

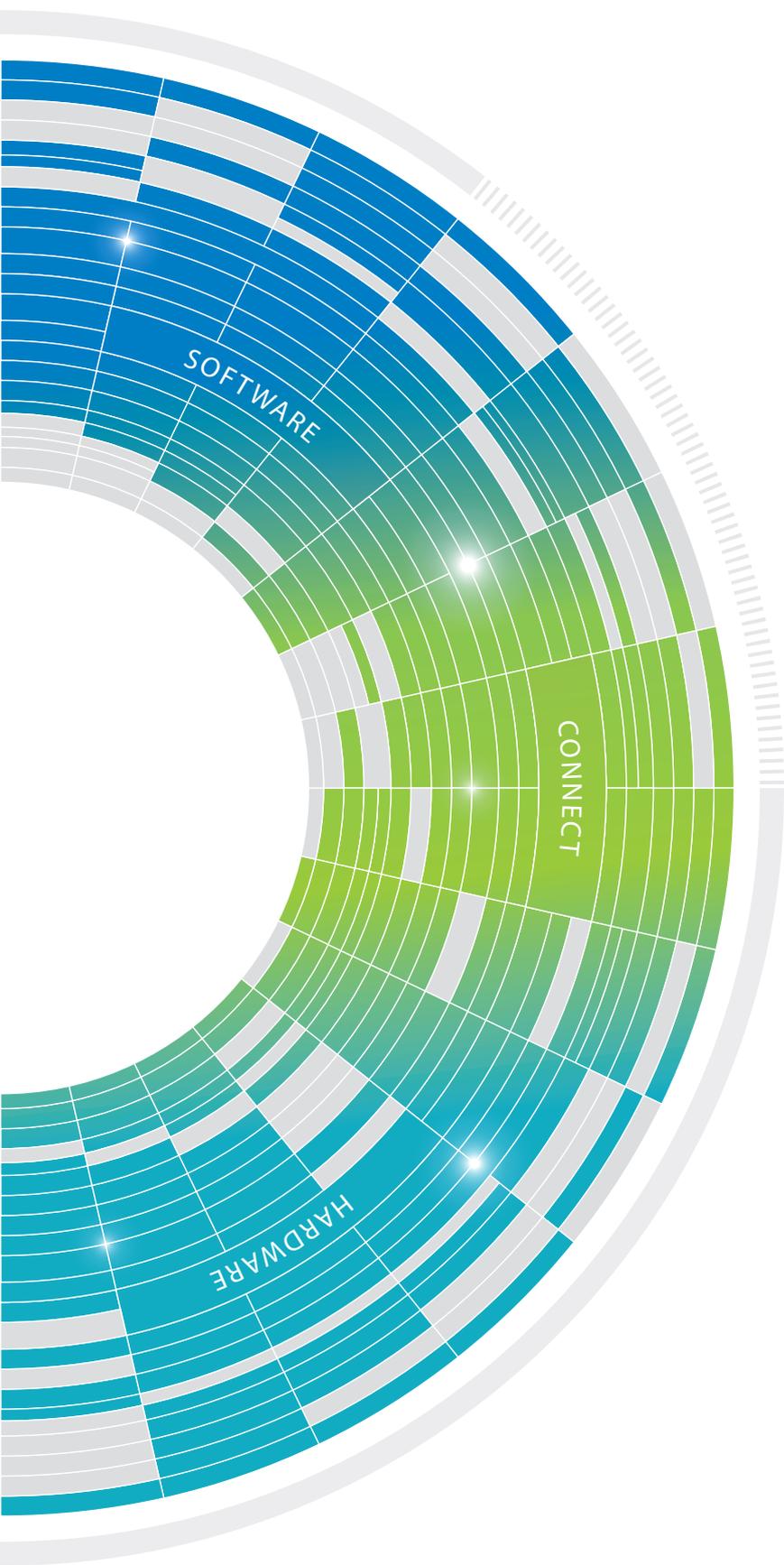


 [www.yudo.com](http://www.yudo.com)

 [exhibition.yudo.com](http://exhibition.yudo.com)

 [www.facebook.com/yudokorea](http://www.facebook.com/yudokorea)

 [www.youtube.com/yudogroup](http://www.youtube.com/yudogroup)



**Consilience** Technology



## CONTENTS

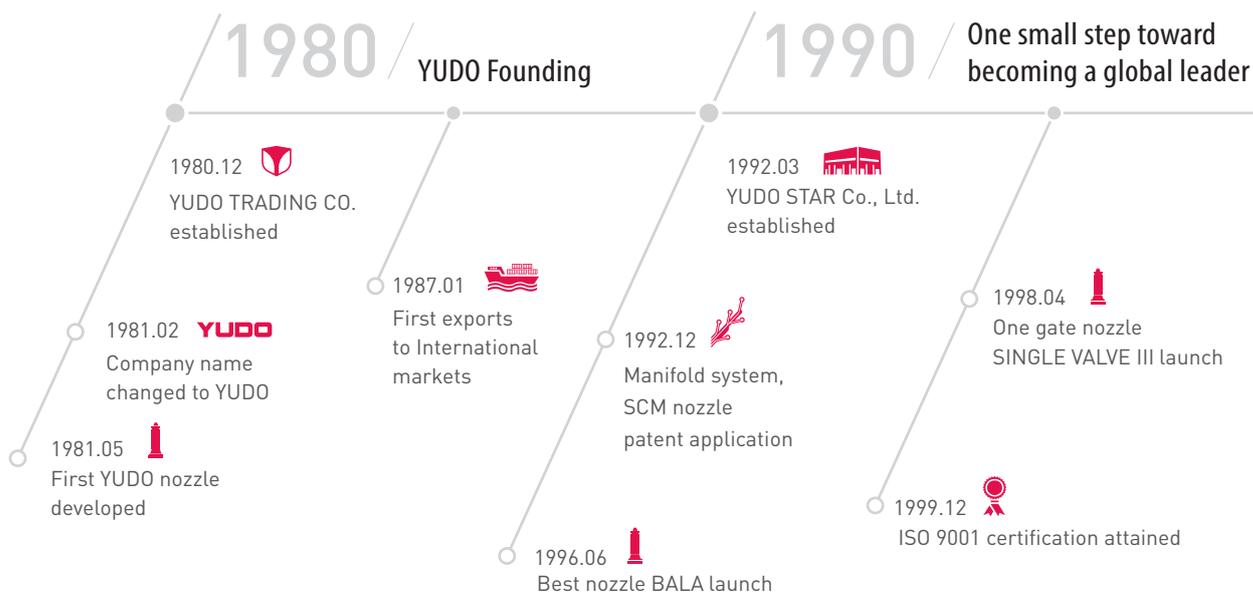


Milestones	2	Technology	30
Vision Map	4	General Information	
Business Area	6	YUDO Company	42
Software Area	8	Global Network	44
Connect Area	22	Social Contributions	46
Hardware Area	26	Facts & Figures	48

# Milestones

## Aiming for the next 100 years

YUDO will continue to leap forward for smart manufacturing beyond hardware to software through Consilience Technology.



- 1980 12 YUDO TRADING CO. established (3m<sup>2</sup> office, Dongkyo-dong, Seoul)
- 1981 02 Company name changed to YUDO
- 05 First YUDO nozzle developed
- 1983 04 First exhibition
- 10 Technical seminar (Injection molding cooling system design)
- 1987 First exports to International markets
- 1988 08 YUDO office building built in Seoul (Guro-dong)

- 1991 06 Signed joint venture agreement with STAR-SEIKI
- 1992 03 YUDO STAR Co.,Ltd. established
- 09 World top 2000 conference
- 12 Manifold system, SCM nozzle patent application
- 1995 06 SCM nozzle launch
- 1996 06 'Best nozzle' BALA launch
- 11 YUDO JAPAN Co.,Ltd. established
- 1997 01 First global solutions base established (Los Angeles, U.S.A. established)
- 1998 04 One gate nozzle SINGLE VALVE III launch
- 12 Achieved monthly turnover of one million dollars US
- 1999 03 YUDO moved to Gasan-dong industrial area
- 12 ISO 9001 certification attained



