

## ABOUT SIM INFOSYSTEMS

“SIM INFOSYSTEMS is a global leader with over 20 years of experience specializing in the development of software solutions tailored for simulating process plant operations, control and safety systems across diverse industries”.

We have completed more than 150 simulation projects for the Industrial and academic sectors.

Our customer base spanning across 85 Industries, 100 institutions and over 30 countries is a testament to our global footprint and commitment to serving diverse markets.

**ProSimulator™** is a high-end virtual twin software package for training the plant operating personnel and engineering students.

**ProSimulator™** provides opportunities to manipulate systems to simulate all possible emergencies and abnormalities, including plant startup and emergency shutdown that an operator has to face, when placed in the actual process plant control room. This ability of personnel to respond to micro second variations in the parameters of a process plant, ensure optimal production and absolute safety.



### Sim Infosystems Offers:

- ▶ Custom designed simulator for process and power industries
- ▶ Standard simulation software for industrial training center and academic institute
- ▶ Skill development training services for industrial training center and academic institute

### ProSimulator™ is a complete Virtual Twin package and consists of:

- ▶ Simulator hardware
- ▶ Instructor Station
- ▶ Emulation or Direct Connect Operator Station for various DCS
  - **ProSimulator™** Standard or Custom Process Models for:
    - ✓ Process control & Instrumentation
    - ✓ Basic process Operations
    - ✓ Refining
    - ✓ Gas Processing
    - ✓ Upstream Operations
    - ✓ Fertilizer
    - ✓ Chemicals
    - ✓ Petrochemicals
    - ✓ Power & Utilities
    - ✓ Utilities System
    - ✓ Metal processing
    - ✓ Bio and Food processing
- ▶ Pro-VFO, a 3D \ VR Field Operation Suite.
- ▶ Simulator for AI projects
- ▶ Interface Software
- ▶ User Documentation, Software License, training and support



**ProSimulator™** Instructor station enables the instructor to control and direct the training sessions. From the Instructor station, multiple independent training sessions can be invoked by the Instructor and each training session can be assigned to work with one or more operator stations. Using this software, the Instructor can load a model, set an initial condition, invoke malfunctions, take/recall snapshot, change simulation speed and monitor & evaluate the performance of the trainees.

**ProSimulator™** offers full function Direct connect simulator or provide emulation software for various DCS

- ▶ Yokogawa Centum CS3000
- ▶ Yokogawa Centum VP
- ▶ Honeywell TDC3000
- ▶ Experion
- ▶ Fox I/A
- ▶ Siemens PCS7
- ▶ DeltaV
- ▶ ABB Harmony
- ▶ ABB800xA
- ▶ Triconex PLC



## Benefits of ProSimulator™

### For Academic

- ▶ Hands-on Learning experience
- ▶ In-depth Process Understanding
- ▶ Carry out In-house projects
- ▶ Sound Fundamental Concepts of Process Control and safety with DCS Operations
- ▶ Industry readiness - Understanding the Intricacy & Complexity of process dynamics
- ▶ Complete edge for Internship and jobs
- ▶ Faculty Development
- ▶ Boosted accreditations ranking

### For Industries

- ▶ Increase operator skills
- ▶ Improved Plant Safety and compliance to environmental regulations
- ▶ Increased familiarity of Controls & Interlock Systems
- ▶ Smooth Startup & Shutdown
- ▶ Faster Recovery from External/Internal Process Disturbances
- ▶ Higher workforce availability and reduce training time
- ▶ Evaluation of Operator Proficiency
- ▶ Minimize Operator turnover impact

### OUR PARTNERS:



**Honeywell**



**AVEVA**

## ProSimulator™ Standard Models

### PS-1000 PROSIMLAB - Control & Instrumentation Suite

- ▶ PS1001 On-Off Level Control
- ▶ PS1002 On-Off Temperature Control
- ▶ PS1003 PI & P Controller
- ▶ PS1004 Pressure Controller
- ▶ PS1005 Level Controller
- ▶ PS1006 Direct and Cascade Control
- ▶ PS1007 Split Range Pressure Control
- ▶ PS1008 Ratio Control
- ▶ PS1009 Feedback and Feedforward Control
- ▶ PS1010 Three Element Boiler Control
- ▶ PS1011 Control Valve Characteristics
- ▶ PS1012 Characteristics Coefficient of Control Valve
- ▶ PS1013 Rangeability of Control Valve
- ▶ PS1014 Interacting and Non-Interacting Level Systems
- ▶ PS1015 Basic Instrumentation Troubleshooting System

### PS-3000 Refinery Operations Suite

- ▶ PS3001 Atmospheric Distillation Unit (CDU)
- ▶ PS3002 Vacuum Distillation Unit (VDU)
- ▶ PS3003 Fluid Catalytic Cracking Unit (FCCU)
- ▶ PS3004 Hydrogen Generation Unit (HGU)
- ▶ PS3005 Hydrodesulphurization Unit (HDS)
- ▶ PS3006 Catalytic Reforming Unit
- ▶ PS3007 Continuous Catalytic Regeneration Unit (CCR)
- ▶ PS3008 Hydrocracking Unit (HCU)
- ▶ PS3009 Sulphur Recovery Unit (SRU)
- ▶ PS3010 Amine Treating Unit (ATU)
- ▶ PS3011 Delayed Coker unit (DCU)
- ▶ PS3012 Diesel Hydrotreater Unit (DHDT)
- ▶ PS3013 Naphtha Hydrotreating Unit (NHT)
- ▶ PS3014 Isomerization Unit
- ▶ PS3015 Kerosene Hydrotreater Unit (KHT)

### PS-6000 Gas Plant Operations Suite

- ▶ PS6001 Gas Stabilization Unit
- ▶ PS6002 Degassing Plant
- ▶ PS6003 Gas Dehydration Unit
- ▶ PS6004 Gas Compression Plant
- ▶ PS6005 LPG Unit
- ▶ PS6006 NGL Recovery Unit
- ▶ PS6007 LNG Plant
- ▶ PS6008 Production Wells Manifold & 3 Phase Separator
- ▶ PS6009 Integrated Gas plant

### PS-2000 Basic Process Operations Suite

- ▶ PS2001 Distillation
- ▶ PS2002 Superheated Steam Boiler
- ▶ PS2003 Centrifugal Pump
- ▶ PS2004 Flash Tank
- ▶ PS2005 Heat Exchanger
- ▶ PS2006 Natural / Forced draft furnace
- ▶ PS2007 CSTR
- ▶ PS2008 CSTR Series
- ▶ PS2009 Fixed bed reactor
- ▶ PS2010 Plug flow reactor
- ▶ PS2011 Cyclone separator
- ▶ PS2012 Crystallizer
- ▶ PS2013 Centrifugal Compressor
- ▶ PS2014 Compressor with Utilities
- ▶ PS2015 Reciprocating compressor
- ▶ PS2016 Evaporator
- ▶ PS2017 Blending
- ▶ PS2018 Gas Turbine
- ▶ PS2019 Ball Mill
- ▶ PS2020 PH Neutralization
- ▶ PS2021 Batch Reactor
- ▶ PS2022 Cement Plant Operation
- ▶ PS2023 Refrigeration System
- ▶ PS2024 Turbine driven Compressor
- ▶ PS2101 Flow Through Pipes
- ▶ PS2102 Flow Through Packed Bed
- ▶ PS2103 Flow Through Fluidization Bed
- ▶ PS2104 Heat Loss Through Pipes
- ▶ PS2105 Double Pipe Heat Exchanger
- ▶ PS2106 Rotary Dryer

### PS-2500 CRE Lab Simulator Suite

- PS2501 Preparation of Catalyst
- PS2502 Steady State Non Isothermal Reactor
- PS2503 Non Isothermal Continuous Flow reactor
- PS2504 Fluidized bed reactors
- PS2505 Slurry reactors
- PS2506 Trickle Bed reactor

### PS-4000 Fertilizer Operations Suite

- ▶ PS4001 Ammonia plant
- ▶ PS4002 Urea Plant
- ▶ PS4003 Sulphuric Acid plant
- ▶ PS4004 Phosphoric Acid plant
- ▶ PS4005 Granulation Plant
- ▶ PS4006 Ammonia Storage Terminal

## ProSimulator™ Standard Models

### PS-5000 Power & Utilities Operations Suite

- ▶ PS5030 Boiler Operations Suite<sup>1</sup>
- ▶ PS5040 Turbine Operations Suite<sup>2</sup>
- ▶ PS5050 Electrical Operations Suite<sup>3</sup>
- ▶ PS5060 Balance of Plant (BOP)<sup>4</sup>
- ▶ PS5014 Combined Cycle Power Plant
- ▶ PS5015 Thermal Power Plant
- ▶ PS5016 Diesel Generator
- ▶ PS5017 Nuclear Power Plant
- ▶ PS5018 Hydroelectric Power Plant
- ▶ PS2018 Gas Turbine
- ▶ PS5019 100 KW Solar Power Plant
- ▶ PS5020 10 MW Wind Mill Farm

### PS-5030 Power plant - Boiler Operations Suite<sup>1</sup>

- ▶ PS5031 Pulveriser Fuel System
- ▶ PS5032 Oil Firing System
- ▶ PS5033 Flue Gas and Air System
- ▶ PS5034 Superheater & Reheater System
- ▶ PS5035 Boiler Drum
- ▶ PS2002 Superheated Steam Generator

### PS-5040 Power plant - Turbine Operations Suite<sup>2</sup>

- ▶ PS5041 Condensate System
- ▶ PS5042 Deaerator System
- ▶ PS5043 Condenser Vacuum System
- ▶ PS5044 Circulating Water System (Natural Draft)
- ▶ PS5045 Cooling Water System
- ▶ PS5046 Gland Sealing System
- ▶ PS5047 HP LP bypass System
- ▶ PS5048 Turbine Steam Extraction System
- ▶ PS5049 Turbine Lube Oil System

### PS-5050 Power plant - Electrical Operations Suite<sup>3</sup>

- ▶ PS5051 Generator Cooling Water System
- ▶ PS5052 Generator System
- ▶ PS5053 6.6 KV System
- ▶ PS5054 415 V System
- ▶ PS5055 220 KV Switchyard
- ▶ PS5056 Transmission and Distribution

### PS-5060 Power plant - Balance of Plant (BOP)<sup>4</sup>

- ▶ PS5061 Coal Handling Plant
- ▶ PS5062 Ash Handling Plant
- ▶ PS5063 Cooling Tower (Forced Draft)

### PS-5070 Utilities System

- ▶ PS5071 Water Treatment Plant
- ▶ PS5072 Water Desalination Plant

### PS-5100 Industrial Power Plant Operation Suite

- ▶ PS5101 350 MW Gas Turbine
- ▶ PS5102 210 MW Thermal Power Plant
- ▶ PS5103 600 MW Thermal Power Plant
- ▶ PS5104 100MW Thermal Power plant
- ▶ PS5105 300MW Thermal Power plant

### PS-7000 Petrochemical Operations Suite

- ▶ PS7001 BTX Production
- ▶ PS7002 Ethylene Oxide Production
- ▶ PS7003 Phthalic Anhydride Production
- ▶ PS7004 Styrene Production
- ▶ PS7005 Allyl Alcohol
- ▶ PS7006 Ethylene Glycol Production
- ▶ PS7007 Ethane Cracker Model
- ▶ PS7008 Propylene Glycol Production
- ▶ PS7009 Ethanol Rectification Unit

### PS8000 Metals and Special Process Simulator

- ▶ PS8001 Copper Smelting Unit
- ▶ PS8002 Iron & Steel Processing Unit
- ▶ PS8003 ZINC Processing Plant
- ▶ PS8101 Chlor Alkali Plant
- ▶ PS8102 Calcium Chloride plant
- ▶ PS8103 Ethanol Distillation Unit
- ▶ PS8104 Methanol Synthesis Unit
- ▶ PS8105 Soda Ash Plant

### PS-9000 Bio & Food Technology Operations Suite

- ▶ PS9001 Bioreactor
- ▶ PS9002 Biomedical Freezer
- ▶ PS9003 Refrigerated Centrifuge
- ▶ PS9004 Bio-molecular Ultrafiltration
- ▶ PS9005 Protein Precipitation
- ▶ PS9006 Bio-diesel Plant
- ▶ PS9007 Bio-gas Plant
- ▶ PS9008 Bio-ethanol Plant
- ▶ PS9009 Green Hydrogen Production Plant
- ▶ PS9101 Bread Manufacturing Plant
- ▶ PS9102 Milk Processing plant

## Client List – Sim Infosystems Industries

### Refineries

- ▶ LUBREF, Kingdom of Saudi Arabia through Yokogawa
- ▶ Marjan Increment Development Program (MIP) through Yokogawa
- ▶ Takreer RRW, through Yokogawa
- ▶ HPCL Mittal Energy Limited (HMEI) through Yokogawa
- ▶ Takreer Refinery, U.A.E through Yokogawa
- ▶ Refinery in Saudi Arabia through RSI SIMCON.
- ▶ Canada Oil Sands Surmont 2, Canada through Omega Simulation Co.
- ▶ Indian Oil Corporation Limited, Guwahati Refinery, India
- ▶ Chennai Petroleum Corporation Limited, Chennai, India.
- ▶ Petro Rabigh, Saudi Arabia thru' Omega Simulation Co.
- ▶ Oman Refinery Company, Oman.
- ▶ Petron Batan, Philippines thru Yokogawa
- ▶ Nagarjuna Oil Corporation Limited, Chennai, India.
- ▶ Chennai Petroleum Corporation Limited thru' Yokogawa

### Gas / Oil Separation

- ▶ ELMERK, Algeria through Yokogawa
- ▶ KOC, Kuwait through Yokogawa
- ▶ BGC, through Yokogawa
- ▶ Shaybah NGL OTS.
- ▶ HNGL Gas Plant, Hawiyah, through Yokogawa
- ▶ SVDN Gas Plant, Vietnam through Yokogawa
- ▶ KPF, KSA thru Yokogawa
- ▶ Saudi Aramco Master Gas project, KSA thru Yokogawa
- ▶ ADMA ALNASAR through Yokogawa
- ▶ Fadhili, Saudi Arabia through Yokogawa
- ▶ TOTAL MOHO NORD, Congo through Yokogawa
- ▶ West Nile Delta, Egypt through Yokogawa
- ▶ BP Khazzan, Oman through Yokogawa
- ▶ Cygnus, UK through Yokogawa
- ▶ ADCO through Yokogawa
- ▶ FADHILI through Yokogawa
- ▶ GASCO through Yokogawa
- ▶ ZADCO through Yokogawa
- ▶ ISG, Algeria through Omega Simulation Co.
- ▶ Petroleum Development Oman L.L.C (PDO), Oman.
- ▶ Kuwait Oil Corporation (KOC), Kuwait.
- ▶ Hassi Messaoud LPG, Algeria through Omega Simulation Co.
- ▶ Khurais, Saudi Arabia through Omega Simulation Co.
- ▶ IOGR, India through Omega Simulation Co.
- ▶ Qatar Petroleum, Doha, KSA.
- ▶ PTTEP, Thailand thru' Yokogawa
- ▶ PTT, Thailand thru' Yokogawa
- ▶ TTMS, Thailand thru' Yokogawa

### Fertilizers

- ▶ Greenstar Fertilizers Limited, Tuticorin.
- ▶ Brunei Fertilizers, thru' Yokogawa
- ▶ Maaden Phosphate III Ammonia plant, K.S.A thru' Omega Simulation.
- ▶ SAFCO, KSA thru Yokogawa
- ▶ CAMAU Fertilizers, Vietnam thru' Yokogawa
- ▶ Rashtriya Chemicas & Fertilizers Limited, Mumbai.
- ▶ MAADEN Phosphate through Yokogawa
- ▶ Indorama Eleme Fertilizers & Chemicals Limited, Nigeria.
- ▶ Paradeep Phosphate Limited, Odisha.
- ▶ Coromandel International Ltd, Vizakh, India.
- ▶ Coromandel International Ltd, Kakinada, India.
- ▶ Mangalore Chemicals & Fertilizers Limited, Mangalore, India.
- ▶ Madras Fertilizers Limited, Chennai, India.
- ▶ Foskor Pte Ltd, Richards Bay, South Africa.
- ▶ Matix Fertilizers Corp. Ltd, West Bengal, India.

