



Integrated Environment for Dynamic Simulation

# OmegaLand



# Connect with the virtual world

OmegaLand (Integrated Environment for Dynamic Simulation) connects people, knowledge, expertise and experience, and the virtual world (simulation) in a variety of forms by utilizing modeling technology and dynamic simulation technology in the plant life cycle of manufacturing sites supporting production activities, then supports people in the plant operation business more reliably, more safely, more securely and more efficiently.



## C hange

We are facing the environmental changes like the rapidly proceeding energy diversification, global population increase, economic and social structure changes, concerns about global warming, water problems associated with global natural disasters, furthermore the environment surrounding industrial production activities, such as entries from other industries, contributing to local communities, compliance rules, is changing dramatically from the global level to the regional level. Amid such changes, the difficulty of operation is increasing at manufacturing sites and urgent measures are frequently required in response to operation adjustments in accordance with fluctuations in raw material prices, the retirement of experienced operators, and the loss of opportunities to cope with unsteady operation and process fluctuations due to the penetration of automatic control.

## C hallenges

At the manufacturing sites where it is required to respond to such environment changes, more efficiency and safety are required than ever before: not only more stable and reliable operation but also the reduction of specific energy consumption, yield improvements, countermeasures to cyber terrorism and the extension of shutdown maintenance period. Furthermore, with the evolution of computer science represented by statistical analysis and practical applications of the considerable amounts of digital data accumulated day by day, the advancement of computer science represented by AI technology makes it possible to predict future trends of various phenomena. Even in the plant life cycle that includes design, engineering, operation, conservation, and improvements, it is necessary to not only carry out tasks based on past experiences but also to realize more stable, safe, reliable and efficient operation by utilizing such technology.

## S olutions

The OmegaLand integrated environment for dynamic simulation provided by Omega Simulation is designed to solve such problems in the plant life cycle to support people involved in diverse tasks through modeling and simulation technologies. For example, the purpose of providing a plant operator training simulator (OTS) is not only for operators to learn plant operating procedures, but also to provide an environment that enables unprecedented and satisfying communication, by “connecting” young operators with experienced operators, so as to pass on operational know-how at plant start-up and techniques for dealing with abnormalities. Furthermore, even in the daily plant monitoring operation tasks, mutual trust is born by interactive communication conducted through the OTS, contributing to the prevention of human errors by establishing closer relationships.

# Connecting with people, knowledge, expertise and experience

The goal of OmegaLand is to contribute to the improvement of plant operation with connecting people, knowledge, expertise and experience which are the base of their stable, safe, reliable and efficient operation at manufacturing sites, and supporting whole their production tasks.

## **O**perations

OmegaLand supports the operations tasks.

- Learning process principles
- Plant operation including field operating devices
- Operation taking production and energy efficiency into account
- Appropriate responses to changes in weather and production volumes
- Quick responses to abnormalities, etc.

## **E**ngineering

OmegaLand supports the engineering tasks

- Process improvement investigation
- Instrumentation system operation verification
- Creation of standard operation procedure manuals
- Verification of utility balances
- Control system investigation, etc.

## **P**roduction

## **P**roduction

OmegaLand supports the production tasks

- Management of specific energy consumption per unit throughout the plant
- Study of production efficiency of the entire plant
- Determination of production volumes taking supply and demand balances into account, etc.

## **O**perations

# OmegaLand

## **M**aintenance

## **M**aintenance

OmegaLand supports the maintenance tasks

- Examination of equipment abnormality causes
- diagnosis of equipment performance
- Predictive maintenance etc.

## OmegaLand **Trainer**



OmegaLand Trainer provides a high performance operator training environment with a high fidelity, high speed performance precise plant model. For example, since it is possible to connect to the plant model using the DCS and safety instrumented system applications that are actually used in the plant, realistic training can be performed such as startup, shutdown and troubleshooting operation procedures of control room or field operators. In addition, it can be used for designing operations according to the process behavior, verifying operations before reconfiguring the instrumentation and control system, creating standard operation procedure manuals, and verifying advanced control operations.

