pressurizer etc.

[Images of construction and handling projects]
Setup all dismantle process, completed development of decontamination/cutting equipment and radiation safety management. Based on this technology, it is possible to dismantle primary components such as RCP, PZR, PPG, etc.
Decommissioning Technology Development (Completed) - SG Dismantling

- SG Dismantling Video (Play on July 26)
Turbine building is used for the place which heavy component treatment facility is installed. Doosan set up the layout for the turbine building modification in nuclear power plant.
Decommissioning Technology Development (Completed) - TBN. Bldg. Modl.
Decommissioning Technology Development (by 2020) - RV/RVI Dismantling

- In-Situ on air environment
- Container for storage is 200 liter drum.
- Optimizing cutting plan based on the RV characterization result & size of container

<table>
<thead>
<tr>
<th>Items</th>
<th>Expected Value</th>
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<tbody>
<tr>
<td>Cutting Length</td>
<td>603 m</td>
</tr>
<tr>
<td>Number of cut-off piece</td>
<td>708 ea</td>
</tr>
<tr>
<td>Number of Drum</td>
<td>310 ea</td>
</tr>
</tbody>
</table>
Decommissioning Technology Development (by 2020) - RV/RVI Dismantling

- UGS: Upper Guide Structure
- CSB: Core Support Barrel
- CS: Core Shroud
- LSS: Lower Support Structure

- UGS: Band saw installation → UGS cutting
- CSB: Upper CSB lifting → Lower CSB lifting
- CS/LSS: Lower CSB cutting → CS/LSS dividing → CS/LSS cutting

- Under water environment
Decommissioning Technology Development (by 2019) - Eng’g & Simulation

- Optimized dismantle process based on the simulation
- Waste volume, radiation dose, cost (expense) based on the process and equipment/tool
Decommissioning Technology Development (by 2018) - CASK

- Model Developing
  - Korean Type spent fuel storage cask with NAC

- Manufacturing Experience
  - KN-12 Cask designed by GNS
  - TEPCO Cask designed by OCL
Decommissioning Technology Development - Decommissioning Mockup Center

- Original Size Components and Facilities are Tested and Verified in This Center
- Education and Training for Doosan Employee and Customer Site Operators

1. Area: 2,750m² (25W X 110L X 27H m)
2. Mock-up & Facility
   - Original Size Cutting/Segmentation/Decontamination
   - Original Size Steam Generator Mockup
   - Original Size Reactor Vessel, Pressurizer, Reactor Cooling Pump, etc.