# 2000

A giant leap forward with globalization

# 2010

Consilience Technology & IMC



- 2000 08 YUDO SUNS Co.,Ltd. established
- 2000 11 Cyber Factory and head office moved to Hwaseong, Gyeonggi
- 2002 CGF 550 Temperature controller launch
- 2006 Chinese solutions base established (Suzhou, 1 factory)
- 2009 MASS Valve nozzle launch
- 2003 12 Awarded 'Korean World First Class Product'
- 2004 11 YUDO STAR Co.,Ltd. moved to Namdong industrial complex
- 2005 03 Awarded Silver industry medal of honor
- 2005 05 YUDO ROBOTICS Co.,Ltd. established
- 2005 11 2nd Factory Eagle hall completed (10,837 m<sup>2</sup>)
- 2006 08 Entrepreneurship hall of fame (Industrial bank of Korea)
- 2007 04 Portuguese solutions base established
- 2008 11 YUDO MACHINERY Co.,Ltd. established (Weihai, China)
- 2009 04 Second owner-group generation involved in management, new CEO inauguration (YUJIN YU)
- 2009 05 WINA Premium series launch
- 2009 06 PET MOLD production launch
- 2009 08 Merged with WANCO in Singapore, Thailand, Malaysia

- 2010 09 Chinese solutions base established - 2 factories built (Suzhou)
- 2011 03 Cyber Factory equipment changed
- 2011 03 Acquired HESTICO (PTY) Ltd. (Republic of South Africa)
- 2011 04 Factory expansion (Thailand)
- 2011 05 Gold Tower order of Industrial Service Merit awarded
- 2011 06 PETONE Co.,Ltd. moved to an enlarged plant in Hwaseong, Gyeonggi
- 2011 06 YUDO ROBOTICS Co.,Ltd. moved to Bupyeong-gu, Incheon
- 2011 09 YUDO EU moved to an enlarged plant in Portugal
- 2011 10 YUDO S.A. established (Brazil)
- 2011 10 YUDO MACHINERY Co.,Ltd. 2nd factory established (Weihai, China)
- 2012 06 39th day of commerce Prime Minister's Award (YUDO-SUNS)
- 2012 08 Proactive periodic inspection service started-Clinic Program
- 2012 08 YUDO School training Courses open (YUDO-SUNS)
- 2012 10 FRANCIS Special system series launch
- 2013 03 MOTE center established
- 2013 06 KCS certification (YUDO-SUNS)
- 2013 11 IMC launch
- 2014 04 Chinese solutions base established - 3 factories built (Suzhou)
- 2014 06 SEVA (Electrical Servo Valve Cylinder) launch
- 2014 12 CREATION FACTORY established
- 2015 11 Awarded "Man of the Year" at the 19th Die and Mold
- 2016 02 CREATION TOWER established

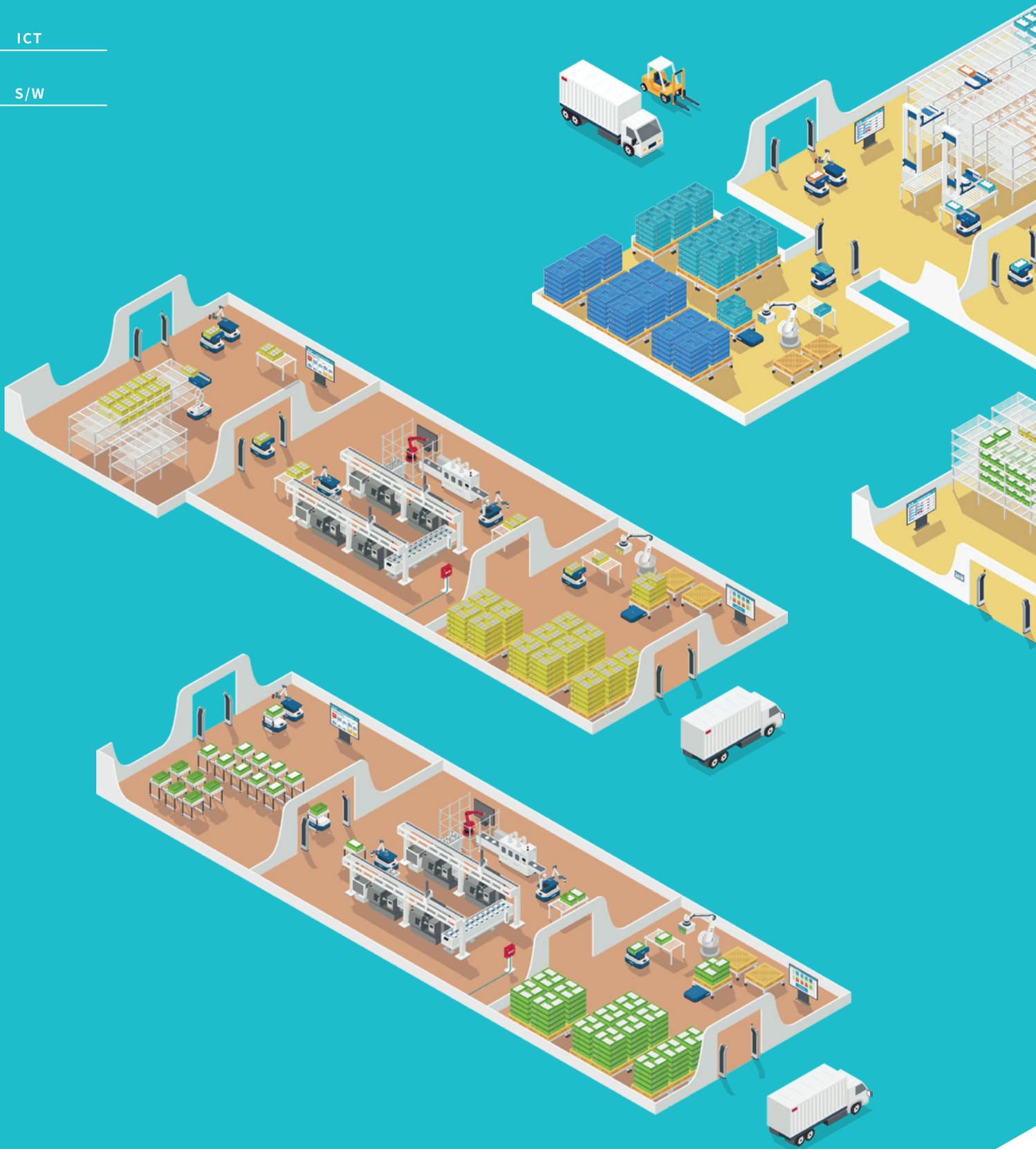


H/W

IoT

ICT

S/W





## YUDO SMART FACTORY

유도는 수주부터 설계/ 구매/ CAM/ 생산/ 품질/ 물류/ 출하에 이르기까지 모든 생산 프로세스의 데이터를 실시간 전산화하여 공유하고 있습니다. 이렇게 생성되는 빅데이터를 통해 효율적 관리와 손실 없는 지속생산을 위한 통합 생산관제·경영관리 소프트웨어들을 개발하게 되었습니다. 생산성 향상/ 리드 타임 단축/ 품질 향상/ 설비 효율 향상/ 비용 절감을 위해 지속적인 연구 개발을 해오고 있으며, 사내뿐만 아니라 협력·외주사에도 확대 적용하여 이상적인 Seamless management를 구현하고 있습니다.

# Business Area



YUDO Group provides solutions required to establish and manage an optimum manufacturing environment.

**Hardware** for Injection Molding and Machining Automation

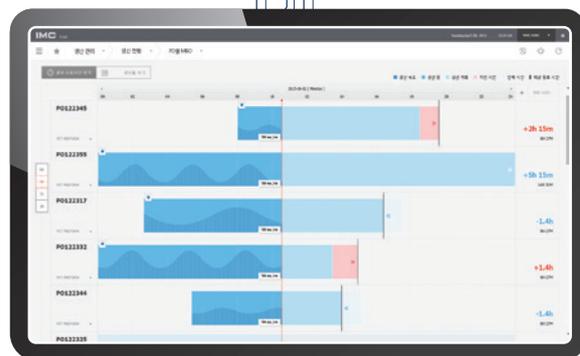
**Software** for Integrated Production Monitoring & Business Management

**Connect** for building communication system between machines and products



## Software Area

- ACM Adaptive Cyber Manufacturing
- IMC Integrated Monitoring & Controlling
- ILC Integrated Logistics Controlling
- IQC Integrated Quality Controlling
- PQM.lite Process Quality Monitoring
- ICC Integrated Clinic Care



## Connect Area

- DIB Digital Input Board
- SIB Sensor Interface Board
- DGS Data Gathering Server
- Networking HUB



## Hardware Area

- HRS Hot Runner System
- HRC Hot Runner Controller
- MTC Mold Temperature Control
- MH Material Handling
- FA / Injection Molding Industry
- FA / Machining Industry
- Take-out Robot
- PET & Packaging Turn-key Solution



# Software Area



**Software**  
Area

**Connect**  
Area

**Hardware**  
Area



YUDO has developed a variety of management software over a long period of time to transform its manufacturing factory into Smart Factory. With such expertise, YUDO provides user-friendly software solutions optimized for each customer's manufacturing environment.

