Case 3: Criticality Accident at JCO in 1999

Author(s)

Hiroshi Iino

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Description

Case 3 of Teaching Case Studies of Accidents in Nuclear Energy Development in Japan describes an "irradiation" accident at JCO, a subsidiary of Sumitomo Metal Mining Co.

Abstract

This case is an excerpt from Three Teaching Case Studies of Accidents in Nuclear Energy Development in Japan.

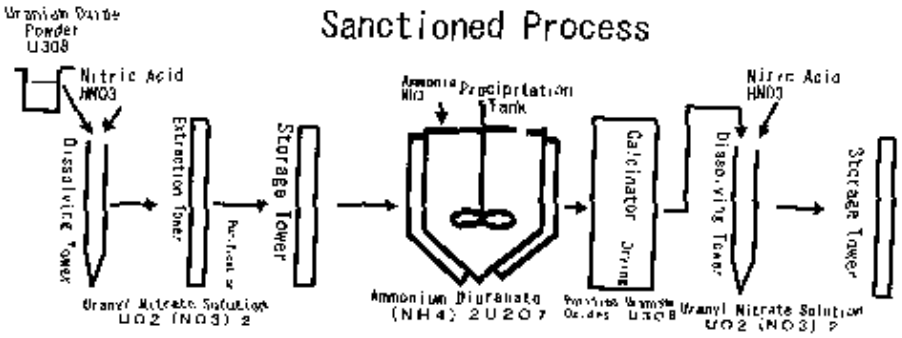
Body

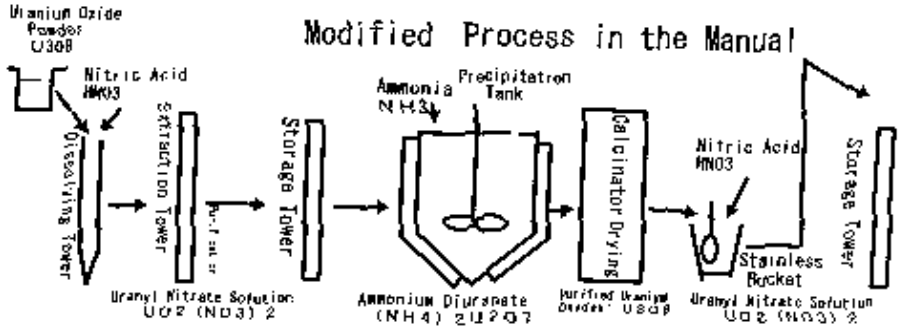
In 1999, a criticality accident at JCO, a subsidiary of Sumitomo Metal Mining Co., astonished the Japanese people and the world at large(4) . Three workers were refining an enriched (the uranium 235 concentration was 18.8%) uranyl nitrate solution for a research fast breeder reactor in Tokaimura, the same village of the second accident. They were pouring uranyl nitrate solution from a five-liter stainless beaker through a funnel into the sedimentation tank that was installed there (but

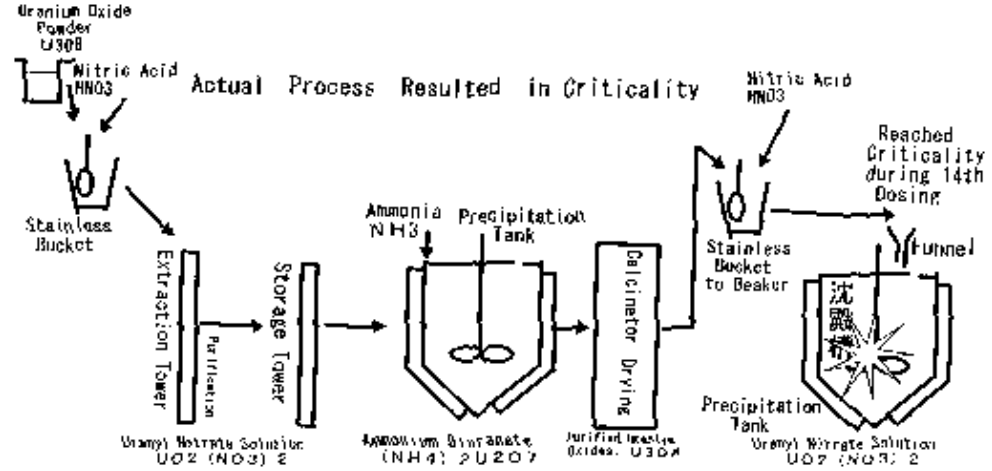
used for other purpose). When they poured the fourteenth dose, they saw a blue flash. The total amount of uranium poured was 16.8 kg, seven times larger than the maximum allowable quantity for the tank. In order to save time, they had changed the process on their own and violated a legal requirement in the operation manuals, which the company had established a few years before. Three were immediately hospitalized and two later died because of excessive neutron and gamma ray exposure. The plant equipment had been designed with a critically safe slim geometry such as 117 mm in diameter and 3500 mm high (80 liters in volume), which also prohibited efficient operation. But the roughly spherical sedimentation tank (450mm in diameter, 600mm high and 100 liters in volume) was an exception. This was an "irradiation" accident, not a "contamination" accident. One hundred and fifty other persons received a radiation exposure, but it was less than a maximum allowable annual dose.

Three kinds of the operation are shown in Fig. 5. This was a special operation for them and, therefore, required some special care. But no qualified engineers were in charge of the operation and workers were not educated well for the operation and accompanying risks partly because the company was in a difficult financial position, which could not be a reason of the excuse. This is simply a problem of poor management and management ethics.

Figure 5:







This accident teaches students following lessons:

1. Poor management. Managements illegally changed the operation manuals and they neither allocated qualified engineers nor educated workers for the operation.
2. The management of the operation was so badly controlled that the workers tried to improve efficiency without knowledge and approval of qualified engineers. Trust and good communication between engineers and workers are essential for safety of any operation.

3. Even under such a situation, engineers who were not in charge of the operation could have pointed out the danger to the management, when they found them.

Several managers (ex-engineers) including the plant manager were put on trial and JCO closed all the operation due to this accident.

- (4)For a final report on the accident in Japanese, refer to "Report from Investigation Committee for Criticality Accident in Uranium Treating Plant", December 24, 1999, pp. 1-141.

Notes

Author: Hiroshi Iino, Kanazawa Institute of Technology, Japan.

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Rights

Resource Type

Case Study / Scenario

Topics

Catastrophes, Hazards, Disasters
Lab and Workplace Safety
Community Relations
Public Health and Safety

Discipline(s)

Nuclear Engineering
Engineering