

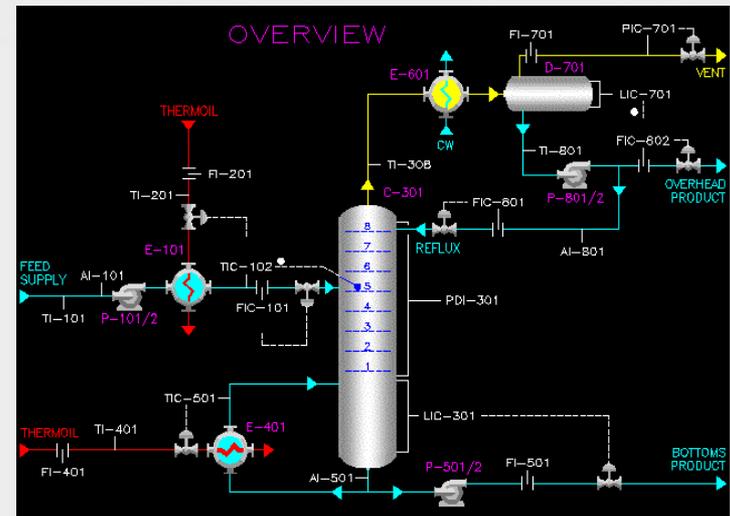
전문 강사와 함께하는 Standard Operator Training Simulator (OTS)

공정 및 장치 원리 이해 및 운전 연습

- 표준 공정 및 장치 모델 (비용 저렴)
- 전문 강사에 의한 교육
- 원리 및 개념 교육
- 공정 및 장치에 대한 이해가 쉬움
- 지시에 대한 이해가 빠르고, 순발력, 자율 능력, 생산성 향상
- 이해를 통한 교육으로 기억이 오래감.
- 절차서에 없는 문제 대응 능력 향상
- 어떤 공정에도 적용 가능함
- 순환 근무시에도 적응이 빠름

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□ OTS 교육을 통한 이익 (Better Operations)

- Better Emergency Response
- Less Downtime
- Less Rerun of Product
- Less Downgrade of Product
- Less Equipment Damage
- Less Absenteeism
- Less Supervision
- Lower Energy Costs
- Less Production Loss
- Closer Environmental Compliance
- Safer Operations.

□ Return of Investment (ROI)

- Saving US\$90,000 / Operator
- Board Operators가 20명일 경우 연간 절감액 : US\$1,800,000

교과 과정

	Pumping System	4	
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2차 교육 과목

- Crude Distillation Units (ADU and VDU combined)
- Fluidized Catalytic Cracking Unit (FCCU)
- Delayed Coking Unit (DCU)
- Hydrosulfurization Unit (HDS)

4차 교육 과목

- Compressor Series:
 - Reciprocating Compressor
 - Centrifugal Compressor
 - Steam Turbine
- Reactor Series:
 - Batch Reactor
 - Multi-Purpose Batch Reactor
 - Continuous Stirred Tank Reactor (CSTR)
 - Tubular Reactor
 - Fixed Bed Reactor

3차 교육 과목

- Pump and Tank Series
 - Pump and Tank System
 - Mix Tank, Blending Tank
 - Total Trainer
- Pump Series:
 - Pumping System
 - Centrifugal Pump
- Heat Transfer Series:
 - Heat Exchanger
 - Condenser
 - Reboiler
 - Air Cooler
 - Cooling Tower
 - Natural Draft Fired Heater
 - Superheated Steam Boiler
- Instrumentation Series:
 - Process Characteristics
 - Basic Control Concepts
 - Multi-Element Control

□ Standard Process Models

- 주요 플랜트에서 공통으로 사용하는 공정으로 구성.
- 주로 공통적으로 적용되는 효과, 원리, 개념을 다룸.
- 교육에 효과적인 기능들이 많음.
- 공장마다 설비 규모, 피드, 운전 변수가 다르나, 동일한 기본 지식과 운전 원리 및 개념은 필요함.
- 표준 공정 모델이 신규 또는 경험있는 운전자 모두에게 귀중한 도움을 주는 것은 증명이 되었음.
- 공정을 심도 있게 이해
- 공정을 변경할 때 / Upset에서 조치할 때 WHY, WHAT, WHEN을 처음으로 이해

□ Custom Process Models

- 신규 공정의 Start-up에 주로 사용
- 예외적인 설비/제어 체계/운전조건을 가진 특이한 공정의 운전 연습을 위하여 사용.
- 초기 Start-up 또는 특정 운전 목적으로 만들었으므로, 사용할수록 효과가 떨어짐.
(대부분의 공장에서 초기 Start-up 이후 사장됨)
- 실제 공정과 유사하게 만들기 위하여 초기 비용 및 시간에 과도한 투자가 필요함.
- 실제 공정과 동일하게 유지 및 수정을 위하여 비용 및 시간 투자가 지속적으로 필요함.

1. Simtronics OTS 개요

□ 공정 산업과 교육 기관을 위한 혁신적인 OTS (Operator Training Simulator)

- 표준 OTS 개발 분야의 세계적인 선두주자
- 동특성 및 지연 시간을 고려한 실시간 공정 모델
- 경제적이고, 직관적이며, 고도의 모사성으로 교육 가치 극대화
- 성과 평가, 정교한 운전 실수 확인, 통합된 설비 교육을 포함한 최첨단 기술

□ A heritage of innovation

- 1992년부터 OTS를 개발
- Simulation과 교육 경험을 바탕으로 증명된 최신 기술과 혁신으로 기능을 지속적으로 확장

□ Simtronics의 OTS 구성

- DSS-100 : OTS 시스템
- SPM Series : 표준화된 공정 모델 (Standard Process Model) ●
- CPM Series : 고객의 요구에 따라 개발된 공정 모델 (Custom Process Model)
- PSU-100 : Operator의 운전 기술 평가를 위한 Tool

1. Simtronics OTS 개요

□ The DSS-100 : a unique combination of sophistication and ease

- 매우 정교하고 사용이 쉽고 편리함.
- 범용적인 표준 운전 모델 (SPM, Standard Process Models)은 상업적 OTS 중에서는 유일.
- 쉽게 구성할 수 있는 시스템의 유연성 - 모든 레벨의 교육에 이상적으로 사용.
- 상호 대화적이고, 동적이며, 실시간 공정 Simulator입니다..
- 고도의 모사성을 가진 Standard Process Models (SPM Series)
- 현장의 요구에 따른 Custom Process Models (CPM Series)을 개발

□ Our clients

- 세계적인 석유화학 회사에서 교육 기관까지 목적에 맞게 경제적으로 OTS 구현 ●

□ Meeting the demands of today's training environment

- 공정 산업에서의 쟁점들이 매일 증가
 - 교육 자원의 소멸, 무한히 증가하는 규제, 인력의 감소
 - PSM (Process Safety Management) 감사
- 가장 경제적인 해결 방법 중 하나가 공정 Operator 교육의 자동화
- DSS-100 Dynamic Simulator는 회사와 정부의 Operator Training에 대한 요구를 만족
- DSS-100은 쉽고 즉시 적용할 수 있으며, 교육 결과를 빠르게 확인.

1. Simtronics OTS 개요

□ DSS-100

- 교육생이 조작한 모든 절차를 자동으로 기록 (운전 시간 포함)
- 예) Set points 변경, Alarm Acknowledging, 계기 Tuning
- PSU-100은 모든 데이터를 분석하며, 시험 문제의 표준 점수에 따라 목표 점수를 할당

□ System Advantages

- 기준 선택 :
 - 표준모델, 표준모델 실행 번호, Simulation 실행 날짜, 강사가 할당한 등급 (Class)
- 성과 표준에 해당하는 자신만을 위한 연습문제 생성 :
 - 스스로 표준 운전 절차의 습득 수준을 관리하고 점수 기준을 생성.
- 5가지 종류의 Report :
 - Score Summary, Score Detail, Trend Comparison, Event Comparison, Notes
 - 모든 Report는 화면에 표시되고 출력이 가능함
- Report는 외부 프로그램에 복사됨 (손쉬운 Comments 기능 포함)
 - 예, MS-EXCEL, 교육기록관리 시스템 (TRMS), 학습관리 시스템 (LMS)
- 종합 점수 Report :
 - 교육생들 간 또는 전체 Class의 점수 비교
 - 동일 문제를 여러 번 반복함으로써 개별적 진척 상황 추적.
 - 여러 개의 Simulation을 관찰하고 0~100%로 점수 관리.

