



Since 2006
helping clients
with Process
Simulation Services

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simulation · knowledge · profit

Beyond Optimize

Supporting the development of plant operators' competence

14 October, 2021



Supporting the
development of plant
operators' competence

inprocess 
Simulation · Knowledge · Profit



independent from any provider
(process simulator or ICSS)

our **core business** is Process
Simulation

keen to **share its knowledge** with
clients



2006

est. in Barcelona by
domain experts



54 countries

worldwide
presence



50+

simulation
engineers



250+

years experience



350+

executed projects



330+

training courses



**Lifecycle
Modelling and
Operator Training
Simulators**



**Process
Simulation
Studies**



**Professional
Development
& Training**



**Applications and
Software Products**



- Introduction
- CRODA's Operation Plant challenges
- What's Training? Poor training vs efficient training
- Operator learning path
- Aspen HYSYS ® Simulation based Training: OTS
- Learning Platform
- Benefits and Conclusions



Challenge: Standardizing both CRODA's working procedures and the way operators learn how to apply them



Solution: Inprocess' Simulation based Training OTS with Aspen HYSYS along with a customized Learning Platform.



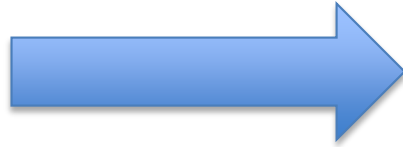
Benefits: Customizable training paths, Aspen HYSYS simulation based effective learning, good track of CRODA operator's learning curve from HR and Management

- Batch processes → single trains can produce a huge variety of products
- Standard procedures, but many degrees of freedom: ambient conditions, changing recipes...
- Difficult to keep standard procedures up-to-date and available for immediate training when required
- Training material from different sources, levels, languages, depth...
- Senior personnel is retiring: deep knowledge loss



- Usual way of training is learn by doing with supervision from a senior operator
- Hard for HR and Management to evaluate and understand the level of competence of each operator
- How to train efficiently and keep track of the learning curve of each operator?



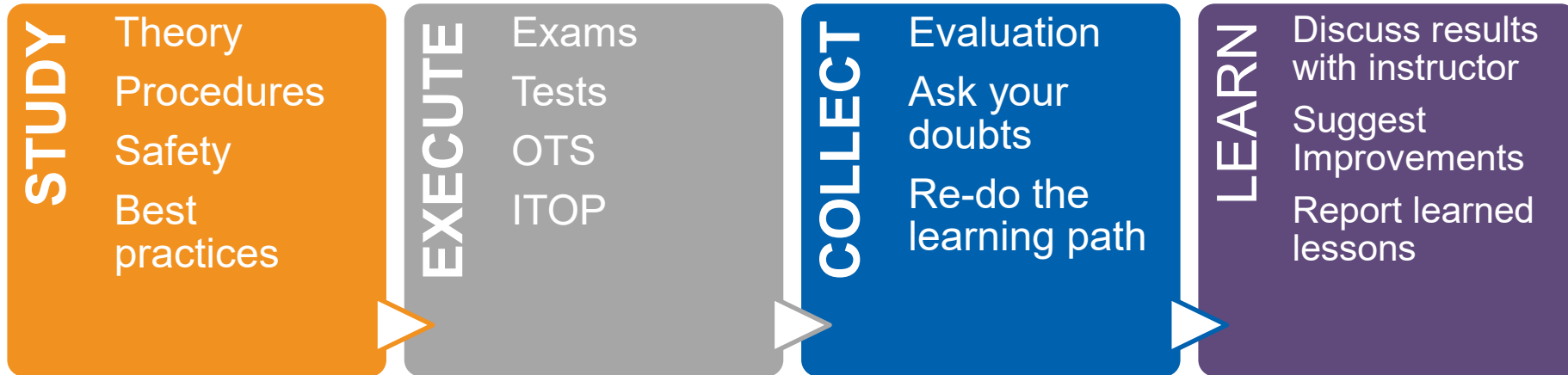


- Checklist operation → Operator only needs to confirm the actions with no need to understand the reasoning behind
- When problems occur junior operators:
 - Struggle to understand what's wrong and the solution
- Lack of competence:
 - Slow reaction time, less efficiency, variability in quality standards for each product, difficulty to improve/innovate or report to Top Management
- Safety - Production concerns





- **Reduced training time:** it's critical to use it in the most effective way
- **Dynamic** simulation-based training along with customized training programs
- Each **operator** has specific needs:
- **Training platform** can tailor learning paths providing a solution flexible and efficient.

