A 3 Day Hands-on Course on

Batch/ Bioprocess Modelling, Scheduling & Optimisation

20 - 22 November 2006

UTM *City Campus*, Kuala Lumpur

Organised by : CEPP Chemical Engineering Pilot Plant

In collaboration with : INTELLIGEN, INC.

The University of Nottingham

COURSE INTRODUCTION

The course presents an overview of process simulation and its role in analysing, evaluating and optimising integrated Biochemical, Fine Chemical, Pharmaceutical, Biotechnology, Food, Agricultural, Consumer Product, and Hydrometallurgical processes. As a hands on course, various case studies in Bioprocessing, Fine Chemical and Pharmaceutical Production will be covered.

Subjects covered by the course include:

- Modelling and optimisation of batch and continuous processes
- Batch process scheduling and cycle time reduction
- Resources and Inventory Tracking
- Throughput analysis and debottlenecking
- Cost analysis & project economic evaluation

All participants will cover the above topics in hands-on training sessions using **SUPERPRO DESIGNER**, a leading software in batch process modelling. SuperPro Designer was initiated at the Massachusetts Institute of Technology (MIT) and is currently developed by Intelligen, Inc. All participants will be given evaluation copies of SuperPro Designer.

COURSE OBJECTIVE

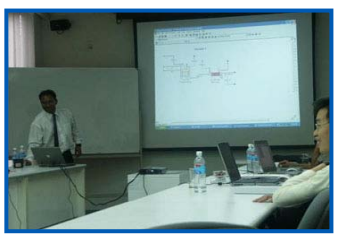
The course is designed to address the needs of scientists and engineers who work in the areas of process development and engineering, strategic and production planning, manufacturing, process scheduling and debottlenecking, as well as instructors at colleges and universities who want to integrate these concepts into related courses.

The objectives of the course are:

- ✓ To demonstrate the role of process simulation throughout the life cycle of process development and product commercialisation, and,
- ✓ For participants, to gain a valuable hands-on experience on how to better design, analyse, evaluate and optimise integrated chemical processes through the use of computer-aided tools.

WHO SHOULD ATTEND

Scientists and Engineers (R&D and process design) in Biotech, Pharmaceutical, Specialty Chemical, Food, Consumer Product, Mineral Processing, and related industries. Instructors, lecturers and researchers at colleges and universities that teach/ do research in Biochemical Engineering, Pharmaceutical Engineering, Process and Plant Design, Food Engineering and related courses.



||Appproved Training Provider by the Ministry of Human Resource (Reg. No 045) ||
Staff from more than **300 local and overseas companies** have attended our life-long learning programmes.

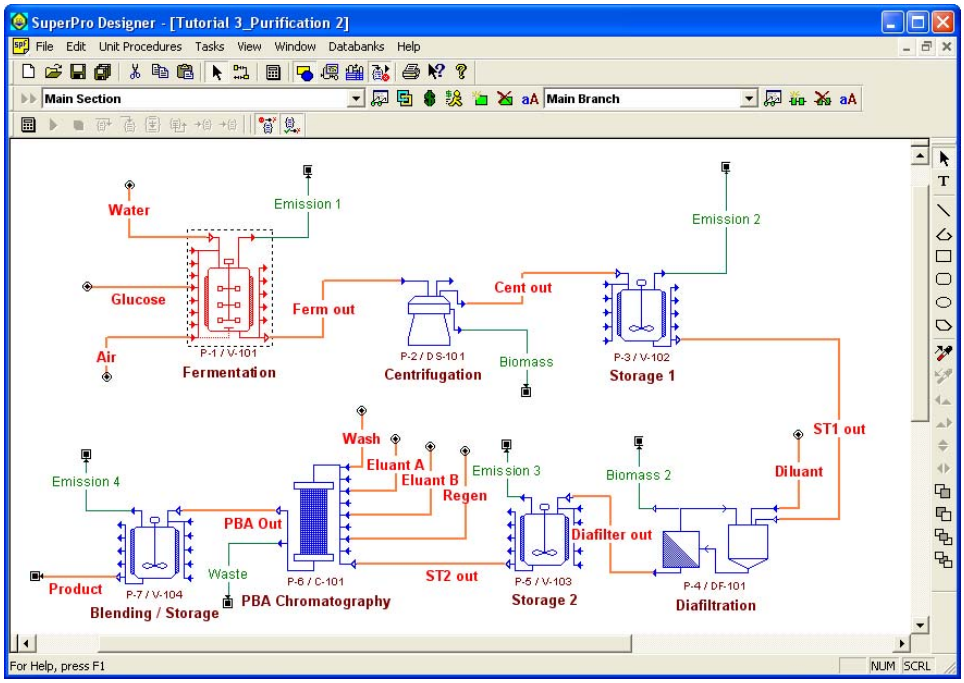
Staff from the the following companies have attended this course :
MINT, Pharmaniaga, MUST, MalChem,Innobiologic,TATI, Singapore Polytechnic

