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Integrated Safety Analysis for Decommissioning Plan of Uranium Recovery from Phosphoric Acid Facilities

Lesson Learned from Decommissioning the Phosphoric Acid Purification Plant in Gresik, Indonesia

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Introduction

The decommissioning program is the final stage in the life cycle of a nuclear facility. The first experience conducting decommissioning in Indonesia was at the uranium recovery facility from phosphoric acid at Petrochemical Company in Gresik, East Java. The installation only operated for four months, from April to July 1989. The completed decommissioning and demolition achieved at the end of 2008.

Facility Description

The facility consist of four zones, (1) phosphoric acid preparation facility, (2) primary extraction-stripping facility, (3) secondary extraction-stripping facility, and (4) settling and drying facility. The highest level of potential radiation exposure was in zone 4 (25 μSv/h), followed by zone 3 (2 μSv/h). Zone 1 and 2 had low levels of radiation exposure of around 0.15 μSv/h. The remaining radioactive material was found in the storage tank and drying tank (zone 4) as yellow cake powder with total 5600 liters. There was 34 m^3 remaining solvent (DEHPA-TOPO mixture in kerosene) in zone 1. Approximately 40 m^3 of organic raffinate with a small amount of water was found in the tank in zone 2.

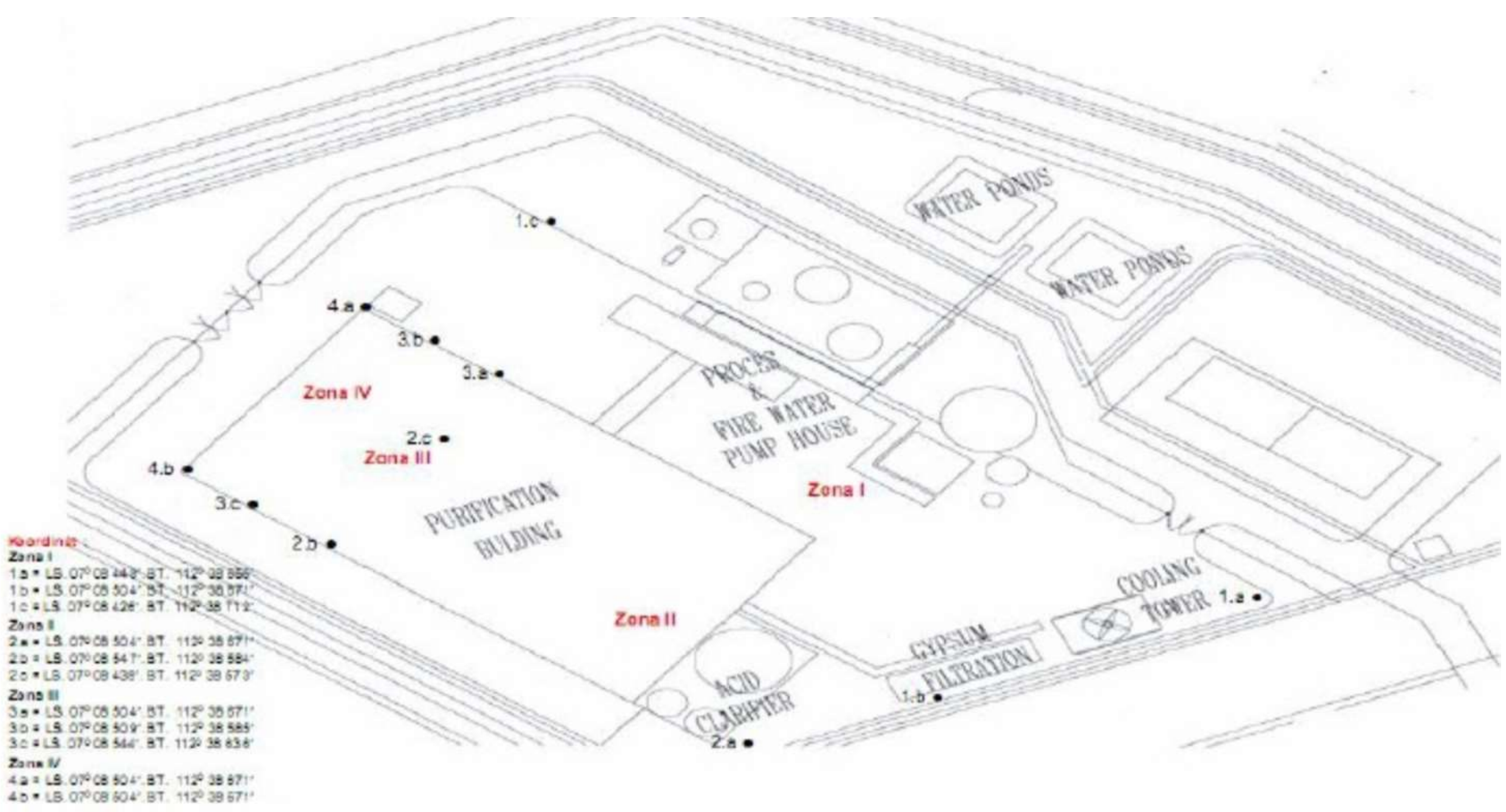
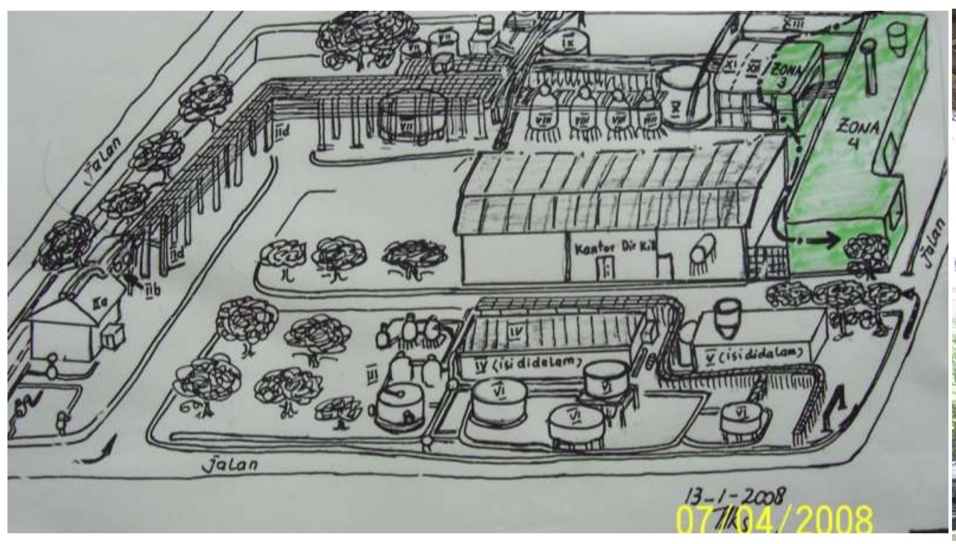


Fig. 1. Overview of facility location



Decommissioning Processes

Integrated safety analysis includes identifying contaminated components, mapping the potential radiation exposure doses, decontamination planning, calculation of estimated doses to be received by decommissioning workers, and identification of any accidents leading to radiological and non-radiological accidents.

The decommissioning process includes five steps:

1. Identification of radioactive material and hazardous chemical substances in the overall facility
2. Decontamination of system and component
3. Demolition of system and component
4. Radioactive waste handling and processing
5. Radiation survey for clearance

Tools and equipment for radiation safety during decommissioning operations were designed using local materials without compromising safety. A subcontractor conducted the demolition process. The reusable metal component could cover the cost of demolition. The decommissioning costs were 7,742 billion rupiahs, lower than the initially planned costs of 25,285 billion.

Summary

Using integrated safety analysis, local products by designing tools and equipment for radiation safety protection could reduce the decommissioning and demolition operational costs. After the clearance procedure, the land area could be released from nuclear regulatory control, and sustainability could be achieved.