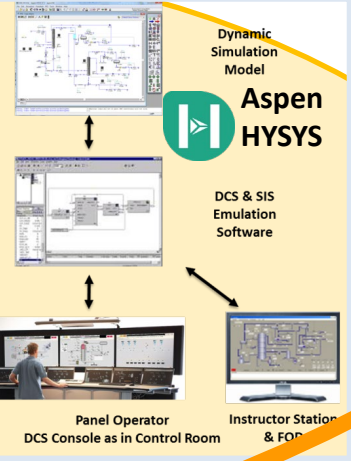


Tell me and I forget,
Show me and I may remember,
Involve me and I understand

Benjamin Franklin
Scientist and statesman

Learning environment Dynamic model based

OTS



ITOP



Skilled Operator



Safety

Control

Products and Processes

Equipment

Fundamentals

Operator





- ITOP flexible training program combines:
 - Theory sessions (based on texts and slides)
 - Interactive and practical sessions (based on first-principles dynamic simulations with Aspen HYSYS)
 - With simulated models & HMI students learn by doing.
- ITOP lessons are used to instruct students on the laws and principles that rule the behaviour of unit operations and their real dynamic response to perturbations.

SINGLE-REACTION CONTINUOUS STIRRED TANK REACTOR

EXERCISE 2. CHANGE IN THE REACTION TEMPERATURE

After analyzing the base case in which the operation was performed at 30 °C, the purpose of this exercise is to reduce the reaction temperature to a minimum, to see how it affects the conversion. To do this, change the temperature control set point and it will act on the valve regulating the heating fluid flow rate supplied to the jacket.

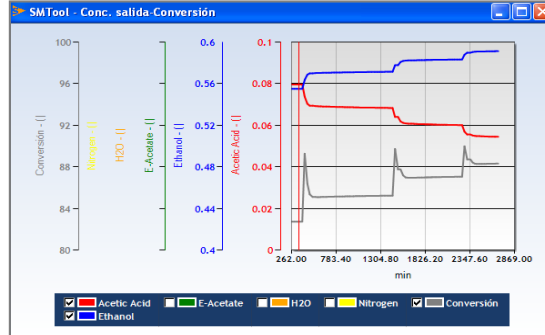
- Using the base case you were working on in Exercise 1, open all the tables to see the initial values in steady state.
- Change the temperature controller set point value. Use the six values recommended in the following table. Take note of the conversion executed inside the reactor after a reaching a new steady state (note all the variables have stabilized).

Reaction Temp. (°C)	Conversion in (%)
25	
30	
35	
45	
55	
65	

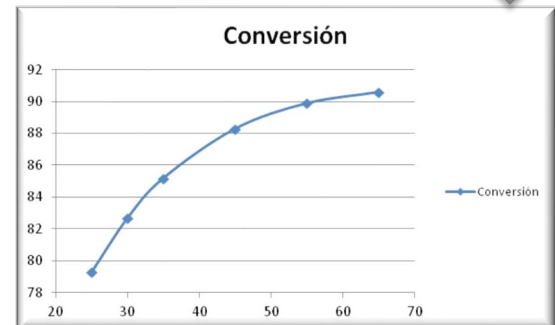
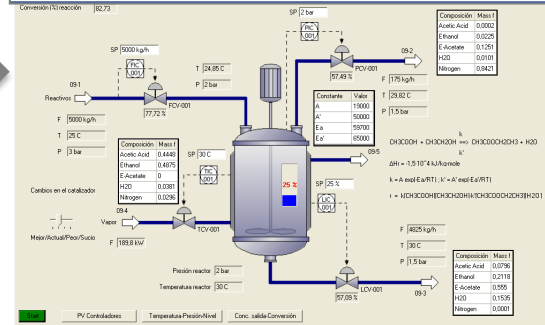
Q2.1: What happens to the conversion when the temperature decreases? What happens when it increases?