YUDO's software system to establish Smart Factory implements seamless management with a high level of interconnectivity. The system is specialized for all areas including logistics, processing(manufacturing), facility maintenance, quality assurance, and warehouse management for continuous manufacturing process without wasting resources and takt time.

Furthermore, YUDO offers services that estimate and verify the optimum process through the Adaptive Cyber Manufacturing simulation based on CPS.

## Sophisticated 'Adaptive Simulation Analysis Consulting' to Estimate and Verify the Optimum Process

Adaptive Cyber Manufacturing is a service that implements cyber manufacturing by reproducing actual physical space into 3D cyber space. It helps to choose the optimum alternative option after conducting simulation with various production conditions and comparing results based on high predictability.

\_ To verify new plants or processing line

\_ To improve the current process and analyze efficiency

- **Production Gantt chart**  
: Figuring out non-value added process
- **LOB chart** : Detecting bottlenecks
- **Lead time** : Measuring maximum, minimum, and average
- **Takt time** : Measuring maximum, minimum, and average
- **Buffer chart** : Analyzing standby time and quantity for each process

- **Equipment operating rate**  
: Measuring equipment operating efficiency
- **Logistics efficiency**  
: Analyzing logistical efficiency
- **Worker efficiency**  
: Analyzing work efficiency and fatigue
- **Worker Gantt chart** : Figuring out worker allocation efficiency
- **Man-machine** : Analyzing collaborations between worker and machine

- **Warehouse flow analysis** : Figuring out average work-in-process stock quantities and periods
- **River diagram** : Analyzing logistics flow orders, congestion section, and distance
- **Logistics congestion** : Estimating travel time, distance, and frequency
- **Activity relationship**  
: Analyzing production correlation
- **Locational flow diagram** : Reviewing layouts

### Productivity Improvement



Figure out the ratio of non-value added time by making a value flow diagram and review the efficiency improvement options

### Improvement of Automation Process



Compare before and after cutting process automation by utilizing gantries, robots, and FA facilities and review the optimum options

### Logistics Layout



Estimate logistical efficiency by understanding traffic line and correlation between material, jig, and part

### Visualization



Provide sophisticated solution establishing an ideal 3D production environment in a virtual space

### Quantization



Set clear objective and initiate improvement based on quantified value obtained from simulation

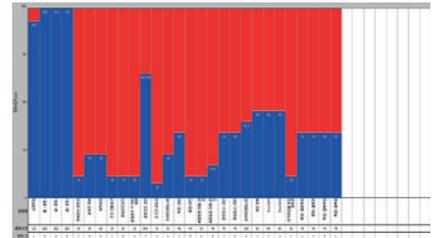
### Comparison of Alternatives



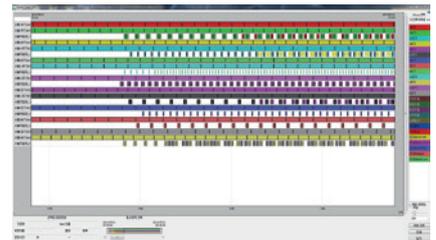
Choose the most efficient alternative after comparing results from various conditions



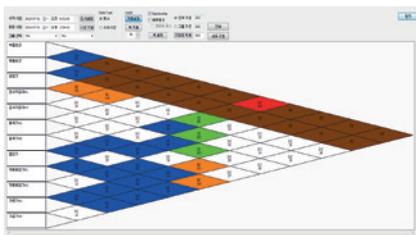
3D Simulation



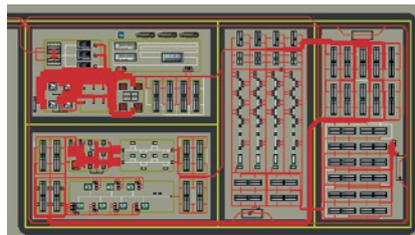
LOB chart  
: Analyzing process line balancing



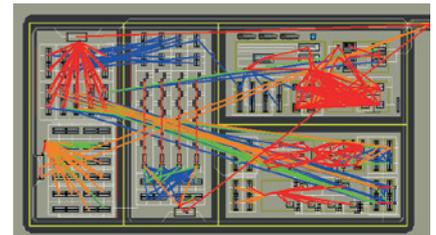
Production Gantt chart  
: Analyzing the overall lead time



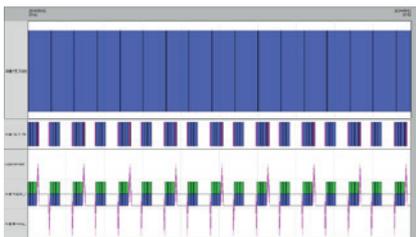
Activity relationship  
: Analyzing production correlation



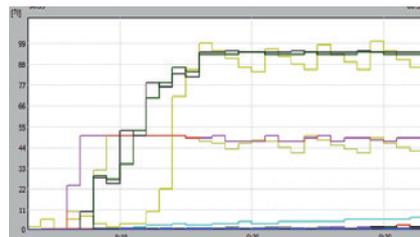
River diagram  
: Analyzing logistics flow orders, congestion section, and distance



Locational flow diagram  
: Reviewing layouts



Man-machine  
: Analyzing collaborations between worker and machine



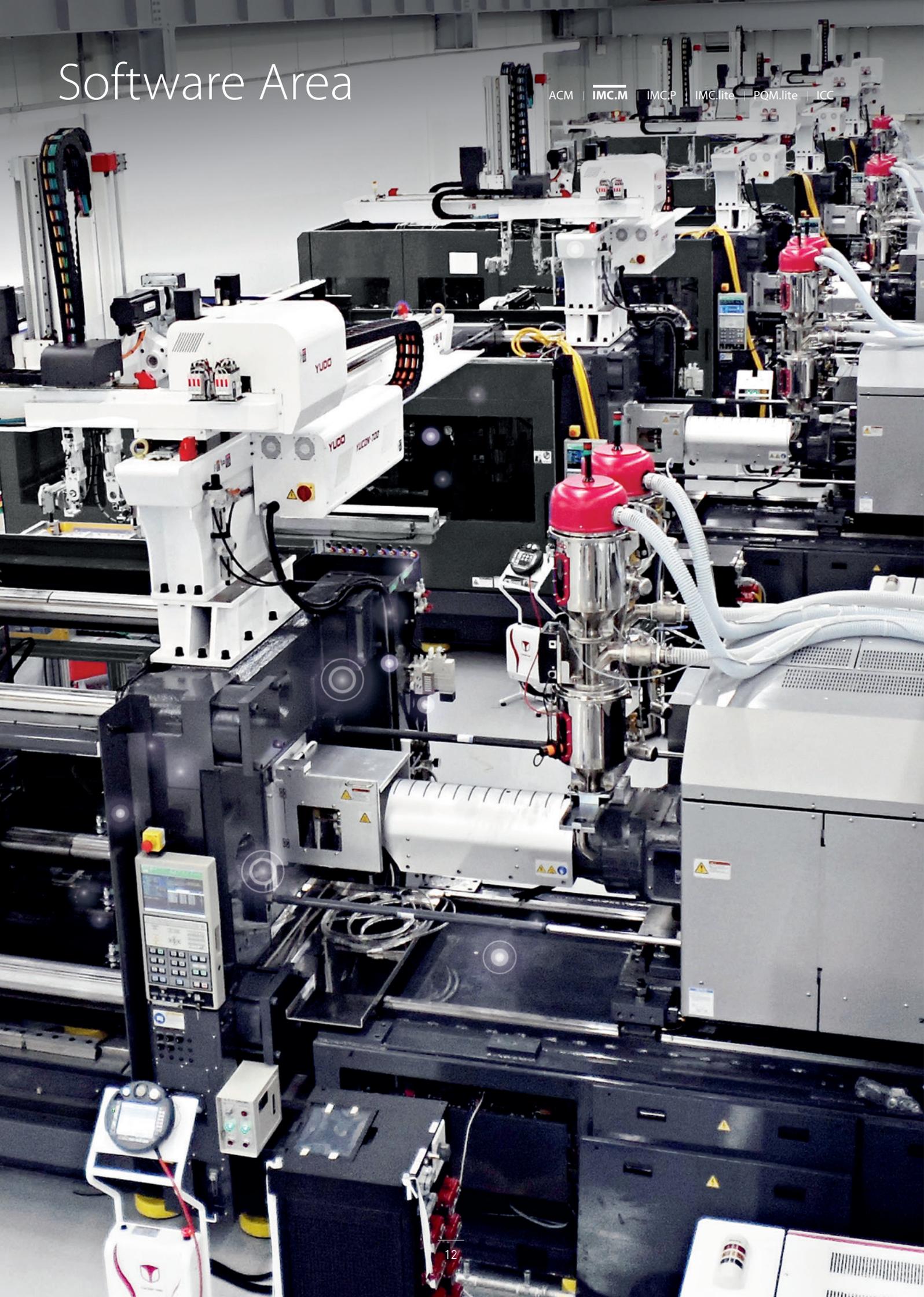
Buffer chart  
: Analyzing standby time and quantity for each process



