

Honeywell Users Group 2009

Return on Imagination

Peter Henderson, Product Marketing Manager

How Operator Training Provides
Returns on Operations and Improves
Return on Capital Investments

Honeywell

Industry Challenges

Safety

Protect People, Assets
and Process



Billions lost per year
in Petrochem Industry

Reliability

Improve Availability
Reduce Downtime



Millions lost per year
due to unplanned
production losses

Efficiency

Improve Productivity
Reduce Cost



Fewer people
can make better
decisions, faster

Industry Challenges

Errors and inefficiency cost money

- U.S. process plants lose over **\$20 billion a year** from abnormal situations; **\$8 billion (40%) is directly attributable to human error.**

These losses are caused by insufficient employee knowledge, and operator and maintenance worker errors.

Abnormal Situation Management Consortium (ASM)



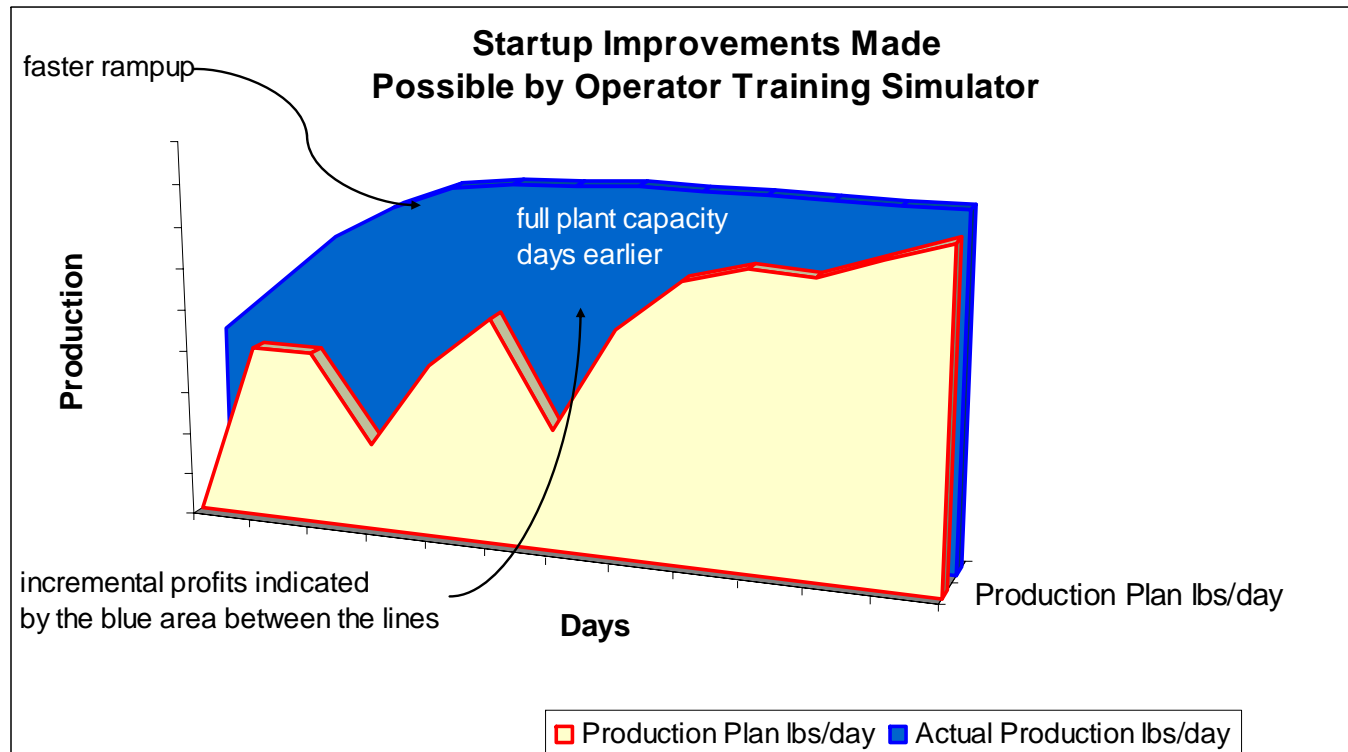
Operator Competency – What is it?