1. Simtronics OTS 개요

□ Delivering Cost-Effective Training

- 실제 운전에서는 시도해 볼 수 없는 운전 변수 변경, 절차에 대한 Simulation
- 표준 공정 모델 사용 - 저렴한 비용으로 다양한 공정의 Operator를 교육.
- 지속적인 사용 (대부분 OTS는 공정 초기 Start-up 이후에는 사장되는 것이 현실).
- 다양한 공정 모델 제공
- 자동으로 평가 / 관리 - 효율적인 시간, 비용, 인력 (효과적인 교육 환경 제공).

□ Promoting Competency Assurance through Performance-based Training

- PSU-100 (Performance Scoring Utility)로 운전 능력을 표준 점수와 비교하여 분석
 - 표준 점수를 기준으로 교육생의 운전 능력을 자동으로 분석 및 Report
 - 6개 주요 운전 Skill에 대하여 점수 (0~100%) 기록 (개인 기록, 그룹 기록)
- 강사를 위한 관리 기능 : 문제 출제, 표준 점수 설정, 운전 기술의 능력에 대한 보고서
- 개별 운전 절차를 기록 : 표준 Event Log과 일일이 비교하여 운전 능력 향상
- 표준 운전 절차와 차이 나는 부분을 확인

□ 6개 주요 운전 Skill 영역

- Elapsed Time (경과 시간)
- Standard Operating Procedure (표준 운전 절차)
- Safety (안전)
- Alarms (경보)
- Deviation from Design (설계와 차이)
- Product Quality (제품 품질)

2. PSU-100 (Performance Scoring Utilities) 개요

- 강사가 교육생의 능력과 진도를 평가할 수 있도록 지원
- Documentation – 교육 결과 (ISO 9000, API RP-750 요구 사항 만족)
- OSHA 1910.119 요구에 따른 Report 제공
- SPM Series는 표준 운전 절차를 가지고 있음.
- 각 SPM 모델 별로 초기 조건 값을 가지고 있음 (예, Distillation : 40개의 초기 조건)
 - Design Condition with Feed Pump Failure
 - Cold start conditions with steam failure
 - Intermediate conditions with upstream composition changes
- 개인적 진도에 맞게 설명
- 운전 능력 증명에 대한 입증된 방법론 제공
- 경쟁심 유발
- 운전 목표 제공
- 수치화된 득점에 대한 인지
- 모든 운전 데이터 기록
- 강사를 위한 추가 데이터 Reporting

3. Simtronics SPM 종류 (1/2)

Tank Series

- SPM-100 Tank System
- SPM-110 Pump and Tank System Process
- SPM-300 Mix Tank
- SPM-310 Blending Tank
- SPM-610 Total Trainer

Distillation Series

- SPM-500 Flash Tank
- SPM-600 Unit Operations
- SPM-700 Distillation
- SPM-910 Reboiler

Pump Series

- SPM-200 Pumping System
- SPM-800 Centrifugal Pump

Compressor Series

- SPM-1300 Reciprocating Compressor
- SPM-1400 Centrifugal Compressor
- SPM-1410 Steam Turbine

Heat Transfer Series

- SPM-400 Heat Exchanger
- SPM-900 Condenser
- SPM-1000 Air Cooler
- SPM-1010 Cooling Tower
- SPM-1200 Natural Draft Fired Heater
- SPM-1500 Superheated Steam Boiler

Reactor Series

- SPM-2000 Batch Reactor
- SPM-2010 Multipurpose Batch Reactor
- SPM-2100 Continuous Stirred Tank Reactor
- SPM-2200 Tubular Reactor
- SPM-2300 Fixed Bed Reactor

Green Energy Series

- SPM-4000 Biomass Fermentation
- SPM-4100 Ethanol Distillation
- SPM-4200 Ethanol Plant

3. Simtronics SPM 종류 (2/2)

□ Refinery Series

- SPM-2400 Fluidized Catalytic Cracking Unit
- SPM-2500 Atmospheric Distillation Unit
- SPM-2600 Vacuum Distillation Unit
- SPM-2700 Crude Units (ADU & VDU combined)
- SPM-2800 Delayed Coking Unit (DCU)
- SPM-2900 Hydrodesulfurization Unit (HDS)

□ Power Plant Series

- SPM-5000 Heat Recovery Steam Generator (HRSG)
- SPM-5100 Steam Turbine with Generator
- SPM-5200 Gas Turbine with Generator
- SPM-5300 Condenser with Cooling Tower
- SPM-5400 Boiler Feedwater System (BFW)
- SPM-5500 Thermal Power Plant
- SPM-5600 Combined Cycle Power Plant

□ Water and Wastewater Series

- SPM-6000 Multi-Stage Flash Evaporator (MSF)
- SPM-6100 Reverse Osmosis Unit (RO)

□ Oil and Gas Processing Series

- SPM-3000 Gas Oil Separation Process (GOSP)
- SPM-3010 Advanced GOSP
- SPM-3020 Three Phase Separator
- SPM-3030 Gas Dehydration
- SPM-3040 Advanced GOSP with Gas Dehydration
- SPM-3050 Tank Battery
- SPM-3100 Amine Treating Unit (ATU)
- SPM-3200 Sulfur Recovery Unit (SRU)
- SPM-3300 Sulfur Plant (ATU & SRU combined)
- SPM-3400 LNG Plant
- SPM-3410 Propane Refrigeration Compressor
- SPM-3500 NGL Recovery Unit
- SPM-3510 Gas Compression Plant
- SPM-3600 LPG Unit
- SPM-3700 NGL Plant (NGL Recovery and LPG combined)
- SPM-3800 GTL Plant

4. DSS-100 주요 기능 (Access 등급)

- **Access 등급 :** **등급에 따라 사용 기능 차이**
 - Operator : 교육생 (운전 기능만 가능)
 - Technician : 교육생 (Operator 기능 + Instrument Detail Display 설정 가능)
 - Standard : 성적 평가 기준 생성 (Performance Standards의 수립/변경 가능)
 - Instructor : 강사 (data 수정 / 훈련 연습 설정 / 성적 평가관리)

- **Process 선택 :** **표준 모델 중 1개 선택**

- **Exercise 설정 :** **연습 문제 선택**

- **RUN :** **연습 실행**

- **TEST :** **테스트 실행**



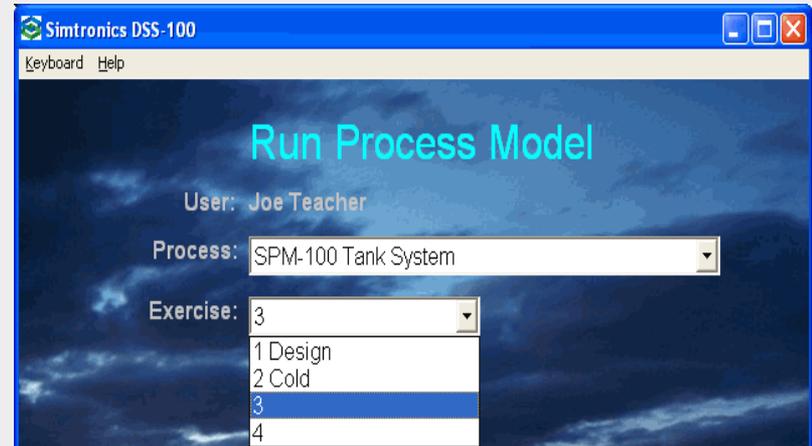
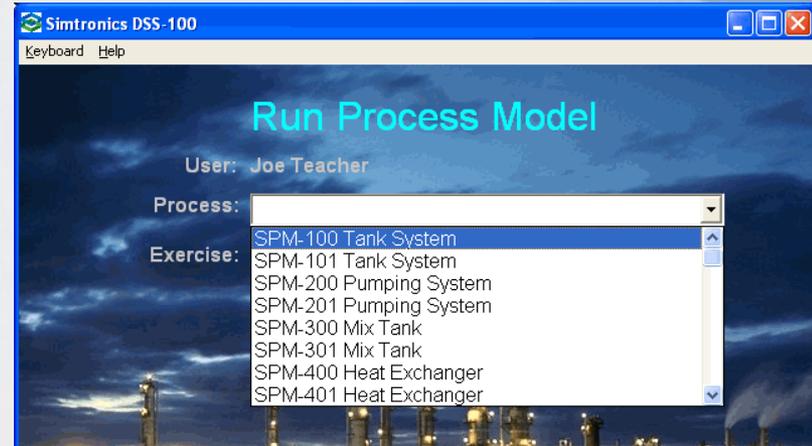
5. DSS-100 주요 기능 (Process 및 Exercise 선택)

□ Process (표준 모델 중 1개 선택)

- 예, SPM-100 Tank System

□ Exercise

- 1 Design : 정상상태 (normal shutdown 연습)
- 2 Cold : Cold Start (Start up 연습)
- 3 이상
 - 공정 별로 다양한 Exercise가 설정
 - 신규 등록 가능.
- 미리 설정된 Fault (공정 Trouble)가 지정한 시간에 발생하면 교육생은 해당 상황에 맞는 조치를 진행하여 연습
 - 연습 절차를 표준 절차와 비교하여 평가.