## OmegaLand **Educator**



OmegaLand Educator uses dynamic simulation models to enable studying the process principles required for plant operators and engineers in a wide range of learning styles including personal learning and group learning by instructors. For example, learning can be done on individual computers and remotely through networks by studying topics such as PID tuning methods, capacity losses due to heat exchanger fouling, material balances / heat balances around a boiler, etc. In addition, applications that allow mastering unit operations by using general dynamic simulation models of distillation towers and compressors are also provided.

## OmegaLand **Visual Modeler**



OmegaLand Visual Modeler is the core plant dynamic simulator of OmegaLand. It is a high-performance dynamic simulator that can faithfully reproduce an entire plant, such as chemical, petrochemical, oil refining, LNG, water purification, or power plants, etc., according to our customers' various needs by using detailed process units. In addition, process models developed in Visual Modeler can also be used to develop systems that allow visualizing detailed internal processes and predicting future trends of plants by tracking and capturing real plant controlled variables and process values in real time via a network.

## OmegaLand **Solver**

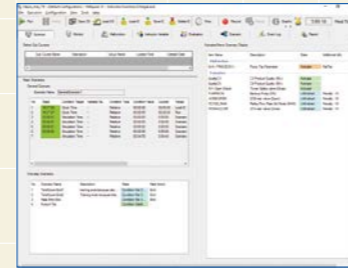


OmegaLand Solver makes modeling possible without programming knowledge because numerical solutions can be obtained simply by expressing equations as they are. For example, calculation results can be obtained simply by inputting as equations, calculations such as reactor analysis, heat exchanger heat transfer, process material balances or chemical equilibrium calculations. Moreover, it is possible to verify control system logic not only offline but also by connecting to a control system via OPC. Furthermore, a connection with the control system of an actual plant can be used as an internal process visualization tool and as an optimization tool.

OmegaLand Trainer is mainly used as a plant operation training simulator for operators. There are two types of simulators: the emulation type for which the GUI and control logic is developed in addition to the process model in the OmegaLand environment only, and the DCS software type for which the DCS application that is actually used in the real plant is connected to the plant model to build a training environment. Both types are equipped with functions that enable to implement and manage training flexibly and effectively, to strengthen training evaluation functions, and to flexibly change the system configuration. Furthermore, by simulating field operation conditions through graphic functions coordinated with 3D systems, it is possible to develop a more realistic training environment linked with the monitoring operation training in the instrument control room.

### Main functions provided by Trainer

Function	Functional Overview
Loading initial conditions	A function for loading the conditions at the start of training into the simulator.
Start/Freeze	Starts or temporarily suspends training.
Timescale change	Changes the simulation execution speed to 1/8 to 8 times.
Snapshot save/load	Temporarily saves or restores conditions in the course of training.
Malfunction	Deliberately generates abnormal plant conditions and equipment failures.
Replay evaluation	A function for reproducing the training operations as they were performed.
Field operation simulation	Simulates field operations using graphics.
Automatic operation	Performs training according to procedures designed in advance.

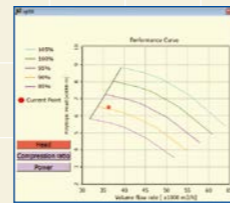
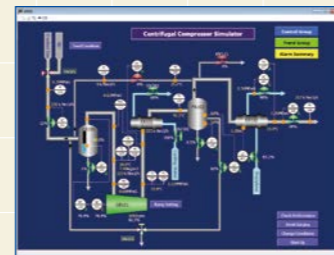


Trainer instructor window

OmegaLand Educator is an educational application that uses dynamic simulation. It can be used by selecting simulators (multiple selections are possible) from the application group: operation principle editions and basic unit editions. The main purpose of the operation principle editions is to learn the theories and rules of processes, while the aim of the basic unit editions is to teach unit operations. These products include process models specialized for each application, with operation windows, figures and tables that allow observing important feature quantities and their changes according to the exercises. There are also various exercises that can be studied repeatedly according to the level of the trainee, and many themes available to efficiently learn the process principles and unit operations. A dedicated learning booklet is also included. In addition, there is also a network version that can be used by a large number of participants at once, and that allow trainees to use the applications separately, assign applications that you want them to attend, and manage their attendance records. OmegaLand Educator will support efficient acquisition of practical knowledge and skills, since it is easy to use and enables each trainee to experience the behavior of processes for actual operation that until now could only be taught in classrooms.