- **Experience** required to properly perform a specific job – founded upon:
 - **Knowledge** – Fundamental Process Understanding
 - **Skills** - Procedural Training, Practical Skills, Achieved through Practice
 - **Behavior** – Composure, Trained Response, Reflexive Under Pressure
 - **Experiment** – although related, you wouldn't want to do it in production
- **Expertise**
 - Skills, understanding, knowledge possessed by expert
- **Expert**
 - Possess Reliable Expertise, confident understanding

Customer Value from Operational Readiness

- Preparing Operators for Initial & Sustained Operations
 - Selecting the right operators
 - Providing with the right skills
 - Ensuring or Certifying Operator Competency
- Preparing Plant Assets virtually for Initial & Sustained Operation
 - Process Readiness
 - Automation System Readiness
 - Procedural Readiness
- Benefits from Operator Training Programs are measured by
 - Economic impact from improved Plant Availability which can expressed in
 - \$ or days
 - Earlier initial operations and in sustained ongoing operations
 - Number of Incident Free Days
 - Number of Certified Operators
 - Program Maturity & Long Term Commitment

Value from Operational Readiness



- Profit Generation realized earlier and reliably
 - Typical payback for new projects from faster start-up (3 days)
 - Annual benefits - improved operations & reduced upsets (0.5% savings)
 - Cumulative benefits over 10 years greater than \$20 million.

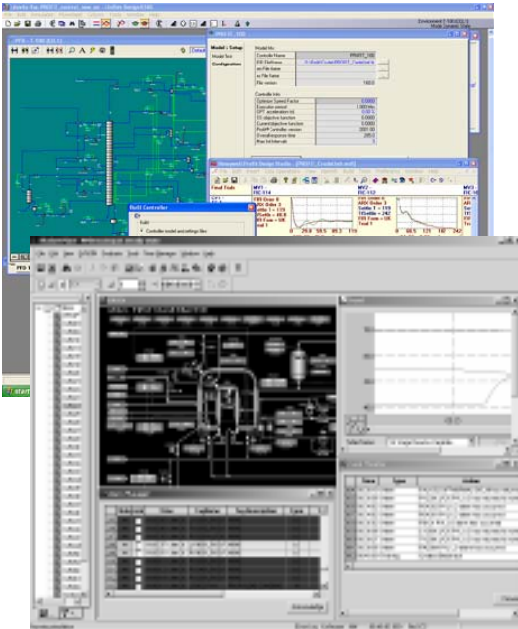
Operator Competency – Today's Training Methods

- Do nothing - Gain nothing
 - Comparison - would you:
 - Fly with an untrained pilot or a pilot uncertified for your 747?
 - Feel comfortable living beside a nuclear facility with untrained operators?
 - Receive a medical procedure by an unskilled practitioner?
- Classroom Training, Reading Exercise
 - Conveys process knowledge without practical operating skills
 - No operating experience (a methodical practice of monitoring operating variables, recognizing impending upsets and reacting before plant trips)
 - No test of ability to act under pressure
- Startup with experienced operators from other sites
 - What do you do if your plant is the 1st of it's kind of operation?
- Operator Mentorship Training in the Control Room
 - On-the-Job Training (OJT)
 - Reduced Curriculum – focus tends to be familiarization at normal conditions
 - There is no latitude to prepare a trainee for startups or process upsets
 - Much more costly to learn from mistakes
 - High travel costs to train in similar corporate facilities
 - Takes a really long time to capture experience !