- 표준 모델은 2가지 단위를 제공함 : SPM-XXX0 (English units), SPM-XXX1 (Metric units)
- 1 Design 및 2 Cold는 모든 Process에 모델 특성에 따라 기본으로 설정되어 있음.

6. DSS-100 주요 기능 (Run 및 Test 선택)

□ RUN

- 테스트를 하지 않고 연습 시에 사용

□ TEST

- RUN과 동일한 기능이나 테스트 시 사용.
- 테스트 결과를 연습한 RUN과 구별하기 위하여 사용.



7. DSS-100 Tutorials

□ DSS-100 Tutorials

- DSS-100의 사용법을 동영상으로 설명 (Flash, Animation, 음성 설명)
- 운전 연습 중에 Tutorial 및 Manual 참조 가능

Help

- Contents
- DSS-100 Tutorials
- Training Manuals...
- User's Guide
- About

DSS-100 Tutorial Contents

- [Log-on and Tour](#)
- [Running an Exercise](#)
- [Basic Simulator Control: Schematic Displays](#)
- [Intermediate Simulator Control: Group Display](#)
- [Intermediate Simulator Control: Trend Display](#)
- [Mastering an Exercise](#)
- [Advanced Simulator Control: Design](#)

Using the Instructor Log-On

- [Introduction to Faults](#)
- [Creating an Exercise](#)
- [Setting a Standard](#)

Introducing the Session Manager

- [Session Manager: Working with...](#)
- [Session Manager: Working with...](#)
- [Performance Score Utility: Ana...](#)

simtronics

DSS-100-G01 Log-On and Tour

Purpose

Learner will log onto the DSS-100, select a model, run a process (Design exercise), use navigation methods, and identify screen areas. Exit the simulation and log off.

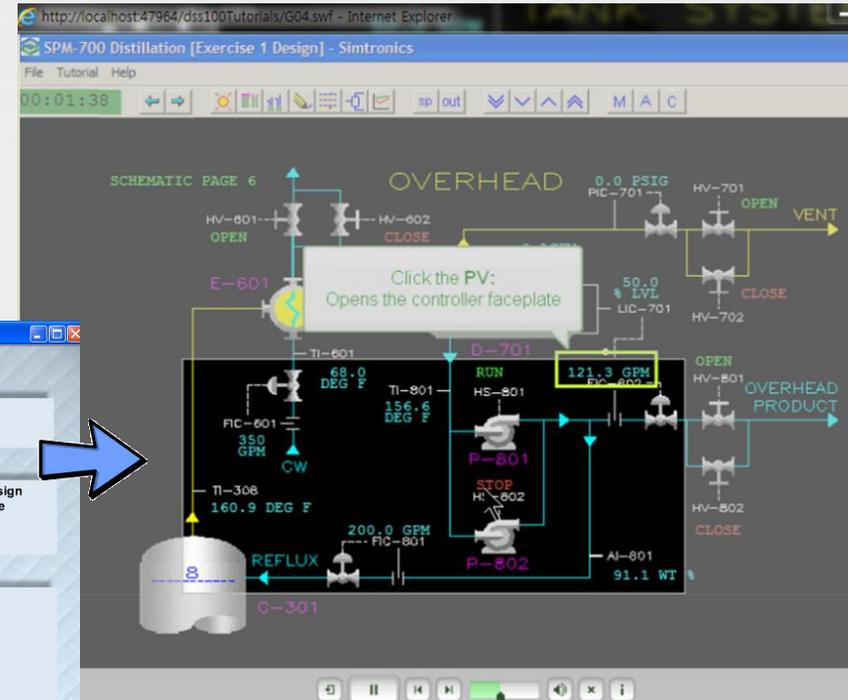
Objectives

- Go Use the logon screen to start the DSS-100.
- Go Identify default screen contents and basic elements of navigation.
- Go Identify critical menu bar and toolbar options, and state their purpose.
- Go Identify process parts and components in schematic view.
- Go Demonstrate log off procedures.

HOW TO USE

- Targets
- Rollovers

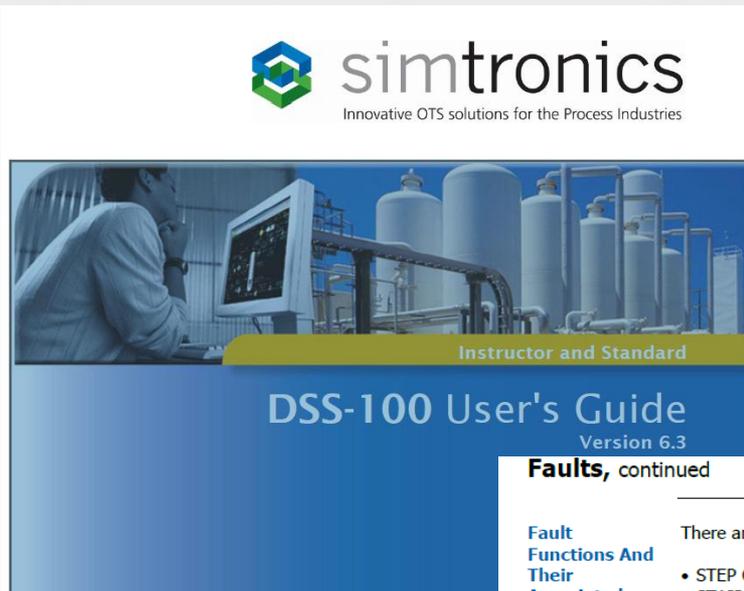
Continue



7. DSS-100 Tutorials

□ User's Guide

- DSS-100 의 사용 설명서



Faults, continued

Fault Functions And Their Associated Parameters

There are several Fault Functions.

- STEP CHANGE
- STAIRCASE
- RAMP
- SLOPE

What The Function Does

Each Fault Function is configured using their associated parameters as follows. An example shows the RAMP function.

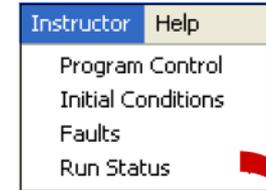
Function	Effect
STEP CHANGE	moves immediately to either the HIGH or LOW value.
SQUARE WAVE	varies between the HIGH and the LOW value at a frequency of DELAY time.
STAIRCASE	steps either up or down by a value of RISE at an interval of DELAY time.
STAIRS	steps up and down by a value of RISE at an interval of DELAY time.
RAMP (1)	moves linearly to either the HIGH or LOW value (2) over an interval of DELAY(3) time.
SAWTOOTH	varies linearly between the HIGH and LOW values over an interval of DELAY time for each spike.

Program Control: overview of the options available

Initial Conditions: store or recall an initial condition

Faults: initiate or change an exercise's fault condition

Run Status: select the simulation speed

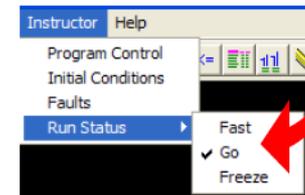


Begin with Run Status.

Run status has three options - Fast, Go and Freeze. Go is the default value. Go indicates that the simulator is running and that it is running at normal speed.

If **Fast** is selected, then the simulator is running faster than real time. You will notice that the speed of simulation time located in the Tool Bar is increased.

Freeze stops the simulator time. You will see that the simulation time is stopped. Changing or stopping the simulator speed is useful if you are creating exercises or scenarios or asking operators to predict how a change will affect a process.



00:00:14
FAST

00:03:30
FREEZE

7. DSS-100 Tutorials

□ Training Manual

- 선택한 표준 공정 모델 개요 및 사용법 설명
 - 공정에 대한 상세정보
 - Exercise 종류 별 목적
 - Exercise 종류 별 진행 절차

SPM-100 Manual Instructor



Emergency Operations

Emergency Operation Procedure

All emergencies should be handled quickly. The particular steps taken in an emergency are specific to the problem at hand. As always, your trainees should follow the emergency procedures particular to your process plant. If an emergency cannot be handled quickly, then an emergency shutdown should be performed.

Emergency Shutdown Procedure

The following is an emergency shutdown procedure recommended by Simtronics. You may modify this procedure to more closely reflect your particular process plant emergency shutdown procedures. The entire shutdown should take approximately 10 minutes.

Check	Step	Procedure	Time (hh:mm:ss)
	1	PLACE tank 1 feed flow controller FIC-101 CONTROLLER MODE in MANUAL.	00:00:06
	2	ADJUST tank 1 feed flow controller FIC-101 OUTPUT to 0.0%.	00:00:13
	3	ADJUST tank 1 feed flow controller FIC-101	00:00:15

Exercise 1: Design

Objective: The Design Initial Condition is used as a starting point for training exercises. For the purpose of this manual a normal shutdown procedure is presented.