Capacity / Takt time analysis

# Software Area

ACM | IMC.M | IMC.P | IMC.lite | POM.lite | ICC





Integrated Monitoring & Controlling  
for Injection Molding Industry

## 'Integrated Monitoring & Controlling System for Injection Molding' to Establish Optimum Production System

IMC.M provides integrated business management solution of monitoring & controlling the equipment required for Plastic Injection Molding such as Injection Molding Machines, Molds, Hot Runner Systems, Mold Temperature Control, Material Handling, and Take-out Robots. Besides monitoring, it analyzes the correlation of quality through Critical to Quality (CTQ) analysis and brings high productivity and uniform reproducibility through comprehensive production automation.

- \_ Monitoring real-time production (by line / machine / product)
- \_ Managing progress rate by production objective (by order / line / yield)
- \_ Managing productivity per unit (by manpower / facility)
- \_ Monitoring equipment efficiency (capacity utilization ratio / yield / time utilization ratio)
- \_ Figuring out the proportion of equipment by condition
- \_ Providing summarized report of order status, timely delivery rate, production progress rate, and equipment efficiency
- \_ Monitoring CTQ (Critical To Quality) range

### Uniform Reproducibility



Realize continuous production of high quality product by real-time detecting and monitoring ongoing production process and equipment property value

### Implementation of Planned Production



Manage production objective through meeting delivery rate by checking real-time production status such as in-progress / waiting / completion and estimating final completion time

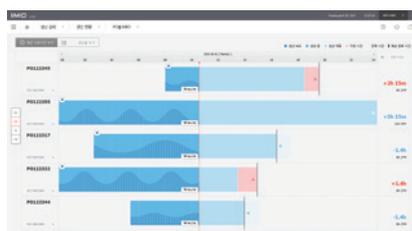
### Continuous Production with Maximum Efficiency



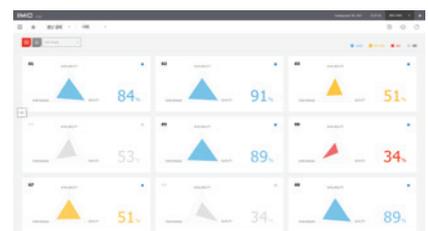
Operate production with maximum efficiency by measuring the overall efficiency based on time utilization ratio / capacity utilization ratio / yield per line



MES Manufacturing Execution System



MBO Management By Objectives



OEE Overall Equipment Effectiveness





Integrated Monitoring & Controlling  
for Precision Machining Industry

# 'Integrated Monitoring & Controlling System for Precision Machining' for Continuous Production with Maximum Efficiency

IMC.P offers the solution that can monitor and control the overall production of Precision Machining Industry. It provides accurate production status to manager by informationizing the input/output signals of each facility from material setting, machining, loading/unloading, transfer to stacking based on production plan. Moreover, it increases productivity by maximizing the operating rate of equipment and informationizes production traceability in order to provide intuitive business management solution.

- \_ Monitoring real-time production (by line / machine / product)
- \_ Monitoring line balance
- \_ Detecting inefficient process by measuring process cycle efficiency
- \_ Managing progress rate by production objective (by order / line / yield)
- \_ Managing productivity per unit (by manpower / facility)
- \_ Monitoring equipment efficiency
- \_ Monitoring tool condition
- \_ Managing equipment lifespan by monitoring its condition

### Flow Production without Loss



Realize continuous production with optimum efficiency by reducing non-value added time and lead time through monitoring the overall production process

### Planned Production



Establish planned production by estimating accurate delivery time and the next schedule based on production progress rate / production volume / yield

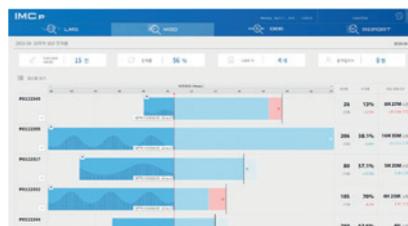
### Stable Continuous Production



Achieve high quality product stably in normal conditions with the highest utilization ratio by checking key management factor of tool and equipment



LMS Line Monitoring System



MBO Management By Objectives



OEE Overall Equipment Effectiveness

# Software Area

ACM | IMC.M | IMC.P | **IMC.lite** | PQM.lite | ICC



**GIGA-2020**



## Smart Function

Real-time Data Measurement > Management of Data History > Data Analysis > The Total Management of Smart Robot by IMC.lite

## Factory Automation (Take-out Robot / Gantry Loader / etc.)

Auto - Manual Alarm, Production Counter, Counter Reset, Power ON/OFF



Integrated Monitoring & Controlling.lite

# 'Integrated Production Efficiency Management System' for Planned Production with Minimum Connection

IMC.lite is a monitoring system that can review production efficiency through the intuitive GUI including real-time production quantity / progress rate per equipment by target quantity / equipment condition. It helps manager understand production status more clearly and establish efficient production plan utilizing resource more effectively based on integrated data by equipment beyond the limitation of complex communication.

- \_ Managing production schedule  
Monitor progress status by equipment in the basis of target production quantity
- \_ Managing production objective  
Monitor the production objective and quantity according to production schedule
- \_ Monitoring equipment efficiency  
Monitor equipment efficiency by equipment and line
- \_ Monitoring daily / weekly / monthly shot count by equipment

### Monitoring Real-time Status



Check production progress / objective management / equipment efficiency in real-time through the intuitive UI

### Simplified Production Management

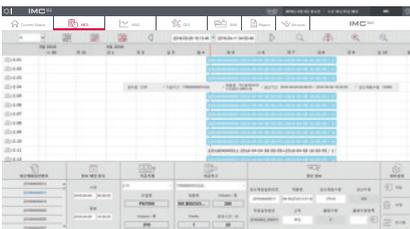


View daily / weekly / monthly management index with a single touch and establish clear plan

### Improved Production Efficiency



Economical monitoring system equipped with management efficiency by simple accessibility



MES Manufacturing Execution System



MBO Management By Objectives



OEE Overall Equipment Effectiveness

# Software Area

ACM | IMC.M | IMC.P | IMC.lite | PQM.lite | ICC



Connect up to **7** measurement devices with **1** QC manager



| Process Quality Monitoring

Simple and Economical

# 'Initial / Middle / Final Product Management System'

with Convenient Input and Management Efficiency

PQM.lite system shares quality measurement data of half-finished product immediately and manages product quality transparently to increase the product reliability for stable continuous production. It can also be connected to the MES system and respond to business logic through customizing inspection template by customer / product. As a clear guideline for each process, it allows reliable quality management between manager and worker / orderer and supplier.

Wireless Wi-Fi AP is required for communication between Tablet and PQM.lite server and multiple deployment of AP can be applied according to the size of production field and the location of test / measurement

Connecting all measurement device with communication capability (Use various protocols such as Serial, Bluetooth, Ethernet, etc.)

