

54th Annual Meeting on Hot Laboratories and Remote Handling

HOTLAB 2017

17-22 September 2017, Mito, Japan

BATAN - IAEA COOPERATION IN THE PROGRAM OF DECONTAMINATION AND POST IRRADIATION EXAMINATION (PIE) IN RADIOMETALLURGY INSTALLATION

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CONTENT

INTRODUCTION

DECONTAMINATION HOT CELL STATUS

INTER-REGIONAL WORKSHOP 2015

IAEA EXPERT MISSION TO BATAN 2017

FUTURE PLAN

INDONESIAN REACTOR SITES



REACTOR KARTINI YOGYAKARTA

Reactor Kartini is a research reactor / non-power pool type, have a nominal power of 250 kW and currently operates 'steady state' to the power of 100 kW. Reactor Kartini is a TRIGA reactor 250.

Reactor was built in 1976, and began operating in 1979 on the power of 50 kW



REACTOR TRIGA 2000 BANDUNG

TRIGA reactor 2000 located in Bandung is the first research reactor built in Indonesia.

The reactor was built in 1960 and in 1964 was inaugurated with reactor power is 250 kW.

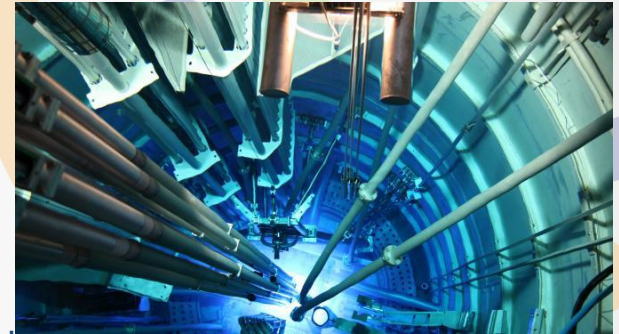
In 1971, the reactor was increased to 1,000 kW power

In 2000 its increased again to 2000 kW.



RSG-GAS – REACTOR IN SERPONG

- RSG-GAS is a multipurpose nuclear reactor
Thermal power capacity is 30 MW
Neutron Flux (mean) 10^{14} n / cm²
MTR Reactor Type
Fuel U₃Si₂Al
Reactor coolant H₂O
Used for research and development of reactor technology and
conduct irradiation services



NON-REACTOR NUCLEAR FACILITIES

EFEI (Experimental Fuel Elements Installation)

- ▶ EFEI is a facility to produce power reactor fuel elements PHWR - Cirene type using natural uranium.

EFEI consists of PCP Facility (Pilot Conversion Plant), Fabrication Facilities and Quality Control Facility.



NON-REACTOR NUCLEAR FACILITIES

RMI (Radio Metallurgy Installation) - HOT CELL- SERPONG

Concrete cells

- temporary storage for fuel elements subjected for examination.
- disassembling and cutting for sample preparation
- NDT

Steel cells

- metallographic testing
- physical and chemical testing
- mechanical and technical testing
- sample preparation for SEM/TEM analysis

Hot cell activities

- PIE U_3O_8 -Al fuel plate
- PIE U_3Si_2 -Al fuel plate
- Dismantling LEU Foil target

Hot cell problems

- Tools are ageing, broken and can not work anymore
- Need to decontaminate hot cell for repair or replacement of test equipment

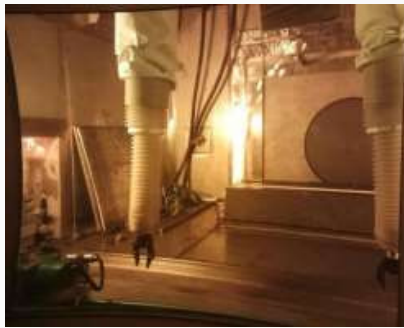


DECONTAMINATION HOT CELL STATUS

- Decontamination Works in 2013-2014 for hot cell No 101, 102 and 103
- Remote decontamination for floor, walls of the room and equipment
- Direct decontamination by entering in the hot cell



