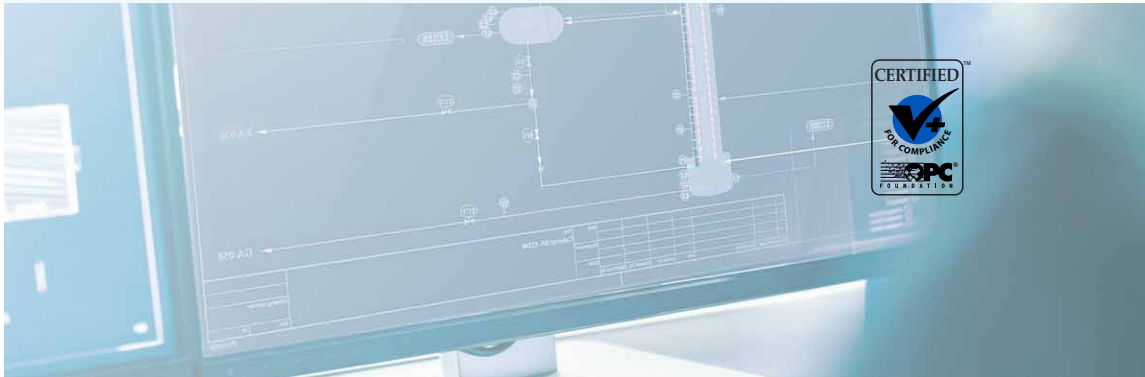
NAPCON

# NAPCON SIMULATOR

NAPCON Train solutions bring your real life plant into the virtual world taking operator training to a whole new level.

NAPCON TRAIN

- NAPCON GAMES
- NAPCON SIMULATOR



# NAPCON SIMULATOR

# BRINGS YOUR PLANT TO THE VIRTUAL WORLD.

NAPCON Simulator is a highly interactive operator training simulator (OTS) that turns your plant into a safe yet intriguing training environment. It offers challenging and motivating training for both beginners and experts.

## NAPCON SIMULATOR MAIN BENEFITS

### SAFETY

NAPCON Simulator improves plant asset safety. Plant operators and engineers can be trained in risk free environment on how to respond during upset conditions to reduce incidents.

### PROFITABILITY

Increased plant availability, enhanced asset performance as well as safe and reliable plant operation due to improved operator skills.

### CONFIDENCE

Personnel can work professionally under pressure and solve problems efficiently. The simulator provides true value for beginners as well as for the most experienced engineers and operators.

### LIFE CYCLE

NAPCON Simulator provides a possibility to validate engineering design, test plant controls and provide state of art training by modern and continuously maintained training simulator that ensures the learning environment evolves together with the actual plant.

### FLEXIBILITY

Cloud services provide easy to scale virtual training rooms and location independent access. Cloud and/or In-premises operator simulator allows highly realistic training experience with easy scalability.

### ENHANCEMENT

Allows identifying improvements in actual plant operability as well as in the automation system.

### EARLY START

NAPCON Simulator provides possibility to replicate and assess the operational readiness of plant assets long before they are applied in real-world production scenarios.

## COMPREHENSIVE

NAPCON Simulator simulates all the possible production states such as start-up, shutdown or special breakdown situations. You can also cover all sections including process phenomena, plant equipment and process automation (control system and safety logics) in your training.

## TRAINER DASHBOARD

Easy-to-use graphical interface for introducing various faults and disturbances for different scenarios in any part of the process. Comprehensive training reporting with possibility to track training sessions and generate training reports.

## AUTOMATION SYSTEM INDEPENDENT

Emulated user interface allows creating high fidelity training simulator no matter which DCS is in use.

## HIGH FIDELITY PROCESS MODELS

Operators can focus on specific process phenomena to gain deeper understanding of process models.