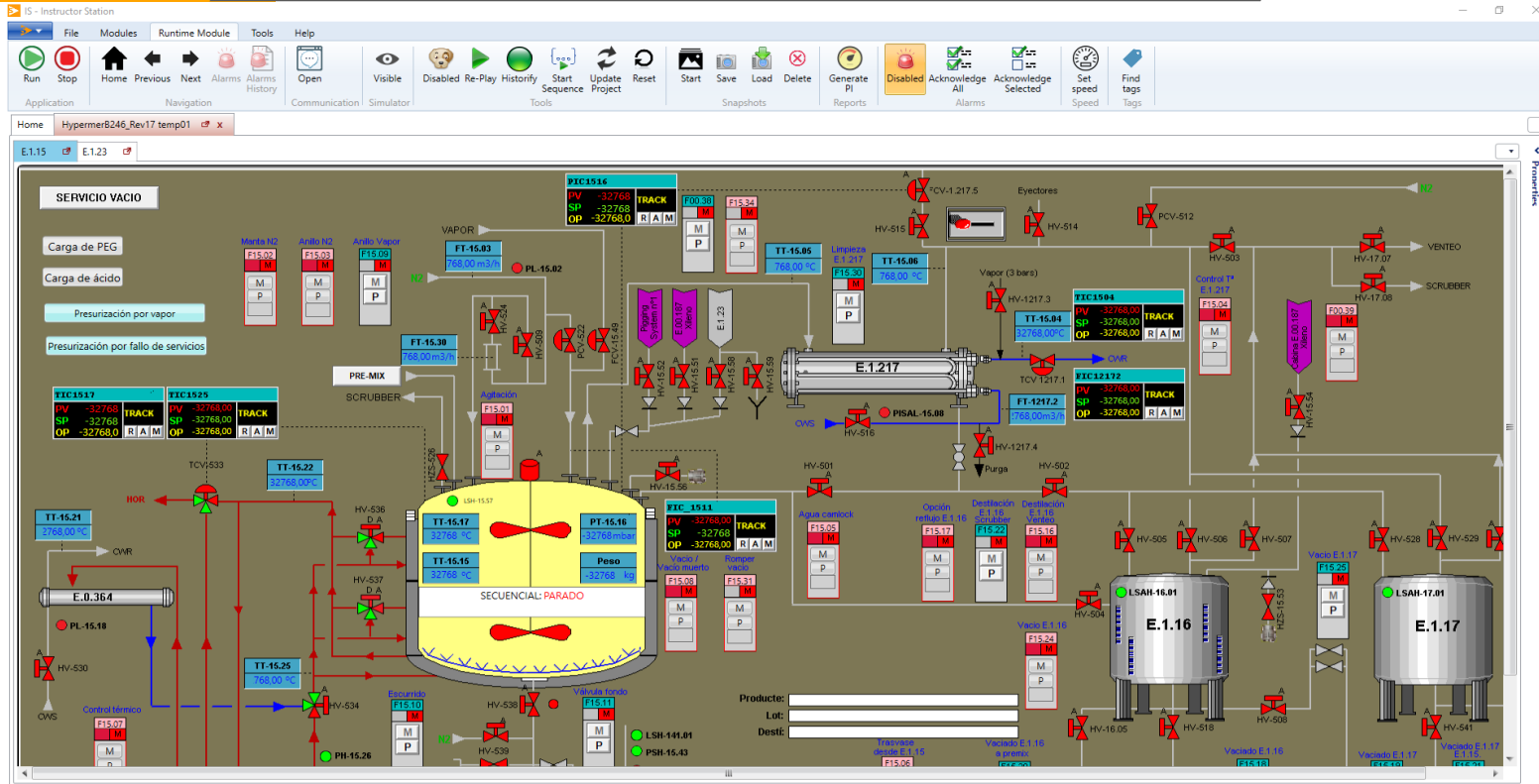
Q2.2: Why do you think that if first the conversion increases in smaller increments and then does not continue to increase at the same pace?

