Why the dynamic Operator Training Simulator proofs to be an Indispensable Tool

Jasper Rutten
Huntsman

Henk Leegwater
OTS

Emerson Global Users Exchange Brussels 2016

Twitter Conference Hashtag: #EMRex
Presenters

- Jasper Rutten
- Henk Leegwater
Introduction – Jasper Rutten

- Senior Process Engineer for the Upstream MDI plants at the Rotterdam site of Huntsman.

- Team leader for process engineers, which supports the day-to-day operation of the two Upstream plants.

- Beside this role, also performed the role of commissioning manager for the recent DCS migration of the MDI-2 plant.

- Within the 15 years working for Huntsman several roles in the area of process engineering (process engineering, process development, R&D).

- **Per 1 April 2016** – Process Automation Teamleader
Introduction – Henk Leegwater

- Active in process industry > 38 years
- Former Plant Manager Naphtha Cracker
- Former University Professor
- Consultant from Board Room till Plant Floor
- Managing Director of Operator Training Solutions
Introduction
Introduction

Markets include:
- Adhesives, Coatings and Elastomers
- Appliances
- Automotive
- Insulation
- Composite Wood Products
- Footwear
- Furniture & Bedding
- TPU
OTS an indispensable tool

Session tomorrow 9:30
Room 216
Challenges - Huntsman

Qualified operators
- Aging experienced operators
- Increased mobility operators
- Certification (CCR-) Operators

Process Control System
- Existing system was limiting the production goals
- Aged control strategy
- EndOfLive current DCS- and SIS-system
Operators back in charge

Huntsman Management:

“Condition for starting up the modified MDI 2 plant:
Huntsman Management:

“Condition for starting up the modified MDI 2 plant: well trained operators based on a dynamic Operator Training Simulator”
User requirement specifications

Operator Training Simulator incl. dynamic plantmodel

Phase 1:
- Train operators for TA2015
- Support DCS-FAT

Phase 2:
- Advanced training and certification with high fidelity plantmodel
- Testing future modifications
Long term goals

- Well trained pro-active acting operators, who prevent upsets and disturbances.
- Abnormal situations or emergencies will be handled proficiently and adequately.
- Operators will be certified based on competence profiles.
However: experiences with OTS

Many Operator Training Simulators in the industry are out of service:

- Not reflecting the plant anymore
  - new DCS graphics, control etc. not changed in the OTS
  - plant modifications not implemented in the OTS

- Training programs not challenging

- Not needed for operator certification as for airline pilots
OTS: Joined Competences and Experiences

Operations
Business Needs

Training Assessment Certification

Simulation Dynamic Process Model

lexxin management & consultancy

EMERSON.

TEM
TRAINING EVENT MANAGEMENT BY


Mobatec model-based technology
Operator Training Simulator

- High Fidelity simulation of a plant: control room operator does not see a difference
- Field operator training included!
- Disturbances by the instructor
- Operator assessment based on scenario’s
Architecture of OTS from OTS BV

Installation

HMI

DCS ESD/SIS

I/O

plant

Simulator

HMI

DCS ESD/SIS

Dynamic Process Simulator

NOT connected to the real world!
OTS Architecture - OTS BV

Installation

- HMI
- DCS ESD/SIS
- I/O

Simulator

- HMI
- DCS ESD/SIS
- Dynamic Process Simulator

Identical:
No maintenance needed!
Just: copy & paste

Mobatec:
No programming skills needed
OTS maintenance

Big projects: performed by contractor(s)

Small projects: DIY
Process Operators are the Pilots of the Process Industry

Cockpit Flight Simulator Boeing 737-800
Minimize the Human Factor like your Achilles Heel

Prepare your crew for Procedures and Emergencies
Why Simulators?

- I hear and I forget
- I see and I remember
- I do and I understand

Confucius
Simulator Elements

- Simulation Environment (Mobatec Modeler software)
- Plant Model
- DCS
- ESD/SIS Emulation
- Non DCS Panel: annunciator/push button emulated via a touchscreen display
- Instructor station
- Field Operator Functionality
Simulator Elements
Simulator Elements
Crew Resource Management

- Performance depends on all operators:
  - Control Room Operator
  and
  - Field Operator

- Both need to know what and where to handle

- Communication crucial!
Crew Resource Management

Objectives:

• to enhance the communication and management skills of the crew members concerned

• emphasis is placed on the non-technical aspects of crew performance

Source:

European Aviation Safety Agency — Rulemaking Directorate
Notice of Proposed Amendment 2014-17

