

Feasibility Study of Fuel Debris Cutting and Dust Collection Technology for Innovative Approach <Taisei Corporation>

Purpose and Goal

The purpose of this project is to contribute to the realization of the essential technology that supports the alternative fuel debris retrieval method with a theme of the development of remote long boring technology for fuel debris cutting. The purpose is, while cutting the fuel debris which is expected to be diverse in physical property with extremely high degree of hardness from the operating floor level with the long boring using newly designed robot boring machine and diamond bit, to study the equipment and system to collect dust during the cutting, cooling water and fuel debris, to examine its feasibility, and to make a specific development plan.

Overview and Feature

Remote robot boring machine

- Boring multiple locations from one opening on the operating floor using tilt and swing of the machine.
- Rod supporting structure enabling the long boring more than 35 m from the operating floor.
- Newly developed auto rod adding mechanism and bit replacement mechanism are installed.
- A mobile crawler type with full remote operation including automatic operation.

Diamond bit, drilling tools

- Correspond to the debris with diversified physical property based on PDC, surface, and impregnated.
- Special bit properties, diamond and matrix specifications for new design.
- Both types: non core bit with high stability for drilling and core bit leaving core.
- Study the applicability of drilling tools with a tip driving mechanism such as DHM.

Dust and fuel debris collection system

- Use dust control equipment auxilarily, since there is little dust due to water fed drilling.
- Newly develop the fuel debris suction/delivery system based on the experiences of TMI-2.
- Storing equipment equipped with a separator which corresponds to a small storage pipe which is under the study for 1F.

Remote operation support system

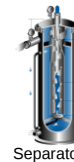
- Photo measurement system to identify the fuel debris dimension and morphologies.
- Dose monitoring system through the wireless system in the operating area.
- Promote safe and smooth remote operation through the combination with above machine system.



Top drive type machine



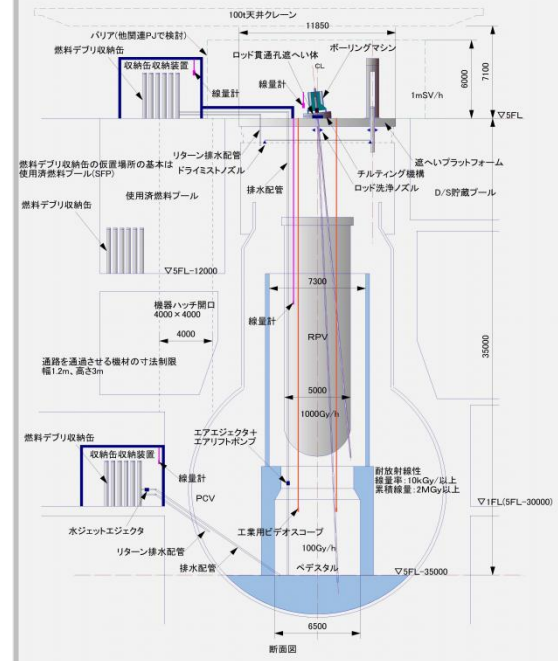
Diamond bit



Separator

Dry mist nozzle

Water jet ejector



■ Sample of essential technology

■ Outline drawing for development technology

Focus point and Expertise



- Top boring equipment manufacturer, KOKEN BORING MACHINE CO.,LTD., and K. Maikai Co., Ltd. are included in the organization.
- Efficient and feasible technology development plan based on the world-level technology.

Output so far/Output expected

Output so far

- Concept of robot boring machine
- Method for supporting the rod and fixing the debris
- Rod dimension specifications, structures
- Rod adding procedures
- Boring machine control flow
- Concept of remote control system
- Method of remote operation and bit replacement
- Boring machine specifications
- Multiple bit concept by new design and scheme
- Issues on drilling tools application (radiation resistant)
- Concept of fuel debris collection equipment and system
- Concept of photo measurement system
- Concept of dose monitoring system

Output expected

- Concept of rod storing equipment (mounted on the unit)
- Concept of bit replacement equipment(mounted on the unit)
- Concept of bit supply equipment (separate unit)
- Specification list for each piece of equipment
- Concerns on the design and its solution
- Study for the site application (installation, layout, investigation)
- Technology development plan(process, organization, cost)

Overall Schedule

Current status (Mid-Dec)

- Study is being promoted as planned.
- Almost finished the cutting equipment structure and system.
- No issues raised in the technology development so far.

Future schedule

- Promote study continuously as planned process.
- Study the issues on the design and its solution (Finish in Mid-Jan.).
- Study for the site application (Finish in Mid-Jan.).
- Study the technology development plan (Finish by end of Feb.).
- Final report on Mar..

Overall Schedule as of startup of the project (planned process)

Item	2014			2015		
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
	✓ Selection		✓ Interim report			Final report ✓ ✓ Draft report
1. Basic plan for proposed technology				✓ Complete study for the specification for boring machine		
1.1 Study spec of boring machine						
1.2 Study boring machine structure and system						
1.3 Study attach/detach method by remote operation						
1.4 Study the remote operation method						
1.5 Issues and solution for design						
2. Study for site application						
2.1 Transfer/assembly of the core boring equipment/auxiliary facility						
2.2 remote operation-related equipment, layout and wiring of facilities						
2.3 Confirm site condition for practical application and issues						
3. Process, structure and cost to realize proposed technology						
3.1 Issues, expected resolution, development period to realize proposed technology						
3.2 Process and implementation structure						
3.3 Approximate cost						
4. Make a report						