Providing measurement equipment as Turn-key solution upon customer's request

Weight	Weighing scale Push-pull gauge Load cell Etc.	
--------	--	--

Dimension	Vernier callipers Micrometer Probe (LVDT/HBT) Laser sensor Etc.	
-----------	---	--

Exterior	Vision sensor Laser sensor Visual inspection Etc.	
----------	--	--

### Reliable Quality Management



Prevent any omissions or errors and eliminate the possibility of editing or writing data arbitrarily by sharing measurement data immediately

### Easy Input and Utilization



Enter value by simply touching the screen and register any issues with picture using Tablet camera during exterior inspection

### Economical System



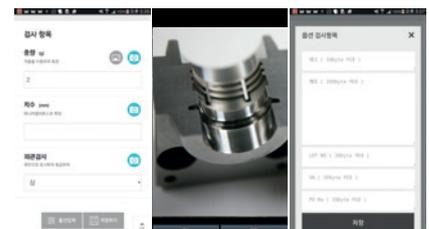
Save paper, manpower, and time generated by paper work



BOP Management  
\_ Manager PC



Process Template Management  
\_ Manager PC



Register Measurement Data /  
Picture / Issue \_ Tablet

# Software Area

ACM | IMC.M | IMC.P | IMC.lite | PQM.lite | ICC





Integrated Clinic Care

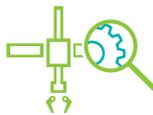
## 'Proactive Maintenance System'

to Ensure Continuous Production of Uniform Quality through Pre-inspection of Production Facility

ICC is 'Proactive Maintenance Management System' established upon YUDO's specialized know-how of facility maintenance. YUDO provides specialized consulting and service program through ICC and data collected during the service is accumulated, analyzed, and then sent to customer in the form of report. The integrated solution of consulting / service / system can save cost and time required to establish facility maintenance system.

- \_ Analyzing customer environment / Reviewing overall facility / Establishing facility management plan (Consulting)
- \_ Managing inspection list for each facility / Main product / Type of countermeasure
- \_ Providing daily inspection / To Do List (Operator)
- \_ Recording and reading clinic care service in real-time  
(Regular inspection / Precision diagnosis / Regular maintenance / Replacement of consumable part)
- \_ Managing service issues / Checking and adjusting service schedule
- \_ Checking service progress status by each visitation
- \_ Proactive maintenance performance rate / Result / No. of resolved service
- \_ Maintenance checklist pass / Fail statistics for each facility
- \_ Time-based Maintenance (Product lifespan) statistics for each facility

### Facility System Management



Establish optimum management system for each facility by managing lifespan of main components (TBM), maintenance checklist, and type of countermeasure / cause

### Mobile Platform



Provide mobile platform to establish a system that responds to various facilities and production environment and facilitate recording in the field

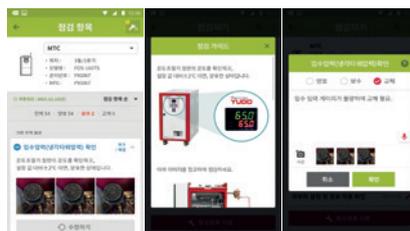
### Economical System



Provide consulting, expert diagnosis and evaluation & repair and restoration service and optimized system that cost less than hiring management worker



Clinic Care Schedule Management \_ PC



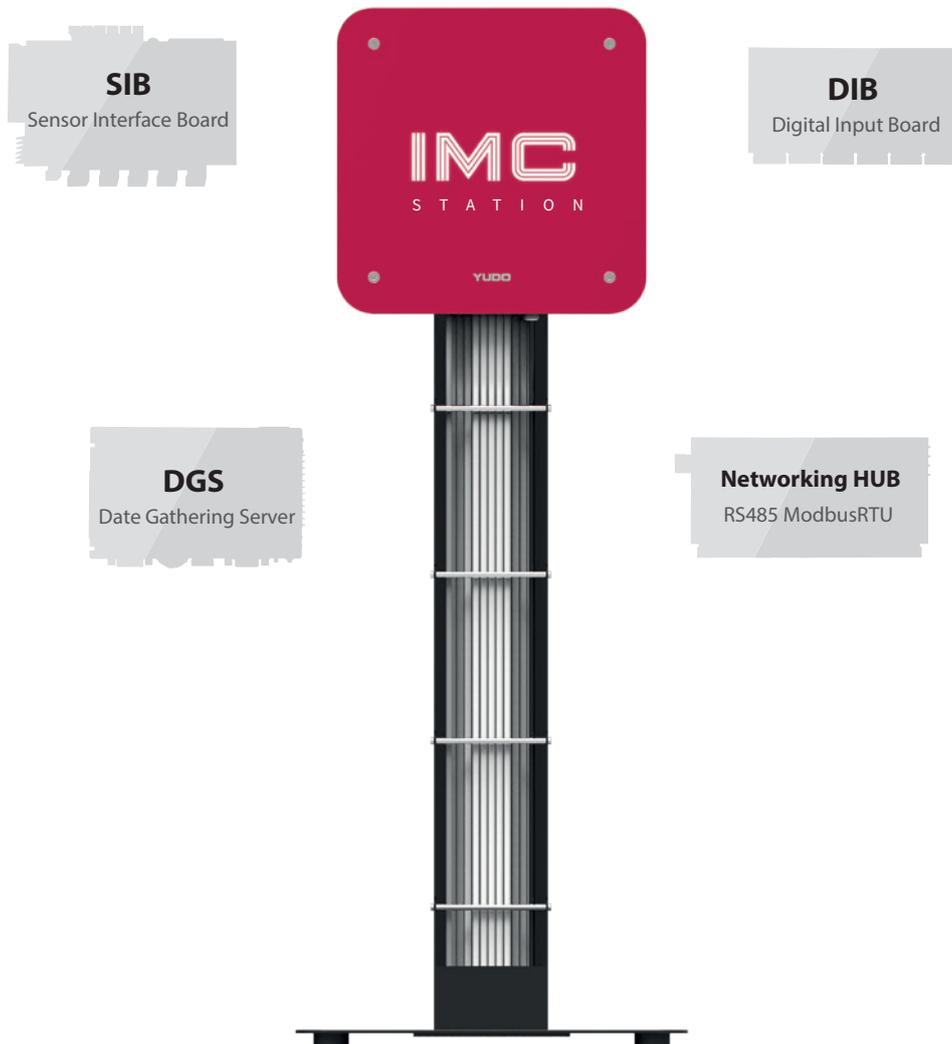
Inspection List / Inspection Guide / Inspection History \_ Mobile