Time: 10 minutes.

Procedure: [Normal Shutdown](#)

Exercise 2: Cold Start

Objective: The following is a startup procedure recommended by Simtronics. You may modify this procedure to more closely reflect your particular process plant startup procedures.

Time: 30 minutes.

Procedure: [Normal Startup](#)

Exercise 3: Fail Main Water Supply

Objective: Recognize loss of main water supply.

Time: 4 minutes.

Cause: Loss of upstream water supply.

Effect: Loss of product flow (FIC-104) and a drop in tank levels (LIC-103).

Solution: Shut down the system and notify maintenance.

Procedure:

7. DSS-100 Tutorials

□ Tutorial

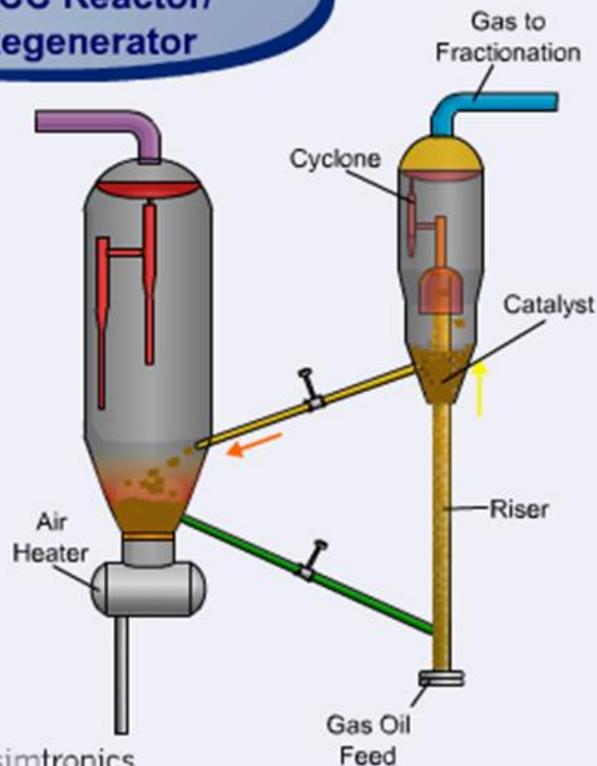
- 선택한 표준 공정 모델에 포함된 장치, 계기, 밸브 등에 대한 목적, 동작 원리, 설치 및 사용법 설명.
- Animation 및 음성지원

Pressure Tap & DPI

Pressure gauges are installed on tapped connections on pipelines, tanks, or other points where pressure monitoring is required.

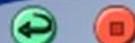
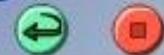
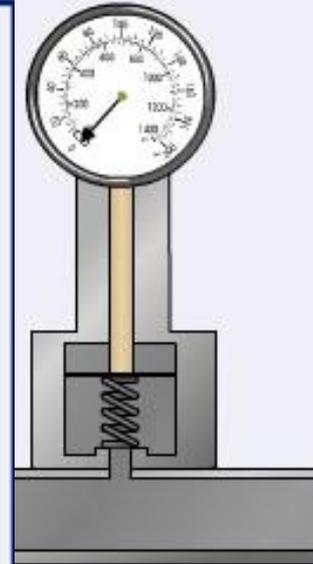
The pressure tap is a reinforced welded fitting installed on the pipeline at the desired location. Depending on the size of the pipeline, the pressure sensing line may be reduced in size one or more times before the pressure gauge is installed.

FCC Reactor/Regenerator



The catalyst falls to the bottom of the reactor where it is removed and fed through a pipe to the Regenerator.

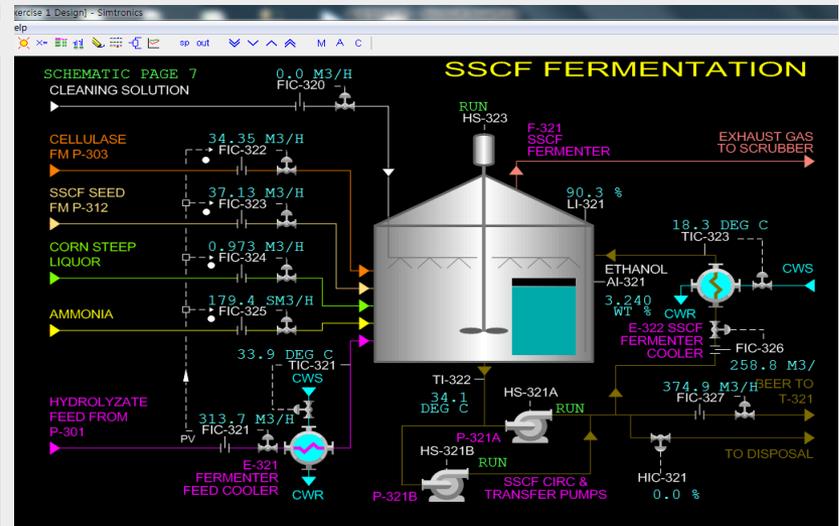
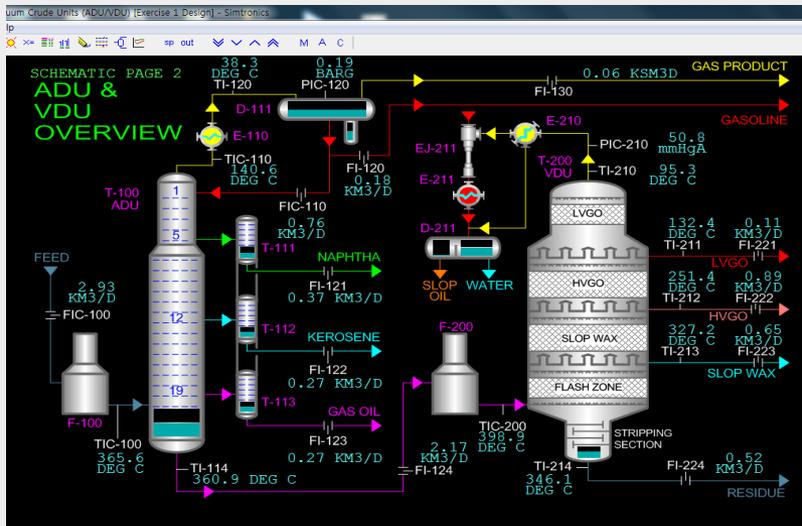
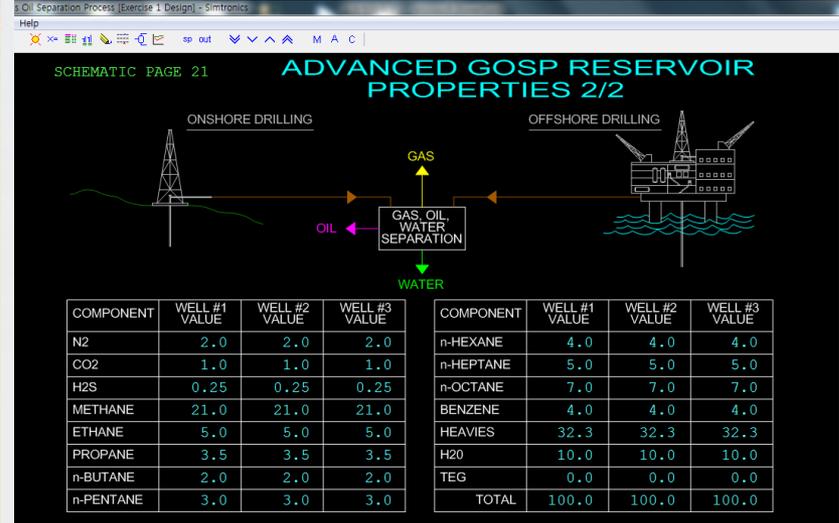
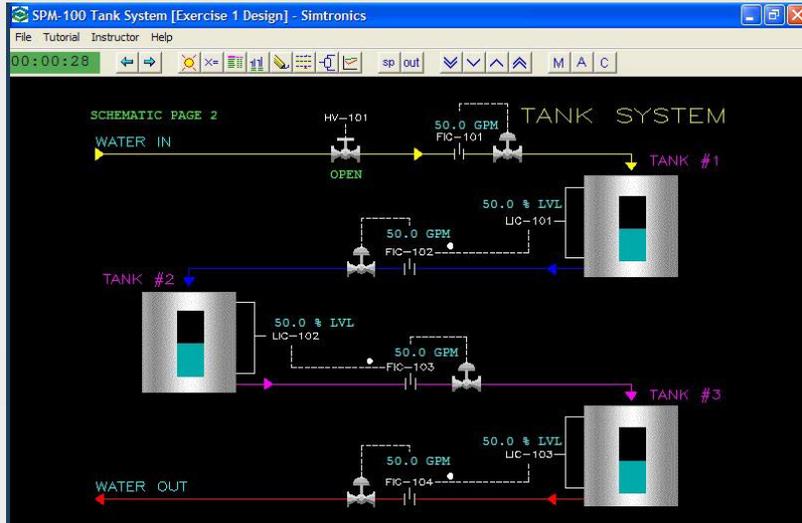
The Regenerator "burns" the coke off the catalyst under controlled conditions. Air is added to the process to ignite and burn the coke. "Regenerated" catalyst with coke removed is returned to the Reactor through another pipe connected to the riser.