### LNG Storage Terminal / LNG Liquefaction

- ▶ CALCASIEU Pass LNG Export terminal thru' Omega Simulation
- ▶ YAMAL, Russia through Yokogawa
- ▶ Hazira LNG Terminal Ltd (HLPL) thru' Yokogawa
- ▶ GNL Quintero, Chile LNG Terminal, Italy thru' Omega Simulation Co.
- ▶ Adriatic LNG Terminal, Italy thru' Omega Simulation Co.
- ▶ South Hook LNG Terminal, Italy thru' Omega Simulation Co.
- ▶ BP Tangguh LNG OTS, Indonesia thru Yokogawa

### Power & Utilities

- ▶ Fuji Oil Company, Japan.
- ▶ Az-Zour Combined Cycle Gas Turbine Plant, Kuwait thru Yokogawa
- ▶ Wartsila India Pvt. Ltd.
- ▶ Pertamina Refinery, Indonesia through Yokogawa
- ▶ Kinyerezi-II power plant, Tanzania through Yokogawa
- ▶ IPMA, Bhopal.
- ▶ Electric Generation Co Inc., Turkey.
- ▶ ESSAR Power plant thru' ABB
- ▶ Electric Company of Ghana.
- ▶ Volta River Authority, Ghana.
- ▶ OEG India Ltd, Chennai, India.
- ▶ TATA Power Company, Mumbai, India.
- ▶ IGCAR, Kalpakkam, Tamil Nadu, India.
- ▶ Bhabha Atomic Research Centre, Mumbai, India.

### Petrochemicals / Chemicals / Pharma

- ▶ APOC, Kingdom of Saudi Arabia.
- ▶ InoChem, Saudi Arabia.
- ▶ SABIC Phenol Plant, USA thru Yokogawa
- ▶ JUPC EOEG-3, Jubail, K.S.A thru' Omega Simulation.
- ▶ Petronas RAPID HDPE thru' Yokogawa
- ▶ NIGC Phase 8 (Saudi Arabia) thru' Omega Simulation Co.
- ▶ SHINTECH, USA through Omega Simulation Co.
- ▶ Ethylene plant in USA through Omega Simulation Co.
- ▶ FPCC Taiwan thru' Omega Simulation Co.
- ▶ Jubail Chemical Industries Co, KSA.
- ▶ Tamilnadu Petroproducts Limited, Chennai, India.
- ▶ TCI Sanmar Chemical SAE, Egypt

### Engineering Consulting

- ▶ CORYS France.
- ▶ BPT Norway.
- ▶ AVEVA Solutions India LLP.
- ▶ ABB India Limited.
- ▶ Omega Simulation Company, Japan.
- ▶ Yokogawa Europe Solutions B.V., Netherlands
- ▶ Yokogawa India Limited, Bangalore, India.
- ▶ Yokogawa Middle East B.S.C, Bahrain.
- ▶ Yokogawa Engineering Asia Pte Ltd, Singapore.
- ▶ Yokogawa Corporation of America.
- ▶ Honeywell Automation India Ltd.
- ▶ NESTE Engineering Solutions Oy.
- ▶ CORYS / RSI Simcon / Trident, USA.
- ▶ SCIENSIM Sdn Bhd, Malaysia.
- ▶ SVL Engineering Pvt Ltd, Chennai, India.
- ▶ Mahindra Satyam (formerly Satyam Computer Services), India.
- ▶ Fantoft Process Technologies / Kongsberg, Norway.

## Client List – Sim Infossystems

### Academics

#### Southern India

- ▶ Sathayabama Institute of Science & Technology, Chennai.
- ▶ Rohini College of Engineering & Technology, Palkulam.
- ▶ Coimbatore Institute of Technology, Coimbatore
- ▶ Institute of Energy Studies, Anna University.
- ▶ Alagappa College of technology, Anna University-Food Technology, Chennai.
- ▶ Alagappa College of technology, Anna University-Industrial Biotechnology
- ▶ Alagappa College of technology, Anna University-Pharmaceutical Technology
- ▶ Alagappa College of technology, Anna University-Ceramic Technology
- ▶ Alagappa College of technology, Anna University-Petroleum Engineering
- ▶ Alagappa College of technology, Anna University-Chemical Engineering
- ▶ Institute of Energy Studies, Anna University, Chennai.
- ▶ Prathyusha Engineering College, Tiruvallur.
- ▶ Sree Sastha Institute of Engineering & Technology, Chembarambakkam.
- ▶ Sri Muthukumaran Institute of Technology, Chennai.
- ▶ St. Peter's College of Engineering & Technology, Chennai.
- ▶ Jaya Engineering College, Chennai.
- ▶ Rajiv Gandhi College, Chennai.
- ▶ Sri Jayaram Institute, Chennai.
- ▶ Government College of Technology, Coimbatore
- ▶ Madha Engineering College, Chennai.
- ▶ Thanthai Roever Institute of Polytechnic College, Perambalur.
- ▶ Indian Polytechnic College, Tirunelveli.
- ▶ S. Thangapazham Polytechnic College, Tirunelveli Dist.
- ▶ Kavary Polytechnic College, Salem.
- ▶ Government College of Engineering, Thanjavur.
- ▶ Government College of Engineering, Bargur.
- ▶ SASTRA University Thanjavur.
- ▶ Institute of Chemical Technology, Taramani.
- ▶ SRKV Polytechnic College, Coimbatore.
- ▶ RKM Polytechnic College, Mylapore.
- ▶ Sethu Institute of Technology, Pulloor.
- ▶ PSG College of Technology, Coimbatore.
- ▶ JCT College of Engineering & Technology, Coimbatore.
- ▶ Er. Perumal Manimegalai Polytechnic College, Hosur.
- ▶ Kongu Vellalur Polytechnic College, Erode.
- ▶ KAAVERY College of Engineering, Mettur.
- ▶ Annai JKK Sampoorani Ammal Polytechnic College, Erode.
- ▶ Nanda Polytechnic College, Erode.
- ▶ Shree Venkateswara Hitech Polytechnic College, Erode.
- ▶ CPCL Polytechnic College, Chennai.
- ▶ SVS College of Engineering, Coimbatore.
- ▶ Andhra University, Vizag.
- ▶ Central University of Karnataka, Gulbarga.
- ▶ Meridian School of Oil & Gas, Chennai.
- ▶ Vellore Institute of Technology, Vellore.
- ▶ Global Institute of Technology, Arcot.
- ▶ NIT Warangal.
- ▶ Annamalai University.
- ▶ Kongu Engineering College.
- ▶ Adhiparasakthi Engineering College.
- ▶ Sri Venkateswara College of Engineering, Sriperambatore.
- ▶ Kongu Polytechnic College.
- ▶ Dharmambal Polytechnic, Chennai.
- ▶ Dayananda College of Engineering, Bangalore.
- ▶ BIET, Davangere.
- ▶ BMS College of Engineering, Bangalore.
- ▶ Manipal Institute of Technology.
- ▶ SDM Engineering, Dharwad.
- ▶ Vivekananda Institute of Technology, Bangalore.
- ▶ REC Hulkoti.
- ▶ Coimbatore Institute of Technology, Coimbatore.
- ▶ Tamil Nadu Skill Development Corporation (Naan Mudhalvan)
- ▶ Dr. MGR University
- ▶ Hindustan Institute of Engineering & technology

#### Northern India

- ▶ Dr. APJ Abdul Kalam Technical University, Lucknow.
- ▶ University of Petroleum & Energy Studies, Electrical Engineering Dept.
- ▶ University of Petroleum & Energy Studies, Chemical Engineering Dept.
- ▶ Government Eng. College, Ujjain.
- ▶ BIET Jhansi.
- ▶ HBTI, Kanpur.
- ▶ Aligarh Muslim University.
- ▶ MNIT Jaipur.
- ▶ DCRUST, Sonipet.
- ▶ Banasthali University.
- ▶ Deenbandhu Chhotu Ram University of Science and Technology.
- ▶ Kurukshetra University.
- ▶ Madhav Institute of Technology & Science, Gwalior.
- ▶ CIPET-IPT, Jaipur

#### Eastern India

- ▶ Calcutta University.
- ▶ Jadavpur University.
- ▶ JIS Engineering College.
- ▶ NIT Silchar.

#### Western India

- ▶ MIT Academy of Engineering, Pune.
- ▶ MIT WPU, Pune
- ▶ Dr. Babasaheb Ambedkar Technological University
- ▶ Walchand College of Engineering, Sangli.
- ▶ Rajashree Industrial Training Institute Gujarat.
- ▶ Institute of Technology, Nirma University.
- ▶ C K Pithawala College of Engineering and Technology, (CKPCET).
- ▶ SV NIT, Surat.
- ▶ Pandit Deenadayal Petroleum University, Gujarat.
- ▶ Government. Engineering College, Gandhinagar.
- ▶ Government. Polytechnic, Gandhinagar.
- ▶ NMIET, Pune.
- ▶ Keystone Engineering, Pune.
- ▶ Bharti Vidyapeeth University College of Engineering, Pune.
- ▶ J.K Institute of Technology, Rajasthan.
- ▶ Loyola Training Center, Gujarat.

#### Training Institutes

- ▶ Indian Institute of Petroleum, Dehradun.
- ▶ Yanbu Technical Institute, K.S.A.
- ▶ Petro Vietnam Manpower Training College, Vietnam.
- ▶ Jubail Technical Institute, K.S.A., Chemical Eng. Dept.
- ▶ Jubail Technical Institute, K.S.A., Electrical Eng. Dept.
- ▶ GIL Automation, Nigeria.
- ▶ Technocrat Automation Solution Pvt Ltd.
- ▶ Meridian school of oil and gas Pvt. Ltd.

## PS1000: ProSimlab Software

### Process Control & Instrumentation Simulator:

The PS-1000: PROSIMLAB is a simulation software package to teach and experience the basic and advanced concepts of process control and instrumentation. Using PROSIMLAB, the trainee learns:

- ▶ Basic concepts of measurement and Instrumentation
- ▶ DCS operations
- ▶ Basic controls — Flow, pressure, level, temperature
- ▶ Advanced control — Split range, cascade, ratio, three-element boiler, feed forward / feedback controls.
- ▶ Tuning of P,I, D values
- ▶ Instrumentation troubleshooting



#### **PS-1001: On-Off Level Control:**

This module simulates an On-Off Controller used to control the liquid level in a drum. The trainee can operate the inlet and outlet valves to change the inlet / outlet flows, which will affect the level of the drum and can observe the On-off level control action. The trainee can also change the Hi-set and Low-set values of this On-off level controller.

#### **PS-1002: On-Off Temperature Control:**

This module simulates an On-Off Controller used to control the temperature of the liquid in a drum. Steam is used to heat up the liquid in the drum and trainee can operate the inlet / outlet valves to change the inlet / outlet flows of the drum. The inlet flow change will affect the temperature of the liquid in the drum and the on-off temperature controller regulates the steam flow in order to maintain the temperature.

#### **PS-1003: P & PI Controller:**

This module simulates a flow controller with Proportional term and a flow controller with Proportional and Integral terms. The trainee can study and compare the behavior of both the controllers for any external disturbances or set point changes. Trainee can also tune the P & I values to study the controller performance.

#### **PS-1004: Pressure Controller:**

This module simulates a vapor drum with a pressure controller. The first vapor inlet flow can be regulated by changing the globe valve position and the second vapor inlet flow is under open/close block valve operation. The trainee can change the two inlet vapor flows, tune P & I of the controller and study the process dynamics and controller performance.

#### **PS-1005: Level Controller:**

This module simulates a liquid drum with a level controller. The inlet liquid flow can be regulated by changing the globe valve position. The DP cell measures the pressure drop across the liquid height, SDBT, SLPC, I/P converter and final control valve are simulated. The trainee can understand these components of the level controller, tune P & I of the level controller and study the process dynamics and controller performance.

## PS1000: ProSimlab Software

### **PS-1006: Direct and cascade Control:**

This module simulates two of identical liquid drums — one with direct level controller and the other with cascade level controllers. The trainee can change the inlet flow, storage tank pressure, etc. The trainee can learn the superiority of the cascade controller by giving an external disturbance to the process.

### **PS-1007: Split range pressure Control:**

This module simulates a Split Range Pressure Controller which controls the pressure in the pressure vessel by controlling the two valves — the 1st Valve is on the process line and the 2nd valve is on the flare.

### **PS-1008: Ratio Control:**

This module simulates a ratio control which controls flow of stream "A" in proportion to flow of stream "B". The trainee can set the desired ratio as the set point of the ratio controller and can understand the ratio control system.

### **PS-1009: Feedback and Feed forward Control:**

This module simulates a feedback temperature controller of a furnace and a feed forward temperature controller of a furnace. The trainee can change feed flow and understand the performance and benefit of the feed forward controller.

### **PS-1010: Three element boiler Control:**

This module simulates a boiler drum level controller that takes feed forward signal from the steam flow and sums it to the drum level to determine the set point to the feed water flow controller. The trainee can understand the benefit of 3-element controller especially during "Shrink and Swell" of the boiler drum.

### **PS-1011: Control valve characteristic:**

This module is designed to study the characteristics of different control valves like Linear Control Valve, Equal Percentage Control Valve and Quick Opening Control Valve.

### **PS-1012: Characteristic coefficient of Control valve:**

This module is to study the inherent characteristic co-efficient of control valves. For the same valve opening and DP, the trainee can alter the Specific Gravity of the fluid and observe the response.

### **PS-1013: Rangeability of Control valve:**

In the simulated module, a Butterfly Valve and a Globe Valve are used for two Flow Controllers located in two identical lines having the same pressure drop. Trainee can compare the performances of these valves and find out which valve gives a better performance (stability in maintaining the flow) in wide range of operation.