Main Component TBM Statistics \_ PC

# Connect Area





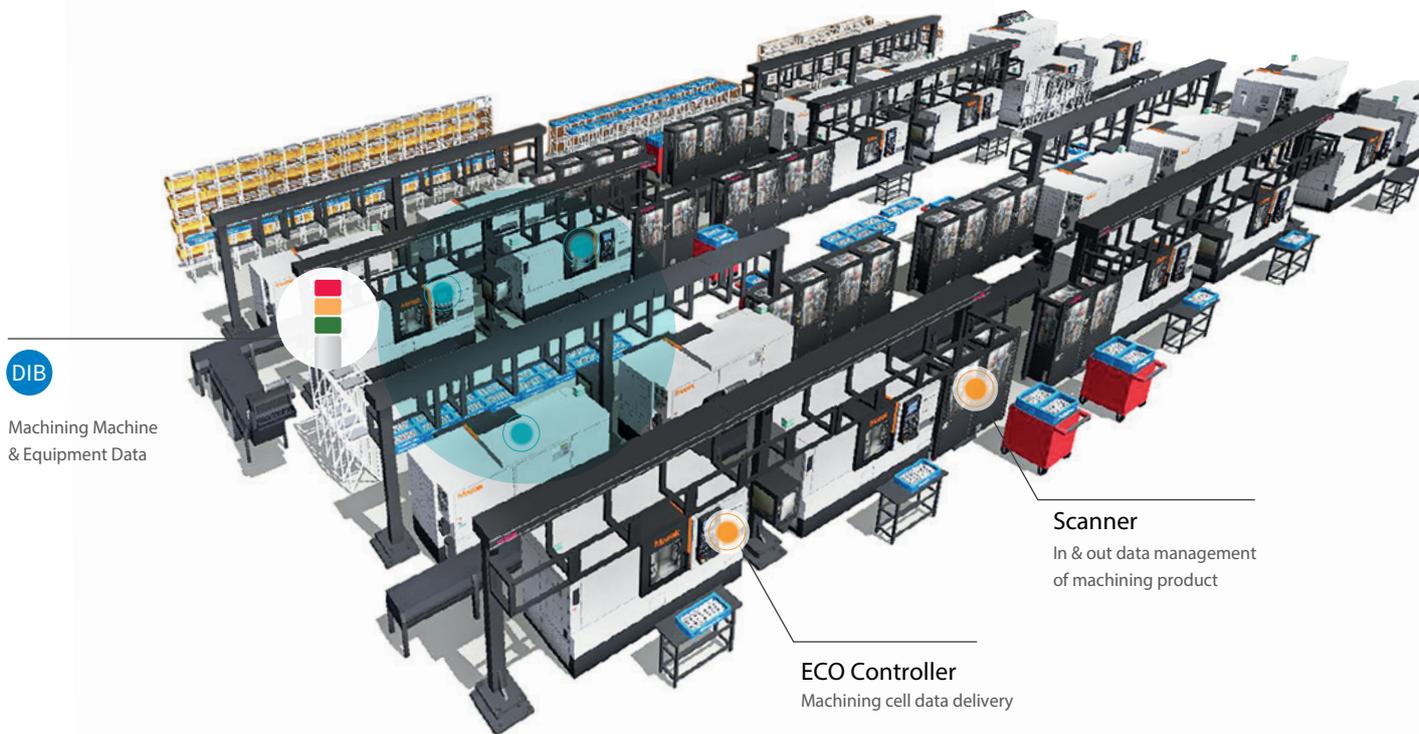
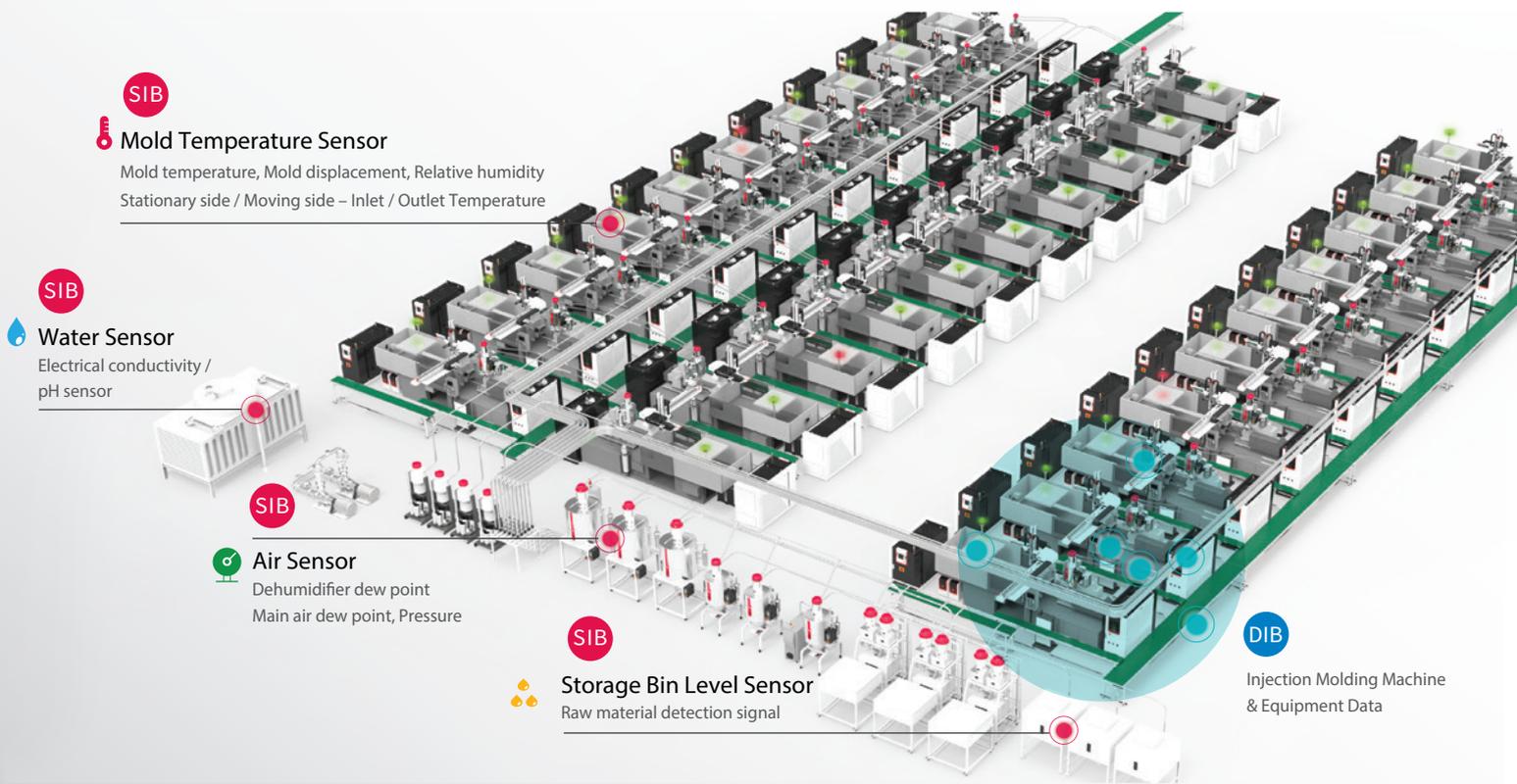
YUDO has developed circuit design and communication modules (DIB/SIB) internally for the networking of utility sensors such as digital signal generated from device, temperature, pressure, and electricity based on the know-how and in-depth understanding of manufacturing facility accumulated over the past 35 years. By developing powerful logic with compact size, YUDO can provide high compatible system at a reasonable cost.

Moreover, YUDO has been developing Middleware for DGS to accumulate essential data and collect information for main elements of advanced software IMC at the same time.

Research Institute in-house has been continuously researching / developing, so that it can respond, revise, and improve quickly according to the change in production environment.

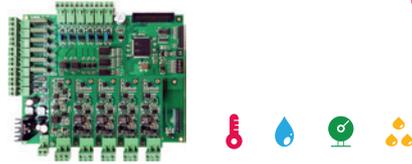
YUDO provides optimum communication system for customer's production field by making all devices in the production field connected through Internet (IoT) and interact with each other intelligently by interchanging data.

# Connect Area



# System & Network

YUDO establishes a network that can collect data in real-time on production machine / main factor that affects to quality / production information through the in-house developed communication module.



## SIB Sensor Interface Board Analog Signal from Utility Sensor

Manage main factor of Injection Molding Industry

- Raw materials : Moisture management / Loss rate
- Mold temperature management : Mold, Mold temperature controller
- Injection Molding Machine condition management : Nozzle temperature, Hydraulic fluid temperature, Pressure, Speed, Position, Metering, and Time



## DIB Digital Input Board Digital Signals from Various Devices

Inspect equipment status through digital signals from all devices

Auto – Idling – Setup – Alarm – Power Off

Data Gathering



## Networking HUB

RS485 ModbusRTU / Ethernet



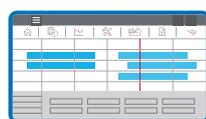
- Utilities Sensor
- Equipment Signal
- Production Data

## DGS Date Gathering Server

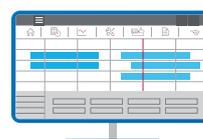
Collect data on all devices specialized for Injection Molding and Precision Machining Industry and allow user to check the field situation from a remote location.

All gathered data is converted into advanced software language and transmitted to data server.

Data Server



Status Monitor  
PLANT



PC Monitor  
OFFICE



Mobile / Tablet PC

# Hardware Area





YUDO develops and produces manufacturing equipment in-house for Injection Molding Industry and Machining Industry and fulfills any demands from customer through '**Consilience Technology**'.