## SIMULATION VISUALIZATION

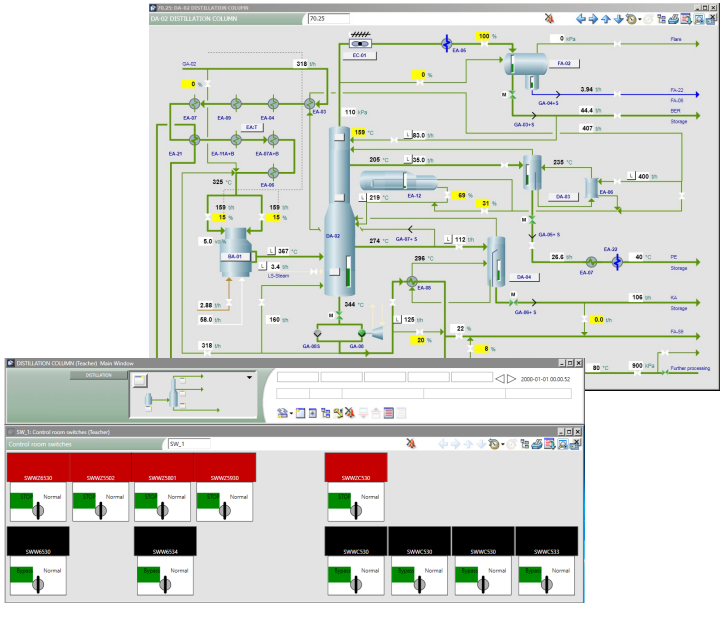
Detailed graphical user interface for automation and process models with data visualization.

## PLATFORM

In premises or cloud setup with flexible training room allowing training of multiple units and trainees.

## TRAINER FUNCTIONS

Modern Instructor functions with easy-to-use graphical interface for introducing various faults and disturbances for training scenarios.



## NAPCON SIMULATOR (OTS)

- NAPCON Simulator is a custom made, state of art simulator that offers the production line wide teamwork training for operator shifts and has several operator training applications that cover basics process phenomena and all process equipment.
- Modern Instructor functions with easy-to-use graphical interface for introducing various faults and disturbances for training scenarios.
- Available with both Generic and vendor specific emulated operator displays (Human Machine Interface).
- High fidelity simulations based on rigorous physical properties and dynamic models that reflect the operations and control responses of the actual plant.
- Integrated simulation of process and automation models at user defined simulation speed. Typical speed for NAPCON Simulator (with multiple integrated units) is up to 6 times real time speed and as high as 10 times real time speed.

## NAPCON ENGINEERING SIMULATOR

- NAPCON Engineering Simulator enables using the simulator for conducting dynamic engineering studies along with the control system configuration.
- Few of many assessments that can be done via NAPCON Engineering Simulator are:
    - What-if scenarios (i.e. study how the plant would respond to different operating strategies).
    - Control strategy assessment (i.e. how different control schemes affect plant operation).
    - Optimization strategy assessment (i.e. impact of different feeds and blends on plant performance).
    - Operational procedure assessment (i.e. checking that operational procedures are valid).

## NAPCON LITE OTS

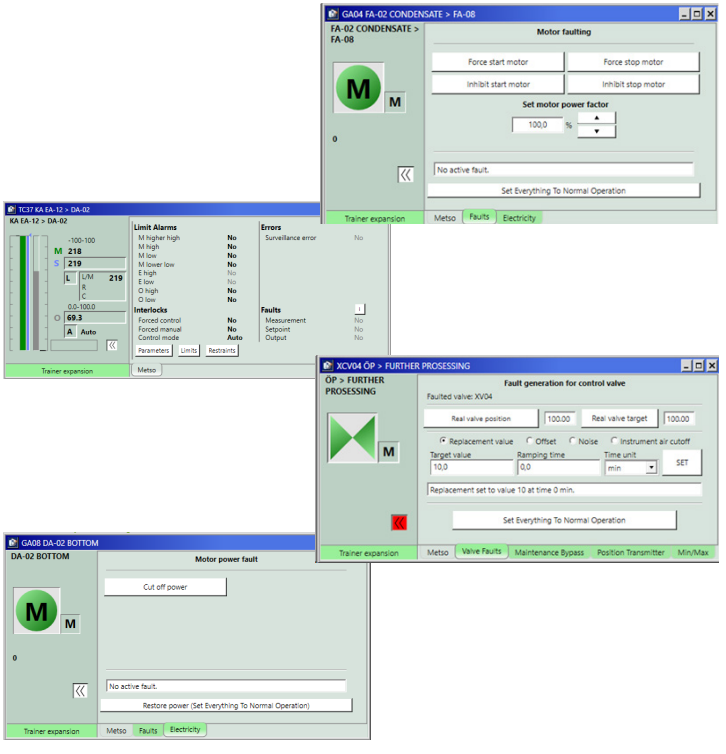
- NAPCON Lite OTS is a generic level simulator that offers a possibility to train plant personnel on particular technology or on a process without going specific to the specific process plant details.
- NAPCON Lite OTS is available in high or medium level fidelity based on the needs of the training and as per requirements. The NAPCON Lite OTS is often offered with NAPCON generic emulated operator display and has in-house developed instructor functions for introducing faults and disturbances.
- Typical speed for NAPCON Lite OTS can be as high as 10 times to 30 times the real time speed (for smaller entities).