CHEMICAL ENGINEERING PILOT PLANT, UNIVERSITI TEKNOLOGI MALAYSIA

INQUIRIES

81310 UTM Skudai, Johor, MALAYSIA
Tel : +607-5531565 Fax : +607 - 5569706
Attn: **Mrs Zulia** E-mail : zulia@cepp.utm.my

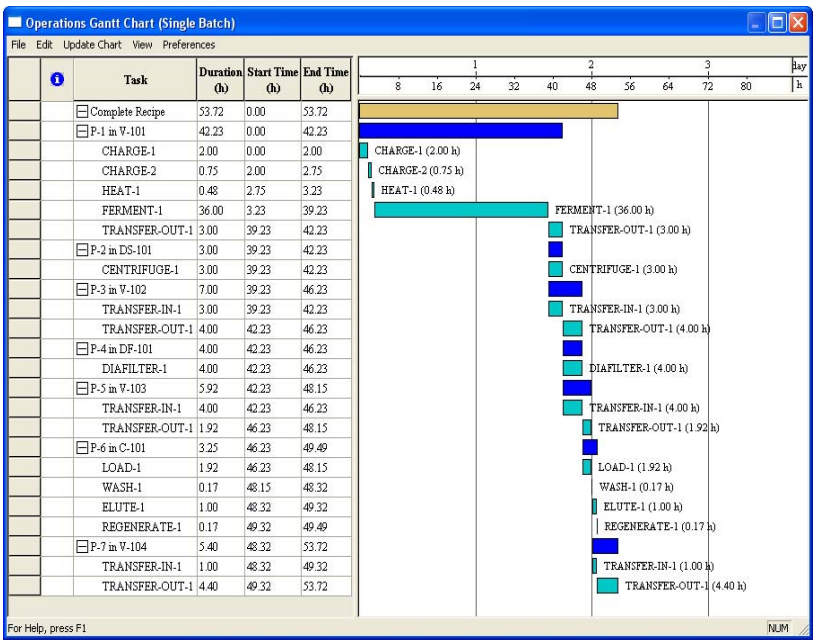
Jalan Semarak, 54100 Kuala Lumpur, MALAYSIA
Tel : +603-2615 4358 / 2615 4406 Fax : +603-26937921
Attn: **Mrs Nik Norhayati** E-mail : nikyati@citycampus.utm.my



Process description:

Water, microorganisms, nutrients and air are fed into a bioreactor where at 37ºC a fermentation takes place yielding an enzyme and impurities. Biomass is separated in a disk-stack centrifuge and the liquid is stored in tank. It is then processed in a diafilter where the remaining biomass is removed (with a small loss of product). It is stored again and then loaded onto a PBA chromatography column where the enzyme binds and is eluted using a WFI/NaCl mixture.

SuperPro Designer generates the **Operations Gantt Chart** that provides a detailed visual display of the execution of the various operations in the context of their procedures. The overall batch time is approximately 53.72 hours. The minimum effective batch time (minimum time interval between consecutive batches) calculated by Pro-Designer is 42.23 hours. This is determined by the occupancy of the scheduling bottleneck equipment, V101. The maximum number of batches per year is 187 (assuming an annual operating time of 7920 h and a plant batch time equal to the minimum effective batch time). On an annual basis, the plant produces 2440 kg/batch of purified enzyme.



The figure below is an **Equipment Utilisation Chart** generated by SuperPro Designer. It shows the execution of the various process steps as a function of time for four consecutive batches. This Equipment Utilization Chart allows for easy visualisation of the time (scheduling) bottlenecks. Along with the Throughput Analysis Report, this chart greatly simplifies the debottlenecking of complex processes.

COURSE TUTORS

SIVAKUMAR KUMARESAN

Sivakumar Kumaresan is currently a Research Associate at the Chemical Engineering Pilot Plant, Universiti Teknologi Malaysia (CEPP, UTM). He is also a lecturer at the Chemical Engineering Programme at Universiti Malaysia Sabah (UMS). He has a BS in Chemical Engineering from Texas A&M University (US) and a MSc. in Advanced Control from Universiti of Manchester Institute of Science & Technology (UMIST, UK). His area of work includes the application of artificial intelligence to water treatment and is currently working on model-based phytochemical processing design and optimisation.