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Reaction Temp	Conversion
C	%
25	79.3
30	82.7
35	85.2
45	88.3
55	89.9
65	90.6



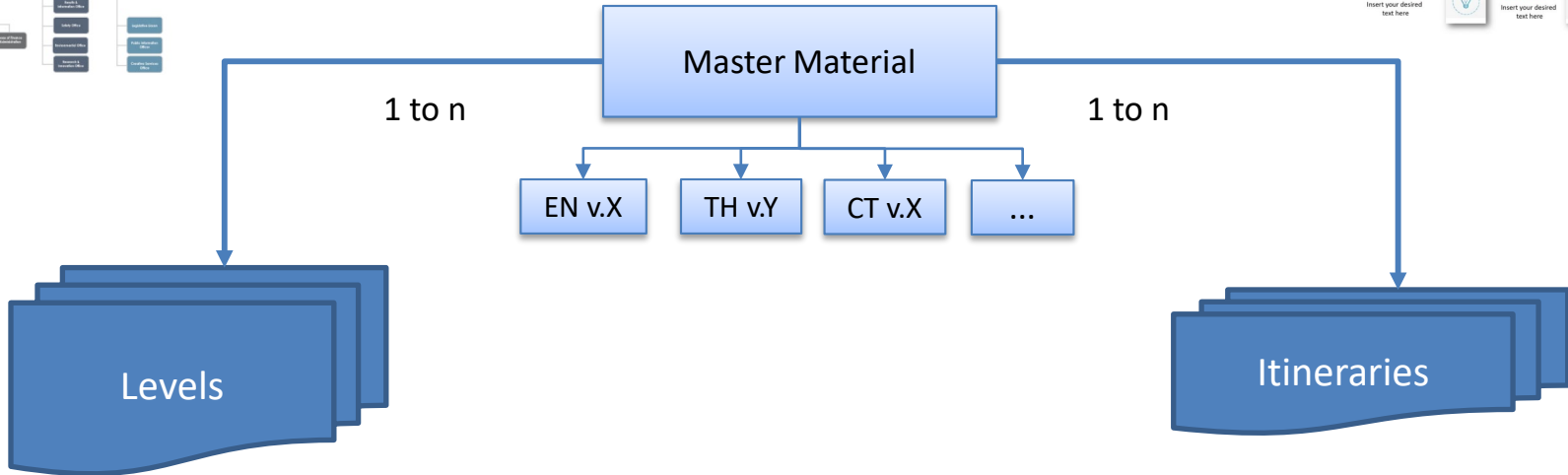
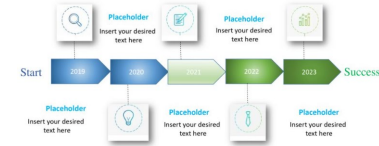
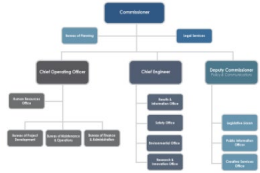


Operators can be trained on a learning environment almost equal to real control room with all the real life functionalities, using developed screens along with a simulated model of the plant with Aspen HYSYS Dynamics.



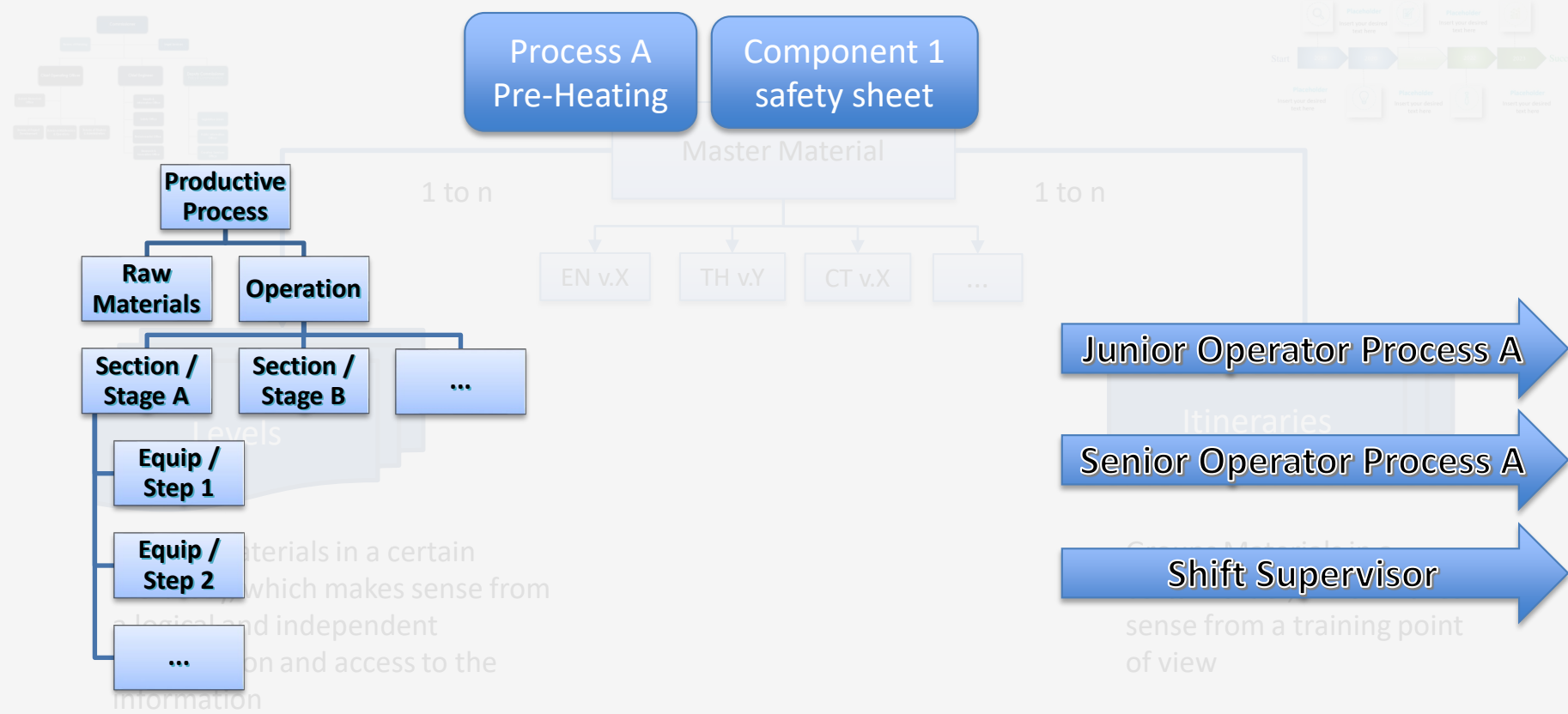
Some benefits of OTS training:

- **Close to real life environment**
 - Lessons and mechanics learnt are directly usable at control room,
 - Knowledge and understanding improving along with efficiency in panel operation.
- **Training from anywhere and when required. HR can organize the trainings focused on Productions needs.**
- **Use of the Aspen HYSYS Dynamic model for further development. Increase of value of the simulation tool**
 - Test / train other scenarios.
 - New sequences of actions (especially in batch type processes).
 - Change of products (the same production line can handle several kinds of products)...



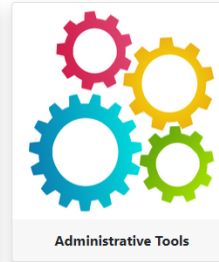
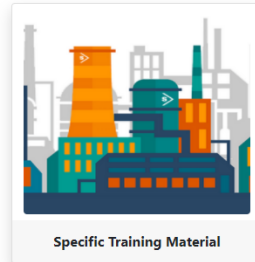
Groups Materials in a certain hierarchy, which makes sense from a logical and independent presentation and access to the information

Groups Materials in a certain order, which makes sense from a training point of view



- Home
- Generic Training Material
 - Binary Distillation
 - Absorption Column
 - Centrifugal Compressor
- Specific Training Material
 - Multipurpose – Hypermer B246
 - Càrrega
 - Etapes
 - Equips
 - Matèries Primeres
- ITOP 3D

Welcome, **Erika**, to the INPROCESS Educational Platform.
 What do you want to work on?



My Account English

Itineraries

- Itinerary 3 materials
 - 100%
- Itinerary 4 materials
 - 25%

- Home
- Generic Training Material
 - Binary Distillation
 - Absorption Column
 - Centrifugal Compressor
- Specific Training Material
 - Multipurpose – Hypermer B246
 - Càrrega
 - Etapas
 - Equips
 - Matèries Primeres

ITOP 3D

Welcome, **Erika**, to the INPROCESS Educational Platform.
What do you want to work on?

My Account English

Itineraries

Itinerary 3 materials 100%

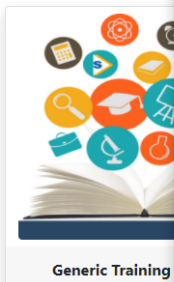
TWO-PHASE LIQUID SEPARATOR
TWO-PHASE LIQUID SEPARATOR- V1

English

Introduction

The separation of immiscible liquids is a recurrent process in the chemical and petrochemical sector. This separation process is based on the difference between the existing densities of both liquids, which makes it possible to obtain two differentiated and easily separable phases.