8. 운전 연습 화면 (Schematics)

□ 운전 연습화면 사례

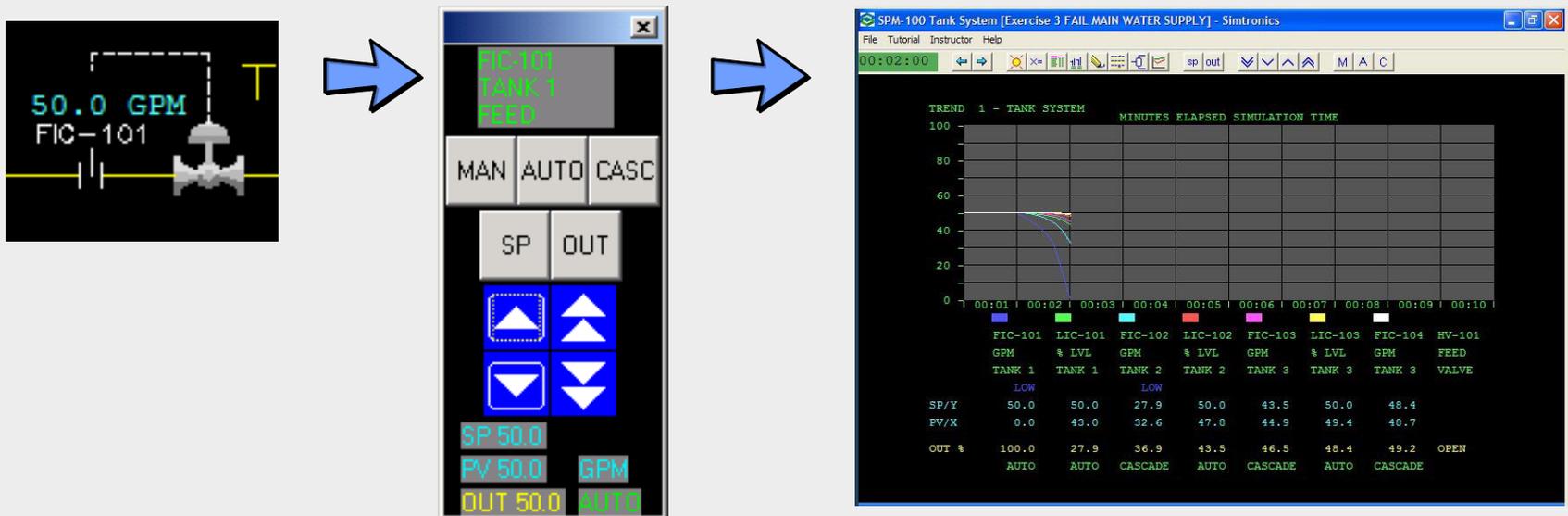
- 공정 별 Overview 및 세부 화면 제공



8. 운전 연습 화면 (운전 조작)

□ 선택한 Exercise의 목적에 맞는 절차 (Procedure)를 진행

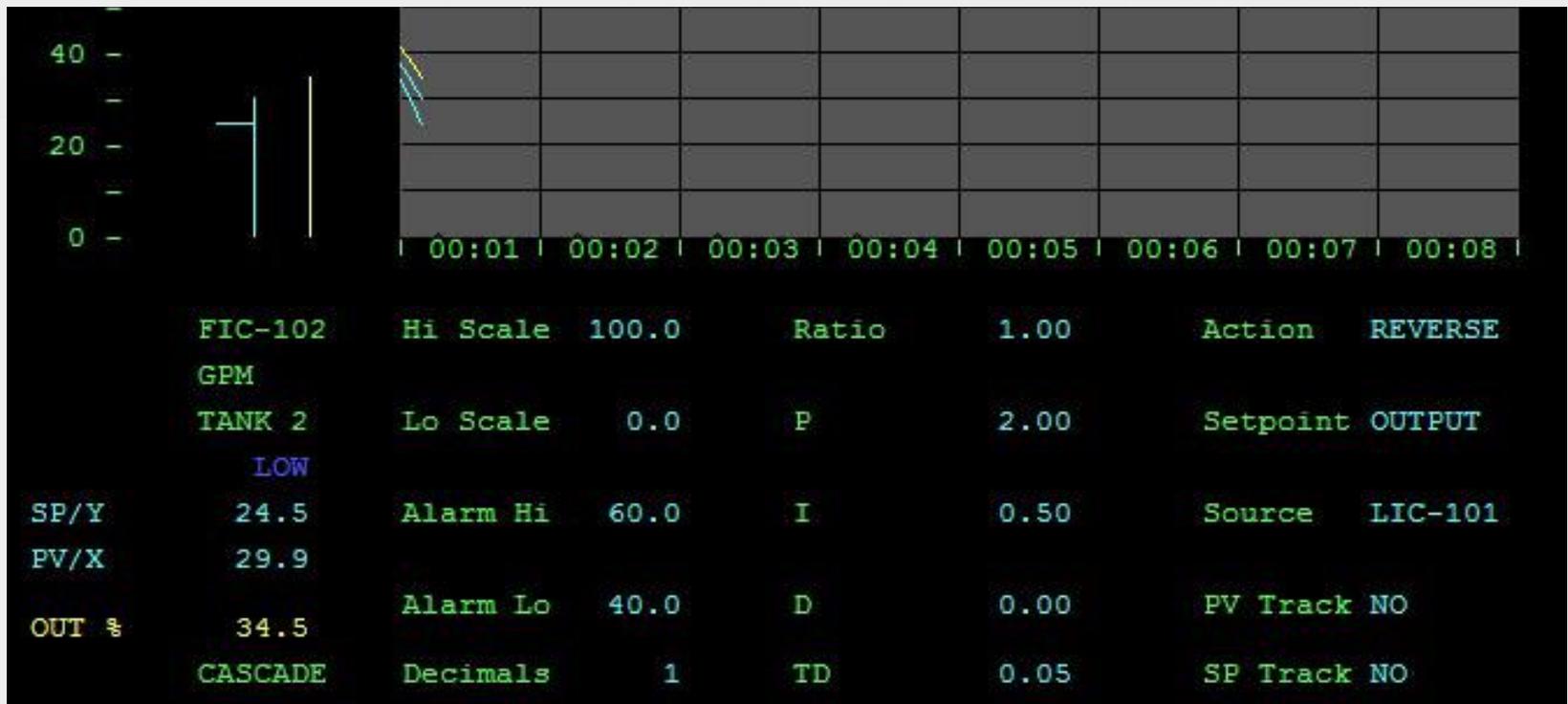
- Shutdown, Start up 또는 이상발생에 대한 조치.
- Mode 변경 (MAN, AUTO, CASC)
- Value 변경 (SP, OUT)
- 변경 후 변화 상태를 TREND에서 확인
- 교육생이 한 모든 동작절차와 시간은 자동으로 기록되어 평가 됨.



