

Operation & Process Technology Department (OPTD)

This department equipped with 8 high tech labs and shops with modern technology named as Large unit operation lab, Small unit operation lab, Measuring and control lab, Physics lab, Process operation lab, Process simulation lab, Corrosion testing & research lab and Boiler & Compressor house.

Trainees get an opportunity to acquire real applicable knowledge and hands on practice facility in closed contact theoretical & practical session. Practice on Drawing, Designing, Calculation and Operation of small-scale pilot plant increase their confidence and operational capability.

Large Unit Operation Laboratory

This laboratory is equipped with the following pilot plants/process units having fully automatic factory model control & monitoring instrumentation:

- Water treatment pilot plant
- Absorption/Neutralization pilot plant
- Evaporation & Crystallization pilot plant
- Distillation pilot plant (Refining Process)
- Extraction pilot plant (Refining Process)
- Absorption pilot plant for packed tower operation
- Pump arrangement
- Ion Exchange pilot plant
- Solids handling pilot plant



Fig: Solid Handling Unit Operation Plant



Fig: Ion Exchange Unit

Modern industries consist of different process units lined-up together to achieve designed process flow. In large Unit Operation Lab, the trainees acquire hands-on experience on operation of various process units which they are supposed to operate in real plants. The trainees also practice operation of various process units and study on how to solve problems during start-up, shut-down and normal operating condition of the plant.

Absorption/Neutralization Pilot Plant: This pilot plant helps trainees to face real applicable knowledge on mass transfer.

Water Treatment Pilot Plant: The plant consists of scaled down process equipment and field instruments hooked-up to central control panel. It is facilitated with different level sensor as well as three different mixing system. Trainee get clear view on practicing the removal of hardness on water.



Evaporation-Crystallization Pilot Plant: The above pilot plant hooked-up together with Absorption/Neutralization Pilot Plant to constitute Ammonium Sulphate production system. Trainees face a critical drawing and designing environment to work in a three floored area. Moreover, an open view of crystallization and centrifuging give them an esteem knowledge on granulation system.

Distillation Pilot Plant: The liquid movement can be seen in all the area of the operation by this plant as this is a glass unit. Trainees can practice different feature of distillation tower with clearly viewing the consequence. Liquid taking out from different part of the distillation column is easily shown by this plant.

Extraction Pilot Plant: This is another glass unit. Here, one chemical is separated from an azeotropic mixture by adding third component. Also, trainees can learn controlling two phases system, fitting arrangement, leakage management etc. by this special oriented plant.

Small Unit Operation Laboratory

This laboratory is equipped with lab scale assembly of various process units, namely:

- Flow behavior study assembly
- Heat exchange assembly
- Solid drying assembly
- Distillation Assembly
- Dissolution & Crystallization set-up.



Fig: Solid Drying Unit

In this laboratory the trainees acquire knowledge about effect of various process parameters on industrial process.



Fig: Flow Assembly Unit

The study on fluid flow give an overall information on change of fluid internal energy due to flow within different situation. Trainees also gets some deep facts to choose of valves and fittings considering different energy drop areas.

The Distillation unit is equipped with different types of column. Trainees acquire knowledge on basic difference of operation of different temperature and setup.

Measuring & Control Laboratory

This laboratory is equipped with different automatic control loops, measuring and control instruments such as:

- Automatic level control loops
- Flow control loop
- Temperature control loop
- Industrial model transmitters & controllers of different types including exploded view assembly.



Fig: Study of Process response & Control mode in automated level control loop

The trainees can study various process control loop arrangements, control mode and system response with the help of control loops/pneumatic process simulators. Exploded assembly of different controllers, transmitters and control elements help trainees to study working principle of various measuring and control components.

Process Operation Laboratory

The South Korean Govt development aid KOICA establish this new laboratory with computer control pilot plant with SCADA and PID control. These units can be run with specialized PLC system by touch pad. The lab is furnished with 3 different study system. These are:

- Process Control Plant with Industrial Instrumentation with SCADA and PID Control
- Heat Exchangers Training System with SCADA and PID Control
- Double Effect Rising Film Evaporator with SCADA and PID Control



Fig: Process Control Plant with SCADA & PID control



Fig: Heat Exchange Training System with SCADA and PID Control



Fig: Double Effect Rising Film Evaporator with SCADA and PID Control

The process control plant is facilitated by a service module with hot water and pneumatic air supply system. All the process parameter viz. level, flow, temperature and pressure control system can be studied by this pilot plant.

The heat exchanger training module have 9 different types heat exchange unit. Various observation like NTU, LMTD etc. can be studied by this pilot plant.