### **PS-1014: Interacting and non-interacting Level systems:**

This module simulates two interacting level tanks and two non-interacting level tanks. The trainee can study their behaviors and also learn the controller tuning in each case.

### **PS-1015: Basic Instrumentation troubleshooting:**

This module simulates a typical overhead section of a separation unit which consists of overhead condenser, reflux drum, reflux flow, drum vapor flow and product flow. The system simulates condenser outlet temperature, drum pressure controller, reflux controller and drum level controller. All the elements like sensor, Input Barriers, S.T.E.D, SLPC, output Barriers, I/P converters, Instrument air regulator and final control element are included in the simulation. Troubleshooting and calibration of these elements can be learnt through this simulation module.

## PS2000: Basic Process Operations Simulator

The PS-2000 is a simulation software package with rigorous and detailed dynamic simulation models of industrial process equipment — Heat Exchanger, Pump, Compressor, Distillation column, Reactor, Furnace, Boiler, etc. The trainee can learn the equipment configuration, control system, perform normal operations, emergency handling and troubleshooting procedures, startup and shutdown operations on each of the module.

### For Academic

- ▶ Hands-on Learning experience
- ▶ In-depth Process Understanding
- ▶ Carry out In-house projects
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### For Industries

- ▶ Increase operator skills
- ▶ Improved Plant Safety and compliance to environmental regulations
- ▶ Smooth Startup & Shutdown
- ▶ Faster Recovery from External/Internal Process Disturbances
- ▶ Higher workforce availability and reduce training time
- ▶ Evaluation of Operator Proficiency
- ▶ Minimize Operator turnover impact

The package consists of simulation models for various equipment that are used in process and power plants. Each model simulates an equipment with its control, instrumentation and safety systems and field devices. The Instructor can invoke malfunctions, disturbances and instrument failures and evaluate the trainee performance. Trainee can perform normal and emergency operations as well as startup/shutdown operations on these models.

## PS2000: Basic Process Operations Simulator

### PS-2001 Distillation:

The Distillation module simulates a De-Propanizer column with steam boiler, overhead air-fan cooler and reflux drum. The simulation model also displays the top and bottom product purity.

### PS-2002 Superheated Steam Boiler:

The Boiler simulation model simulates a typical industrial boiler which includes feed drum, deaerator, steam drum, combustion system and desuperheater. All the controls and trip system are included in the simulation.

### PS2003 Centrifugal pump:

This module teaches the trainee the operating fundamentals of the Centrifugal pump. The dynamic simulation of pump provides a virtual environment for the trainee to understand various functional aspects of the equipment, normal operating conditions and effect of changes in the input parameters and their corresponding responses on suction head, NPSH available and required, power and discharge flow.

### PS-2004 Flash drum:

The flash drum model simulates a multi component vapor-liquid flashing. The drum pressure and level controller are provided. Trainee can change the inlet feed temperature and composition and observe the vapor and liquid flows and composition.

### PS-2005 Heat Exchanger

Single phase heat exchanger that simulates all the design parameters and variation of them as well as inlet stream flow and properties.

### PS-2006 Heater with APH

Crude heater consisting of two coils, fuel system and Air preheater. The Oxygen content of flue gas is displayed

### PS-2007 CSTR

This module is to teach trainees the operating fundamentals of a CSTR using dynamic simulation. The trainee can change the flow rates of the two reactants, reactor temperature, rate of reaction and simulate the product composition.

### PS-2008 CSTR in series

This module simulates two CSTR operating in series. The product from 1st reactor is fed to 2<sup>nd</sup> reactor for further reaction. The temperature of the reactors can be controlled by respective temperature controllers.

### PS-2009 Fixed Bed Reactor

This module simulates a hydrocracking reactor where the heavy feed is cracked into lighter product in the presence of catalyst. Hydrogen is introduced between the beds to quench the heat of reaction.

### PS-2014 Compressor with utilities

This module simulates a centrifugal compressor along with the lube and seal oil system.

### PS-2015 Reciprocating Compressor

Simulates a two stage reciprocating compressor.

### PS-2016 Evaporator

Controllers are provided for Evaporator temperature and pressure. User can change feed flow rate, feed temperature, ID, OD, tube pitch, number of tubes, number of tube passes, tube length and study the evaporation performance.

### PS-2017 Blending

This module is to simulate fuel oil viscosity blending operation using diesel as the cutter stock.

### PS-2018 Gas Turbine

Gas Turbine section, in which compressed air and fuel oil or fuel gas are ignited, drives the turbine, which in turn drives the electric generator. Air system, combustion section, turbine and generator are simulated.

## PS2000: Basic Process Operations Simulator

### PS-2010 Plug Flow Reactor

Reactor flow rates, inlet temperature and order of reaction can be changed to study the outlet product composition.

### PS-2011 Cyclone Separator

Collection Efficiency is calculated as a function of Viscosity of gas, Density of particles, Density of the gas, Inlet Velocity of gas, Inlet Width of the cyclone, Number of Effective Turns provided by cyclone and Particle Diameter.

### PS-2012 Crystallizer

The feed is heated in a heat exchanger through steam and evaporated in a flash evaporator. Heat exchanger outlet temperature and flash pressure can be varied to study the water crystallization rate.

### PS-2013 Centrifugal Compressor

The feed supply pressure, feed gas molecular weight, feed temperature and compressor RPM can be changed to simulate the compressor discharge pressure and flow. Anti-surge controller is simulated.

### PS-2022 Cement plant

This is a simulation of Cement kiln operation. Besides feed, fuel and air controller, the user can also simulate effect of various disturbances and malfunctions.

### PS2024: Turbine driven compressor

Simulates 4-stage centrifugal compressor. The compressor is driven by a HP-extraction, induction and condensing type steam turbine. Compressor & turbine trip logic and various malfunctions are part of this

### PS2102: Flow through Packed Bed

Simulates a Virtual lab. This exercise is to experiment flow of water through a packed bed and variation of pressure drop and friction factor with Reynold's Number in a packed bed.

### PS2104: Heat Loss through Pipes

Simulates a Virtual lab. This exercise is to determine the heat loss through pipes for different types material of construction.

### PS2106: Rotary Dryer

Simulates a Virtual lab. This exercise is to determine the drying characteristic for rotary dryer.

### PS-2019 Ball Mill

Ball mill along with feed bin, cyclone, classifier, bag filter and product bin are simulated. Feed particle size, ball mill speed and classifier can be changed to study the product particle size.

### PS-2020 pH neutralization

Simulates acid neutralization using NAOH. Effect of change in acid and NAOH concentration can be studied in this model.

### PS-2021 Batch Reactor

Simulates a batch reactor. Effect of reactor temperature and reaction time on product quality can be studied.

### PS2023: Refrigeration System

This model simulates a typical vapor compression Refrigeration system or modified Carnot cycle. This will have one theoretical model with commonly used refrigerant and two industrial use cases, one with ammonia and another with propane as a refrigerant.

### PS2101: Flow through Pipes

Simulates a Virtual lab. This exercise is to determine the frictional losses encountered in a hydraulically smooth pipe under laminar and turbulent flow situations and to determine the effect of Reynolds number on fanning friction factor.

### PS2103: Flow through Fluidization Bed

Simulates a Virtual lab. This exercise is to experiment on the flow of air through fluidized bed and to obtain the effect of superficial velocity on bed porosity and pressure drop. Determine the minimum fluidization velocity from the experimental data.

### PS2105: Double Pipe Heat Exchanger

Simulates a Virtual lab. This exercise is to determine the overall heat transfer coefficient making use of logarithmic mean temperature difference. From the overall heat transfer coefficient, determine the individual heat transfer coefficient for laminar and turbulent flow heat transfer. To compare overall heat transfer coefficient for parallel and counter flow heat exchange processes in a Double Pipe Heat Exchanger.

## PS2500: CRE Lab Simulator

The PS-2500 is a simulation software package with rigorous and detailed dynamic simulation models of various types of reactors. The modules simulate different types of reactors available in Chemical Reaction Engineering Lab and can conduct experiments by changing the design parameters of these reactors and learn the behavior of the system.

The package consists of simulation models for various types of reactors:

- Preparation of Catalyst
- Steady State Non Isothermal Reactor
- Non Isothermal Continuous Flow reactor
- Fluidized bed reactors
- Slurry reactors

The trainee can determine the rate of reaction, reaction constant and perform various experiments.



### PS-2501 Preparation of catalysts:

This module explains the catalyst preparation steps like heating, mixing, filtration, drying, powdering and sieving of catalysts and make it ready for loading into Reactor.

### PS-2502 Steady State Non Isothermal Reactor:

Imparts knowledge on Non Isothermal reactors, where temperature of reactants varies and reaction rate or direction is controlled by changing temperature.

### PS-2503 Non Isothermal Continuous Flow Reactor:

Imparts knowledge on Non Isothermal reactors with continuous supply of feed and constant withdrawal of products take place and reaction rate or direction is controlled by changing temperature.

### PS-2504 Fluidized bed reactors:

Catalyst will be in Fluidized state enabling more reactive sites and better contact of reactants with catalyst. Cracking of heavy oil into gasoline is an example. Fluidization medium will be inert.

### PS-2505 Slurry reactor:

This is a reactor where catalyst is suspended in a liquid. These are 3-phase reactors, in which catalyst (solid) suspended in a liquid, through which a gas is bubbled.

### PS-2506 Trickle bed reactor:

Liquid reactant is sprayed from top using distributors that reacts with upcoming gas from bottom. This will occur over a fixed bed of catalyst. 3- Phase reactor.

## PS3000: Refinery Operations Simulator

The PS-3000 is a simulation software package with rigorous and detailed simulation models of Refinery process plants. The benefits of this package are:

### For Academic

- ▶ Hands-on Learning experience
- ▶ In-depth Process Understanding
- ▶ Carry out In-house projects
- ▶ Sound Fundamental Concepts of Process Control and safety with DCS Operations
- ▶ Industry readiness - Understanding the Intricacy & Complexity of process dynamics
- ▶ Compleitive edge for Internship and jobs
- ▶ Faculty Development
- ▶ Boosted accreditations ranking



### For Industries

- ▶ Increase operator skills
- ▶ Improved Plant Safety and compliance to Environmental regulations
- ▶ Smooth Startup & Shutdown
- ▶ Faster Recovery from External/Internal Process Disturbances
- ▶ Higher workforce availability and reduce training time
- ▶ Evaluation of Operator Proficiency
- ▶ Minimize Operator turnover impact

The package consists of simulation models for various refinery plants. Each model simulates a refinery plant with its control, instrumentation and safety systems and field devices. The Instructor can invoke malfunctions, disturbances and instrument failures and evaluate the trainee performance. Trainee can perform normal operations, emergency operations as well as startup / shutdown operations on these models.

#### PS-3001: Atmospheric Distillation Unit:

The model simulates a refinery Atmospheric Distillation Unit which includes Preheat trains, Desalter, Crude heater, Atmospheric column, side strippers, and pump around systems, overhead system and stabilizer

#### PS-3004: Hydrogen Generation Unit:

The model simulates a refinery Hydrogen plant which includes the following sections: Desulphurization, Reforming, CO conversion (shift section), Separation of H<sub>2</sub> and Steam Generation.

#### PS-3002: Vacuum Distillation Unit:

The model simulates a refinery Vacuum Distillation Unit which includes vacuum heater, vacuum distillation column, overhead steam ejectors, hotwell, product strippers and coolers.

#### PS-3005: Hydrodesulphurization Unit:

The model simulates a refinery hydrodesulphurization plant which includes feed section, preheat system, heater, reactor, High Pressure system and Product Section.

#### PS-3003: Fluid Catalytic Cracking Unit:

The model simulates a refinery fluid catalytic cracking Unit which includes feed section, reactor—regenerator section, Fractionation section and Gas concentration section.

#### PS-3006: Catalytic Reforming Unit:

The model simulates a refinery catalytic reformer unit which includes feed preheat section, reactor section, Product Separator section and Debutanizer section.

## PS3000: Refinery Operations Simulator

### PS-3007: Continuous Catalyst Regeneration Unit:

The CCR unit simulates Catalyst transfer and Catalyst regeneration. In Catalyst transfer, the catalyst is transferred from the Catalytic reforming reactors to the Regenerator and back again as regenerated catalyst back to the reactors. In Catalyst regeneration, the coke is burned off at a high temperature and low oxygen concentration and the catalyst passes into the Chlorination Zone where it is oxidized at high temperature and high oxygen concentration. The "Logic" is divided into Master Controller, Lock Hopper No.1 and No.2 Controllers

### PS-3009: Sulphur Recovery Unit:

This model simulates a Sulphur recovery unit which includes Feed gas knockout drums, Combustion chamber, Reaction furnace, Sulfur condensers, Steam re-heaters, Catalytic converters and Sulphur pit.

### PS-3011: Delayed Coker Unit:

The model simulates a Delayed Coking Unit which consists of Coker furnace, Fractionator, Coke drums and Pre heat exchangers.

### PS-3013: Naphtha Hydrotreater Unit:

The model simulates a Naphtha Hydrotreater Unit which consists of Feed surge Drum, Reactor feed heater, Lead and main Reactors, Hot Separator, Recycle gas compressor and Naphtha stripper.

### PS-3015: Kerosene Hydrotreater Unit:

The model simulates a Kerosene Hydrotreater Unit which consists of Feed surge drum, Reactor heater, Hydrotreater reactor and Stripper.

### PS-3008: Hydrocracker unit:

This model simulates a refinery Hydrocracker unit which includes Feed preheat exchangers and surge drum, Lead and Main reactors, HP, LP Hot Separators, HP, LP Cold Separators, H<sub>2</sub>S absorber, Recycle Gas compressor, Makeup Hydrogen compressor trains, Fractionator furnace, Main Fractionator and Product strippers.

### PS-3010: Amine Treating Unit:

This model simulates an Amine Treating Unit which consists of Absorber Section, Turbines and Pumps Section and Stripper Section.

### PS-3012: Diesel Hydrotreater unit:

The model simulates a diesel hydrotreater Unit which consists of Feed Coalescer, Feed surge Drum, Reactor feed heater, DHDT Reactor, Cold HP Separator, Cold LP Separator, Make-up gas compressor and Recycle gas compressor.

### PS-3014: Isomerization Unit:

The model simulates a Kerosene isomerization Unit which consists of Feed surge Drum, H<sub>2</sub> makeup compressor, Feed dryer, Hydrogen dryer, Isomerization reactors and Stabilizer.

## PS4000: Fertilizer Operations Simulator

The PS-4000 is a simulation software package with rigorous and detailed simulation models of Fertilizer plants. The benefits of this package are:

### For Academic

- ▶ Hands-on Learning experience
- ▶ In-depth Process Understanding
- ▶ Carry out In-house projects
- ▶ Sound Fundamental Concepts of Process Control and safety with DCS Operations
- ▶ Industry readiness - Understanding the Intricacy & Complexity of process dynamics
- ▶ Compleitive edge for Internship and jobs
- ▶ Faculty Development
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### For Industries

- ▶ Increase operator skills
- ▶ Improved Plant Safety and compliance to environmental regulations
- ▶ Smooth Startup & Shutdown
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- ▶ Higher workforce availability and reduce training time
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- ▶ Minimize Operator turnover impact

The package consists of simulation models for various Fertilizer plants. Each model simulates a fertilizer plant with its control, instrumentation and safety systems and field devices. The Instructor can invoke malfunctions, disturbances and instrument failures and evaluate the trainee performance. Trainee can perform normal operations, emergency operations as well as startup / shutdown operations on these models.