## NAPCON CLOUD OTS

- NAPCON Cloud OTS is Location and Hardware Independent Training Solution. It can be accessed from anywhere in world and with any browser.
- NAPCON Cloud OTS is gives the opportunity to support multi-user online training and remote learning by having simulators in the cloud.
    - It provides possibility to do training equivalent to classroom based training in the cloud
    - Supports multi-user sessions
    - Highly scalable and flexible environment, allowing dynamic adding or removing of seats
    - Cost Effective – uses the resources only when needed
- Powered by computing capabilities and NAPCON Simulation Software
    - Cyber Secure by nature
    - Easy to scale out globally
    - Hardware Independent

## TRAINING, SCENARIOS AND LEARNING ENVIRONMENT

- Pre-defined set of basic exercises for supervised training and individual learning.
- Separate instructor work station with tailored graphical user interface and intuitive training functionalities on top of operator graphics and loop window expansions.
- True-to-life training environment for operators with high quality operating displays, multiple monitors and hardware switches or flexibility via touch screen switch panels.
- Large-scale training scenarios emphasizing the cooperation of panel and field operators and shift supervisor.
- Unlimited amount of generic faulting options for unlimited training scenarios.
- NAPCON Simulator helps operator to be trained on various aspects of operations, including (but not limited to): power/voltage drop, instrument air shortage, cooling water shortage, furnace total burning out, steam shortage, pump failure, turbine issue, faulty valves (multiple valves), faulty measurement instruments (multiple instruments), faulty motors (multiple motors), different abnormal, incidents like equipment malfunctions and emergency conditions, changing instructor variables (ambient temperature and feed composition), unlimited number of malfunctions/scenarios, process upsets (provided on trainer interface).
- NAPCON Simulator offers a possibility to start and stop simulation (freeze/unfreeze) anytime, rerun stored simulation states, saving trend history data, saving initial conditions, loading initial condition, as well as selecting, running and stopping sequence.