The double effect rising film evaporator module is facilitated with serial, parallel, single effect and double effect managing system.

These plants can be programmed and run with PLC system. The PLC module is equipped with software for both the facilitators and trainees that can be edit, format, change even can be programmed with different setup.

All three of these plants are facilitated with ECM software given by EDIBO, Spain. This software can arrange an automated class and practice session. It is well equipped with overlooking, giving and receiving exercise, simulating with practical data to examine student reports.

Process Simulation Laboratory

The courses in this lab cover practices along with theoretical sessions on different topics, e.g. Built in Function and Physical Properties Estimation, Thermodynamic Model Selection Guide, Various Flash Calculations, Vapor Compression & Refrigeration Cycle, Heat Exchanger Simulation, Reactor Modelling, Basic Distillation and Dynamic Simulation.



Fig: Process simulation lab setup with 1 Server and 24 client computers.

This software help participants to perform their job with more skill and confidence in their application field. It is also facilitated to run a plant repeatedly to review data and calculation.

Corrosion Testing & Research Laboratory

Corrosion has many serious economic, health, safety, technological and cultural consequences to our society. This lab installed by KOICA with a view to disseminate knowledge and acquaint with the effects of corrosion. Factors influencing corrosion, Principles and application of cathodic & anodic protection and Analysis of corrosion failure are the most attractive part in the training related to this lab. The main equipment and instruments in this lab are:

- Portable Corrosion Monitoring Kit.
- RMS2 High Speed Remote Access C-Scan Corrosion Mapping System
- Anode Simulator for Cathodic Protection Testing
- Corrosion Profiling, mapping & flaw detector (UTLITE R-SCAN 100)
- Soil Resistivity Meter
- Oil and Gas Corrosion Test Equipment
- Portable Corrosion Rate Measurement Instrument with probes
- Metallurgical microscope, BX53M
- Corrosion Coupon Test Arrangement



Fig: UT-Lite RScan



Fig: Corrosion Testing and Research Lab



Fig: RMS2 450 for Tank & Pipeline corrosion testing and profiling

RMS2 450 is a computer-controlled equipment operated with magnetic wheels installed in robotic crawler and remote control. This system allows inspection of large, simple geometries with a minimum set-up of time. Both the probe and crawler movement are programmable for scan data collection.

The Cu strip corrosion tester is equipped with two different pressure vessels made of stainless steel that is submerged in a deep liquid bath. The bath is fitted with suitable support and temperature controller. It can evaluate the degree to which a lubricant will corrode copper-containing materials (i.e., bronze, brass). to determine the suitability of a lubricant for use in equipment containing copper-based components. It may also be used with silver bearing metals.

The BX53M microscope can be operated both by computer and manual system. Different arrangement is facilitated by this equipment to get a real corrosion status of any material face mostly with Bright field, dark field, transmitted light source, refracted light source, 1000x enlarging, movable base for display etc.

Physics Laboratory

Self-contained physics laboratory is furnished with modern equipment to study & practice applied physics used in industries. The main instruments in this lab is:

- Centrifugal pump (Hand operated demonstration model)
- Radioscope (Crookers)
- Archimedes Principle Apparatus
- Baroscope
- Gravesend Vessel
- Hair Hygrometer
- Precision Hygrometer
- Barometer

Boiler and Compressor House

8 bar pressure, 500kg/hr capacity complete automatic gas fired boiler facilitates for operational practice and supplying steam to pilot plants.



Fig: TICI Boiler setup

The compressor is capable of supplying 7 bar pressure, 725m³/hr, -20°C dew point, dust free air to different pilot plants as process air and to various control instruments as instrument air.

Expert Service offered by Operation & Process Technology Department:

- Operational assistance of process plants & equipment
- Preparation of standard operating & shut down procedure (SOP & SSP)
- Efficiency calculation and performance evaluation of process equipment/machinery
- Determination of water quality requirement of process plants and design of water treatment plant
- Identify causes of industrial corrosion, advise for remedial measures and assist in implementation
- Corrosion profiling and current state of vessel.

List of Training Operation & Process Technology Department:

Upgradation Training for Employees:

- Pumps: Characteristics & Operating Behavior
- Heat Transfer & Operation of Heat Exchanger
- Industrial Water Treatment Method and Operation
- Industrial Corrosion & Corrosion Control
- Industrial Boilers & Operation of Steam Generation system
- Measuring & Control of Process Parameters
- Industrial Waste Water Treatment & Effluent Management
- Process Simulation Using AspenONE Software

Special Training for Universities:

- Industrial Process Unit Operation & Process Control Technique