8. 운전 연습 화면 (Detail, Trend)

□ 운전 변수 설정

- SP, OUT, Mode (Manual, Auto, Cascade)
- Range (Hi / Lo Scale, Alarm Hi / Lo, Decimal)
- PID Tuning Parameter (Ratio, P, I, D, Time Delay)
- 기타 (Control Action, SP Source, PV Source, PV Tracking, SP Tracking)



8. 운전 연습 화면 (Alarm, NotePad, Event Log)

□ 기타 기능

- ALARM: Alarm display
- NOTEPAD: 사용자 해설, LOG 등을 직접 입력.
- EVENT LOG : Simulation 중의 모든 Event (동작절차, 시간)를 기록하여 기준 Event Log와 비교, 평가

```
ALARM SUMMARY PAGE 1
1  FIC-101  TANK 1  FEED      LOW      0.0    GPM      00:01:28 simulation time
2  FIC-102  TANK 2  FEED      LOW      21.1   GPM      00:01:50 simulation time
3  LIC-101  TANK 1  LEVEL     LOW      39.6   % LVL    00:02:11 simulation time
4  FIC-103  TANK 3  FEED      LOW      39.4   GPM      00:02:12 simulation time
```

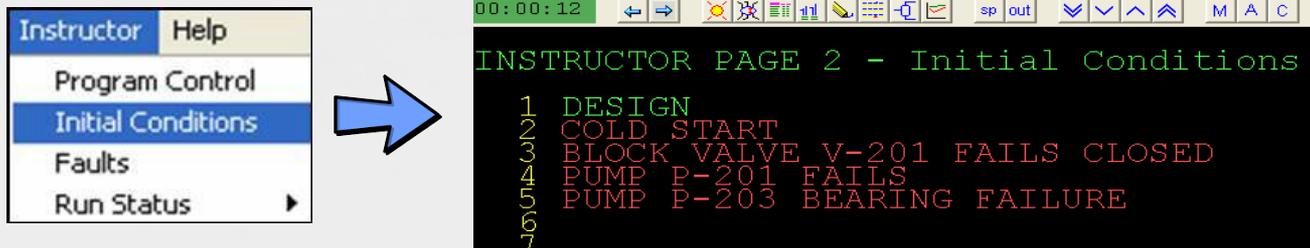
```
00:02:17 [Navigation icons] sp OL
NOTEPAD PAGE 1
00:00:00 Joe Teacher: System Programmer
00:00:00 Process Model: Tank System
00:00:00 Initial Condition: # 3
00:02:13 THIS IS A LOG ENTRY
```

```
EVENTLOG PAGE 1
00:00:00 Joe Teacher: System Programmer
00:00:00 Process Model: Tank System
00:00:00 Initial Condition: # 3
00:00:05 TREND 1 - TANK SYSTEM
00:00:46 RUN STATUS = FREEZE
00:00:46 RUN STATUS = GO
00:01:00 Water Supply GPM ACTIVATED
00:01:04 RUN STATUS = FREEZE
00:01:04 RUN STATUS = GO
00:01:28 FIC-101 - Low Alarm
00:01:50 FIC-102 - Low Alarm
00:01:54 RUN STATUS = FREEZE
00:01:54 INSTRUCTOR PAGE 2 - Initial Conditions
00:01:54 INSTRUCTOR PAGE 1 - Program Control
00:01:54 AUDIBLE ALARM DISABLED
00:01:54 TREND 1 - TANK SYSTEM
00:01:54 TREND POINT - FIC-102
00:01:54 DETAIL - FIC-102
00:01:54 FIC-102 - Low Alarm Acknowledged
00:01:54 RUN STATUS = GO
00:02:11 LIC-101 - Low Alarm
```

9. 신규 문제 생성

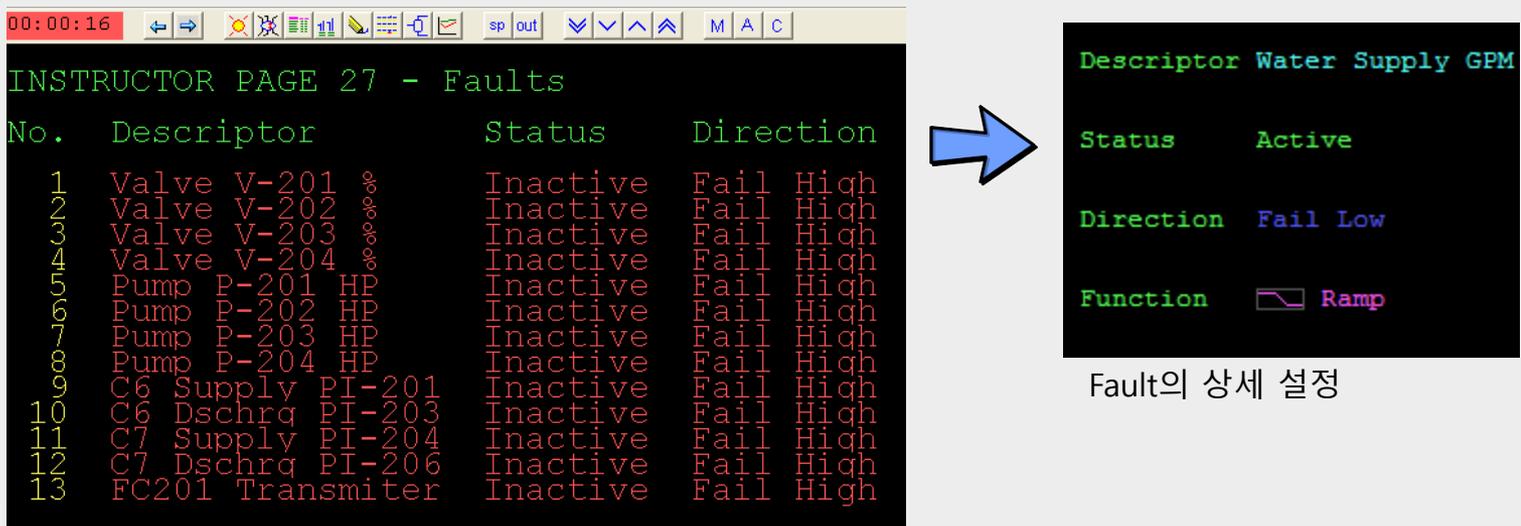
□ 신규 문제 생성:

- Initial Conditions에서 [1.DESIGN Exercise]를 선택한 후 설정 변경.



□ Fault 생성:

- Faults Summary Page에서 운전 연습할 Fault (공정 이상) 선택 및 상세 설정



9. 신규 문제 생성

□ 변경된 Fault Summary Page 화면

```
INSTRUCTOR PAGE 27 - Faults
```

No.	Descriptor	Status	Direction	Fault Function	Signal
1	Valve V-201 %%	Inactive	Fail High	Step Change	100.00
2	Valve V-202 %%	Inactive	Fail High	Step Change	100.00
3	Valve V-203 %%	Idle	Fail High	Stairs	100.00
4	Valve V-204 %%	Inactive	Fail High	Step Change	100.00
5	Pump P-201 HP	Active	Fail Low	Square Wave	0.000
6	Pump P-202 HP	Inactive	Fail High	Step Change	25.000
7	Pump P-203 HP	Inactive	Fail High	Step Change	25.000
8	Pump P-204 HP	Inactive	Fail High	Step Change	25.000

□ 다시 가동 [Go]



□ 신규 Exercise의 저장

- Initial Conditions의 빈 슬롯에 신규 Exercise 명을 입력 및 저장.

```
INSTRUCTOR PAGE 2 - Initial Con
1 DESIGN
2 COLD START
3 BLOCK VALVE V-201 FAILS CLO
4 PUMP P-201 FAILS
5 PUMP P-203 BEARING FAILURE
6
7
8
```

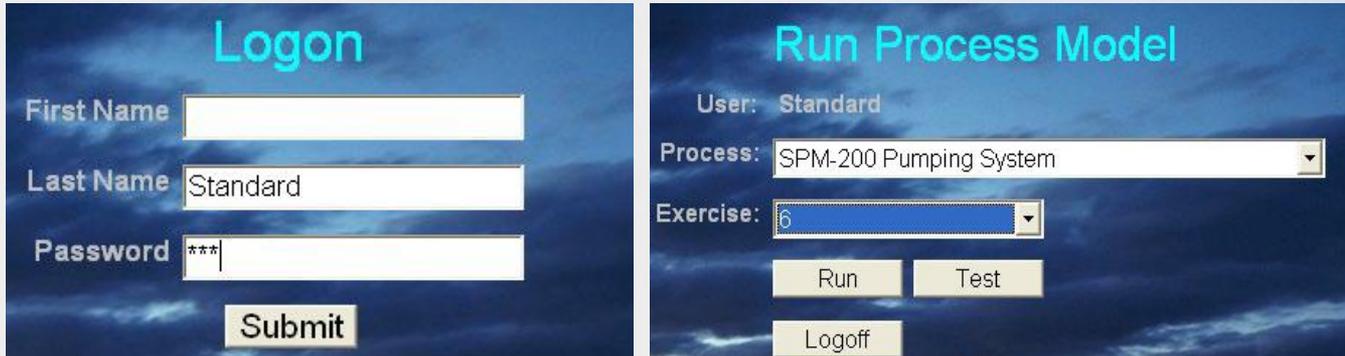


```
INSTRUCTOR PAGE 2 - Initial
1 DESIGN
2 COLD START
3 BLOCK VALVE V-201 FAILS
4 PUMP P-201 FAILS
5 PUMP P-203 BEARING FAILU
6 VALVE V-201 FAILS ✓
7
8
```

10. 신규 평가 기준 생성

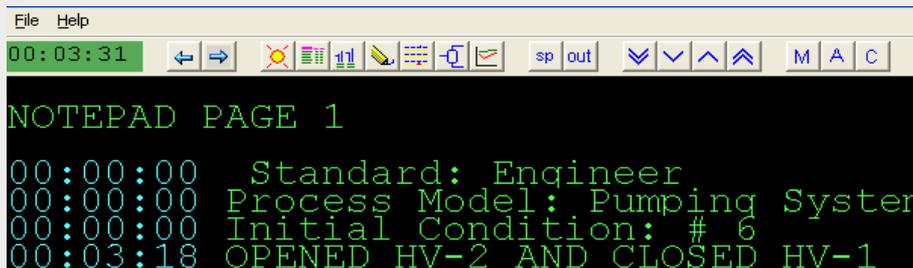
□ 생성한 신규 연습의 평가기준 작성

- "Standard" access level로 logon 후 기준을 만들 표준 모델을 선택.