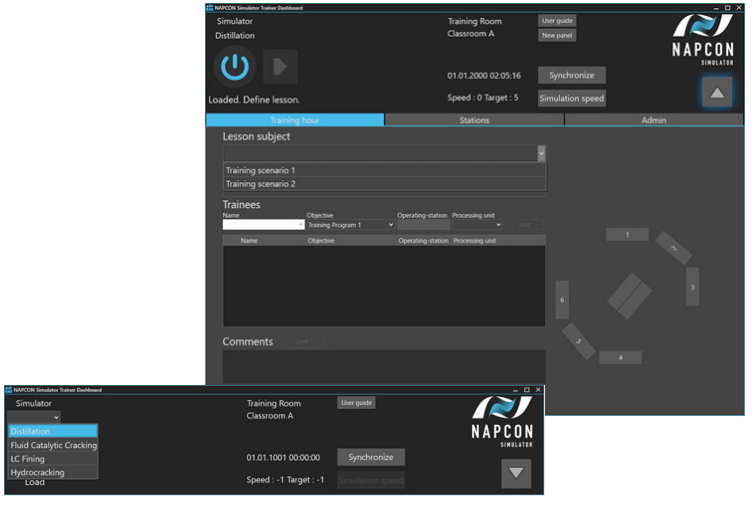


## TRAINER DASHBOARD

- Helps in running and managing simulator training sessions as well as generating training reports.
- Features easy-to-use graphical interface for managing simulator training sessions and generating reports to show realized training records.
- Trainer Dashboard features.
- Provides a possibility to select one of the several available simulators to run on the NAPCON OTS Platform.
- Basic simulation control features such as load initial condition, start simulation, pause and continue simulation, save simulation session.
- Observe and change simulation speed compared to real time. Faster than real time simulation speed allows covering critical trainings (such as startup, shutdown etc.), which takes longer time to be simulated in lesser time and thus also makes training more interesting.
- Integrated training session and simulator management for smooth workflow to start, execute/keep and report the training session.
- Ensures that training session information such as lesson subject, objectives, trainees, instructor/trainer and notes are recorded.
- Training room operator station configuration for the training session is included. This adds flexibility to set the multipurpose training room for each session as needed, e.g. select which operator stations will be used for which panels.
- Training session and simulator status information is easily available for Trainer.
- Reports accessible for privileged users. User management by privileged users.
- Simulator admin can set available initial conditions for training as well as a default initial condition.
- Predefined training scenarios and free scenarios.
- Utilization rate calculation for training rooms and simulator to follow asset usage.

**Trainer user interface**

- Possibility to record operation control actions for later review and replay which helps in realistic training assessment.



## NAPCON SIMULATOR TECHNOLOGY

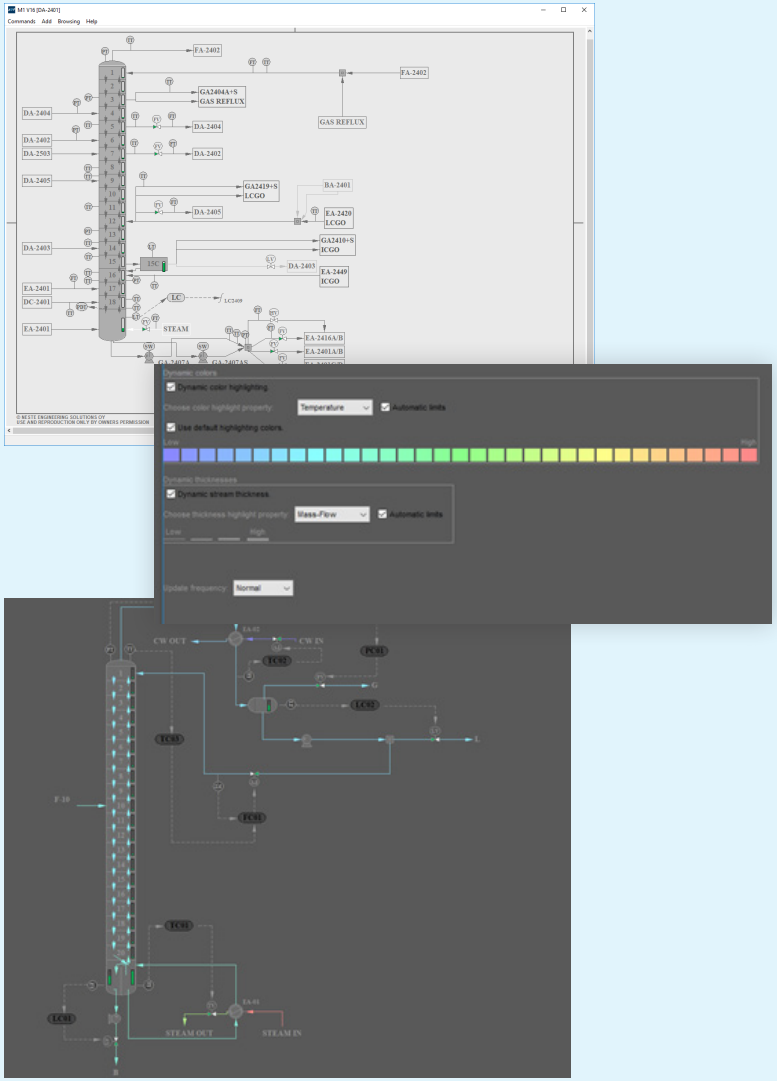
Extensive and customizable chemical component library with built-in rigorous kinetics and thermodynamics.

Several equations of state can be used simultaneously.

Hierarchical and modular networks of simulated objects with variable step lengths enable simulations of highly complex systems with desired level of accuracy.