In a liquid separation design, it is important to know the process conditions that will make it possible to separate the two-phase mixture. The sizing of these separators is mainly based on the retention time (also known as the residence time) during which the phases are efficiently separated. Normally this will vary, depending on the liquid composition. As already commented, the variable responsible for the separation is the difference between the densities of both liquids. Unlike liquid-vapour (LV) mixtures, the difference in densities between liquid phases is not usually large, and this, together with a relatively high viscosity, generates a low speed in the separation of both liquids. For this reason, liquid-liquid (LL) separation requires much larger separators than those required for LV separation.



ICOM

- User Mngt.
- Material Dev.
- Material Languages
- Std. Content ITOP
- Custom content (OTS...)
- Itineraries
- Progress tracking

User Management Screenshot:

Name	Default Name	Name	Email	Profile	Created	Deleted
Administrator	ICOM\ADMIN	Admin	admin@inprocess.com	Admin	2011-01-01	2011-01-01
Professor	ICOM\PROFESSOR	Prof	prof@inprocess.com	Prof	2011-01-01	2011-01-01
Instructor	ICOM\INSTRUCTOR	Instr	instr@inprocess.com	Instr	2011-01-01	2011-01-01
Student	ICOM\STUDENT	Stud	stud@inprocess.com	Stud	2011-01-01	2011-01-01
Student	ICOM\STUDENT	Stud	stud@inprocess.com	Stud	2011-01-01	2011-01-01
Student	ICOM\STUDENT	Stud	stud@inprocess.com	Stud	2011-01-01	2011-01-01

Material Languages Screenshot:

Material Identifier	Language	Version	Creation Date	Actions
CENTRIFUGAL_COMPRESSOR	English	V2	23/01/2021 13:51:00	[Icons]
Compressor Centrifugal	Catala	V1	23/01/2021 11:48:46	[Icons]
Compressor Centrifugal	Español	V2	31/01/2021 13:38:35	[Icons]

Centrifugal Pump Screenshot:

Training Unit: Centrifugal Pump

Introduction

The operating principle of a centrifugal compressor is the same as that of a centrifugal pump with the main difference being that in a gas compressor, compressible, whereas in the case of a pump, the fluid is incompressible. Centrifugal compressors are commonly used for the compression of gases and vapors.

Centrifugal compressors are usually driven by electric motors, steam turbines, or gas turbines.

Centrifugal compressors are usually used for a wide range of applications, such as in the chemical industry, for the compression of gases and vapors.

The centrifugal compressor is a type of compressor that uses a rotating impeller to compress the gas. The impeller is mounted on a shaft that is driven by a motor. The gas enters the compressor at the center of the impeller and is pushed outwards by the centrifugal force. As the gas moves outwards, it is compressed and its pressure increases.

Informació

El procés de producció de l'Hypermer B246 es resumeix en el diagrama de blocs que apareixerà a l'esquerra.

Llegeix la descripció que es presenta a la pantalla i a continuació, fes clic al primer document de l'itinerari formatiu per a començar.

També pots fer clic a les paraules destacades al text per ampliar la informació.

Learning Environment

HR and Management

Plant Operation

OPERATION



- Product information
- Manual Procedures
- How to operate
- Fundamentals of chemicals and equipment

OTS



- Control room operation
- Close to real plant scenarios
- Further study of different control logic or other scenarios, procedures or products

Safety



- Critical parameters
- Possible dangers
- PPE's need and use

COMPETENCE ACHIEVEMENT



- Best practices
- Time to finish the learning path
- Evaluation
- Instructor Feedback
- Seniority of the operator
- Skills acquired
- Demonstrated knowledge

DAILY PLANNING



- Shift organization
- Available operators
- Task distribution
- Production needs
- Shift organization
- Adaptation to production needs

OPERATIONS IMPROVEMENT



- Procedures Improvement
- Plant Monitoring
- Debottlenecking
- Faster Plant troubleshooting
- Increased efficiency
- Homogeneous procedures
- Higher quality production



5 Shifts: 70 operators have already used the platform



4 new employees already trained up to date.



8 new learning paths created and uploaded. **New training material** created



Trainings created on a production basis schedule. **Higher flexibility** achieved.



Homogeneous repository: Old training material and documentation organized in the platform.



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Thank you!

Any question?