The Pursuit of Operator Competency

- What kind of Training Solutions are Customers asking for?
- Accelerated knowledge transfer by process & procedural training !
- Formalized, comprehensive, graduated level Operator Training Program
 - **Entry Level Training** for new operators
 - Result → Finding the Right Candidates
 - **Classroom Training** to present fundamental knowledge of the relationships between process & operating variables
 - Result → Understand Fundamentals
 - **Process Simulator Training** to dynamically reinforce process classroom fundamentals by observation
 - Results → Practical Experience
 - **Procedural Training on a Customized Simulator** to consolidate years of practical control room experience in a concise operations curriculum
 - Results → Skills, Behavior, Practice, Reinforcement, Routine, Free to Learn from Mistakes/Experiment
- Maintained program as plant changes
 - Result → Sustained Training Benefits of Long Term Investment`

UniSim Operations Suite R320



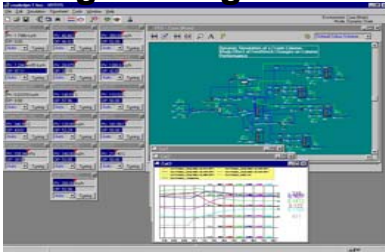
- What is UniSim Operations Suite R320?
 - UniSim Instructor Interface, Training Tools & Platform
 - UniSim Design Dynamics R390
 - Control System Simulation
 - Experion PKS R310 & Safety Manager R120
 - Many other DCS/Safety System solutions
- Applications
 - Operator training
 - Process & Equipment Readiness
 - Control strategy verification
 - Operating procedure development

Safety Reliability Efficiency

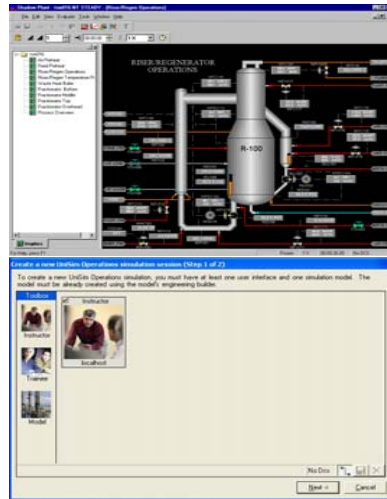
	Safety	Reliability	Efficiency
UniSim Design	<p><u>Safe Design</u></p> <ul style="list-style-type: none"> Safe Operating Bounds What-if Scenario - HAZOP Develop Safe Procedures Develop Control Strategy 	<p><u>Reliable Design</u></p> <ul style="list-style-type: none"> Predict Life of Service Corrosion Planning (Pipe) Catalyst Aging Furnace/Exchanger Fouling 	<p><u>Efficient Design</u></p> <ul style="list-style-type: none"> Capital cost optimization Optimized Process Design Optimized Targets
UniSim Operate	<p><u>Safe Operation</u></p> <ul style="list-style-type: none"> Procedural Training Operate within Bounds Safe, Correct, Quick Response to Upsets 	<p><u>Reliable Operation</u></p> <ul style="list-style-type: none"> Recognize & React before Trip Trouble Shooting for Operators 	<p><u>Efficient Operations</u></p> <ul style="list-style-type: none"> Efficiently Trained Faster Startups Operate @ Design Targets Operate On Spec
UniSim Optimize	<p><u>Safe Control</u></p> <ul style="list-style-type: none"> Control within Operating & Equipment Limits 	<p><u>Reliable Control</u></p> <ul style="list-style-type: none"> Improve on Online Analyzer Availability 	<p><u>Efficient Control</u></p> <ul style="list-style-type: none"> Increase Yields, Capacity Control to Optimal Targets Quicker Transitions Lower Material & Utility Costs