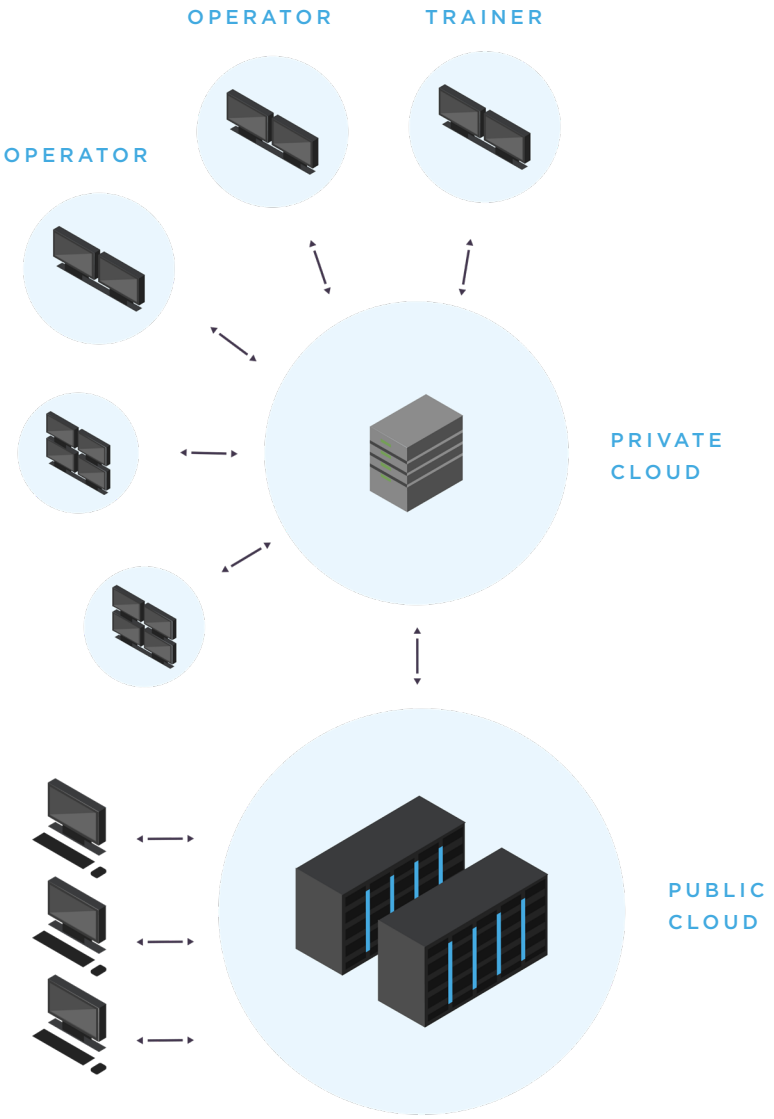
Fully integrated database for storing simulation history.

OPC Unified Architecture (UA) standard compliant database and interface.



## PLATFORM

- In-premises or public cloud platform for flexible use of resources and location independent access.
- Simulation speeds are tailored based on training requirements. Typical speed for plant simulator (with multiple intergrated units) is from 0.5 to 6 x real time speed and as high as 0.5 to 30 x  real time speed for smaller entities.
- Windows 64 bit 7/8/10/2008/2012/2016+ platforms.
- Runs with in-house developed NAPCON Informer software database that offers advanced process information management services and secure OPC Unified Architecture (UA) connection.
- Operator and trainer workstations with touchscreens, switch panels, simulation servers and engineering services.
- NAPCON OTS Platform allows selecting one or more simulators for training session in each simulator training room. Provides a possibility to utilize the same training room for training different process units. OTS Platform provides a flexible training room to run different process units connected to each other in series or parallel as an individual simulation sessions.

