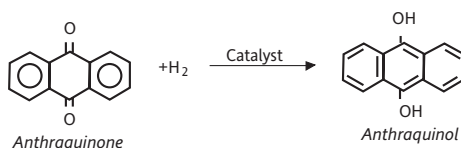


- Control and sequencing
- Recipes
- Batch control and reporting
- Setpoint programming
- Bespoke displays
- Alarm management
- 21 CFR Part 11

The Hydrogenation Process

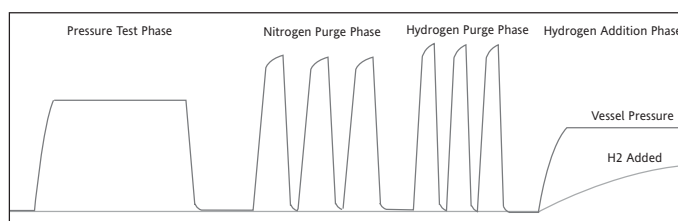
Application Note

Hydrogenation is the chemical addition of hydrogen to a hydrocarbon in the presence of a catalyst, a severe form of hydrogen treating. Hydrogenation may be either destructive or non-destructive. In the former case, hydrocarbon chains are ruptured (cracked) and hydrogen is added where the breaks have occurred. In the latter, hydrogen is added to a molecule that is unsaturated with respect to hydrogen. In either case, the resulting molecules are highly stable.



Hydrogenator design and control

The use of hydrogen requires precautions against creating an explosive mix of hydrogen and air. Typically, a hydrogenation vessel undergoes a pressure test followed by several nitrogen purges before hydrogen is introduced. Similarly, at the end of the reaction process, the vessel is purged with nitrogen in order to leave it in a safe condition. Normally, a hardwired safety system confirms the pressure test and nitrogen purge phases before allowing the hydrogen line to be opened.



Hydrogenation requires high pressures to be maintained in the reaction vessel - giving problems over maintaining seals around agitators which in some cases require additional seal integrity checks or upgrades to incorporate magnetic coupling systems.

Hydrogenation also tends to be a highly exothermic reaction, resulting in demanding temperature control requirements.

The R&D and Clinical Trials environments in which many small scale hydrogenation vessels operate are such that facilities must cater for a variety of products each having precisely defined requirements both for the hydrogen addition itself and for the associated temperature profile.

A control system must therefore provide flexibility in the way in which accurate and repeatable control of the hydrogenation environment is achieved and will include the following features:

- Sequential control for vessel pressure testing, purging and hydrogen addition
- Precise loop control for temperature and pressure (temperature setpoint profile programming is also available on the Eycon if required)
- Secure collection of on-line data from the hydrogenation process for analysis and evidence
- Local operator display with clear graphics and controlled access to parameters



Eurotherm® Eycon™ Visual Supervisor

The Eurotherm® visual supervisor is ideal for hydrogenation applications because it combines all these key features into a single compact unit:

- Powerful loop and sequence control
- Flexible graphics
- Setpoint programmer
- Batch control and reporting
- Audit trail
- XGA touchscreen display to IP65
- Secure data logging and trending
- Recipe management
- Alarm management
- Access control and electronic signatures

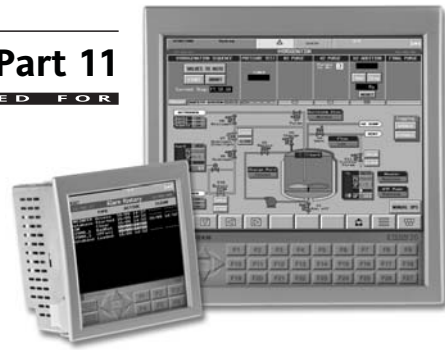
21 CFR Part 11 - 'Ready to use!'

Many hydrogenation vessels are used in industries likely to require validation to the requirements of the FDA, EMEA or other applicable regulatory body. The visual supervisor has been widely used in validated processes including freeze dryers, autoclaves, reactors, fermenters, purified water systems, tablet coating machines, etc. The Auditor feature on the visual supervisor has been specifically designed to meet the requirement of the FDA's 21 CFR Part 11 including:

- Controlled user access
- Secure data logging in tamper resistant format
- Audit trail recording user actions and changes to process parameter
- Electronic signature

21 CFR Part 11

ENHANCED FOR



With the Auditor feature, Electronic signature is configurable for all actions which may be performed from the visual supervisor display including the customised display and standard features such as batch, recipe changes, access control changes, etc.

Scalable architecture

A complete system can be created in combination with T2550 DIN rail I/O bases. Connection is via ELIN and I/O is scalable by adding 4, 8 or 16 slot bases as required. A range of I/O modules caters for the various interfaces required:

Analogue inputs	Temperature, pressure, RPM
Analogue outputs	Pressure control valves, heaters, cooling fluid control valves
Digital inputs	Seal status, bursting disk, valve status feedback, handshaking with hardwired safety system
Digital outputs	Valve control solenoids, pump control, handshaking with hardwired safety system

System building blocks:

- Single hydrogenation vessel (single Eycon™ visual supervisor)
- Multiple units with supervisory workstation(s)

Eurotherm: International sales and service

Understanding and providing local support is a key part of Eurotherm's business. Complementing worldwide Eurotherm offices are a whole range of partners and a comprehensive technical support team... to ensure you get a service you will want to go back to.

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