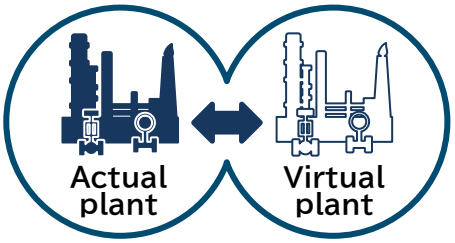
Next-generation Plant Operation System

Mirror Plant

What is “Mirror Plant”?

“Mirror Plant” is an online plant simulator which connects the actual plant to a high accuracy plant model developed by the plant dynamic simulator “OmegaLand Visual Modeler”. Mirror Plant makes it possible to visualize the plant’s internal conditions that could not be realized by a normal control system. It carries out the case study of the future process behaviors and predicts the process conditions during the elapse of a certain period of time after changing a setpoint value.

Mirror Plant can realize next-generation operations with a “real” digital twin that makes plant production activities safer, more secure, more stable and higher quality than ever before.



Digital Twin

Next-generation plant operation system with real Digital Twin

Mirror Plant Challenges

Mirror Plant can solve the followings;

✓It’s difficult to identify quality changing quickly since the update cycle of on-line gas chromatography data runs every 10 minutes.

✓It’s difficult to manage the catalytic activities in a reactor without expert experience.

✓The condition in the raw material tank is estimated by operators in consideration of temperature and pressure. Unfortunately, there is no other method to monitor it.

✓A product with a high-impurity concentration is produced whenever the feed rate of raw materials is changed. It should be transferred to another tank as an off-spec product but to identify the timing to switch it to a normal product line is difficult.

✓Originally, quality should be controlled as a target value but there is no way to measure it directory therefore it is controlled by the balance between temperature, pressure, and time.

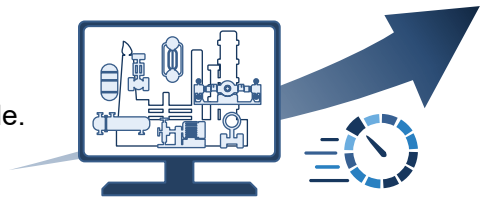
Help in solving various issues

Mirror Plant Features

・Use the reliable and proven dynamic simulator as a simulation engine

Mirror Plant uses plant models running on OmegaLand, an integrated dynamic simulation environment that has been installed at more than 480 sites worldwide.

The plant model of Mirror plant has a high-speed engine that can solve the pressure flow network. It uses the calculation based on the first principle of physicochemical engineering. Therefore, it offers the tracking of process values from the actual plant in real time with a high fidelity and high performance.



High fidelity and high performance

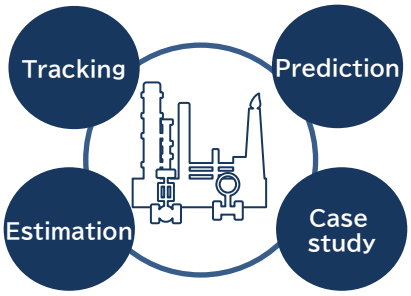
High compatibility with CENTUM

・High compatibility with YOKOGAWA DCS

In order to visualize the plant’s estimated internal states, the information should be displayed on the operator console that the operators regularly use to monitor and operate the plant. A dedicated client for displaying Mirror Plant simulation results can be displayed on the operator console of YOKOGAWA DCS CENTUM.

・Simultaneous simulations by multitasking

Mirror Plant can execute multiple simultaneous simulations on a single computer system. It performs the tracking of the process value from the actual plant or target value in real time and predicts the future behavior. This results in the system simultaneously running process behaviors in response to changes in the set value as a case study.



Multiple simultaneous simulations

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Mirror Plant

System configuration

“Mirror Plant” is composed of three main types of simulation models.

・Mirror model

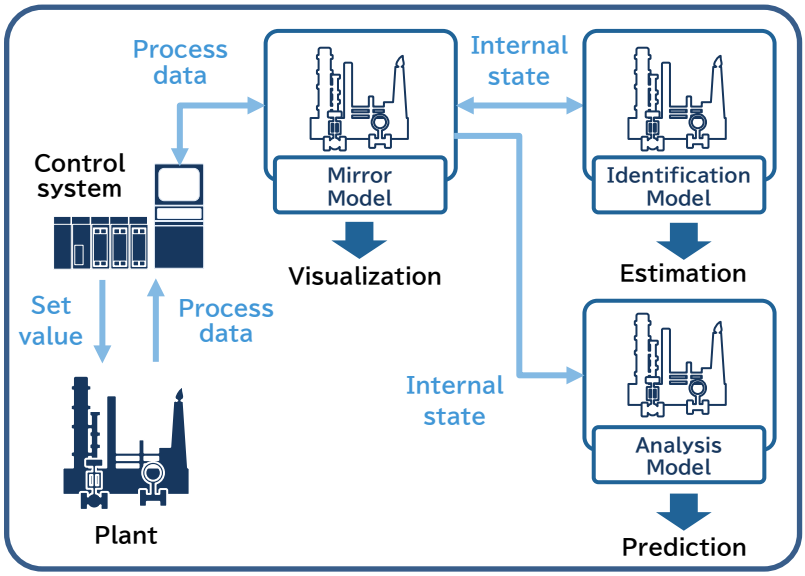
The mirror model connects to the DCS which controls the actual plant and imports the process data with the control mode. Based on the imported data, the mirror model is reconciled to match process values in the model with the actual plant. This processing is called "tracking" and makes it possible to visualize the unmeasured process values.