UniSim Operations Suite User Interfaces

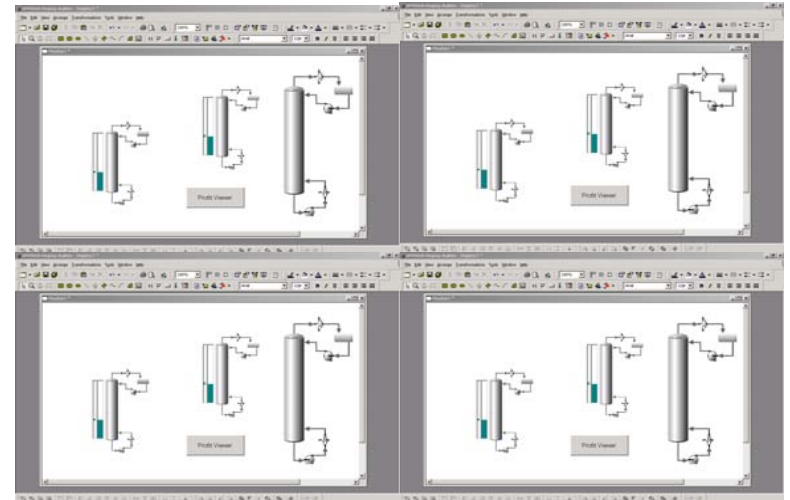
UniSim
Engineering Station



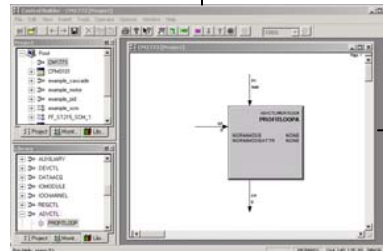
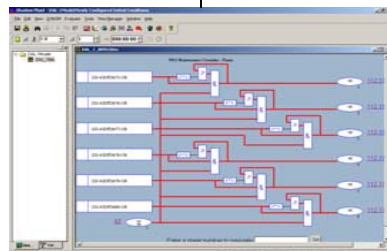
UniSim
Instructor Station