Result of decontamination works



Hot cell 103



Hot cell 102

Inter-regional workshop 2015

- 4 - 8 May 2015 in Serpong, Indonesia.
- Inter-Regional Workshop / Training course on Characterization and Decontamination Techniques for Hot Cell Facilities
- As the part of nuclear decommissioning projects
- 20 participants from 14 countries: Algeria, Bangladesh, Chile, Iraq, Latvia, Lithuania, Malaysia, Mexico, Morocco, Pakistan, Philippines, Poland, Russian Federation and Ukraine.
- 4 IAEA Experts: Mr. Vladimir Michal from IAEA-Department of Nuclear Energy-Division of Nuclear Fuel Cycle and Waste Technology-Waste Technology Section, Mr. Charly Mahe of France-Center d'etudes nucleaires (CEN) - CEA, Mr. Sergey Mikheykin from Russian Federation-Repository Project Management and Mr. Ed J. Butcher from United Kingdom-British Nuclear Fuels Plc. (BNFL).

Materials provided by experts include:

- Decommissioning Technical and Safety Guides & Decommissioning Planning
- Characterization techniques – Introduction, Alpha and Gamma Imaging
- Post-decontamination measurements
- Decontamination methods and tools for hot cells
- Chemical decontamination
- Electrochemical techniques, Physical and mechanical method
- Characterization and decontamination of hot cells – practice experience and lesson learned
- Radiation protection, radioactive waste management and safety aspects

ACTIVITIES :

- All participants from various countries were also asked to present the National Presentation
- In this workshop there is also a visit to hot cell facility in Nuclear Fuel Technology Center - BATAN
- This kind of workshop is very useful for us to understand each other activities of various countries related to the activity of each hot cell
- To be follow-up from this workshop :
 - Promote cooperation in the decontamination of hot cell and nuclear facilities
 - Organize more meetings in the subject matter as necessary
 - Develop related Coordinated Research Project (CRP) to allow sharing of hot cell facilities around the world

Expert Mission to BATAN 2017

- 3 – 7 April 2017 with 3 IAEA experts from CEA, JAEA, Kurchatov Institute, and 1 expert from IAEA Technical Officer
- Theme: Practical Aspects of Hot Cells Decontamination for further Dismantling or Revitalization
- Focused on remote decontamination of BATAN hot cells for further revitalization or dismantling and to advice on technical specification of equipment that will be later used for PIE (Post Irradiation Examination) starting from non-destructive testing to destructive testing
- EM to BATAN 2017 is follow-up of “Inter-Regional Workshop on Characterization and Decontamination Techniques for Hot Cell Facilities”, BATAN, May 2015.

AGENDA

- Monday April 3, 2017: presentations of BATAN – overview of technical issues to be addressed, IAEA presentation and introductory presentations of IAEA experts on their national experience in hot cells decontamination and/or dismantling.
- Tuesday April 4, 2017 /Wednesday April 5, 2017: hot cells site visits and meetings/discussions with the BATAN staff.
- Thursday April 6, 2017: work on the EM report with recommendations.
- Friday April 7, 2017: presentation and discussion of recommendations.