□ 선택한 연습을 수행 및 저장.

- 진행과정은 모두 Event Log에 기록됨 (평가 시 기준(표준 운전 절차)으로 사용됨).
- Exercise 수행을 마친 후 Notepad에 교육생을 위한 설명 기록.
- 저장하면 해당 연습 문제는 새로운 평가기준 (표준 운전 절차)을 적용하게 됨.



```
File Help
00:03:31
NOTEPAD PAGE 1
00:00:00 Standard: Engineer
00:00:00 Process Model: Pumping System
00:00:00 Initial Condition: # 6
00:03:18 OPENED HV-2 AND CLOSED HV-1
```

11. PSU-100 (교육생의 운전 능력 평가)

Simtronics Session Manager Reports

- 평가할 교육생과 Exercise 검색
- Class / Process / Exercise / Dates 항목 선택
- Generate Report " 로 4종의 Report 생성.

Simtronics DSS-100 Session Manager - Reports

File Edit View Help

Baseline: New Data Available

Tests Only

Class: ✓

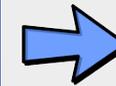
Process: ✓

Exercise: ✓

Dates: ✓
 1/2/2007
 1/3/2007
 1/4/2007
 1/5/2007
 1/7/2007
 1/8/2007
 1/9/2007
 1/11/2007
 1/16/2007
 1/17/2007

Click selects a date
 Shift-Click selects a range
 Ctrl-Click toggles a date

Process	Exercise	Class	Name	Date
spm200	1		Operator	5/20/2007
spm200	4	Team A	Sally Jones	5/20/2007
spm300	1		taft	1/16/2007
spm300	3	Fam 121	tafo	1/17/2007
spm300	1	Fam 121	tafo	1/17/2007
spm300	3	Fam 121	tafo	1/17/2007
spm300	3		DB	1/17/2007
spm300	3		DB	1/17/2007
spm300	3	Shift 2	A A DB (test)	1/17/2007
spm300	3	Shift 2	joe smith (test)	1/17/2007
spm301	1	Fam 121	tafo	1/11/2007
spm700	1		Operator	12/20/2006
spm700	2		Operator	5/3/2007
spm700	20		Operator	5/11/2007
spm700	3	Shift 2	joe smith (test)	1/17/2007
spm700	1		Operator	1/3/2007
spm700	20	Fam 121	Ramesh Das (test)	5/22/2007
spm700	1		Operator	5/3/2007



Simtronics PSU-100 \. Distillation [Exercise 3] - S

File Edit Select View Help

A4 Sarah Parker

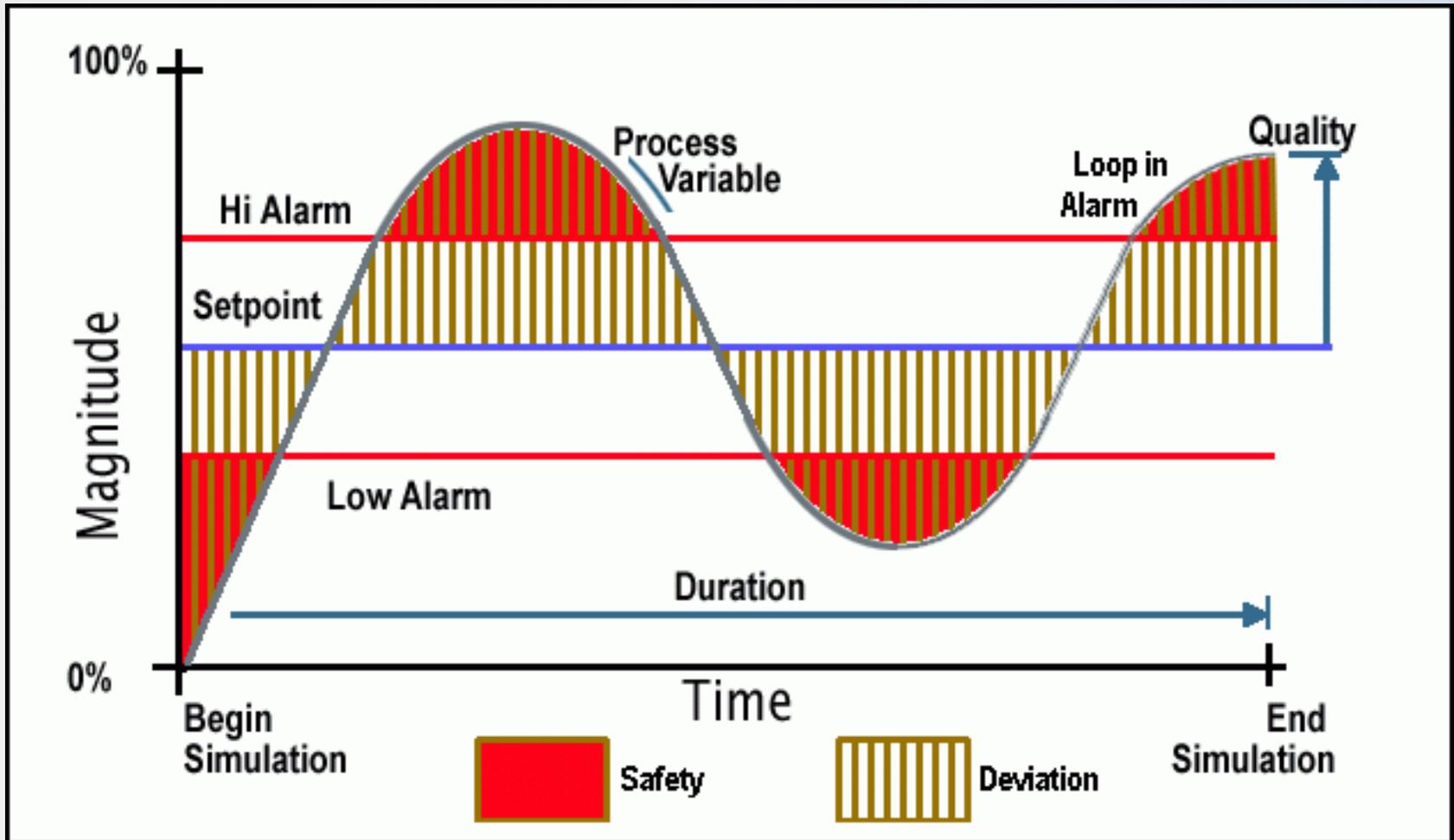
	A	B	C	D
1				
2				
3	Student	Duration	Procedure	Safety
4	Sarah Parker	100	0	35
5	Jeff Jones	100	0	97
6	Bill Perkins	100	14	100
7	Sarah Parker	100	14	41
8				
9	Average	100	7	68
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Score Summary / Score Details

11. PSU-100 (교육생의 운전 능력 평가)

□ 평가기준:

- Duration, Procedure, Safety, Alarms, Deviation, Quality의 여섯 항목으로 평가



11. PSU-100 (교육생의 운전 능력 평가) - Report

□ Score Summary report

- 6개의 평가기준에 따른 성적과 평균을 %로 표시함

	A	B	C	D	E	F	G	H
1								
2								
3	Student	Duration	Procedure	Safety	Alarms	Deviation	Quality	Average
4	Sarah Parker	100	0	35	0	59	11	0
5	Jeff Jones	100	0	97	100	100	48	0
6	Bill Perkins	100	14	100	0	100	13	9
7	Sarah Parker	100	14	41	0	72	11	6
8								
9	Average	100	7	68	25	83	20	

□ Score Detail report

- 교육생이 수행한 운전 절차 단계 및 수행 결과를 표준 점수와 비교

	A	B	C	D	E	F	G
1	Simtronics Corporation	15.03	9.00	2,018.49	0.00	8,488.10	35
2							
3	Student	Duration	Steps	Safety/min	Alarms	Deviation/min	Quali
4	Sarah Parker	0.77	0.00	10,366.38	3.00	25,631.81	617
5	Jeff Jones	0.98	0.00	3,751.98	0.00	19,478.81	264
6	Bill Perkins	1.05	2.00	2,478.76	3.00	15,962.81	616
7	Sarah Parker	0.97	1.00	9,012.73	3.00	22,595.62	621

← 표준 점수

← 교육생 점수

11. PSU-100 (교육생의 운전 능력 평가) - Report

□ Event Comparison:

- 표준 운전 절차와 교육생의 운전 절차를 1:1로 비교.