Experion Station



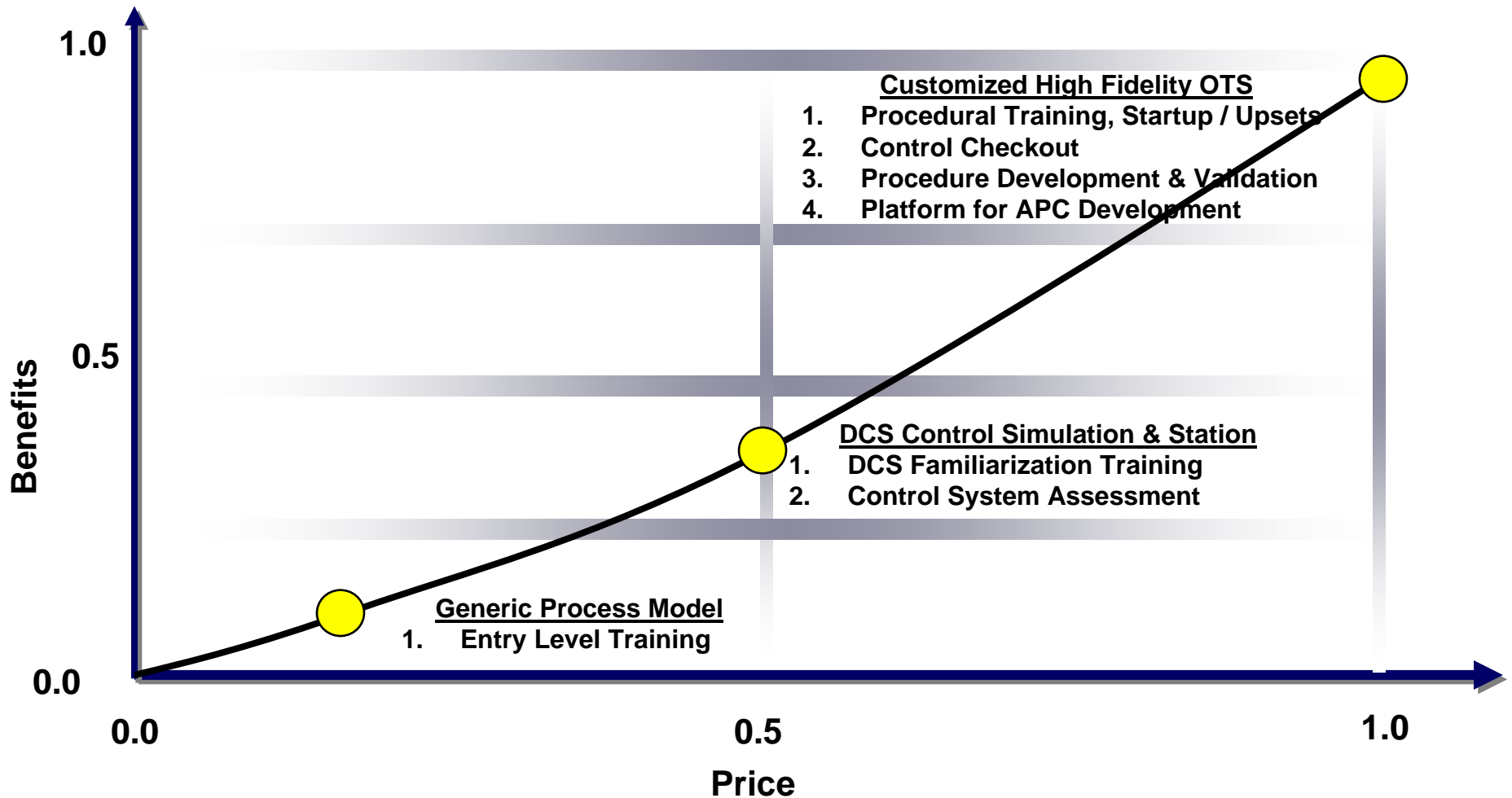
UniSim
Design Dynamic
Process Models



UniSim DCS Interface
Experion Server

UniSim Safety Manager UniSim / Experion
Control Environment Control Environment

UniSim Training Solution Map – Cost : Benefit Ratio

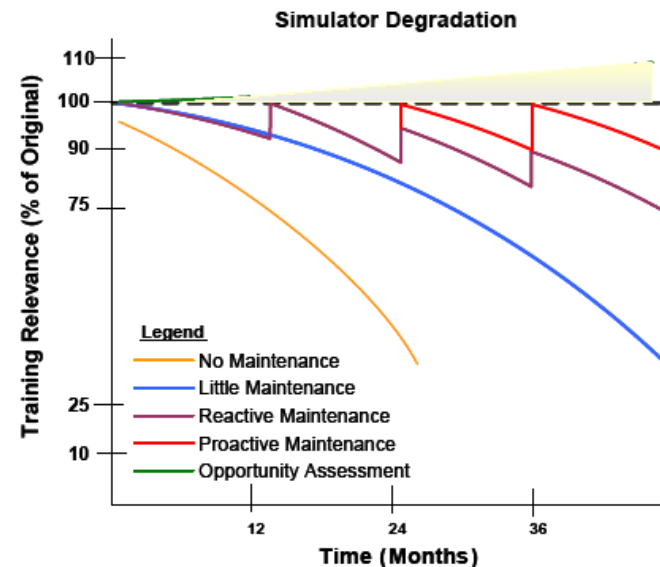


Is UniSim Better than the Next Best Alternative?

- Generic Model Training – low cost, low benefits → low value
 - Process Fundamentals on Basic Unit Operations
 - Candidate Selection
- Simplified Control Simulation – mid cost, mid benefits → mid value
 - Control Fundamentals
 - Control System Assessment
- Customized Simulator Training – high cost, max benefits → max value
 - Accelerates Transfer of Knowledge, Skills, Behavior, Confidence through
 - Process & Control Fundamentals – Controls, Graphics, Logic, Alarms
 - Procedural Training – Startup, Shutdown, Process Troubleshooting, Trip Avoidance, Rapid Recovery, Transition to Alternate Production Scenarios
 - Environment to learn from mistakes and experiment in the pursuit of Experience
 - Additional Benefits from Control & Procedural Assessment
 - Plan should consider support and system/model update
 - Investment decision & justification requires plan for the life of the plant