Material from experts

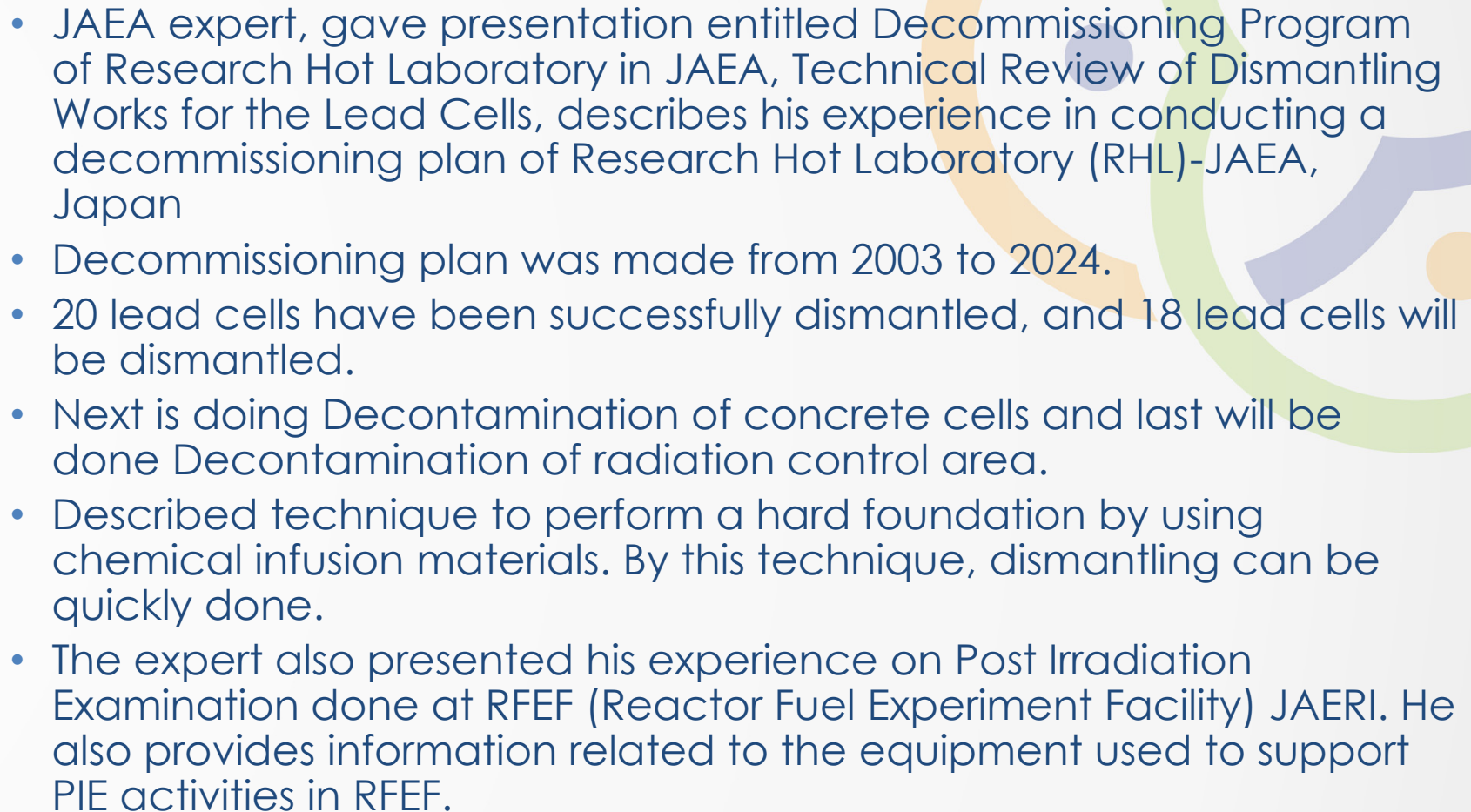
- Decontamination of various surfaces using gels and foams for nuclear facilities
- Waste management strategy
- Technologies and processes of post irradiation examination in the reactor fuel examination facility
- Decommissioning program of Research Hot Laboratories in JAEA
- Concept of creation the PIE facility for studying of HTGR spent fuel
- Experience in the decontamination and refurbishment of nuclear fuel cycle hot cells

