

GUJARAT TECHNOLOGICAL UNIVERSITY



Gujarat Technical University

Chandkheda, Ahmedabad

Affiliated



LUKHDHIRJI ENGINEERING COLLEGE

MORBI

A Project Report
On

NUCLEAR REACTOR

Under subject of
DESIGN ENGINEERING – I B
B.E. Semester – IV

(Chemical Branch)

Submitted by

Sr.	Name of student	Enrollment No.
1.	Karan Gupta	130310105015
2.	Mehul Patel	130310105041
3.	Devarshi Tadv	130310105057
4.	Rajesh Parmer	130310105038
5.	Sanjay Vasava	130310105062

Prof. M.T. Chauhan
(Faculty Guide)

Prof. A.N. Vaghela
(Head of Department)

Academic year
(2014-2015)

**LUKHDHIRJI ENGINEERING COLLEGE MORBI
CHEMICAL ENGINEERING DEPARTMENT**

Morbi-2



CERTIFICATE

Date: _____

This is to certify that **Karan Gupta, Mehul Patel, Devarshi Tadvi, Rajesh Parmar, Sanjay Vasava** of B.E. Semester IV (Chemical Engineering) has completed their Design Engineering-I B work titled "Nuclear Reactor" satisfactorily in partial fulfillment for requirement of Design Engineering I course, Gujarat Technical University, Ahmedabad, in the academic year 2014-2015.

Prof. M.T. Chauhan
(Project Guide)

Prof. A.N. Vaghela
(Head of Department)

ACKNOWLEDGEMENT

This project is done in our Second of BE-Chemical Engineering. However it won't have been possible without tremendous effort from our project instructor Prof. M.T. Chauhan, Department of Chemical, L.E. College, Morbi.

We are highly indebted to L.E. College for their guidance and constant supervision as well as for providing necessary information regarding the project & also for their support in completing the project.

We would like to express our special gratitude and thanks to other persons for giving us such attention and time.

Finally, yet importantly, we would like to express our heartfelt thanks to our beloved parents for their blessings, our friends/classmates for their help and wishes for the successful completion of their project.

Abstract

A nuclear reactor is a device to initiate and control a sustained nuclear chain reaction. The most common use of nuclear reactors is for the generation of electric energy and for the propulsion of ships.

The nuclear reactor is the heart of the plant. In its central part, the reactor core's heat is generated by controlled nuclear fission. With this heat, a coolant is heated as it is pumped through the reactor and thereby removes the energy from the reactor. Heat from nuclear fission is used to raise steam, which runs through turbines, which in turn powers either ship's propellers or electrical generators.

Since nuclear fission creates radioactivity, the reactor core is surrounded by a protective shield. This containment absorbs radiation and prevents radioactive material from being released into the environment. In addition, many reactors are equipped with a dome of concrete to protect the reactor against both internal casualties and external impacts.

Nuclear reactors

A nuclear reactor is a device to initiate and control a sustained nuclear chain reaction. The most common use of nuclear reactors is for the generation of electric energy and for the propulsion of ships.

Steam turbine

The purpose of the steam turbine is to convert the heat contained in steam into mechanical energy. The engine house with the steam turbine is usually structurally separated from the main reactor building. It is so aligned to prevent debris from the destruction of a turbine in operation from flying towards the reactor.

In the case of a pressurized water reactor, the steam turbine is separated from the nuclear system. To detect a leak in the steam generator and thus the passage of radioactive water at an early stage, an activity meter is mounted to track the outlet steam of the steam generator. In contrast, boiling water reactors pass radioactive water through the steam turbine, so the turbine is kept as part of the control area of the nuclear power plant.

Generator

The generator converts kinetic energy supplied by the turbine into electrical energy. Low-pole AC synchronous generators of high rated power are used.

Cooling system

A cooling system removes heat from the reactor core and transports it to another area of the plant, where the thermal energy can be harnessed to produce electricity or to do other useful work. Typically the hot coolant is used as a heat source for a boiler, and the pressurized steam from that one or more steam turbine driven electrical generators.

Safety valves

In the event of an emergency, safety valves can be used to prevent pipes from bursting or the reactor from exploding. The valves are designed so that they can derive all of the supplied flow rates with little increase in pressure. In the case of the BWR, the steam is directed into the suppression chamber and condenses there. The chambers on a heat exchanger are connected to the intermediate cooling circuit.

Feed-water pump

The water level in the steam generator and nuclear reactor is controlled using the feedwater system. The feed-water pump has the task of taking the water from the condensate system, increasing the pressure and forcing it into either the steam generators (in the case of a pressurized water reactor) or directly into the reactor (for boiling water reactors).