### PS-4001 Ammonia Plant

The model simulates an Ammonia plant of a fertilizer complex which includes Primary Reformer, Secondary Reformer, HT and LT Shift Converters, CO<sub>2</sub> removal section, Methanator, Synthesis Gas Compressor, Synthesis Converter, Purification section, Ammonia / Hydrogen recovery sections and Steam svstem.

### PS-4002 Urea Plant

The model simulates a typical Urea manufacturing plant of a fertilizer complex which includes Urea Synthesis and High Pressure Recovery, Urea Purification: Medium and Low Pressure Recovery, Urea Concentration.

### PS-4003 Sulphuric Acid Plant

The model simulates a Sulphuric Acid plant of a fertilizer complex which includes Furnace, Air blowers, Boiler, Converter, Intermediate Absorption Tower (IAT), Final Absorption Tower (FAT), IAT and FAT coolers, Economizer and Steam System, DT Plate Cooler, Drying Tower (DT) and Product Acid section.

### PS-4004 Phosphoric Acid Plant

This simulated plant includes Rock feed to the Reaction tank/attack tank, Digestion, Filtration lines, Gypsum Disposal, Gas scrubber, Acid Clarification and Storage, Concentration Units and Fluorine Recovery, Strong acid Cooling, Concentrated Acid: Clarification and Export to Storage.

### PS-4005 Granulation Plant

The Granulation plant simulator consisting of Ammonium Phosphate Reactor, Scrubbers, Granulator, Dryer, Solid Conveying System, Process Screening and Milling System, Intake system and Ammonia Loading Operations and Product System. DAP and MAP cases are simulated in the model.

### PS-4006 Ammonia Storage Terminal

Atmospheric ammonia storage terminal simulator consists of storage tanks, ship unloading and transferring to the plant. The compressor cooling system continuously condenses the generated vapor from the storage tank and maintain the temperature of stored ammonia liquid. The trainees will understand how to respond safely and efficiently to disturbances and the operation of the system.

## PS5000: Power & Utilities Operations Simulator

The PS-5000 is a simulation software package with rigorous and detailed simulation models of various units and types of power plants. The benefits of this package are:

### For Academic

- ▶ Hands-on Learning experience
- ▶ In-depth Process Understanding
- ▶ Carry out In-house projects
- ▶ Sound Fundamental Concepts of Process Control and safety with DCS Operations
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### For Industries

- ▶ Increase operator skills
- ▶ Improved Plant Safety and compliance to environmental regulations
- ▶ Smooth Startup & Shutdown
- ▶ Faster Recovery from External/Internal Process Disturbances
- ▶ Higher workforce availability and reduce training time
- ▶ Evaluation of Operator Proficiency

The package consists of simulation models for various power & utility plants. Each model simulates the plant with its control, instrumentation and safety systems and field devices. The Instructor can invoke malfunctions, disturbances and instrument failures and evaluate the trainee performance. Trainee can perform normal operations, emergency operations as well as startup / shutdown operations on these models.



### PS5030 Boiler Operations Simulator:

This package consists of following independent simulation models of a boiler in a power plant:

- Pulverizer Fuel System
- Oil Firing System
- Flue Gas and Air System
- Super Heater (SH) and Re-heater (RH) Systems
- Boiler Drum
- Superheated Steam Generator

### PS5050 Electrical Operations Simulator:

This package consists of following independent simulation models of a generator and electrical sections in a power plant:

- Generator Cooling Water System
- Generator System
- 6.6 KV System Layout
- 415 KV System Layout
- 220 KV Switchyard Layout
- Transmission and Distribution

### PS5040 Turbine Operations Simulator:

This package consists of following independent simulation models of a steam turbine in a power plant:

- Condensate system.
- Deaerator System.
- Condenser Vacuum System.
- Circulating Water System.
- Cooling Water System.
- Gland Sealing System.
- HP LP by-pass System.
- Turbine Steam Extraction System.
- Turbine Lube Oil System.

### PS-5060 Balance of Plant (BOP):

The balance of plant operation suites consists of the following units:

- **Coal handling system** which transport and deliver the coal by belt conveying to the mill area for further processing.
- **Ash handling system** handle the fly and bottom ashes which are the byproduct of the coal combustion. Two methods of ash disposal systems are employed in general, namely dry and wet ash disposal system.
- **Cooling towers** use the evaporation of water to remove the process heat and cool the working fluid to near wet-bulb temperature. The trainee understand the system and losses such as drift and vaporization losses. All the BOP units has associated control and safety systems.

## PS5000: Power & Utilities Operations Simulator

### PS-5070 Utilities Systems:

The Utility systems package consists of the general plant utility simulation models listed as below:

- Water Treatment Plant
- Water Desalination Plant

### PS2018 Gas Turbine:

Gas Turbine section, in which compressed air and fuel oil or fuel gas are ignited, drives the turbine, which in turn drives the electric generator. Air system, combustion section, turbine and generator are simulated.

### PS5014 Combined Cycle Power Plant:

The standard Combined Cycle Power Plant simulator is a comprehensive, dynamic simulation of a typical combined cycle power plant. The model is designed to operate on a simulator, which has a DCS emulation and Instructor Function. Capacity: 450 MW, Fuels: Natural Gas; Fuel Oil. The main equipment and sections simulated are Circulating water pump, Gland steam condenser, Feed water, Condensation, Condenser circulating water, Make up water, Deaerator, Air Compressor, Evaporator, Heat Recovery Steam Generator (HRSG), Burner, Fuel (Gas, oil), Flue gas, Turbine, Generator, DC excitation, Transformer.

### PS5015 Thermal Power Plant:

The standard thermal power plant simulator is a comprehensive, dynamic simulation of a power plant and utility system. The model is designed to operate on a simulator, which has a DCS emulation and Instructor Function. Functionally, the simulated plant consists of Boiler Section, Turbine Section, Condensate Section, Steam and Utilities section, Coal Mill, Fuel and Burner System:

The Boiler Section Consist of Steam Drum, SH System, Coal and Fuel gas system, Burner System, Flue Gas & Air System, Induced Draft & Forced Draft fans. Turbine Section consist of Steam Extraction System & Generator System. The Condensate Section consist of Steam Condenser, Condensate Extraction pumps (CEP), Deaerator, Boiler Feed Pumps (BFP), LP & HP Heaters. The Steam Utility section: HP, MP & LP Steam headers and its utilities.

### PS5016 Diesel Generator:

The standard Diesel Generator simulator is a comprehensive, dynamic simulation of a Diesel Generator power plant used in industries. The model is designed to operate on a simulator, with a DCS emulation and Instructor Functions. The diesel power plant relies on the diesel engine along with the generator/alternator for the power production and the fuel is diesel and air for combustion inside the engine. The Diesel Generator: Fuel and Air Section, Engine Section and Cooling Water Section.

### PS5018 Hydroelectric Power Plant:

The standard Hydroelectric Generator simulator is a comprehensive, dynamic simulation of a hydroelectric power plant used in industries. The model is designed to operate on a simulator, with: a DCS emulation and Instructor Functions. The Hydroelectric power plant produces 125MW Power. This model consists of two main systems they are Reservoir & six surge Tank System and Turbine & Generator System. Turbine and the Generator are connected in a single shaft. So as the turbine rotates generator also comes online. Each generator produce 25 MW power and 6th generator is spare.

### PS5017 Nuclear Power Plant:

The standard Generic simulator is a comprehensive, dynamic simulation of a Nuclear power plant. The model is designed to operate on a simulator, with a DCS emulation and Instructor Functions. The Nuclear power produces 15MW of Power. This model consist of Condenser, Low Pressure Heater 1(LPH1), Low Pressure Heater 2(LPH2), deaerator, High Pressure Heater 1(HPH1), High Pressure Heater 2(HPH2), Nuclear Reactor, Steam generator, HP turbine, LP turbine and Generator.

### PS5019: 100KW Solar Power Plant

This solar power plant model is having a capacity of 100 KW. The model consists of solar panels PV module which converts solar energy into electrical energy. The generated DC power will be converted into AC power using an Inverter and distributed to users.

### PS5020: 10MW Wind Mill Farm

This wind mill model consists of 6 units each generating 1.7 MW. Each unit is having wind turbine coupled with generator. The overall power produced by the mills will be distributed to the users and also to grid.

## PS-5100 Industrial Power Plant Operation Suite

The PS-5100 is a simulation software package with rigorous and detailed dynamic simulation models of industrial power plants with detailed configuration and with different types of power plant units. The trainee can learn the equipment configuration, control system and perform normal operations, emergency handling and troubleshooting procedures, startup & shutdown operations on each of the

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### PS5101 350 MW Gas Turbine

The Gas turbine simulator is a comprehensive, dynamic simulation of Gas turbine equipment with 350MW capacity. The simulator can be operated in the full dynamic range, including startup from cold condition, load maneuvering, and shutdown. The fully integrated simulator includes an Instructor Console, and operator Stations. The Operator display software can be selected from a list of DCS emulations. The description of the power plant and the training features are summarized below.

The power plant consists of a multi-stage air compressor, a multi-stage gas turbine and an electrical generator. The gas turbine uses gas/ oil for fuel. The generator provides power to a 138 KV electrical grid. An Auxiliary bus of 4,160V is also provided for plant use.

The gas turbine power plant has four main functional divisions:

- ▶ Air section
- ▶ Fuel, Burner, and Combustion Section
- ▶ Turbine, Generator, and Electrical Section
- ▶ Plant Auxiliaries

## PS-5100 Industrial Power Plant Operation Suite

### PS5102 210 MW Thermal Power Plant

The 210MW Power Plant Simulator consists of a comprehensive Model of a fossil fired (coal, oil, gas) power plant:

FUELS: Coal, Heavy Oil (warm-up), Light Oil (ignition).

STEAM GENERATOR: Drum type, Natural Circulation.

#### Furnace Air and Gas Systems:

2 Forced Draft Fans, 2 Induced Draft Fans, Primary Air fans (1 for each Pulverizer), 1 Igniter Fan & 1 Scanner Fan, Windbox, 1 Regenerative Air Heater, Soot blowers, Electro-static precipitator.

#### Fuel and Burner Systems:

4 Coal Feeders, 4 Pulverizes, 2 Ignition Oil pumps, 2 Fuel Oil Pumps, Coal and Oil Burners at 6 Levels.

Boiler Water and Steam Systems:

Economizer, Steam Drum, Downcomer, Waterwalls, Primary Superheater, Secondary Superheater, Reheater, Attemperators for Superheater, Auxiliary Steam Header.

#### Turbine and Generator Systems:

HP/IP/LP Turbines, Main Stop Valve with Bypass, 4 Turbine Control Valves, Turbine Turning Gear, 2 Turbine Lube Oil Pumps, Turbine Lube Oil Cooler, Turbine Lube Oil Cooling Water Pump, Turbine Lube Oil Filters, Bearing vibration monitors, Rotor eccentricity monitor, Differential expansion monitor, Generator with Exciter and Automatic Voltage Regulator, Syncope, Hydrogen Cooler, Hydrogen Seal Oil Pump, Stator Cooling water Pump.

#### Condensate and Feed water System Equipment:

Condenser, 2 Air Ejectors, 2 Circulating Water Pumps, 2 Condensate Extraction Pumps, Condensate Storage Tank, 1 Makeup Pump, Air Ejector Steam Condenser, Gland Seal Steam Condenser with Exhaust Fan, Condensate Polisher, 3 Low Pressure Heaters, Deaerator with Storage Tank, 2 High Pressure Heaters, 3 Boiler Feed Pumps (motor driven).

### PS5103 600 MW Thermal Power Plant

600MW Power Plant Simulator consists of a comprehensive Model of a fossil fired (coal, oil, gas) power plant. The simulator can be operated in the full dynamic range, including startup from cold condition, load maneuvering, and shutdown. The fully integrated simulator includes an Instructor Console, and operator Stations. The Operator display software can be selected from a list of DCS emulations. The description of the power plant and the training features are summarized below.

This model has pulverized fuel tangential fired, balanced draft furnace, forced circulation boiler drum with single reheating. Turbine has 1-HP, 1-IP and 2 LP with multiple extraction stages and auxiliary systems such as lube oil and machine monitoring systems.

The electrical generator has water cooled stator and hydrogen cooled rotor with H<sub>2</sub> seal oil system. AVR and Syncope are part of electrical system. Transformers (Station, Utility and Generator) with 20KV, 11KV and 400 KV buses along with switchyard, circuit breakers and trip logics constitutes the power distribution systems downstream of generator.

## PS-5100 Industrial Power Plant Operation Suite

### PS5104 100 MW Thermal Power Plant

The 100MW Power Plant Simulator consists of a comprehensive Model of a fossil fired (coal, oil, gas) power plant:

FUELS: Coal, Heavy Oil (warm-up), Light Oil (ignition).

STEAM GENERATOR: Drum type, Natural Circulation.

#### Furnace Air and Gas Systems:

2 Forced Draft Fans, 2 Induced Draft Fans, Primary Air fans (1 for each Pulverizer), 1 Igniter Fan & 1 Scanner Fan, Windbox, 1 Regenerative Air Heater, Soot blowers, Electro-static precipitator.

#### Fuel and Burner Systems:

4 Coal Feeders (3 running & 1 Standby), 4 Pulverizers (3 running & 1 Standby),, 2 Ignition Oil pumps, 2 Fuel Oil Pumps, Coal and Oil Burners at 6 Levels.

#### Boiler Water and Steam Systems:

Economizer, Steam Drum, Downcomer, Waterwalls, Primary Superheater, Secondary Superheater, Reheater, Attemperators for Superheater, Auxiliary Steam Header.

#### Turbine and Generator Systems:

HP/IP/LP Turbines, Main Stop Valve with Bypass, Turbine Control system, Turbine Turning Gear, 2 Turbine Lube Oil Pumps, Turbine Lube Oil Cooler, Turbine Lube Oil Cooling Water Pump, Turbine Lube Oil Filters, Bearing vibration monitors, Rotor eccentricity monitor, Differential expansion monitor, Generator with Exciter and Automatic Voltage Regulator, Synchroscope, Hydrogen Cooler, Hydrogen Seal Oil Pump, Stator Cooling water Pump.

#### Condensate and Feed water System Equipment:

Condenser, 2 Air Ejectors, 2 Circulating Water Pumps, 2 Condensate Extraction Pumps, Condensate Storage Tank, 1 Makeup Pump, Air Ejector Steam Condenser, Gland Seal Steam Condenser with Exhaust Fan, Condensate Polisher , 3 Low Pressure Heaters, Deaerator with Storage Tank, 2 High Pressure Heaters, 3 Boiler Feed Pumps (motor driven).