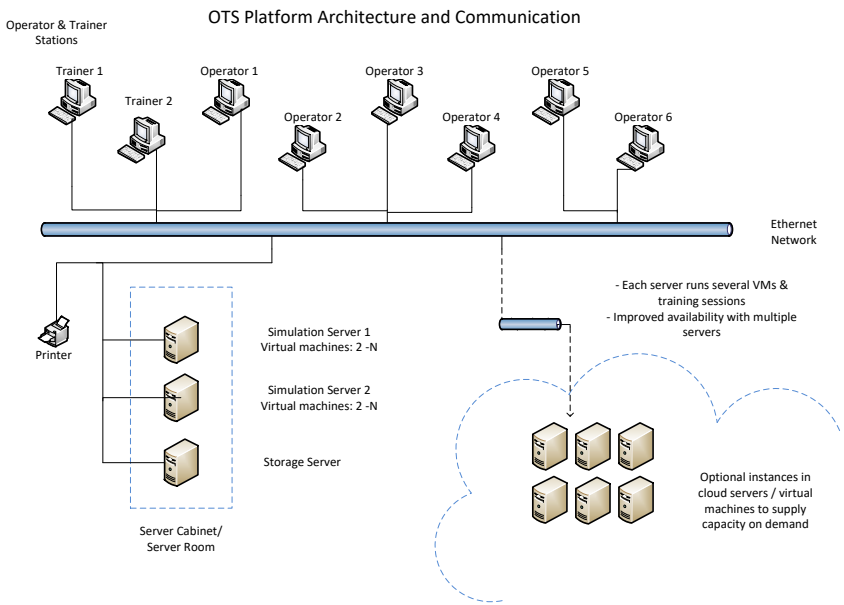


## PROCESS AND AUTOMATION MODELS

- First-principle models for all commonly used process equipment. Physical phenomena and chemical reactions are the basis of the modeling to reach highest level of realistic process feedback.
- Extensive chemical components library that consists of hydrocarbons, amines, alcohols, ketones, aldehydes, esters, carboxylic acids, halogens, phenols, solids and other miscellaneous pseudo components.
- Rigorous model library with Distillation column, absorber, adsorber, reflux absorber, liquid-liquid extractor, fractionator, heat exchanger, air cooler, heater, two phase separators, three phase separators, centrifugal separator, cyclone, pump, compressor, ebullated bed reactors, conventional fixed bed reactor, hydroprocessing reactors, ebullated pump system & seal oil system, reciprocating & centrifugal compressor, pipe, mixer, power recovery expander, expander, valve and miscellaneous equipments like PID controller, multi variable controller, controller auto tuning.
- Advanced piping network modelling with two-phase flow calculations.
- Simulation of complex distributed control system (DCS), safety instrumented system (SIS) and sequential operations (SEQ) applications.
- Detailed graphical user interface with data visualization features to easily get touch on the process state and dynamics. Process properties like temperature, flow and pressure can be illustrated dynamically with user adjustable color gradients.
- Process is modeled on hierarchical flowsheets and equipment states as well as connectivity can be fully examined even during the active simulation.
- Quicker and shorter calculation steps in process and automation models of lesser than one second provides accurate dynamic simulation results. Information is updated at each simulation interval within and between process units.
- Reference list of modelled unit processes : Amine gas treater, Amine regeneration, Atmospheric distillation, Crude distillation, Desalter, Furnace, Hot system AUX, Hydrocracker, Hydrogen production, Isomerization, LC-fining, Solvent Dearomatization, Sour water stripping AUX, Steam reforming AUX, Sulphur removal, Vacuum distillation unit, Polypropylene processes with loop and gas phase reactors, Polyethylene processes, Propane and Propene splitting process, Pressure swing adsorption (PSA), Light gas distillation, Fixed bed Mild Hydrocracker, Multistage compressors network, Furnace with Superheater, Phenol CHP reactor, Fluid Catalytic Cracking.

## PROCESS HISTORIAN

- Full support for OPC UA information modelling e.g. for controllers, alarms, and events, including OPC UA standard information models
- Dynamic address space enables addition of new nodes on run time
- Industry 4.0 ready connectivity to systems from shop floor to office level using OPC UA and OPC DA




## REALTIME DATABASE

- Informer uses powerful PostgreSQL database for large scale history data storage.
- NAPCON History Writer acts as an intermediary buffer between the NAPCON UA Server and NAPCON History Database.
- PostgreSQL database technology, object-relational database.
- Storage for process data, alarms and events.
- Partitioning of history to optimize data access speed and storage capacity.
- Several schemes for data compression.
- Buffered input to even out momentary high loads of data transmissions.
- Independent user operations via Windows Services based components.
- Built on Microsoft .NET and OPC UA standard.
- Windows 32/64 bit platforms.

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## UNDERSTAND

NAPCON Understand solutions will turn the data provided by your plant into relevant information that helps to optimize your company's production.

*NAPCON Informer*
*NAPCON Analytics*

## IMPROVE

NAPCON Improve solutions will bring out the maximum potential of your operations and helps you to ensure that your investments meet your strategic goals.

*NAPCON Controller*
*NAPCON Optimizer*

## TRAIN

NAPCON Train solutions will bring the real life plant into the virtual world, making training operators and testing the limits of your plant safe and exciting.

*NAPCON Simulator*
*NAPCON Games*

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