### Educator applications

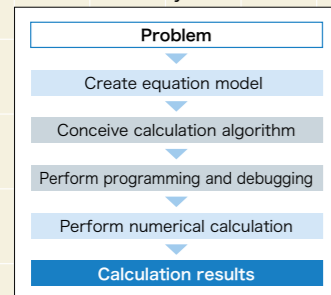
Type	Purpose
Operation principles edition	Learning theories and principles of fluid, heat transfer, PID tuning etc.
Basic units edition	Mastering unit operations for distillation, compression etc.



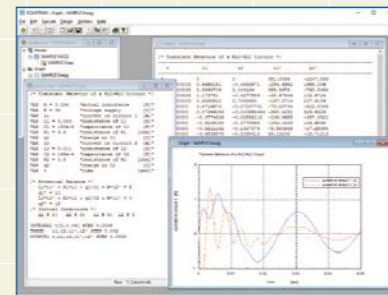
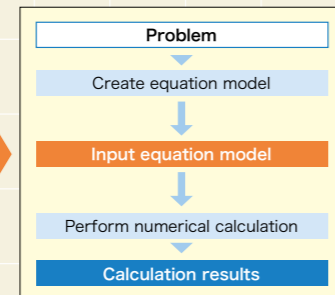
Heat transfer application learning window

OmegaLand Solver can perform numerical calculations simply by inputting a equation model created without considering calculation algorithms by use of the functions of the EQUATRAN equation solving software. Therefore, it is possible to solve a mathematical model in a short time compared to a programming language. A model creation function in the C language is also offered for users who are familiar at solving numerical calculations with programming languages. Interactive dynamic simulation and static simulation can be performed by defining the created equation model as a unit on a graphical interface and combining those units. In addition, since it can be connected to a real plant via an OPC interface, OmegaLand Solver can be utilized as an online system for plant visualization, or equipment diagnosis by balance calculations, through model calculation using real-time process data of real plants. By combining them with graphic functions, simulation results can be displayed in an easily understandable manner.