### PS5105 300 MW Thermal Power Plant (Oil/Gas Fired)

300MW Power Plant Simulator consists of a comprehensive Model of oil/gas fired (oil, gas) power plant. The simulator can be operated in the full dynamic range, including startup from cold condition, load maneuvering, and shutdown. The fully integrated simulator includes an Instructor Console, and operator Stations. The Operator display software can be selected from a list of DCS emulations. The description of the power plant and the training features are summarized below.

This model has oil/gas fired, balanced draft furnace, natural circulation boiler drum with single reheating. Turbine has 1-HP, 1-IP and 2 LP with multiple extraction stages and auxiliary systems such as lube oil and machine monitoring systems.

2 Forced Draft Fans, 2 Induced Draft Fans maintain balanced draft in the Boiler furnace

The electrical generator has water cooled stator and hydrogen cooled rotor with H2 seal oil system. AVR and Synchroscope are part of electrical system. Transformers (Station, Utility and Generator) with 20KV, 11KV and 400 KV buses along with switchyard, circuit breakers and trip logics constitutes the power distribution systems downstream of generator.

The water and steam system comprises of Economizer, Steam Drum, Downcomer, Waterwalls, Primary Superheater, Secondary Superheater, Reheater, Attemperators for Superheater, Auxiliary Steam Header.

The turbine area comprises HP/IP/LP Turbines, Main Stop Valve with Bypass, 4 Turbine Control Valves, Turbine Turning Gear, 2 Turbine Lube Oil Pumps, Turbine Lube Oil Cooler, Turbine Lube Oil Cooling Water Pump, Turbine Lube Oil Filters, Bearing vibration monitors, Rotor eccentricity monitor, Differential expansion monitor, Generator with Exciter and Automatic Voltage Regulator, Synchroscope, Hydrogen Cooler, Hydrogen Seal Oil Pump, Stator Cooling water Pump.

## PS6000: GAS OIL PROCESSING PLANT SIMULATOR

The PS-6000 is a simulation software package with rigorous and detailed simulation models of Gas Oil Separation and upstream processing facilities. The benefits of this package are:

### For Academic

- ▶ Hands-on Learning experience
- ▶ In-depth Process Understanding
- ▶ Carry out In-house projects
- ▶ Sound Fundamental Concepts of Process Control and safety with DCS Operations
- ▶ Industry readiness - Understanding the Intricacy & Complexity of process dynamics
- ▶ Compleitive edge for Internship and jobs
- ▶ Faculty Development
- ▶ Boosted accreditations ranking

### For Industries

- ▶ Increase operator skills
- ▶ Improved Plant Safety and compliance to environmental regulations
- ▶ Smooth Startup & Shutdown
- ▶ Faster Recovery from External/Internal Process Disturbances
- ▶ Higher workforce availability and reduce training time
- ▶ Evaluation of Operator Proficiency
- ▶ Minimize Operator turnover impact

The package consists of simulation models for various Gas Oil Separation plants and upstream operations. Each model simulates a Gas Oil Separation plant with its control, instrumentation and safety systems and field devices. The Instructor can invoke malfunctions, disturbances and instrument failures and evaluate the trainee performance. Trainee can perform normal operations, emergency operations as well as startup / shutdown operations on these models.

### PS-6001 GAS STABILIZATION UNIT

The condensate stabilizer is designed to top off the lighter components till butane. The stabilizer overhead gas is passed through a scrubber and compressed by an overhead compressor system before routing to Dehydration unit. The overhead compressor has two stages with air-cooled interstage coolers and KO drum. The stabilizer column is equipped with reboiler to supply heat using hot oil.

### PS-6003 DEHYDRATION UNIT

Production gas from the 3-phase separator enters the gas dehydration unit to remove the water. The dehydration unit has Tri Ethylene Glycol (TEG) in a recirculating system to absorb the water from the gas stream. The rich TEG is regenerated at low pressure using the heat to boil off the water. The dehydration is specified to provide the dehydrated gas with allowable moisture content to meet the export specification of the sales gas.

### PS-6002 DEGASSING PLANT

The model consists of Wellheads, Test Separator and Production separator. Each Well comprises of Down-hole safety valve, Master valve, Wing valve and Choke valve in series.

### PS-6004 GAS COMPRESSION PLANT

Gas from the 3-phase separator is routed to the suction header of the export compressor where it feeds export gas compression train. The export compressor system consists of a suction drum, LP and HP compressors, air-cooled interstage and discharge coolers. The compressed gas is then routed to the sales gas export pipeline through a metering skid.

## PS6000: GAS OIL PROCESSING PLANT SIMULATOR

### PS-6005 LPG PLANT

This simulated plant consists of De-ethanizer, De-propanizer and LPG Column sections.

### PS-6006 NGL RECOVERY UNIT

This simulated plant consists of Gas/Gas/Liquid Exchangers, Warm Separator, Turbo Expander compressor, J-T Valve and De-ethanizer Absorber

### PS-6009 INTEGRATED GAS PLANT

This model simulates a typical integrated gas plant and consists of following sections:

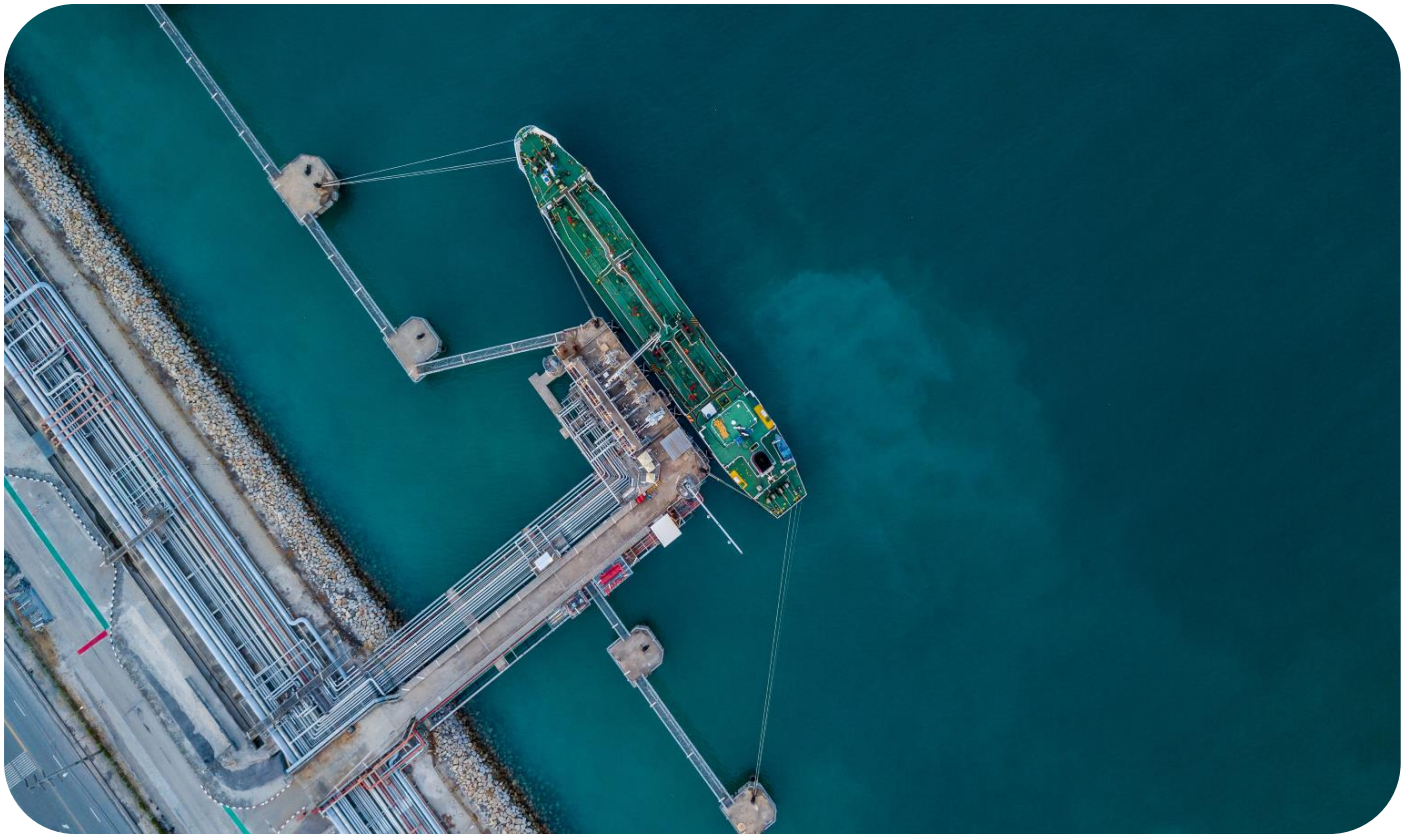
- Well section
- Inlet Manifold
- Three phase separators
- Gas Dehydration
- Gas Compressor and Export section
- Condensate section
- Stabilizer

### PS-6007 LNG PLANT

LNG PLANT: The process involves 3 cycles in cascade, using a pure refrigerant in each of the cycles. Refrigeration cycles include Propane Cycle, Ethylene cycle and Methane cycle.

### PS-6008: PRODUCTION WELLS, MANIFOLD AND 3-PHASE SEPARATOR UNIT

Well Fluid from two set of well headers enters the production manifold via Master valve and wing valve. The flow from individual well is controlled through choke valve. From the production manifold the fluid enters the three phase separator and slug catcher, where the gas, condensate and the aqueous layers are separated. The aqueous and condensate liquids are routed to respective vessels and the gas is routed to the dehydration unit.



## PS7000: Petrochemical Operations Simulator

The PS-7000 is a simulation software package with rigorous and detailed simulation models of Petrochemical plants. The benefits of this package are:

### For Academic

- ▶ Hands-on Learning experience
- ▶ In-depth Process Understanding
- ▶ Carry out In-house projects
- ▶ Sound Fundamental Concepts of Process Control and safety with DCS Operations
- ▶ Industry readiness - Understanding the Intricacy & Complexity of process dynamics
- ▶ Complete edge for Internship and jobs
- ▶ Faculty Development
- ▶ Boosted accreditations ranking

### For Industries

- ▶ Increase operator skills
- ▶ Improved Plant Safety and compliance to environmental regulations
- ▶ Smooth Startup & Shutdown
- ▶ Faster Recovery from External/Internal Process Disturbances
- ▶ Higher workforce availability and reduce training time
- ▶ Evaluation of Operator Proficiency
- ▶ Minimize Operator turnover impact

The package consists of simulation models for various petrochemical plants. Each model simulates a petrochemical plant with its control, instrumentation and safety systems and field devices. The Instructor can invoke malfunctions, disturbances and instrument failures and evaluate the trainee performance. Trainee can perform normal operations, emergency operations as well as startup / shutdown operations on these models.

### PS-7001: BTX Production:

The Hydrocarbon feed containing Benzene, Toluene and Xylene are separated through fractionation in series of three fractionation columns. Each column is equipped with steam reboiler, overhead condenser, overhead accumulator, reflux pumps and bottom pumps.

### PS-7002: Ethylene Oxide Production:

Ethylene feed is mixed with recycled ethylene and mixed with compressed and dried air, heated, and then fed to the reactor. The reaction is exothermic, and high-pressure steam is made in the reactor shell. Conversion in the reactor is kept low to enhance selectivity for the desired product. The reactor effluent is cooled, compressed, and sent to a scrubber where ethylene oxide is absorbed by water. A fraction of the unreacted vapor stream is purged and the remaining is recycled. The aqueous product stream is cooled, throttled and distilled to produce the desired product. The required purity specification is 99.5 wt % ethylene oxide.

### PS-7003: Phthalic Anhydride Production:

The key reactants for the production of phthalic anhydride are naphthalene and excess air. Naphthalene is fed into the naphtha furnace. Naphthalene is heated and vaporized in the naphtha furnace using fuel gas and then air is mixed with the vaporized naphthalene. The mixture is then allowed to react in the fluidized bed reactor in the presence of vanadium oxide coated on silica gel as catalyst. The temperature at which reaction will be occurring is 536.15K. 100% conversion of naphthalene is achieved and products leave the fluidized bed reactor as vapors. The reaction is exothermic and the temperature of the reactor is controlled by circulation of molten salt as coolant. The coolant is circulated through the coils inside the reactor and the heat carried away by the coolant is used to produce high temperature steam in a heat exchanger.

## PS7000: Petrochemical Operations Simulator

### PS-7004: Styrene Production:

Ethylbenzene is mixed in the gas phase with 10-15 times its volume in high-temperature steam, and passed over a solid catalyst bed. Styrene, a monomer which is used to make polystyrene, is produced by dehydrogenation of Ethyl Benzene in a two stage packed bed reactor. The feed component, Ethyl Benzene is heated by using high pressure steam in a heat exchanger. At this elevated temperature, the feed is further mixed with steam generated from a steam generator which dilutes the components as well as rise the temperature of the feed. The steam generator uses low pressure steam as its feed and increases the temperature of steam by burning fuel oil. Then the feed components traverse the two stage packed bed reactor and styrene can be obtained from the second reactor.

### PS-7005: Allyl Alcohol:

The allyl alcohol unit employs direct oxidation of propylene. The catalyst used in this unit has high activity and high selectivity. The main sections are:

- Oxidation reaction section
- CO<sub>2</sub> removal section
- Flash gas recovery section
- Hydrolysis section
- Azeotrope separation and heavy end removal section
- Allyl alcohol purification section

The unit basically consists of the following two reactions:

- ▶ Oxidation  
Main reaction:  $C_3H_6 + 1/2 O_2 + CH_3COOH \rightarrow CH_3COOC_3H_5 + H_2O$   
Side reaction:  $C_3H_6 + 9/2 O_2 \rightarrow 3CO_2 + 3H_2O$
- ▶ Hydrolysis:  $CH_3COOC_3H_5 + H_2O \rightarrow C_3H_5OH + CH_3COOH$

The oxidation reaction section to synthesize the allyl acetate is of a cyclic type. During the production of Allyl acetate, Carbon-di-oxide and other byproducts are generated by allowing the raw materials of propylene, oxygen and acetic acid to pass through a noble metal catalyst in a gaseous phase and a high pressure.

The hydrolysis reaction is allowed to take place in a liquid phase using a highly acidic ion exchange resin as catalyst. Allyl alcohol, and acetic acid are generated by this reaction. As the hydrolysis is an equilibrium reaction, the reaction products are a mixture of allyl alcohol, acetic acid, allyl acetate and water and sent to purification section for further processing.

### PS-7006 Ethylene Glycol Production:

Ethylene glycol is produced from ethylene, via intermediate ethylene oxide. Ethylene oxide reacts with water in the presence of acids or bases as catalyst to produce ethylene glycol. Ethylene glycol is widely used for the production of the polyester fibers and it is used as an antifreeze compound. Ethylene glycol is manufactured by using ethylene oxide and water with sulphuric acid as catalytic agent in reactors placed in series. Ethylene oxide is fed into the first reactor where it reacts with water to produce ethylene glycol. Water is mixed with sulphuric acid, which acts as catalytic agent before feeding into the reactor. The reactants are allowed to react in the first reactor where the mixture is constantly stirred with an impeller, which is placed as the reactor mounting. The reactor is cooled externally by water-cooled jacket provided at the periphery of the reactor since the reaction is exothermic in nature.