Maintaining Simulator to Sustain Training Benefits

- Only thing that is constant is change !
 - Plant slowly deviates from the Model
 - Simulator Software Evolves
 - System Hardware, Software Evolves
 - Training Requirements Change
 - Instructor Changeover
 - OTS Use Cases Expand
- Training Evolves with Experience
 - Captured incidents are assessed
 - Procedures evolve to avoid incidents
 - Simulator training scenarios updated
 - Remedial training for operators



Best Practices for Sustainable Training Programs

Plan

1. Identify a Simulation Sponsor from Operations
2. Study Business Drivers & Operating Objectives
3. Identify Risks that threaten Operating Objectives
4. Propose Training Solutions to Mitigate Risks

Execute

1. Scope Simulation for the Training Solutions
2. Create Schedule Identifying all Project Dependencies (Data, DCS)
3. Implementation, Delivery, Training, Turnover & Support

Reflect

1. Follow Up - Recognize Earned Benefits
2. Communicate Earned Benefits to Justify Re-Investment
3. Extend Simulation to New Problems – APC development, Incident Assessment, Process Debottlenecking, Plant Updates

OTS Program Benefits – A Sustainable Work Practice

Customer	Industry	Models	OTS	Sites	Program (Years)	Benefits
Syncrude Canada	Synthetic Crude Production	22	6	3	20+	Initial/Refresher Training for Expansion Training for Control Modernization 500 + operators Bitumen Mining & Extractions Heavy Oil Upgrading Utilities
Suncor Energy	Synthetic Crude Production	30	7	4	16	Initial/Refresher Training for Expansion Training for Control Modernization 500 + operators Heavy Oil Upgrading Utilities
Ras Laffan LNG	Liquified Natural Gas Production	18	3	1	12	300 operators, 1500 man-days annually Additional Benefits from Lifecycle Modeling Enhanced Process, DCS & Procedures Startup several days early Never missed a delivery Result ==> World Class Reputation
Shell Canada	Gasoline	10	3	3	10	75 operators
Petro-Canada	Gasoline Production	9 2	2 1	3	6	all operators from units trained Classroom Operations & DCS Montreal, Edmonton Developments in Mississauga
Comalco Alumina Refinery	Alumina Production	3	3	1	3	25+ operators, 160 hours each 4800 hours over 4 month curriculum, Additional Benefits DCS/Logic enhanced, procedure update, major process design update, Result ==> Smooth Startup

Benefits Measured in Production – Credibility through Longevity

Has UniSim been Responsible for Customer's Success?

- Honeywell can claim that:
- Simulator based operator training is just 1 of many valuable strategies clearly adopted by many of our customers which they leverage in building their world class reputation.
- Their experiences with simulation have been strong enough to accept it as a repeatable best/work practice in their business.

Interesting Recent Verbatims from Customers

- Customer Needs
 - “We need more than a training simulator”
 - “We need a training solution that:
 - captivates the operator throughout the entire training experience
 - manages enrollment/engagement of many trainees, provides training curriculum that guides trainees through challenges, captures their actions, assesses their abilities against consistent evaluation criteria, archives the result as evidence of competency”
- Accelerated Knowledge Transfer
 - “Classroom & control room mentorship is a slow process - you may never see a startup”
 - “Operators trained on OTS were independent in 1 year instead of 3 years without OTS”
- Operator Confidence
 - “If I can run the simulator, then I know I can control the unit”
- Operator Competency
 - “Operators lose their edge to APC”
 - “For operator certification through Procedural Training we require a customized OTS”
- Financial Impact
 - “Operator Training can save ½ day in a 3 day startup”
 - “Production loss due to operator ~ 1 day/yr”
 - “Converting a below average operator to an above average operator improves our bottom line by \$250k”
- American Petroleum Institute

Questions & Answers



UniSim in Action

- UniSim will be featured in several Demo Room areas

- Operate Safely & Efficiently (OSE)
 - UOP CCR Demo
 - Operator Training & AMS Graphics

- Manage Plant & Enterprise Production (MPEP)
 - Energy Dashboard

- Engineer the Process & Control System
 - UniSim in Design
 - UOP Collaboration on Master Models
 - Advanced Energy Systems
 - Advanced Bleaching