**Hot Runner System** is the core technology of Plastic Injection Molding.

**Hot Runner Controller** provides optimal temperature control.

**Mold Temperature Control** regulates the temperature of Mold.

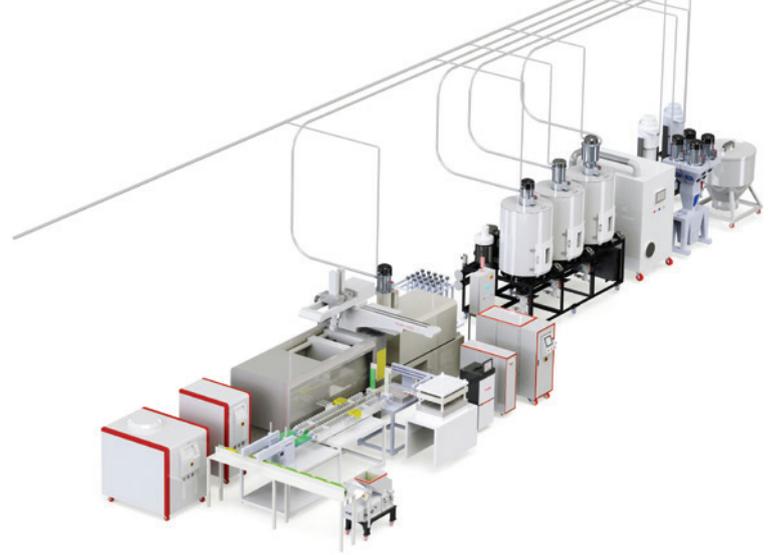
**Material Handling** automates the process until material reaches to Injection Molding Machine.

**Take-out Robot** automatically takes out product from Mold.

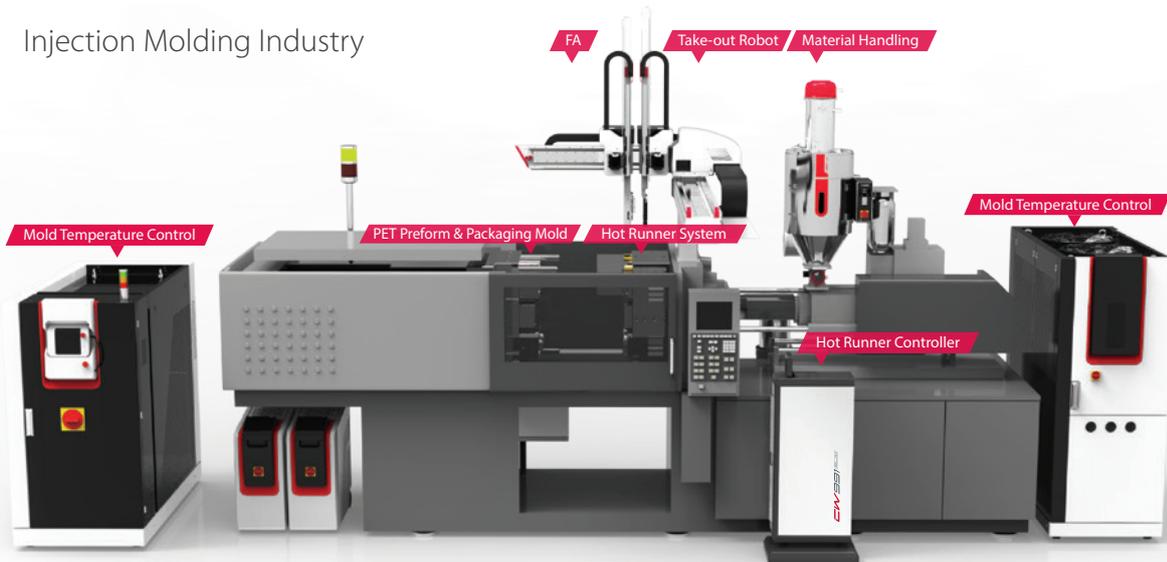
**Factory Automation** automates Injection Molding and Machining Process.

**PET Preform & Packaging solution** is provided as One-stop service, Turn-key system.

# Hardware Area



## Injection Molding Industry



### HRS Hot Runner System



MODU system   Pre-wired system   Manifold system   Nozzle system

### HRC Hot Runner Controller



Temperature controller   Servo Valve controller   Screw Position Meter controller   DOMA Mixing & Dosing controller [LSR]   Sequence timer

### MTC Mold Temperature Control

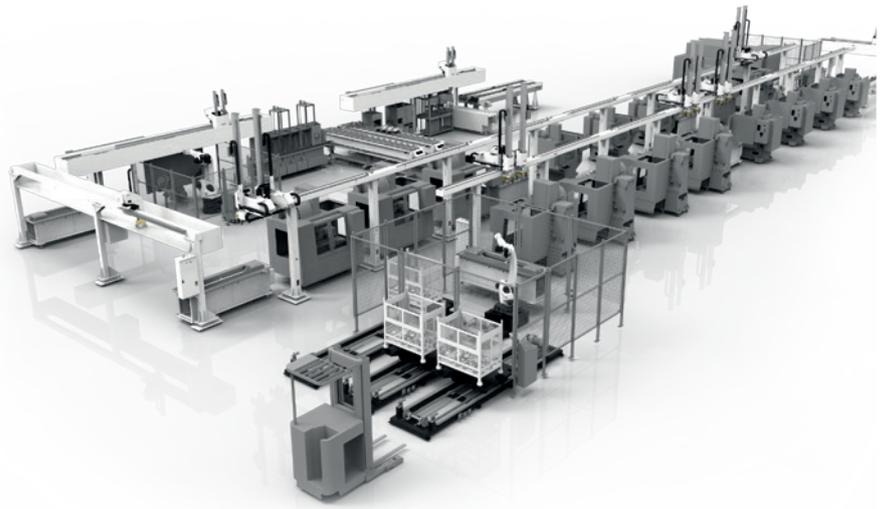


Steam controller   Air cooler   Chiller   Mold temperature controller

### MH Material Handling



Hot air dryer   Multi hopper   Cyclone   Granulator   Storage bins   Desiccant dryers   Filter & Blower   Controller system



## Machining Industry



### FA Factory Automation / Injection Molding Industry

### FA Factory Automation / Machining Industry



Mobile equipment    Optical equipment    Car manufacturing    In-mold labeling    Home electronics



Gantry loader system    Multi-axes robot    FMS system    Stocker system    Shuttle system

### Take-out Robot [ IMM 30~4,000ton ]

### Mobile Robot

### PET Preform & Packaging Solution



Ultra large sized robot    Traverse type    Side entry    Swing type



AGV system



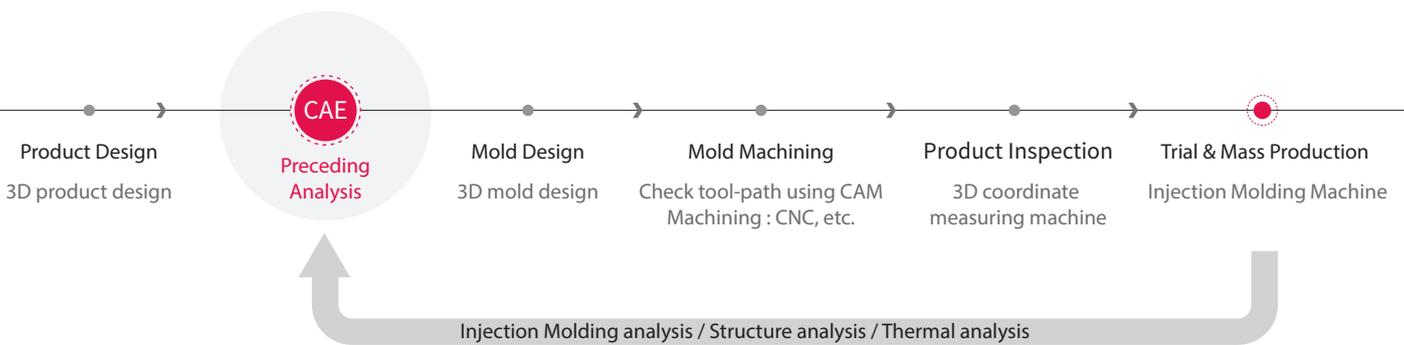
Hot half



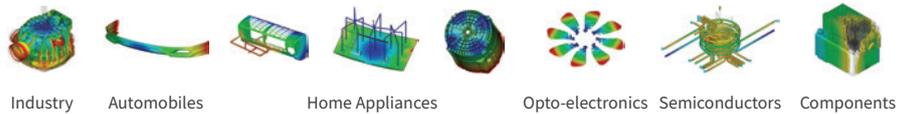
Cold half

As a specialized organization in Injection Molding analysis, **FLOWAY LAB provides optimal CAE analysis.**

FLOWAY LAB offers prompt and accurate analysis service including flow analysis, structural analysis, and thermal analysis by converging YUDO Group's accumulated know-how for the past 35 years in Injection Molding with the expertise of partner companies such as Moldex3D, Moldflow, Solid works, and ANSYS. By allowing advanced development of mold, it helps customer to produce reliable mold. Hot Runner System manufactured after review by FLOWAY LAB has higher level of reliability.