## PS7000: Petrochemical Operations Simulator

### PS-7007: Ethane Cracking Unit:

This model simulates Ethane Cracking Unit which include of Feed section, Preheating section, Cracking Heater section, Heat Recovery section. Ethane and Propane are the major feed component and it is cracked by using steam to produce Ethylene and Propylene as products. The cracking will take place at high temperature around 850°C. The cracking conversion will be 65 % of total feedstock and a function of critical process variables such as temperature, feed concentration and hydrocarbon to steam ratio.

### PS-7008 Propylene Glycol Production:

Propylene glycol is produced by the hydration process of Propylene oxide. Propylene oxide plant uses non-catalytic high temperature process at 190°C to 200°C or using a catalytic method, which proceed at 150°C in the presence of ion exchange resin or small amount of sulphuric acid or alkali. Initially propylene oxide is made to react with de-mineralised water in excess at high temperature and pressure inside a tubular reactor. The remaining water content present after the reaction is removed by using multiple effect evaporator.

### PS-7009 Ethanol Rectification Unit:

Ethanol is produced from the fermentation of molasses obtained from the sugar industries. The molasses is an organic mass which contains large amount of Carbohydrates which is converted into ethanol, carbon dioxide and many other impurities. CO<sub>2</sub> is removed initially from the mixture containing large amounts of ethanol and water by flashing. Then the remaining mixture is stripped with help of steam in Column-2 and then the products are distilled in other two columns Column-3 and Column-4. Finally pure ethanol is obtained which has a purity of 97.58 %.

Besides supply of above standard simulation plants, we develop rigorous custom simulation models for your plants based on the plant configuration, design parameters, operating data and instrumentation and safety systems. These custom models are very useful for training / re-training your operators/engineers as well as control / safety system verification, validating operating procedures, de-bottlenecking studies and what-if analysis.



## PS8000: Metal and special Process Simulator Suite

The PS-8000 is a simulation software package with rigorous and detailed simulation models of Metal Processing plants and other special chemical process units. The benefits of this package are:

### For Academic

- ▶ Hands-on Learning experience
- ▶ In-depth Process Understanding
- ▶ Carry out In-house projects
- ▶ Sound Fundamental Concepts of Process Control and safety with DCS Operations
- ▶ Industry readiness - Understanding the Intricacy & Complexity of process dynamics
- ▶ Complete edge for Internship and jobs
- ▶ Faculty Development
- ▶ Boosted accreditations ranking

### For Industries

- ▶ Increase operator skills
- ▶ Improved Plant Safety and compliance to environmental regulations
- ▶ Smooth Startup & Shutdown
- ▶ Faster Recovery from External/Internal Process Disturbances
- ▶ Higher workforce availability and reduce training time
- ▶ Evaluation of Operator Proficiency
- ▶ Minimize Operator turnover impact

The package consists of simulation models for paper & Pulp, metal processing plants including Copper and Iron & Steel. The Models simulate a Metal processing plant with basic controls, Instrumentation systems and field devices. The Instructor can invoke malfunctions, disturbances and instrument failures and evaluate the trainee performance. Trainee can perform normal operations, emergency operations as well as startup / shutdown operations on these models.

## PS8000: Metal and special Process Simulator Suite

### PS-8001: Copper Smelting Unit:

The model simulates a Copper Smelting Unit which converts concentrated Copper ore to 99.9% pure copper. Major sections in model are:

- Flash Smelter: Copper Concentrate blend mixed with flux ( $\text{SiO}_2$ ) is fed to the smelting furnace, where enriched air added with oxygen is fed to furnace. The smelting reaction takes place at Furnace temperature around  $1200^\circ\text{C}$ . Furnace produces Copper Matte (~60% Cu); Copper Slag (~1% Cu) and Sulphur Di-Oxide Gas ( $\text{SO}_2$ ). Both Copper Matte (~60% Cu) and Copper Slag (~1% Cu) is tapped to Settling furnace and Sulphur Di-Oxide Gas ( $\text{SO}_2$ ) is transferred to Sulphuric acid plant through a closed pipeline.
- Copper converter: Converters will be used to Convert Copper matte to Blister Copper (~98% Cu). Converting is oxidation of molten matte to form molten 'blister' copper (~98% Cu). It entails oxidizing Fe and S from the matte with oxygen-enriched air.
- Anode Furnace: Anode furnaces will be used to make anode copper (~99.5% Cu) from blister received from Copper Converter. Residual Sulphur is removed by oxidation followed by oxygen removal by reduction. This results in 99.5% pure copper that is finally sent to Electrolysis section for enhancing purity to 99.9%

### PS-8002: Iron & Steel Processing Unit:

The model simulates a direct reduction Process that converts iron oxides containing roughly 67% Fe, which is fed to the furnace in the form of lump and pellet, to high purity directly reduced iron (DRI).

The major equipment of a Direct Reduction Plant includes

- Shaft furnace: The Iron Oxide fed from the top, is carried down to Bottom by the shaft furnace, having hydraulically operated shafts and is discharged from the bottom in the form of DRI (Direct reduced Iron).
- Gas handling system: Spent Gas after reduction cooled in Scrubber and circulated to Reformer through Process Gas compressors.
- Reformer and Heat recovery system: Compressed gas is pre-heated in recuperator where it is heated by Reformer Flue gas and finds way to Reformer to get converted to CO and  $\text{H}_2$  rich gases to reduce the ore in Furnace.

### PS-8003: ZINC Processing Plant

This model simulates a Zinc processing plant that converts zinc ore into high purity metal. The simulation model has the below units:

- Feed Section
- Roaster
- Calcine cooling with waste heat recovery
- Leaching
- Purification
- Electrolysis

## PS8000: Metal and special Process Simulator Suite

### PS8101: Chlor Alkali Plant

The chlor alkali unit has been designed to produce caustic soda, chlorine, hydrogen and hydrochloric acid. This unit has the following main sections:

- Salt Handling and Brine saturation
- Brine Treatment and Filtration
- Deionization and Storage
- Membrane Electrolyzer
- Anolyte Circulation and Catholyte Circulation
- 32% Caustic Storage
- Caustic Soda Concentration
- Chlorine Cooling, Demisting and Compression
- Hydrogen Cooling, Demisting and HCl synthesis Unit
- Brine Dechlorination

The saturated brine solution is treated, filtered and De-ionized and sent to membrane electrolyzer. The electrolysis reactions are as listed below:

Anode:  $2\text{NaCl} \rightarrow 2\text{Na}^+ + \text{Cl}_2 (\text{g})$

Cathode:  $2\text{H}_2\text{O} \rightarrow 2\text{OH}^- + \text{H}_2 (\text{g})$

Overall:  $2\text{NaCl} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{Cl}_2 (\text{g}) + \text{H}_2 (\text{g})$

The remaining brine solution and formed chlorine leaves the anode chamber for the top of the cell and enters the anolyte exit header. The chlorine gas is separated from depleted brine by a separator and further cooled, demisted and dried. The hydrogen gas is separated from caustic soda solution by means of a separator, further cooled, demisted and sent for hydrochloric acid synthesis unit. The caustic soda solution flows to the caustic tank by gravity and sent for further processing and storage.

### PS8102: Calcium Chloride plant

The Calcium Chloride unit consists of following sections:

- Pretreatment
- Pre concentration
- Crude Crystallization
- Pure Crystallization
- Purge Crystallization
- Granulation, Sieving & Air treatment.

The feedstock, a calcium chloride containing outlet stream from an epichlorohydrine production will be worked up into a valuable calcium chloride product by means of crystallization, granulation and destruction of the impurities by incineration. In an alternative mode of operation the impurities can be separated as a concentrated solidified waste stream. The plant consists of a feedstock pre-treatment section, which serves as conditioning step for adjustment of stable feedstock conditions for the crystallization stages. After this pre-treatment the feedstock is evaporated in a pre-concentration section followed by a crude crystallization section where the first calcium chloride crystals are formed. The product is further concentrated and granulated. A constant calcium chloride quality will be achieved by recycling streams.

## **PS8000: Metal and special Process Simulator Suite**

### **PS8103: Ethanol Distillation**

The distillation process begins with heating the ethanol mixture in the beer column, where the ethanol vaporizes and rises through the column. The rectification column then refines this vapour further to enhance purity. The vapour is subsequently condensed into liquid form by the condenser, with any residual heat managed by preheaters. The reflux drum ensures optimal separation by returning a portion of the condensed liquid to the column. Finally, the ethanol drying unit removes any remaining moisture to produce high-quality, anhydrous ethanol.

### **PS8104: Methanol Synthesis Unit**

The Methanol synthesis section consist various unit operations and process includes major equipment Methanol reactor, Synthesis gas compressor, HP Separator, LP Separator, HP Steam drum, Re-circulator, Start-up ejector and minor equipment pumps and compressors.

### **PS8105: Soda Ash Plant**

This plant will produce soda ash with Solvay ammonia and soda process using raw salt and limestone. Crude brine which is made from raw salt dissolving with water undergoes purification, ammonia absorption and carbonating and is then made into sodium bicarbonate crystals (i.e. bicarbonate).

After the bicarbonate crystal slurry is filtered, the filter cake is heated, calcined and decomposed, producing light soda ash (i.e. Light ash). By means of hydration, light ash is made into monohydrated sodium carbonate (i.e. Monohydrated soda). After heated and calcined, monohydrated soda is dehydrated and become dense soda ash (namely dense ash), the final product.

Lime milk is added into the mother liquor from bicarbonate filtration, so that reaction occurs between  $\text{NH}_4\text{Cl}$  in the mother liquor and  $\text{Ca}(\text{OH})_2$  in the lime milk, by which  $\text{NH}_4\text{Cl}$  is converted into  $\text{NH}_4\text{OH}$ .  $\text{NH}_4\text{OH}$  is then decomposed by distillation, producing  $\text{NH}_3$ , which recycles in the process. Lost ammonia will be made up with liquid ammonia procured.

## PS9000: Bio & Food Technology Operations Suite

The PS-9000 is a simulation software package with rigorous and detailed simulation models of Industrial bio technology operations. The Biotechnology Simulator Model aims to provide a virtual environment for users to explore and understand various aspects of biotechnological processes. This simulator is designed to mimic the life science, real-world scenarios, enabling users to engage in hands-on experiments, analyze data, and make informed decisions in a risk-free digital environment.

### For Academic

- ▶ Industrial Exposure for Students.
- ▶ In-depth Process Understanding.
- ▶ Carry out In-house projects.
- ▶ Sound Fundamental Concepts of Process Control and safety with DCS Operations.
- ▶ Understanding the Intricacy & Complexity of process dynamics.
- ▶ Employability



### For Industries

- ▶ Improved Plant Safety.
- ▶ Smooth Startup & Shutdown.
- ▶ Evaluation of Operator Proficiency.
- ▶ Faster Recovery from External/Internal Process Disturbances.
- ▶ Increased familiarity of Controls & Interlock Systems.

The package consists of simulation models for various bio technology operations equipment and plants. Biotechnology simulator model involves designing a system that replicates real-world processes, experiments, and scenarios in the field of biotechnology. The instructor can invoke malfunctions, disturbances and instrument failures and evaluate the trainee performance. Trainee can perform normal operations, emergency operations as well as startup / shutdown operations on these models.

## **PS9000: Bio & Food Technology Operations Suite**

### **PS9001 Bioreactor**

This model educates trainees learn bioreactor, an up-stream operation in biotechnology, in which micro-organisms are biologically cultured under specific conditions. It focus on controlling vital factors like temperature, pressure, oxygen supply, media quantity, agitation, and pH in microbial cell cultures within a Bioreactor/Fermenter. Hands-on experience is gained through adjusting parameters such as temperature, pressure, and agitation speed in small-scale bioreactor systems. The training setup includes simulations of various conditions and troubleshooting scenarios. Real-time monitoring tools and practical case studies enhance the learning experience.

### **PS9002 Biomedical Freezer**

This training model covers the operation of preserving microorganisms, particularly through cryopreservation at temperatures below freezing, typically at  $-20^{\circ}\text{C}$ . Cryopreservation is an effective method for the long-term storage of various microorganisms, including bacteria, algae, fungi, viruses, and protozoa. Trainees will acquire practical skills in controlling the compressor, condenser, expansion valve, and evaporator to optimize power consumption and operational costs.

### **PS9003 Refrigerated Centrifuge**

This model provides training on the effects of centrifugation under refrigeration for improved protein separation. Trainees will gain hands-on experience in controlling the centrifuge speed and temperature, with the setting time yielding optimal results.

### **PS9004 Bio-molecular Ultrafiltration**

This model teaches trainees a highly efficient technique for isolating microorganisms from samples, commonly used in research and industry. It involves biomolecule separation based on pressure and concentration.

### **PS9005 Protein Precipitation**

This model focuses on a robust downstream process for removing impurities and contaminants, followed by sterile filtration and filling. Its goal is to help users achieve maximum protein recovery. It integrates a freezer, refrigerated centrifuge, and protein precipitator for efficient operation.

### **PS9006 Bio-diesel Plant**

The Renewable Biofuel Production Model is a comprehensive plant operation suite that allows trainees to experience real-time plant operations. It covers various stages, including FEED oil properties, meth-oxide preparation, trans-esterification, heat exchangers, biodiesel distillation, acid reaction, solvent recovery, and utilities. The simulation is tailored to achieve production tasks for different feed-oil properties. Additionally, it includes steady state integrated dynamic simulation for process optimization study. This advanced functionality allows users to analyze and optimize the biodiesel production process under varying conditions and scenarios.

## **PS9000: Bio & Food Technology Operations Suite**

### **PS9007 Bio-gas Plant**

This simulation model is designed to train users in operating a biogas plant for methane gas production while effectively controlling CO<sub>2</sub> levels. The model encompasses various operations involved in the biogas production process, including organic loading rate, pre-treatment, fermenter operation, gas production in the digester. By simulating the entire biogas production process, it enables users to develop skills in process optimization and sustainable energy management.

### **PS9008 Bio-ethanol Plant**

The Bioethanol Plant Operation Simulation Model is a comprehensive tool designed to train users in the operation of a bioethanol production facility. The model covers all essential stages of the bioethanol production process, including feed handling, pre-treatment, saccharification, co-fermentation, product purification, and distillation. Additionally, it includes procedures for plant start-up and shutdown to ensure safe and efficient operation.

### **PS9009 Green Hydrogen Production Plant**

This simulation model can help optimize the entire production process, from water electrolysis to hydrogen purification, to maximize efficiency and yield. By simulating different operating conditions, energy consumption patterns can be analyzed to minimize electricity usage and optimize renewable energy integration, thereby reducing carbon footprint. Simulation allows for the evaluation of different configuration, technologies and input costs to determine the most cost-effective setup for green hydrogen production. The simulation can assess the purity and quality of the produced hydrogen to insure it meets industry standards and customer requirements. Through simulation, the optimal utilization of resources such as water, renewable energy sources, and catalysts can be determined to enhance the overall sustainability of the production process.

