Feasibility study project of cutting fuel debris and dust collection technologies for Innovative Approach <Taisei Corporation>

Purpose and Goal

The purpose of this project is to develop remote long boring technique for fuel debris retrieval to support Innovative Approach for fuel debris retrieval.

The target is concept and feasibility study of newly developed robot boring machine and new diamond bit with new design which cut the fuel debris expected to have high hardness and vary in the properties from the operation floor level and dust, cooling water and boring cuttings collection & storage equipment.

Based on this study, specific development plan would be designed. Application of boring technique proved in TMI-2, this development would establish state-of-the-art boring technique with safety, efficiency and reliability.

Outcome obtained

Remote robot boring machine

- Boring pedestal from one opening on operation floor with tilt and swing.
- Rod bolster structure to support rod in 35m space.
- New developed auto rod & auto bit connection, exchange mechanism.
- Complete remote control including automatic. Self travelling by crawler.
- Available of multipurpose boring such as rotary percussion etc.

Diamond bit, Drilling tools

- Applicable for diverse property of debris by PDC, surface, impregnated bit.
- New design special bit form, diamond and matrix.
- Non core bit with high certainty in boring, core bit for sampling.
- Drilling tools for fuel debris core sampling.

Diamond bit

- 13 kinds of new design diamond bit
- Specification & design concept of bit
- Concept of debris test piece(2 types)
- 4steps efficient development flow
- Comparison with TMI-2 applied bit
- Core sampling development, equipment
- Concept of drilling tools

Fuel debris collection & storage equipment

- Concept of dust suppression equipment
- Concept of collection & storage equipment
- Fuel debris collection & storage system flow

Dust, fuel debris cuttings collection & storage equipment

- Infinitesimal dust with water boring, auxiliary dust suppression system.
- New design suction & delivery equipment in reference to TMI-2.
- Collection equipment with separator for small fuel debris canister of 1F.

Auxiliary system for remote operation

- Photogrammetric measurement system for fuel debris dimension and form.
- Remote dose monitoring system for boring work place.
- Safety & facilitation of remote operation promoted by auxiliary system.

Focusing point, strong field

- Organization includes top boring maker of KOKEN and Christensen.
- Efficient and effective development with world-class technology.

Development schedule, cost

- Development schedule & cost study
- 2-years development in the shortest
- 4-years development considering leveling

Application to the site

- Boring machine assembling
- Operation floor layout

Challenges and Issues in the future

- Design, prototyping and operation confirmation
- Demonstration of 35m space bring
- Interface with method
- Auxiliary equipment design & system
- Slurry drain route from pedestal to 5F
- Antecedent real demonstration (core sampling)