### Conventional System

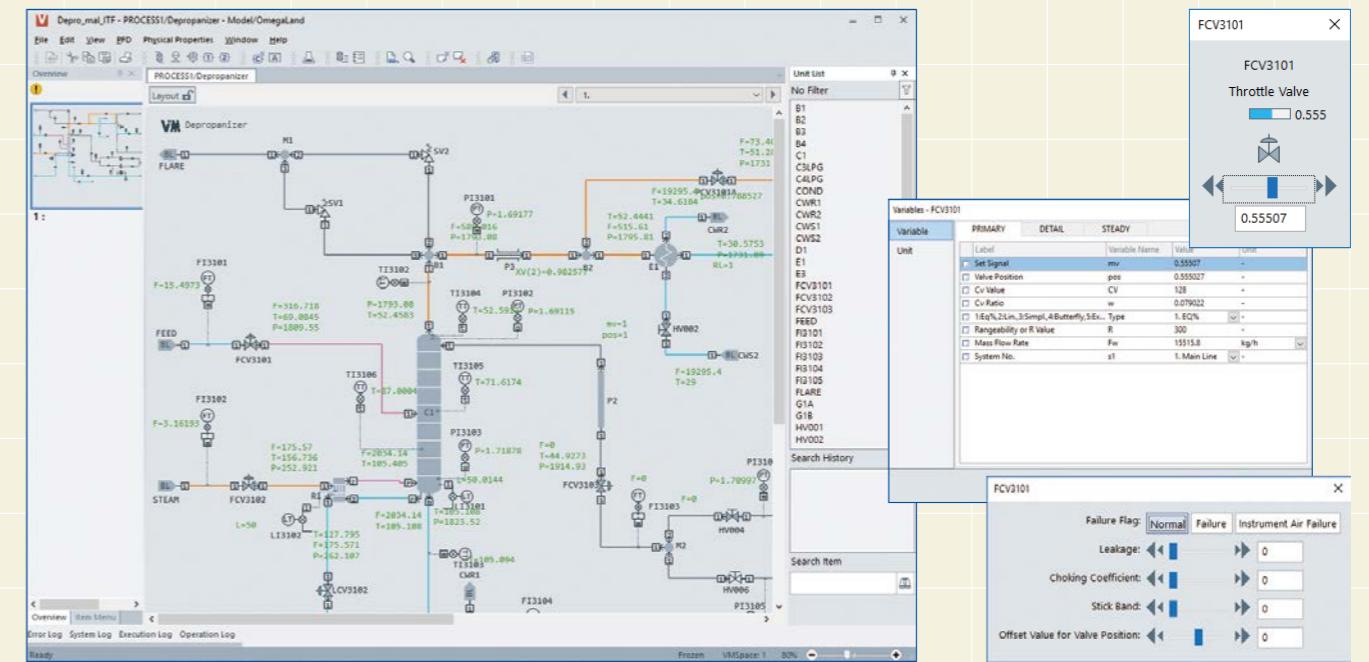


### Solver



Example of Solver development window

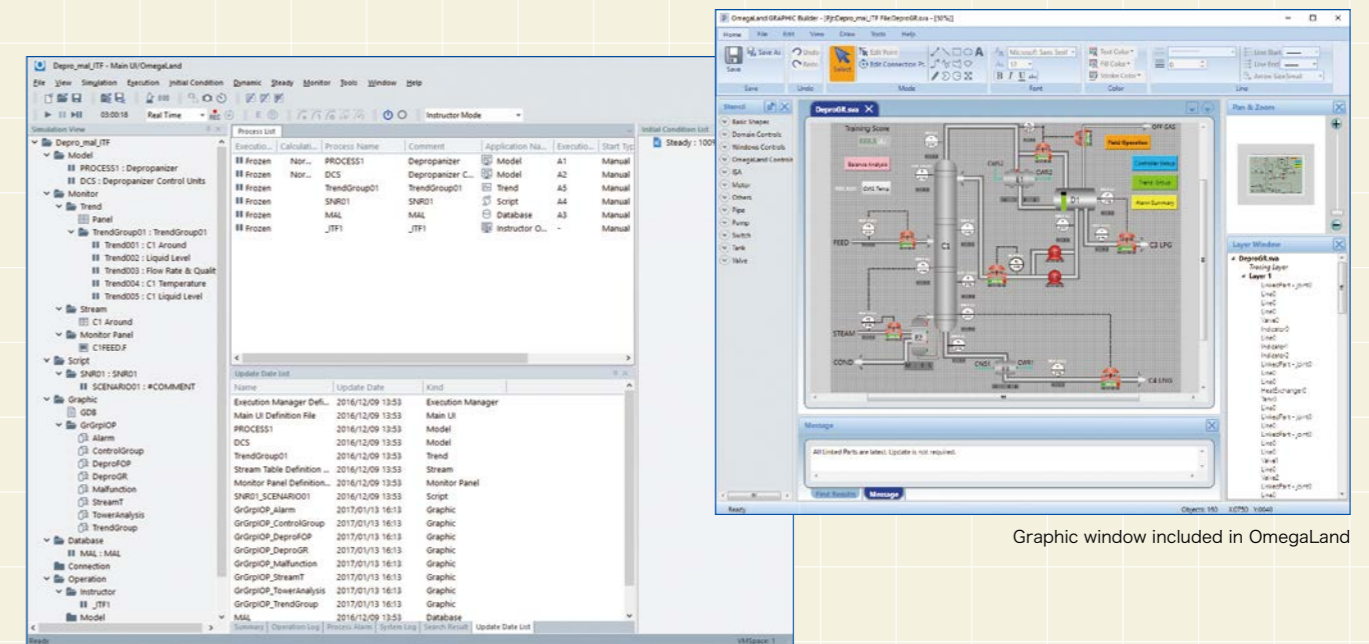
OmegaLand Visual Modeler is the core plant dynamic simulator of OmegaLand. It is a high performance simulator that can be used for various purposes. It has a physical property calculation function and a unit model calculation function that can faithfully reproduce processes such as chemical, petrochemical, oil refining, LNG, water purification, or power plants by using plant level detailed models. The engineering environment of OmegaLand Visual Modeler employs the latest UI technology and can be edited while maintaining the simulation conditions even when the simulator is started. It is also possible to change the display of the variable setting dialog according to differing roles such as engineer or instructor. In addition, by implementing a more user-friendly and intuitive UI, we have realized a dramatic improvement in engineering efficiency. With such highly efficient engineering performance, excellent performance capabilities unparalleled during execution, and the enhancement of simulation execution environments that can connect with real plants on-line, places to utilize dynamic simulation technology will more than ever be expanded.