### **PS9101 Bread Manufacturing Plant**

This model trains users on operating a bread production unit using dynamic simulation. It covers feed supply, kneading, fermentation, baking, and packaging, including start up, shutdown, and handling disturbances. The focus is on understanding the impact of temperature and pressure on operations.

### **PS9102 Milk Processing plant**

Milk processing plant simulation offers a comprehensive virtual experience that replicate real-world dairy operations, allowing for the optimization and analysis of each step in the process. From pre-chilling raw milk to precise pasteurization, cream separation, and fat standardization, this simulation models key stages such as heat exchanger operations, storage tank management, and the cream separator centrifuge. It ensures that milk is processed efficiently and safely, with optimal energy usage and precise temperature control, all while maintaining product quality. This innovative model provides user with hand-on experience in streamline operations, reduce energy costs, and improve overall plant performance, providing valuable insights for process improvement and training

Besides supply of above standard simulation plants, we develop rigorous custom simulation models for your plants based on the plant configuration, design parameters, operating data and instrumentation and safety systems. These custom models are very useful for training / re-training your operators/engineers as well as control / safety system verification, validating operating procedures, de-bottlenecking studies and what-if analysis.

## PS0020: ProSimulator Model Development Package

**ProSimulator™ Model Development package** is a totally integrated set of simulation software development modules for process plants. It is used by simulation engineers to configure, test, and document dynamic simulation models for process and power plants. The model configuration is template based and easy to build.

**The package consists of the following sections:**

- ▶ Simulation database
- ▶ Simulation model library
- ▶ Instructor configuration utility
- ▶ Operator station configuration utility
- ▶ Model view / debugger

Library modules are typically equipment, unit operation and functional modules. Modules that simulate unit operations include: compressors, distillation sections, drivers, heat exchangers, pumps, valves, and vessels. Some modules provide structural functions for the model, such as: source, sink, divider, mixer, and pressure node. Other modules provide instrumentation and logic functionality, for example, control processors, level transmitters and compressor surge controllers.

**The model development tool kit requires Microsoft Visual C++ compiler and the same will be provided in the Engineering station.**

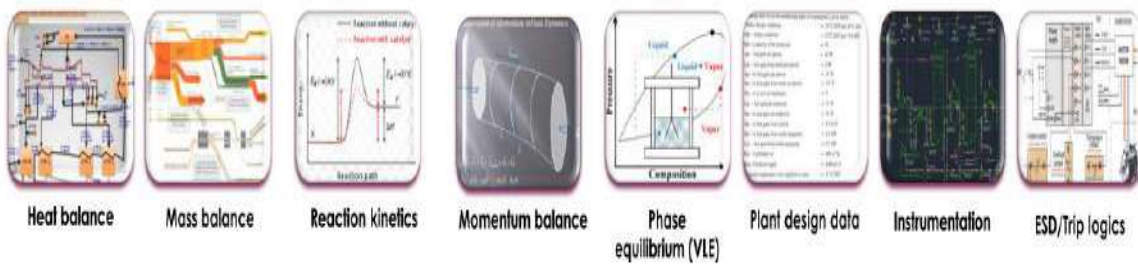
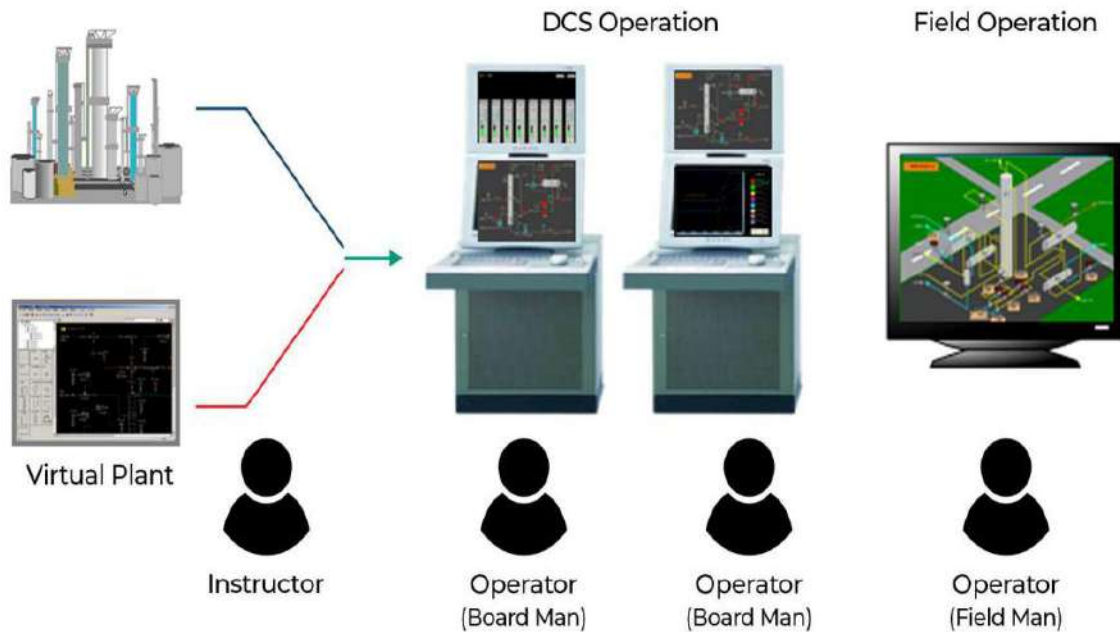
**The development toolkit software shall have the ability to:**

- ▶ Build custom property packages
- ▶ Add proprietary reaction kinetic expressions
- ▶ Develop specialized unit operations for other process plants
- ▶ The simulation software shall permit on line view of the internal process model variables, permit models to be created and modified off line, and permit simultaneous development of two or more models.

The Simulation Model Development Tool is the core of the model development environment. The user trained in simulation model development environment will be in a position to modify the model using this proprietary tool.

## PS0020: ProSimulator Model Development Package

ProSimulator, A Virtual Twin Package for  
Process Industries and Academia.



## PS0020: ProSimulator Model Development Package

Standard library routines available for the following items.

- Sources (air, water, steam, coal, fuel oil, fuel gas, feed)
- Sink
- Centrifugal Pumps
- Heat Exchangers
- Compressors
- Distillation
- Ejector
- Heater
- Multi component Flash
- Steam drum, Deaerator, Drain Tank
- Waterwalls (natural circulation, forced circulation, once-through)
- Superheater, Economizer
- Combustion
- Coal Pulverizer
- Steam Turbine Stage
- Mixed properties
- Pressure flow network
- PID Controllers
- Indicators
- Switches
- Manual Loading Stations
- Valves
- Safety Valves
- Thermodynamics Properties
- Steam Table
- Logic & Interlocks
- Mixing nodes
- Flow Conductances (options include parallel, and series)
- Pipe flow (options include laminar, and turbulent)

## PS0020: ProSimulator Model Development Package

The simulation model development environment has all the relevant simulation algorithms like the following.

- Euler Integration
- First order Lag
- Matrix Solver
- Scale
- Pulse
- Zero Limiter
- Boolean
- Power
- Random Number Generator
- Return Max Value
- Return Min Value
- Interpolation
- Timers
- Pulse Generator
- Logical Functions, such as Flip-flops
- Limit between Max and Min Values

### Instructor Station Configuration

This tool is to configure the Instructor Station features like Initial conditions, failure, disturbance etc. This tool is template based and easy to use.

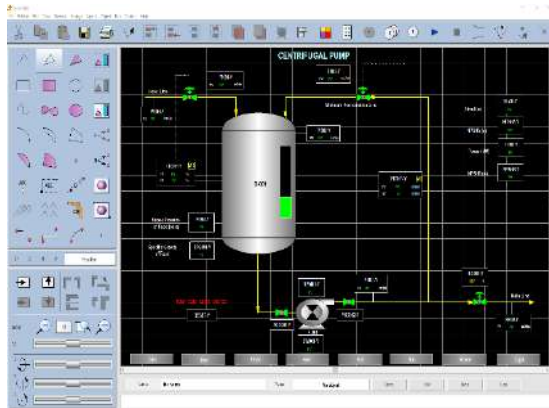
### Operator Station Configuration

This tool is to configure the Operator Station features like tag details, groupings, etc. This tool is template based and very easy to use. Also one can import/export data from/to XL file. The tool support various DCS emulations like Centum CS3000, VP, Honeywell TDC3000, Experion, Fox I/A, ABB & Delta V.

### User Manual

The Model Development Package User Manual provides complete information to the simulation engineer about the organization of the software package, description of all Algorithms in the Libraries, procedures and tasks required for the dynamic simulation project, and several examples. Each of the above nine topics is a chapter in the manual.

# PS0020: ProSimulator Model Development Package



Failure Simulation Performance Evaluation

**Failure** | Database | Instrument Fault | General

**Failure option allows the instructor to activate preconfigured failures in the Simulated plant.**

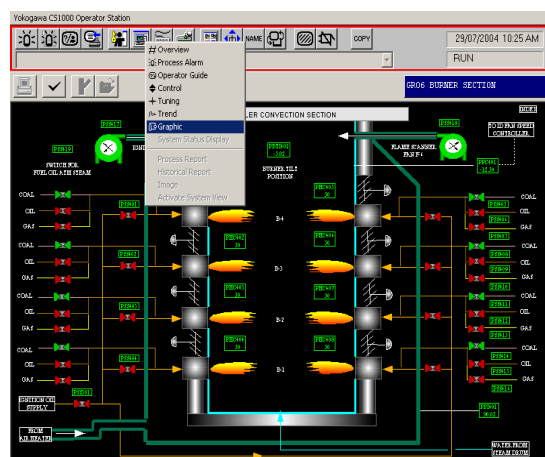
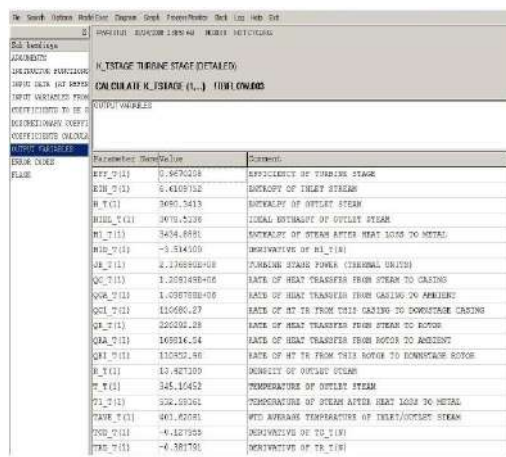
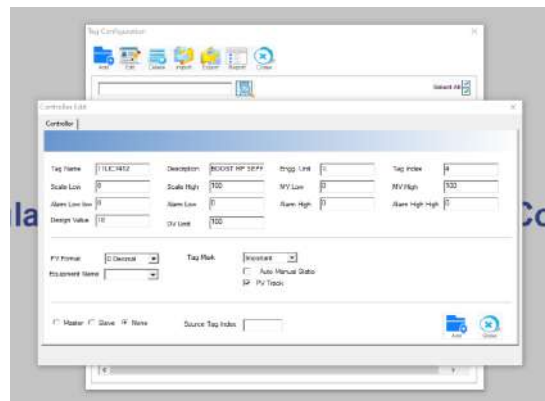
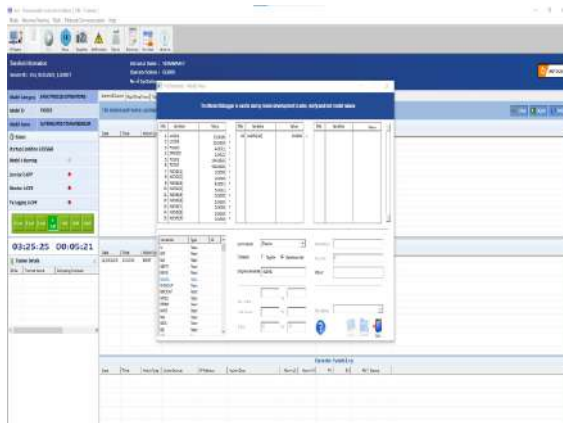
The Failures are grouped into various pages. A Failure can't be activated by double-clicking it or selecting it and hitting the ON/OFF control.

Page Heading		Failures Details						
SNo.	Page Heading	SNo.	Description	Status	Delay	Hrs	Mins	TimeElapsed
1	PUMP AND FAN FA...	1	PUMP P-001 FAIL	OFF	0	0	0	00:00:00
		2	PUMP P-002 FAIL	OFF	0	0	0	00:00:00
		3	PUMP P-003 FAIL	OFF	0	0	0	00:00:00
		4	PUMP P-004 FAIL	OFF	0	0	0	00:00:00
		5	PUMP P-005 FAIL	OFF	0	0	0	00:00:00
		6	PUMP P-006 FAIL	OFF	0	0	0	00:00:00
		7	FD FAN FA-001...	OFF	0	0	0	00:00:00
		8	FD FAN FA-002...	OFF	0	0	0	00:00:00
		9	FUEL GAS SUPP...	OFF	0	0	0	00:00:00
		10	FUEL OIL SUPP...	OFF	0	0	0	00:00:00

Select Evaluation Method **FinalDerivation**

**Reports**

Configure evaluation tabs

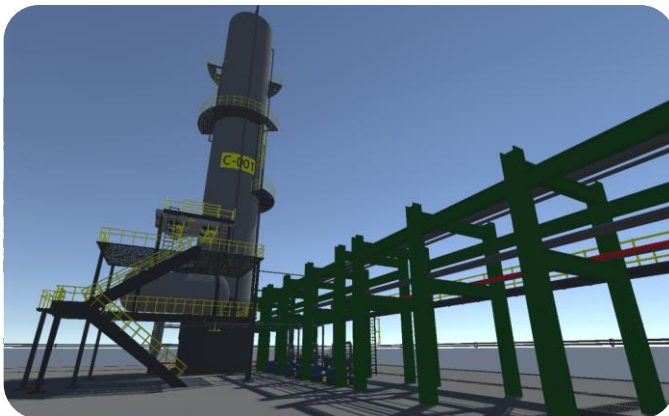


## ProVFO: VR and 3D Field Operations Simulator

The ProVFO is a next generation Virtual Field Operations simulation training module, based on Virtual Reality (VR) technology. It is an interactive 3D virtual plant to assist the trainees to envisage and efficiently get hands on experience of the actual plant. It works with ProSimulator™ as an integrated module with real time communication. The benefits of this package are:

### Benefits

- ▶ Complete process training simulator in a virtual environment
- ▶ Train outside operators, console operators and supervisors in all aspects of operations and Human factors; Communication, collaboration, etc.
- ▶ Lively, interactive and more realistic training environment
- ▶ Animations for clear understanding of process internals
- ▶ Evaluation of Operator Proficiency
- ▶ Improved Plant Safety



The package consists of 3D simulation models for various units and plants. Each model simulates respective units and the field operations with its local control panel, associated field instrumentation and safety systems. The Instructor can invoke malfunctions, disturbances and instrument failures and evaluate the trainee performance.