・Analysis model

The analysis model receives the internal condition which is generated by Mirror model and is used for case studies, forecast alarm, etc..

・Identification model

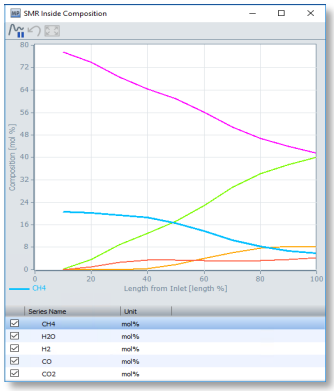
The identification model identifies the long-term fluctuations of equipment performance. It automatically adjusts the parameters inside of the simulator, which leads Mirror Model to follow the actual plant. In addition, the adjusted parameters are used to monitor the aging for the long term.



Visualization, Estimation and Prediction by multiple simultaneous simulations

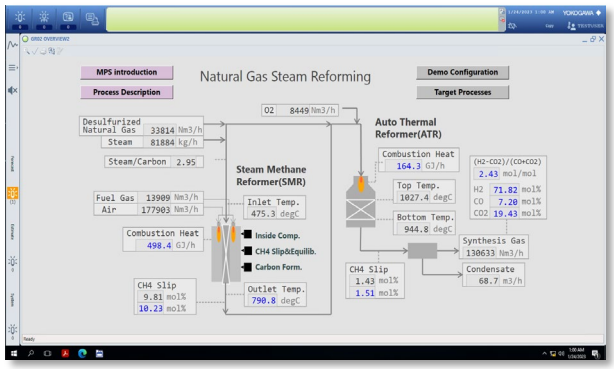
Practical example

The following describes a practical example of “Mirror Plant” used in the reformer process.



・Internal visualization of the plant

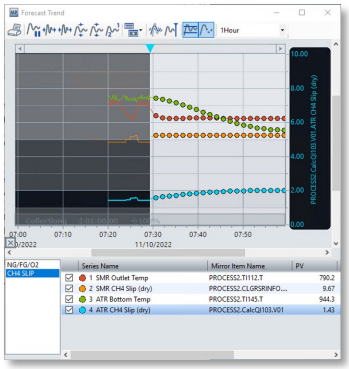
Display the trend of the methane composition change in the reactor.



Main panel of Mirror Plant

・Operation with new indicators

Operate while checking the actual data and the estimated values on the DCS console simultaneously and check the methane slip of control points without waiting.

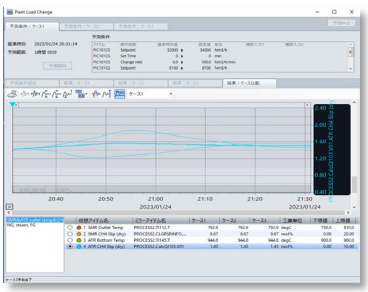


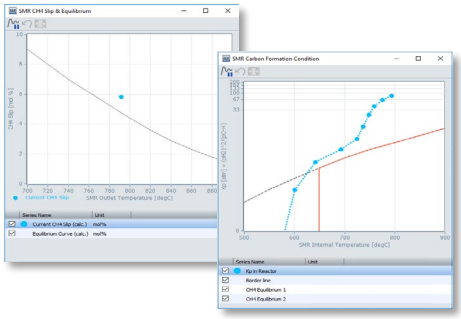
・Early detection of misoperation

Predict the future behaviors periodically and activate an alarm if changes in the set-point value are incorrect.

・Energy-saving operation search

Practice multiple procedures to change the fuel amount when changing the load of natural gas and find the procedure that minimizes the fuel amount.





・Monitoring catalyst performance

Display catalytic performance by the difference between the theoretical methane slip curve and the current value. It visualizes the area where the degradation of catalyst activity progresses and avoids such an operation.

Contact us

For further product information about Mirror Plant, please contact the following.

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2023.1 rev.0
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