Crew resource management (CRM) training
RMT.0411 (OPS.094) — 26.6.2014
Field-operator activities in the simulator
Field-operator activities in the simulator
Field-operator activities in the simulator
Field-operator activities in the simulator
Field-operator activities in the simulator
Field-operator activities in the simulator

Not: Virtual Reality
Not: Augmented Reality
Field-operator activities in the simulator

a Real Reality Opportunity!
Field-operator activities in the simulator

New Reality. New Opportunity!
Field-operator activities in the simulator
Training Effort

Numbers:
- All control room operators trained
- Short acquaintance training
- 5 training blocks of 3.5 hrs
- 20 hrs. training per trainee
OTS an indispensable tool

- Safe & quick start-up of MDI-2 after DCS migration
  - Well trained operators, who started-up already several times the (simulated) plant
  - Start-up time saving thanks to dynamic pre-testing

- Operator development & certification

- Dynamic simulation opportunities
Let’s Connect

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- Back-up sheets
OTS general project steps

- Determining scope
  - Coloring PID’s (what’s in and what’s not)
  - Choice of components
  - Thermodynamics
  - Physical properties
  - Reaction kinetics

- Setting-up equipment & connections in modelling engine: Mobatec Modeller
- Apply chemicals
- Test individual units
- Integrate units into one model
- Connect Dynamic Model with DCS
- Tuning & Acceptance
OTS: Joined Competences and Experiences

Henk Leegwater
- consultant
- former plant manager
- former engineer
- former professor

Operations Business Needs

TEM
- based on industrial experience
- former production supervisors
- assessments
- Deltalinqs trainingloket

Training Assessment Certification

Simulation Dynamic Process Model

Modeller
- > 10 years on the market
- based on TU/e science
- developed by people with 10 – 40 years industrial simulation experience
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PARADIGM SHIFT

OTS has adopted the Zero Fly Time (ZFT) principle and Crew Resource Management from the aviation industry. With the delivery of the high fidelity simulator, all operators - both in the control room and the field - can be trained simultaneously in normal operations and emergency response.

For the training of field operators we make use of augmented reality, on devices like an iPad or tablet. The plant is then used as a learning facility.

Any change in the real system can be updated in the simulator environment instantly. Our unique modeller allows you to adapt the system independently of any supplier, by yourself.

If the plant is adapted or extended, you can test all changes with the simulator before being copied to the real plant.

UNIQUE BUYING ARGUMENTS

Lower Costs

- 30% lower initial investment in simulator technique
- Lower cost of operations: in-house maintenance
- Precommissioning before start-up
- Flawless start-up, teething troubles have been eliminated during simulation

Value for money

- Training for panel and field operators simultaneously
- Scenario based training
- Validated results in assessment
- Input for certification
- Process analysis & optimisation

Flexibility

- Shorter lead-times to experienced operators (minimum 1 year sooner)
- Compatible with all types of DCS (distributed control systems) / SCADA - supervisory control and data acquisition
- Easy to integrate in existing learning

LATEST NEWS

Join our Round Table sessions
25 July 2015
At the end of September we will gather our key partners in the petrochemical industry in a Round Table session
Read More »

New simulator for Huntsman Holland
20 June 2015
New DCS Huntsman Holland successfully trained on OTS simulator.
Read More »
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Training Functionality

• OTS BV:
  – in depth knowledge of operator training
  – based on many years of experience in the process industry
  – former shift supervisors and learning- and development supervisors

• Crucial aspects
  – Competences
  – Assurance
  – To be expected: certification

• Team training incl. field operator

• Special advisors OTS BV:
  • Hans Hollink - captain 747/former KLM instructor
  • Erik van der Pluijm - captain 747 & architect of KLM’s training program after ‘Tenerife’
Tenerife March 27th 1977
Tenerife March 27th 1977

The deadliest accident in aviation history
583 fatalities
Tenerife March 27th 1977

Responsable was one of KLM’s most experience pilot: Captain Jacob Veldhuyzen van Zanten

- 11,700 hours of flying experience
- chef-instructor Boeing 747
- Almost all KLM 747 pilots that time got instructions from him
- Role model in advertorials of KLM
Crew Resource Management objectives

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Crew resource management (CRM) training
RMT.0411 (OPS.094) — 26.6.2014
ICAO: the eight core competencies of flight crew

1. Application of procedures
2. Communication
3. Flight path management - automation
4. Flight path management - manual control
5. Leadership and teamwork
6. Problem solving and decision making
7. Situation awareness
8. Workload management

in alphabetic order
The paradigm shift

• The level of the completion of a task is measured by the level of the application of the Core Competencies and their Behavior Indicators, which differs in sequence and weighting from one task to another.

• This goes beyond the simple fulfillment of the required standard.