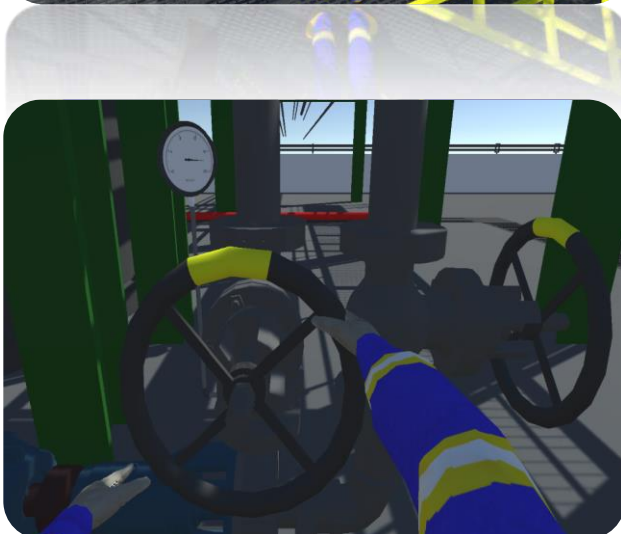
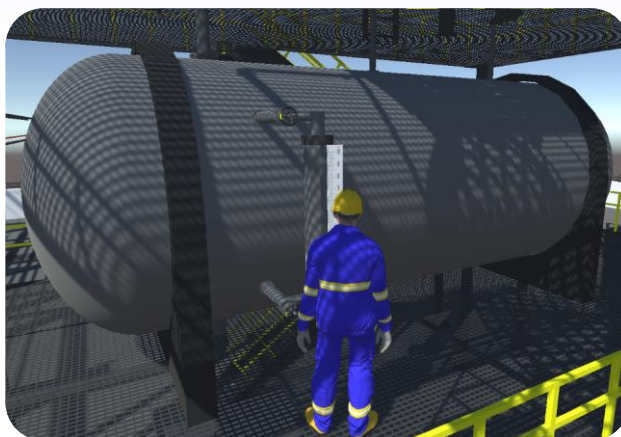
## ProVFO: VR and 3D Field Operations Simulator

### PS-2001VR: Distillation Unit:

**The model simulates a Depropanizer model.**

It consists of column and peripherals, vertical reboiler, overhead system with fan coolers, reflux drum, pump house and pipe rack. The trainees will be able to take a tour of the depropanizer unit and perform the below operations.

- Column: Climb various levels of column and view the top pressure and bottom level
- Operate pump: Switch ON\OFF in local or remote mode of feed and reflux pumps, operate suction and discharge valves, do change-over of the feed pump
- Local Gauges: View pump discharge pressure, column overhead pressure, column level and reflux drum level gauges and its dynamics
- Line up: Local valves such as steam supply valve, pump valves and overhead vent line valve
- Scenarios: Malfunction of fans, pumps and response to the situation
- Start-up of Unit: Commission the plant from COLD case, coordinating between DCS and Field operators.



## ProVFO: VR and 3D Field Operations Simulator

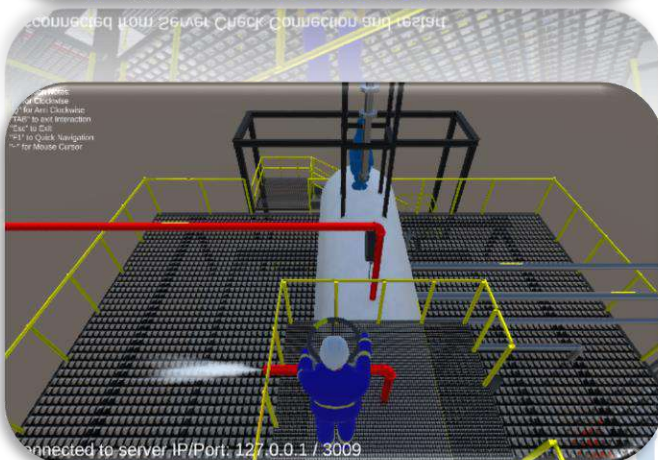
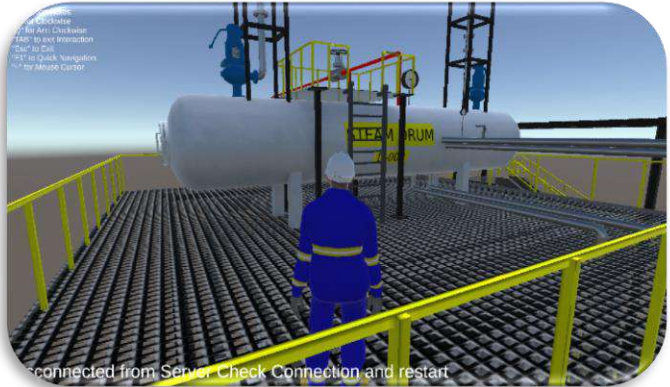
### PS-2002VR: Steam Boiler Unit:

**This model simulates a Steam Boiler model.**

It consists of feed water system, furnace, steam drum, combustion system and associated pumps and piping. Pipe header, open drain channel and associated piping are also covered.

The trainees will be able to take a tour of the Boiler unit and perform the below operations.

- Boiler: Climb to various levels of the Boiler Unit, view the Deaerator, Steam drum, associated piping, equipment and stack
- Operate pump: Switch ON\OFF in local or remote mode, operate suction and discharge valves, do change-over of the pump
- Local Gauges: View pump discharge pressure and feed tank level gauges and its dynamics
- Safety: View popping-up of pressure safety valve associated with Deaerator and steam drum
- Field View: Draining of liquid from piping, stem action of a control valve and furnace peep hole.
- Scenarios: Malfunction of pumps and response to the situation
- Start-up of Unit: Commission the plant from COLD case, coordinating between DCS and Field operators



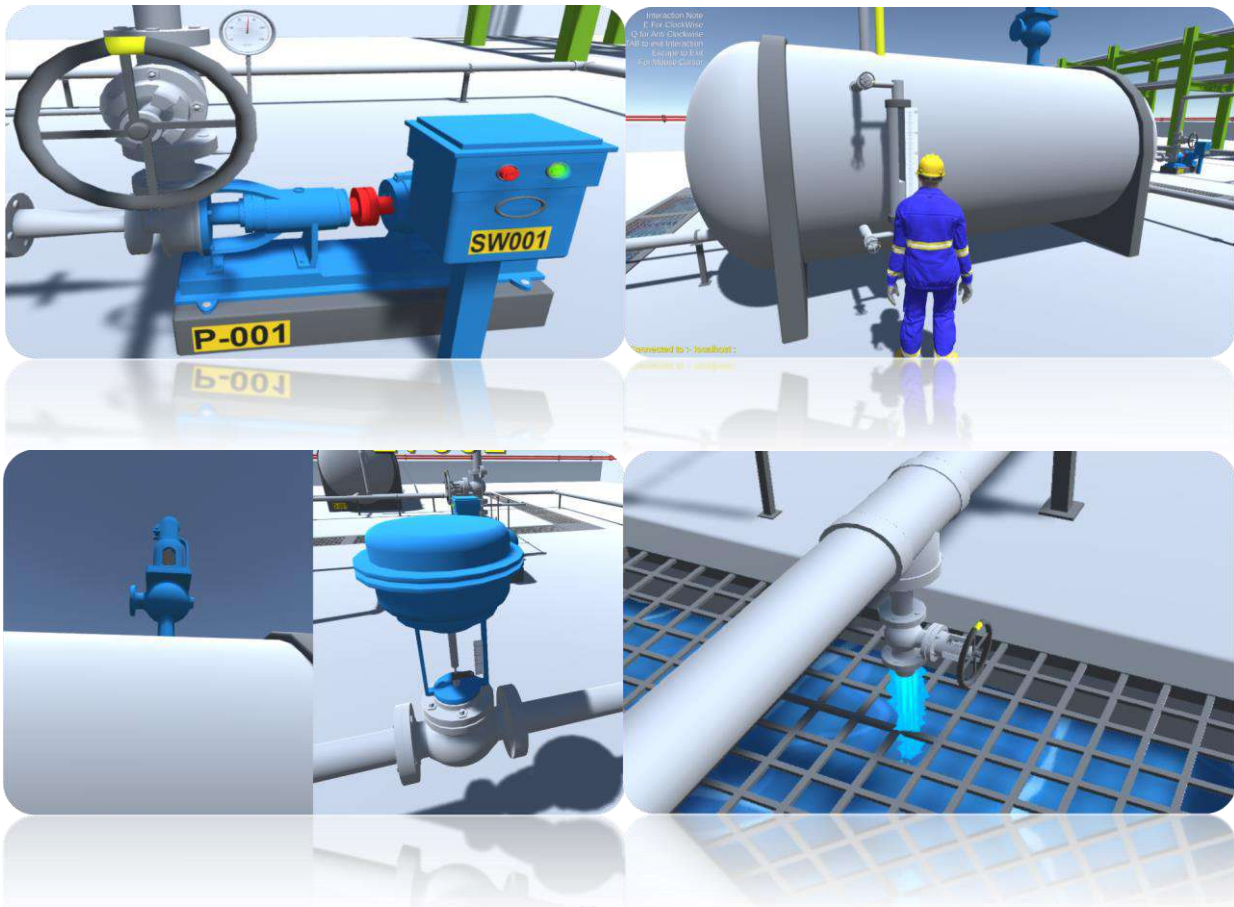
## ProVFO: VR and 3D Field Operations Simulator

### PS-2003VR: Centrifugal Pump Unit:

**This model simulates a Centrifugal pump model.**

It consists of feed tank, two pumps with common discharge header, open drain channel and associated piping. The trainees will be able to take a tour of the centrifugal unit and perform the below operations.

- Operate pump: Switch ON\OFF in local or remote mode, operate suction and discharge valves, do change-over of the pumps
- Local Gauges: View pump discharge pressure and feed tank level gauges and its dynamics
- Safety: View popping-up of pressure safety valve
- Field View: Draining of liquid from piping, stem action of a control valve
- Scenarios: Malfunction of pumps and response to the situation
- Start-up of Unit: Commission the plant from COLD case, coordinating between DCS and Field operators.



## ProVFO: VR and 3D Field Operations Simulator

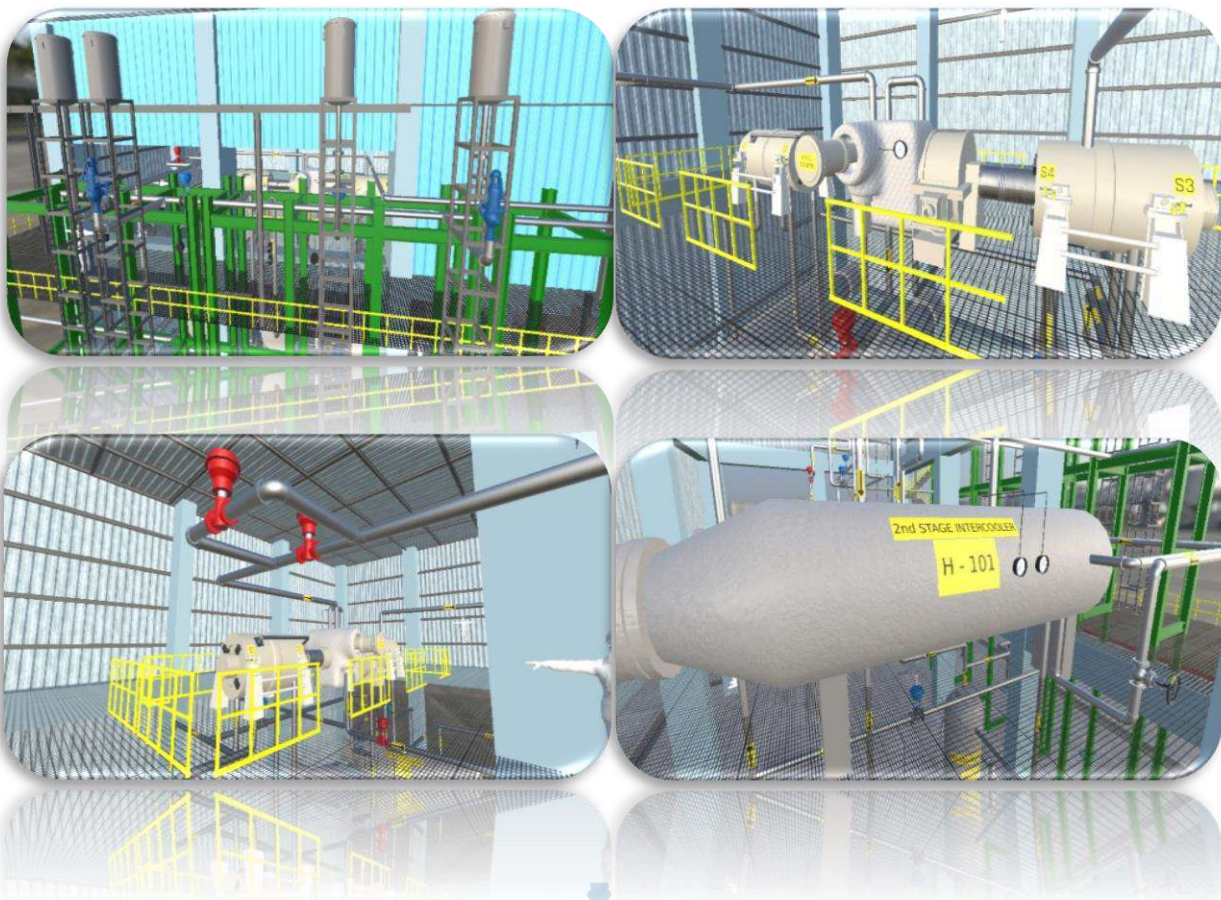
### PS-2023VR: Centrifugal Compressor Unit (Turbine Driven):

**This model simulates a turbine driven multi-stage centrifugal compressor model.**

This model consists of steam turbine driven four stage centrifugal compressor. There are three inter-stage coolers, knock out drums and one discharge cooler. The compressor has two anti-surge control systems and governor control system for the steam turbine.

The trainees will be able to take a tour of the compressor unit and perform the below operations.

- Field View: Claim various levels of the unit, view piping, associated equipment, field gauges, control and safety valves
- Field Operation: Operate field and Hand control valves (HIC)
- Local Gauges: View field gauges and KO drums level gauges and its dynamics
- Scenarios: Malfunction of compressor, turbine, coolers and response to the situation
- Start-up of Unit: Commission the plant from COLD case, coordinating between DCS and Field operators



### Performance evaluation:

Follow typical procedure for a given scenario and control associated key process variables (KPV) within the range, evaluation based on performance of trainee.

# Virtual Twin Software Solution

## Bringing Industries to the Classroom



**Hands on Training | Skilling | Employability**



For more information, Contact: [sales@siminfosystems.com](mailto:sales@siminfosystems.com)

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