DOMINIC FOO CHWAN YEE

Dominic Foo is an Assistant Professor at the University of Nottingham Malaysia Campus (UNMC). Prior to this position, he served as a Research Associate at the Chemical Engineering Pilot Plant, Universiti Teknologi Malaysia (CEPP, UTM). He obtained his BEng degree in 2000, MEng degree in 2002 and PhD in 2006, all in Chemical Engineering. His main areas of work include that of modelling and optimisation for chemical, environmental and biochemical processes; material reuse and recycle via process integration (pinch analysis) techniques; as well as process synthesis and design. He has involved in extensive training by using various process simulators for process modeling and debottlenecking study.

Course Fee

Local Participants

RM 1,550.00 per participant
RM 1,450.00 for 2 or more participants from the same company
RM 1,250.00 for staff from universities and research institutes
RM 900.00 for research students

International Participants

USD 850.00 per participant

(Fee is inclusive of lunch, refreshments and course materials)

We can offer courses in-house at your company

COURSE SCHEDULE

FIRST DAY (20 November 2006)

Morning Session

8.30 - 9.00 am	-	Overview of Process Simulation
9.00 - 9.30 am	-	Mass & Energy Balances with Spreadsheet
10.00 - 10.30 am	-	*Coffee Break*
10.30 - 1.00 pm	-	Sequential Modular vs. Equation Solving
1.00 - 2.00 pm	-	*Lunch Break*
2.00 - 2.40 pm	-	Flowsheet Development
	-	Case Study 1 : Bioprocessing
2.40 - 3.30 pm	-	Unit Procedures Initialisation
8.30 - 9.00 am	-	Process Scheduling
4.00 - 4.30 pm	-	*Coffee Break*

SECOND DAY (21 November 2006)

Morning Session

8.30 - 9.30 am	-	Resources & Inventory Tracking
9.30 - 10.00 am	-	Equipment Rating
10.00 - 10.30 am	-	*Coffee Break*
10.30 - 11.00 pm	-	Throughput Analysis
11.00 - 11.30 am	-	Project Economic Evaluation
11.30 - 12.00 am	-	Case Study 2 : Fine Chemical Production
1.00 - 2.00 pm	-	*Lunch Break*

Afternoon Session

2.00 - 3.30 pm	-	Case Study 3 : Biochemical Production (Fermentation Section)
3.30 - 4.00 pm	-	Biochemical Production (Purification Section)
4.00 – 4.30 pm	-	*Coffee Break*

THIRD DAY (22 November 2006)

Morning Session

8.30 - 9.00 am	-	Batch Process Debottlenecking
9.00 - 10.00 am	-	Case Study 4 : Pharmaceutical Production
10.00 - 10.30 am	-	*Coffee Break*
10.30 - 11.00 pm	-	Throughput Analysis Report
11.00 - 1.00 pm	-	Debottlenecking Strategies
1.00 - 2.00 pm	-	*Lunch Break*

Afternoon Session

2.00 - 3.45 pm	-	Case Study 5: Tongkat Ali Extract Production
3.30 - 4.00 pm	-	Certificate Presentation & Future Outlook
4.00 – 4.30 pm	-	*Coffee Break*
4.30 pm	-	*THE END*

Method of Payments

Please kindly complete and return the reply form together with :

Local Participants

- By cheque / Bank draft which are made payable to **PHYTO BIZNET SDN BHD**

International Participants

- By Direct Transfer/Bank Draft:
  CEPP Bank details: **Bumiputra Commerce Bank Berhad**
  Universiti Teknologi Malaysia
  81310 UTM Skudai, Johor, Malaysia
- Account No : **0118-0004178-05-7**
- Please instruct your bank to remit us the full amount, net of bank charges

Cancellation & Substitutions

A full refund will be promptly made for all written cancellations 2 weeks before the meeting. 50% refund will be made for written cancellations received 7 days before the meeting. A substitute may be made at any time.

Note a) The organiser has the right to make any amendments that they deem to be in the best interest of the course and to cancel the course if insufficient registrations are received a week before course commencements date .
B) ***CERTIFICATE OF ATTENDANCE*** will be awarded at the end of the course.

REPLY FORM

BATCH/BIOPROCESS MODELLING, SCHEDULING & OPTIMISATION

20 - 22 Nov. 2006 : CEPP, UTM *City Campus*, KUALA LUMPUR

YES ! I would like to register the following participants

Name 1 _____

Job Title _____

Name 2 _____

Job Title _____

COMPANY INFORMATION

Company _____

Address _____

_____

Town _____

State _____

Tel _____ Fax _____

AUTHORISED Signatory (*This registration is invalid without signature form an authorised officer)

Name _____

Job Title _____

Tel _____ Fax _____