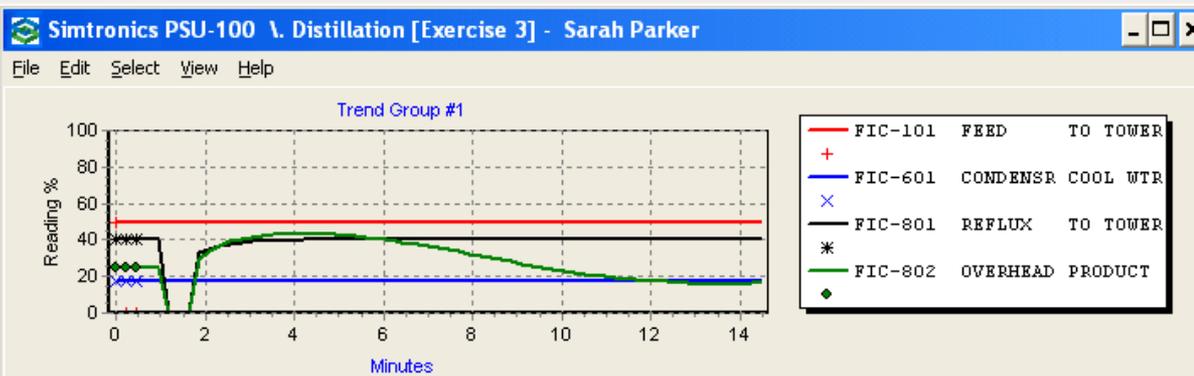
A		B	
1	Reference Event Log	Event Log for Sarah Parker	
2			
3	00:00:00 Simtronics Corporation: Engineer	00:00:00 Sarah Parker: Operator	
4	00:00:00 Process Model: Distillation	00:00:00 Process Model: Distillation	
5	00:00:00 Initial Condition: REFLUX PUMP P-801 FAILURE	00:00:00 Initial Condition: REFLUX PUMP P-801 FAILURE	
6	00:01:18 FIC-801 = MANUAL	00:00:10 HS-101 = STOP	
7	00:01:20 FIC-801 OUTPUT = 0.0 PERCENT	00:00:30 HV-201 = CLOSE	
8	00:01:26 FIC-802 = AUTOMATIC	00:00:34 HV-101 = CLOSE	
9	00:01:26 FIC-802 = MANUAL	00:00:42 HV-402 = OPEN	
10	00:01:30 FIC-802 OUTPUT = 0.0 PERCENT	00:00:46 SIMULATION TERMINATED	
11	00:01:35 HS-802 = RUN		
12	00:01:41 FIC-801 = AUTOMATIC		
13	00:01:49 FIC-802 = AUTOMATIC		
14			
15			
16			

기준 Event Log

교육생의 운전 Log

□ Trend Comparison:

- 표준 운전 절차와 교육생의 운전 절차를 Trend로 비교.



12. Simtronics OTS 주요 Clients

- | | | | |
|--------------------------|----------------------------------|---------------------------|-------------------------|
| ▪ 삼성엔지니어링 | Korea | ▪ 울산과학대학교 | Korea |
| ▪ ADNOC | UAE | ▪ Huntsman Chemical | USA |
| ▪ Anardarko | USA | ▪ Ineos | USA |
| ▪ BP | USA & Canada | ▪ Keyera | Canada |
| ▪ British Gas | Australia | ▪ Kuwait Petroleum Corp. | Kuwait |
| ▪ Calumet Lubricants | USA | ▪ Lubrizol | USA |
| ▪ Chevron | USA, Canada & South Africa | ▪ Marathon | USA & Equatorial Guinea |
| ▪ CITGO Petroleum | USA | ▪ North Atlantic Refining | Canada |
| ▪ ConocoPhillips | USA, Australia | ▪ NT Energy | USA |
| ▪ CVR Energy | USA | ▪ Oman LNG | Oman |
| ▪ Dow Chemical | USA | ▪ Phillips 66 | USA |
| ▪ Dow Corning | USA | ▪ PPPTMGB Lemigas | Indonesia |
| ▪ DuPont | USA | ▪ Qatar Petroleum | Qatar |
| ▪ Eastman Chemical | USA | ▪ Queensland Gas Company | Australia |
| ▪ Enbridge Energy | USA | ▪ SASOL | South Africa |
| ▪ Enterprise Products | USA | ▪ Sinclair Oil | USA |
| ▪ Ergon | USA | ▪ Shell | USA |
| ▪ ExxonMobil | USA, Equatorial Guinea & Nigeria | ▪ Suncor | USA |
| ▪ HollyFrontier Refining | USA | ▪ Tesoro Petroleum | USA |
| ▪ Hess | USA | ▪ Wood Group | Equatorial Guinea |
| ▪ SAY PLANT Refining | USA | ▪ Woodside Energy | Australia |

Abubakar Tafawa Balewa University Bauchi, Nigeria
ADNOC Technical Institute Abu Dhabi, UAE
Alvin Community College Alvin, TX
American University of Sharjah Sharjah, UAE
ARAMCO Learning Center Al-Khobar, Saudi Arabia
Ashland Technical College Ashland, KY
Baton Rouge Community College Baton Rouge, LA
Brazosport College Lake Jackson, TX
Caledonian College of Engineering Muscat, Oman
Calhoun Community College Decatur, AL
Cambrian College of Applied Arts and Technology Sudbury, ON, Canada
College of St. Benedict St. Joseph, MN
College of the Mainland Texas City, TX
College of the North Atlantic Conception Bay South, NL, Canada
College of the North Atlantic - Qatar Doha, Qatar
Colorado Mountain College Rifle, CO
Colorado Northwestern Community College Rangely, CO
Copiah-Lincoln Community College Natchez and Wesson, MS
Delaware County Community College Broomall, PA
Delaware Technical and Community College Newark, DE
Ecole Polytechnic Montreal, QC, Canada
Egyptian Petroleum Institute Alexandria, Egypt
Elizabeth High School Elizabeth, NJ
Grande Prairie Regional College Grande Prairie, AB, Canada
Hallsville Independent School District Hallsville, TX
Higher College of Technology Abu Dhabi, UAE
Higher College of Technology Dubai, UAE
Holland College Summerside, PE, Canada
Institute of Technical Education Singapore
ITI Technical College Baton Rouge, LA
Jefferson Community College Louisville and Carrollton, KY
Jubail Industrial College Al-Jubail, Saudi Arabia
Kenai Peninsula College Soldotna, AK
Keewatin College Fort McMurray, AB, Canada

Lamar Institute of Technology Beaumont, TX
Lamar State College Orange and Port Arthur, TX
Lambton College Sarnia, ON, Canada
Lansing Community College Lansing, MI
Linden Academy of Science and Technology Linden, NJ
Louisiana Technical College Lake Charles and Sorrento, LA
McNeese State University Lake Charles, LA
Medicine Hat College Medicine Hat, AB, Canada
Middlesex County College Edison, NJ
Midlands Technical College Columbia, SC
Minnesota West Community and Technical College Granite Falls, MN
Mississippi Gulf Coast Community College Perkinston and Gautier, MS
MITECH+ Midlands, MI
Montana State University Billings, MT
Nashville State Technical Community College Nashville, TN
Naval Surface Warfare Center Dahlgren, VA
New Brunswick Community College Saint John, NB, Canada
Northern Alberta Institute of Technology Edmonton, AB, Canada
Nova Scotia Community College Sydney, NS, Canada
Nunez Community College Chalmette, LA
Oil and Gas Training Institute Islamabad, Pakistan
OSHA Training Institute Des Plaines, IL
Owens Community College Toledo, OH
PAAET College of Technological Studies Shuwaik, Kuwait
Petroleum and Gas University of Ploiesti Ploiesti, Romania
Portage College Lac La Biche, AB, Canada
Qatar Gas Training Centre Ras Laffan, Qatar
Qatar Petroleum Training Centre Doha, Qatar
Rajamangala Institute of Technology Bangkok, Thailand
Red Rocks Community College Lakewood, CO
San Jacinto College Pasadena, TX
Scaffold Training Institute Houston, TX

SAINT Alberta Institute of Technology Calgary, AB, Canada

SAINT Omani University Muscat, Oman