東京電力福島第一原子力発電所炉内状況把握の解析・評価
(80) SAMPSON コードによる福島第一原子力発電所 3 号機の事故進展解析

Assessment of Core Status of TEPCO's Fukushima Daiichi Nuclear Power Plants

(80) Accident Analysis of Fukushima Daiichi Unit 3 by SAMPSON Severe Accident Code

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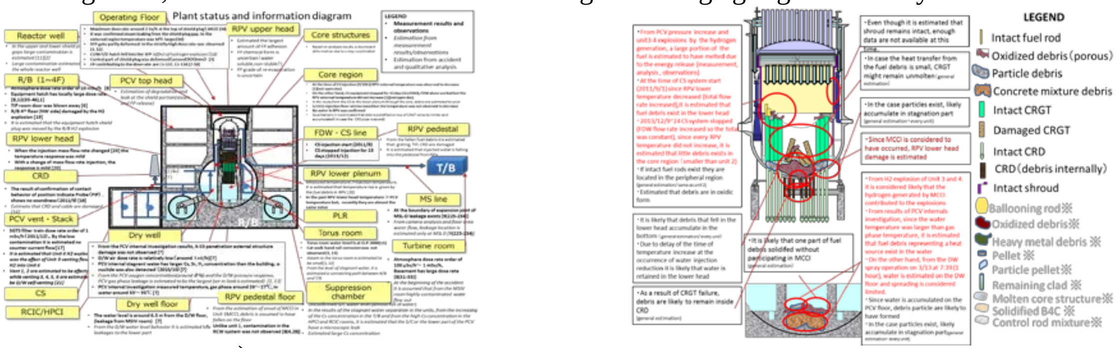
The accident at the Fukushima Daiichi unit 3 has been studied extensively in the last years but still large uncertainty exists on the final state of the core and debris state. Such uncertainties reflect on the difficulty to create strategies for debris removal. In current Japanese national project we have organized all the available information in order to clarify the known condition of the power plant. Based on such information a best estimate current condition of the plant has been proposed in which MCCI played a major role in the accident determining the large hydrogen generation for the explosion of Unit 3 and Unit 4. Based on the analysis of the temperature measurements at the plant a relatively large amount of debris is supposed to remain in the vessel. The estimated results are confirmed with the analysis of the SAMPSON code.

Keyword：Fukushima Daiichi Nuclear Power Plants, Severe Accident, Meltdown, SAMPSON

1. Introduction In Fukushima Daiichi Unit 3 DC batteries remained available until around two days after scram, so that operator could employ emergency systems in the attempt to avoid core meltdown. Nonetheless core level could not be maintained and core boiled off when the reactor depressurized. Several minutes after the depressurization alternative water injection started with the goal to reflood the core with external water. The events happening in the core at this time are still not well understood and purpose of the work is to explain them through the employment of SAMPSON severe accident code Molten Core Relocation Analysis module.

2. Results In the present results the core starts melting after HPCI stopped the operation and relocation happens at large pressure. Debris accumulate on the core plate while the water is at BAF. After depressurization the water level decreases sharply because of flashing It is estimated that even assuming the whole average water injection the water level could not reflood the core and core slumping happens in correspondence of the RPV pressure spikes. After core plate failure the vent valve closes and the pressure increases until head flange leaked. During this period a large amount of hydrogen and steam was released into the building. Pressure decreased by large head flange leak, lower head failed and debris discharge with large gas generation by MCCI.



a) b)

Figure 1 PCV transient in case A (a) and case B (b)

3. Conclusions The SAMPSON code was applied to the accident of the Fukushima Daiichi Unit 3 and the reproduced scenario was able to explain the main pressure signatures. SAMPSON predicts no debris remaining into the lower head since all the fuel melted and was ejected. New models to create crusts and maintain particles will be tested in the near future to obtain results in accordance with findings and estimatinos.

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