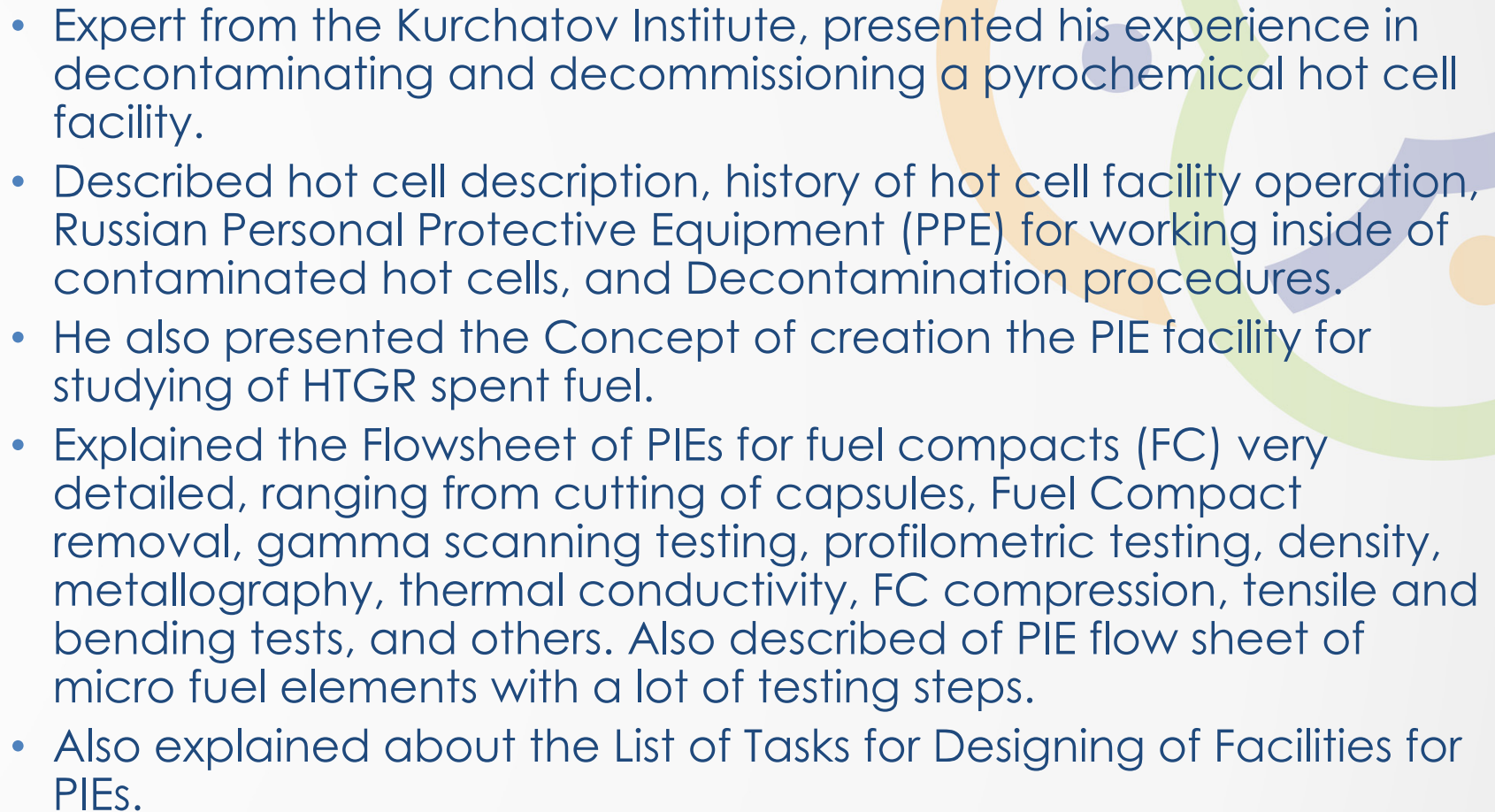
Form of cooperation that can be given by IAEA to BATAN

- Assisting in development of consistent policies and related strategies for decommissioning & support of planning and implementation of decommissioning projects;
- Conferences, workshops, training courses, seminars etc. to support sharing of good practices among involved specialists and organizations;
- Safety standards and guidance & technical publications;
- International Decommissioning Network and related projects;
- Technical Cooperation (TC) projects (national, regional, interregional);
- Coordinated Research Projects.