NUCLEAR REACTOR

❖ Activities

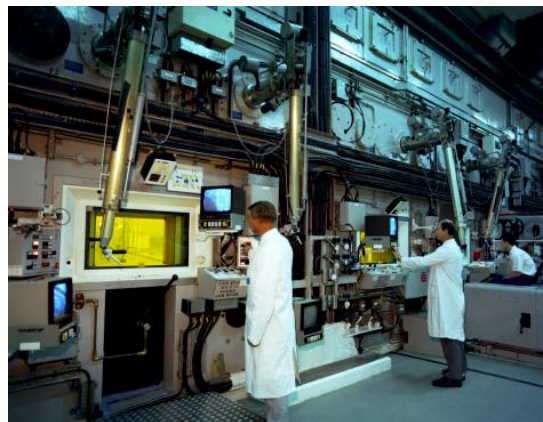
General Impression / Observation

- Power station
- Engineers controlling the process
- Research Center
- Security
- Research fellows
- Workers moving the container

Elements Features and Special Notes

- Renewable Source
- Cheap Electricity
- Reliable
- Low Carbon Emission
- Low Fuel Cost
- High Efficiency

Sketch/Photo-Summary of activities



❖ Environment

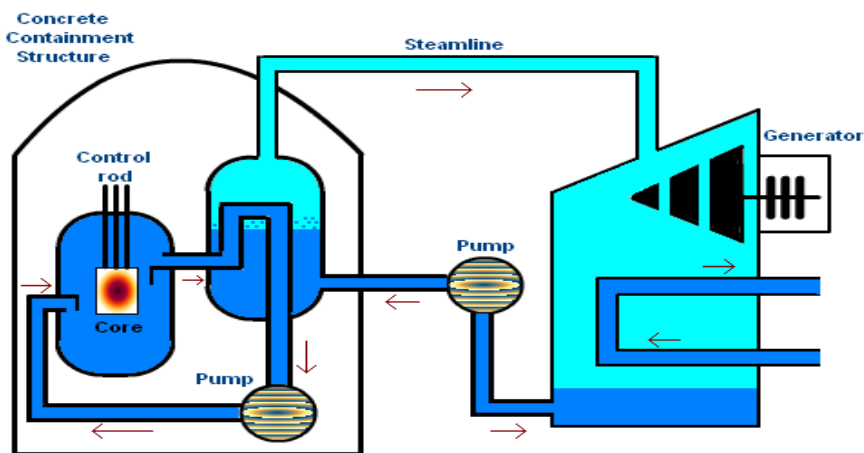
General Impression / Observation

- Pleasant Atmosphere
- Neat and Clean Environment
- Strict Rules
- Safety Measures
- Co-operative Staff

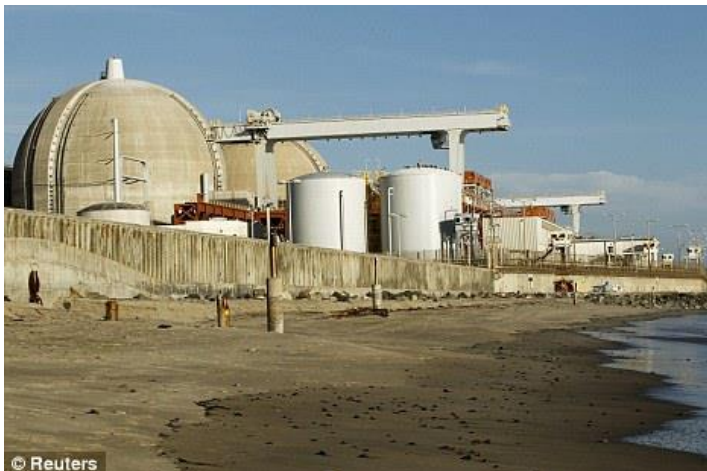
Elements Features and Special Notes

- Chance of leakage of Radioactive Fuels
- Problem of Radioactive Wastes
- Usually located near rivers, lakes and oceans

Floor Plan



Scene



❖ Interactions

General Impression / Observation

- Worker → Staff members
- Security → Workers
- Research fellow → Scientists
- Staff member → Security

Elements Features and Special Notes

- Security → Students
- Students → Research fellow
- Student → Workers

Scene of Interaction



❖ Objects

General Impression / Observation

- CCTV Cameras
- Fire Alarms
- Sign Boards
- Protective Cloths

Elements Features and Special Notes

- Emergency Medical Service
- Automatic Control System
- Fuel Rods
- Activated Charcoal



❖ Users

General Impression / Observation

- Scientist
- Defense Personals
- Government
- Researchers
- Engineers

Elements Features and Special Notes

- Employees
- Operators
- Engineers
- Navy Submarine Staff

Scene of users in context



❖ Conclusion

This project on ‘Nuclear Reactor’ shows the standards and specifications of the power plant. To ensure high efficiency and safety of the working environment these needs to be implied in the power plants. Some special softwares should also be used to simulate the data and predict about the functional aspects of the power plant.