Example of Solver development window

Example of edition / execution window of Visual Modeler

In addition Visual Modeler and OmegaLand provide a graphic function included in the dynamic simulation environment, an external I/F group capable of connecting with third party simulators, a combination of instructor functions capable of efficiently generating abnormal conditions and monitoring the operating conditions, so that a simulation environment that meets all the plant related needs is provided. As the core plant dynamic simulator of OmegaLand, OmegaLand Visual Modeler provides befitting performance for the next generation dynamic simulators that will connect people, knowledge, expertise and experience, and support people in the manufacturing field to respond to a variety of changing requirements.



Graphic window included in OmegaLand

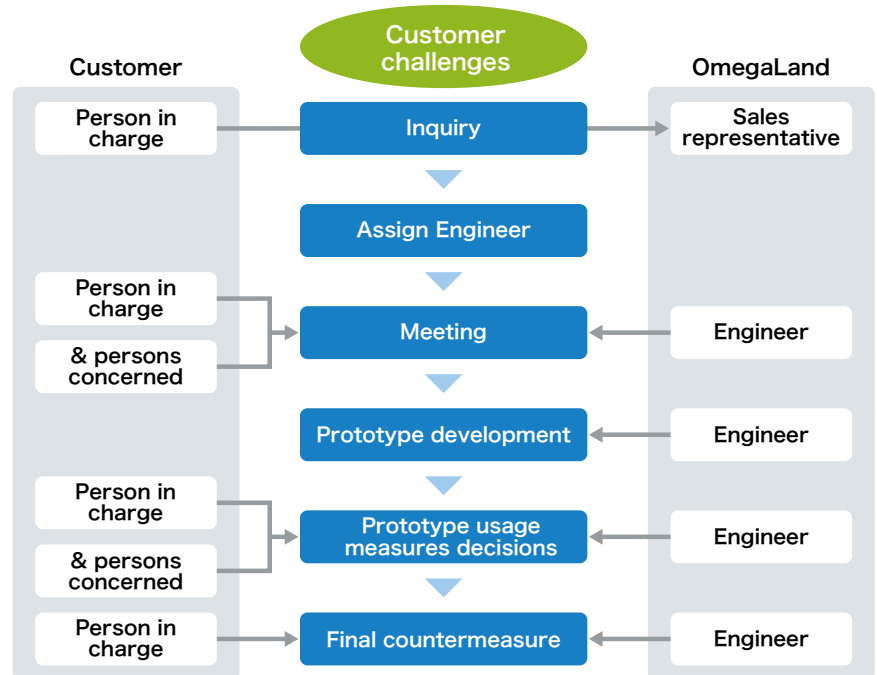
OmegaLand Integrated Dynamic Simulation Environment

OmegaLand Services provides a wide range of services, such as product maintenance services and educational services for each product, consultation services to support the usage of modeling and simulation technologies to ensure process stability, create control strategies, or consider processing capacity before plant renovation according to our customers' requirements, and engineering development services such as process model and operator training simulator development.

## Service Menu

- Product maintenance services
- Examination and creation of mathematical models
- Development of custom unit models
- Development of plant models
- Development of operator training systems
- Educational services for each product

## Consulting Service Flow



## Product Maintenance Service Contents

Providing free version upgrade products	When OmegaLand software product upgrades and service packs are released, we will provide new versions of products and service packs (media) free of charge. Note, however, that we will charge a fee for the installation service of the products.
Providing information on improvements and revisions	From the website provided by our company and dedicated to maintenance contract users, detailed information useful for customers to continue using products is provided such as software revision information about OmegaLand software products, function improvements, information about known
Inquiries concerning usage troubles	<p>① We will respond to inquiries concerning the following product related troubles while customers use our products..</p> <ul style="list-style-type: none"> <li>● The product does not start</li> <li>● The product does not operate correctly in normal usage</li> <li>● The product does not work as described in the manual</li> </ul> <p>② When customers use products and develop process models, we will answer the following product related troubles and inquiries</p> <ul style="list-style-type: none"> <li>● The product does not start</li> <li>● The product does not operate correctly in normal usage</li> <li>● The product does not work as described in the manual</li> <li>● A section of a manual is not understood</li> </ul>



Contact

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