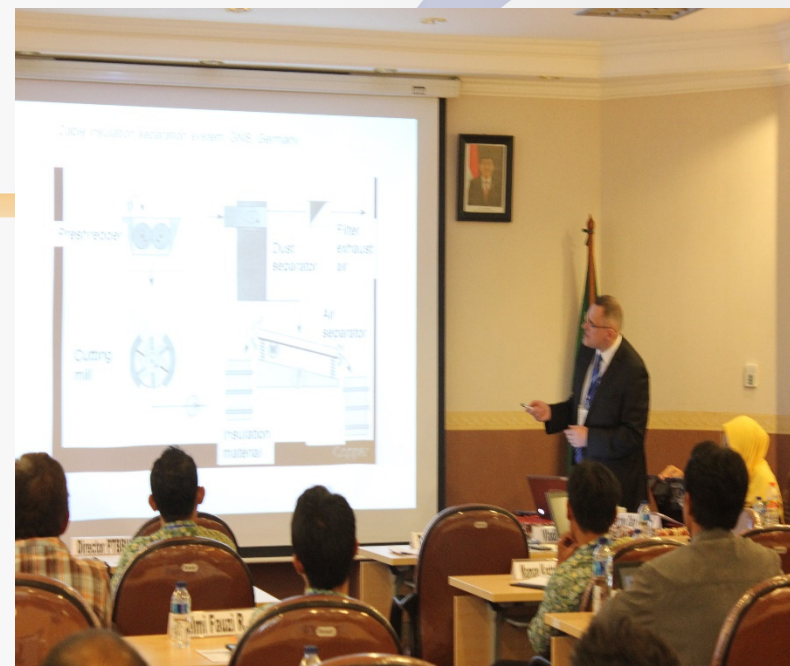
Activities

- CEA expert gave a presentation entitled Decontamination of various surfaces using gels & foams for nuclear facilities.
- There are 2 categories of decontamination methods namely chemical and Physical & mechanical.
- For chemical, the types are: Solution, Foams and Gel.
- For physical & mechanical, the types are: Abrasion (sandblasting, grinding), Dry ice blasting and Laser
- For decontamination of hot cell with large surface, painted concrete, labile & permanent contamination, Gel is more appropriately used as a material or method used to decontaminate.

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- JAEA expert, gave presentation entitled Decommissioning Program of Research Hot Laboratory in JAEA, Technical Review of Dismantling Works for the Lead Cells, describes his experience in conducting a decommissioning plan of Research Hot Laboratory (RHL)-JAEA, Japan
 - Decommissioning plan was made from 2003 to 2024.
 - 20 lead cells have been successfully dismantled, and 18 lead cells will be dismantled.
 - Next is doing Decontamination of concrete cells and last will be done Decontamination of radiation control area.
 - Described technique to perform a hard foundation by using chemical infusion materials. By this technique, dismantling can be quickly done.
 - The expert also presented his experience on Post Irradiation Examination done at RFEF (Reactor Fuel Experiment Facility) JAERI. He also provides information related to the equipment used to support PIE activities in RFEF.

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- Expert from the Kurchatov Institute, presented his experience in decontaminating and decommissioning a pyrochemical hot cell facility.
 - Described hot cell description, history of hot cell facility operation, Russian Personal Protective Equipment (PPE) for working inside of contaminated hot cells, and Decontamination procedures.
 - He also presented the Concept of creation the PIE facility for studying of HTGR spent fuel.
 - Explained the Flowsheet of PIEs for fuel compacts (FC) very detailed, ranging from cutting of capsules, Fuel Compact removal, gamma scanning testing, profilometric testing, density, metallography, thermal conductivity, FC compression, tensile and bending tests, and others. Also described of PIE flow sheet of micro fuel elements with a lot of testing steps.
 - Also explained about the List of Tasks for Designing of Facilities for PIEs.







Future plan

- To continue the hot cell decontamination program at the nuclear fuel technology center – BATAN
- Preparing data of equipment test for PIE for budget planning.
- Continue cooperation with IAEA to support hot cell decontamination and revitalization program.

THANK YOU FOR YOUR
ATTENTION

