R2D2P Workshop on

Characterization Survey

Manila, Philippines

03-07 December 2007

Renewable energies and water desalination research reactor

Tajoura, Libya


Abyar as Sababil
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Google
Pointer 32°50'12.05" N 13°27'15.62" E elev 33 m
Streaming 100%
Eye alt 12.56 km

Introduction:--

Tajoura reactor is a pool type research reactor with nominal power of 10MW.

The reactor core and the lateral beryllium reflector are placed in the reactor pool filled with light water at a depth of >7 meters. The water in the reactor is used as coolant, moderator, reflector and biological shield.

The IRT-4M, 8-tube and 6-tube, type fuel assemblies are used in the reactor Since November 2006 with low enrichment (19.7%) instead of IRT-2M, 3-tube and 4-tube, type high enrichment (80%) fuel.

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- **nuclear physics**
- **Solid state physics**
- **Neutron physics**
- **Radiation biology**
- **Radiation chemistry**
- **Activation analysis**
- **Production of radioactive isotopes.**
- **Study of behavior of structural materials directly in the process of radiation.**

Decommissioning plan:

- There is no ready plan for decommissioning of the reactor at this stage.
- But it is part of the safety analysis report (SAR) to have a chapter on decommissioning plan.
- The SAR is currently being prepared by the staff of the reactor according to IAEA standard and as requested by the National Regulatory Body.

Facility Design Aspects:

The aspects of the facility design that facilitate decommissioning are discussed bellow.

1-Materials used in the reactor pool:

- beryllium is a reflector
- The boron carbide is used in making control rods each rod is placed in an aluminum channel.
- Vertical channels (for sample irradiation) are made from aluminum.
- Zirconium is used in the part of the horizontal channel inserted in the core.
- All tools for loading and unloading are made from aluminum.

2-Radiation Protection Systems

There are many systems that exist to reduce radiation background and to eliminate the need for a major decontamination program during Decommissioning.

- Decontamination system (four chemical reactors with possibility for mixing and heating to prepare different chemicals for decontamination of all part s and components of the reactor cooling and purification systems.
- This system includes pipes which can take these chemicals to all technological rooms in the reactor building).

- There exist three tanks for water drainage from the reactor or in case of leakage from horizontal channels or primary circuit.

- Special ventilation system in normal case and in case of emergency is used with different type of filters to remove any aerosols which may propagate during normal or accident situations.

- The resin used to remove radioactive corrosion products continuously (operation of the primary circuit daily to protect the primary system component from corrosion, the high flow rate of the purification system from 5 to 8 m^3 /hr)

- The primary circuits loop consist of 4 pumps, 4 heat exchangers, valves, and pipes all are made from stainless steel . This reduces the possibility of material failure and hence, leakage between the first and second loops.

- The secondary circuit is a closed loop and the heat exchangers between the second and the third circuit are made from stainless steel.

- There is also a hot cell for cutting radioactive materials.

- Two hot cells for processing the radioactive materials.

- Dray storage .

- UPS system & diesel generator .

• There is an extensive radiation monitoring system to monitoring fast, intermediate and thermal neutrons, and gamma, beta radiations. A gas detector system is used for monitoring radioactive gases, and aerosols.

• An underwater camera and endoscope of 1.2 mm diameter are used periodically to check the inner and outer fuel surfaces.

• Sipping systems which give the possibility to isolate any leakage in any fuel element at early stage eliminating contamination of the primary circuit.

• Reactor facility is equipped with a crane with capacity of 10 tone (there is a project to build shielded control room and to introduce a new remote control system) and one a crane with capacity of one tone in each technological room.

3- Decommissioning Adding Procedures:

Some procedures help making the decommissioning an easy process includes:

• Daily water sampling to monitor water quality.

• Flux measurement laboratory and water analysis for to detect fission product in the primary circuit.

4-Design consideration to reduce the radiation background:

- There is no upper grid in the reactor
- Using light water as a coolant instead of heavy water.
- The reactor pool is large enough making its wall far from the core detect.
- monitoring Detectors are installed away from the core(less irradiation)

The physical protection:

1-Center security

- Guards
- *walls*
- Fence
- Cameras
- Ultraviolet
- Infrared
- The gates opened only with magnetic card

2-Inside the reactor building

- Security check point
- Magnetic locker of the technological rooms
- Camera in the technological rooms and in all the entrance of the building
- Camera and (special locker + magnetic locker) in the fresh fuel storage room.
- 24 hours shift

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