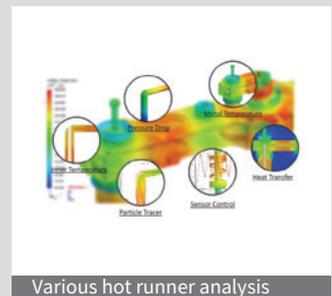
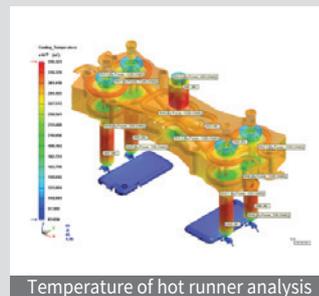
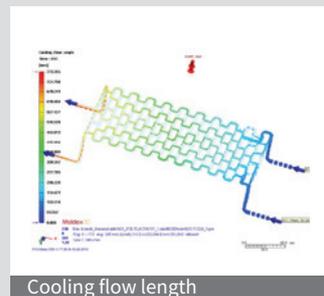
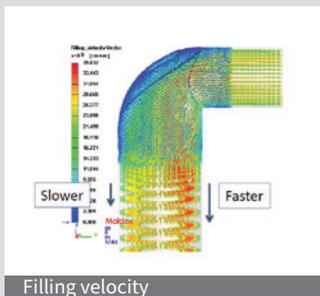
Applications



**Coupled Analysis of Thermal and Flow**

Moldex3D Advanced Technology

- \_Thermal analysis : Verify thermal balance of hot runner system temperature control
- \_Flow analysis : Conform resin flow in runner and injection balance



## Importance of Preceding Analysis

### 1. Optimization of Design

#### Improve quality of molded product & Reduce production costs

- \_ Improve quality of molded product
  - Minimize expected molding defects in injection molding process
- \_ Reduce production costs
  - Reduce proportion of product & scrap and shorten cycle time

### 2. Effect of Injection Molding Analysis

- \_ Time reduction
  - Shorten mold making & product development time
- \_ Quality improvement
  - Increase quality of mold & product
- \_ Cost savings
  - Reduce mold making costs & unit price of product
- \_ Advancement of technology
  - Improve technology of product & mold design by theoretical approach and understanding of injection molding process

## Features of FLOWAY LAB

### 1. FLOWAY LAB Services

- \_ Analysis by the largest experts in injection molding industry
- \_ Analysis & consulting reflecting mold design and mass production
- \_ Preceding analysis applying same flow channel as actual part
- \_ **Recommend optimal number & location of gate for injection balance of product**
- \_ **Select the best nozzle suitable for features of product and raw material**
  - YUDO Nozzle Type & specification selection & analysis progress
- \_ **Recommend new technology of YUDO & graft technology**
  - ISO Matrix (Heating & Cooling system applying brazing technology)
- \_ **Accumulate experience and know-how by analysis of various items**

### 2. Range of Analysis

#### Injection Analysis

Filling / Gate Location / Cooling / Shrinkage / Fiber orientation / Birefringence / Double injection molding / Injection compression / Gas injection / Core Shift Control / Co-Injection / Insert Over molding

#### Structural Analysis

Thermal Analysis / Structural Analysis / Non-linear Analysis / Optimization Analysis / Fatigue Analysis / Vibration Analysis / Dynamic Analysis / Multi-body Dynamic Analysis

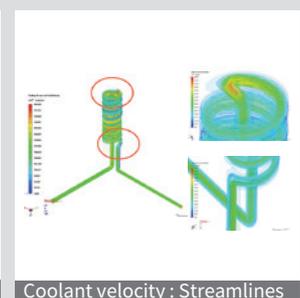
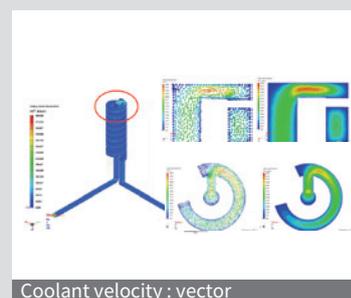
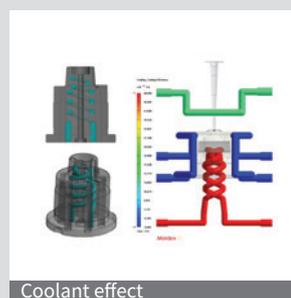
#### Flow Analysis

Thermal Flow Analysis / Flow Analysis / Multi-phase Analysis / FSI Analysis / Conjugate Heat Transfer Analysis / Residual Stress Analysis

## New Technology

### ISO Matrix - Cooling

- \_ Apply conformal cooling to narrow and deep shape by using brazing technology
- \_ Improve product quality due to high cooling efficiency
- \_ Deviate from limited cooling design by linear machining of simple gun-drill process
- \_ Possible to design optimal cooling channel based on customer's product modeling only



# ValuePro<sup>Lab</sup>

## ValuePro Lab is a group of experts in various areas, and repository of Integrated Engineering Solution.

YUDO ValuePro Lab provides productivity improvement activity and performance improvement program by analyzing manufacturing process of customer based on YUDO Group's accumulated know-how and technology for the past 35 years. Through the process, it sets a foundation for the establishment and operation of optimum production line for customer's business.

### Purpose

#### High Cycle

- / Optimizing equipment conditions
- / Optimizing injection conditions

#### Product Quality

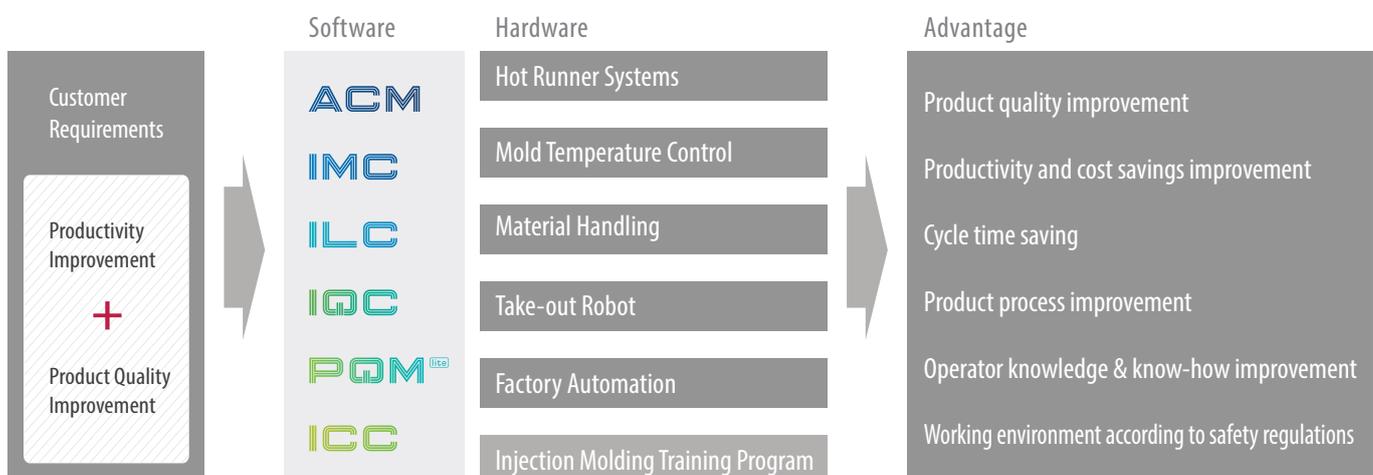
- / Identification and improvement of faulty factor
- / Establishment of the quality criteria
- / Inspection of each process

#### Productivity Improvement

- / Establishment of optimized injection molding conditions
- / Optimized equipment utilization
- / Establishment of maintenance capacity
- / Improvement of human resource management

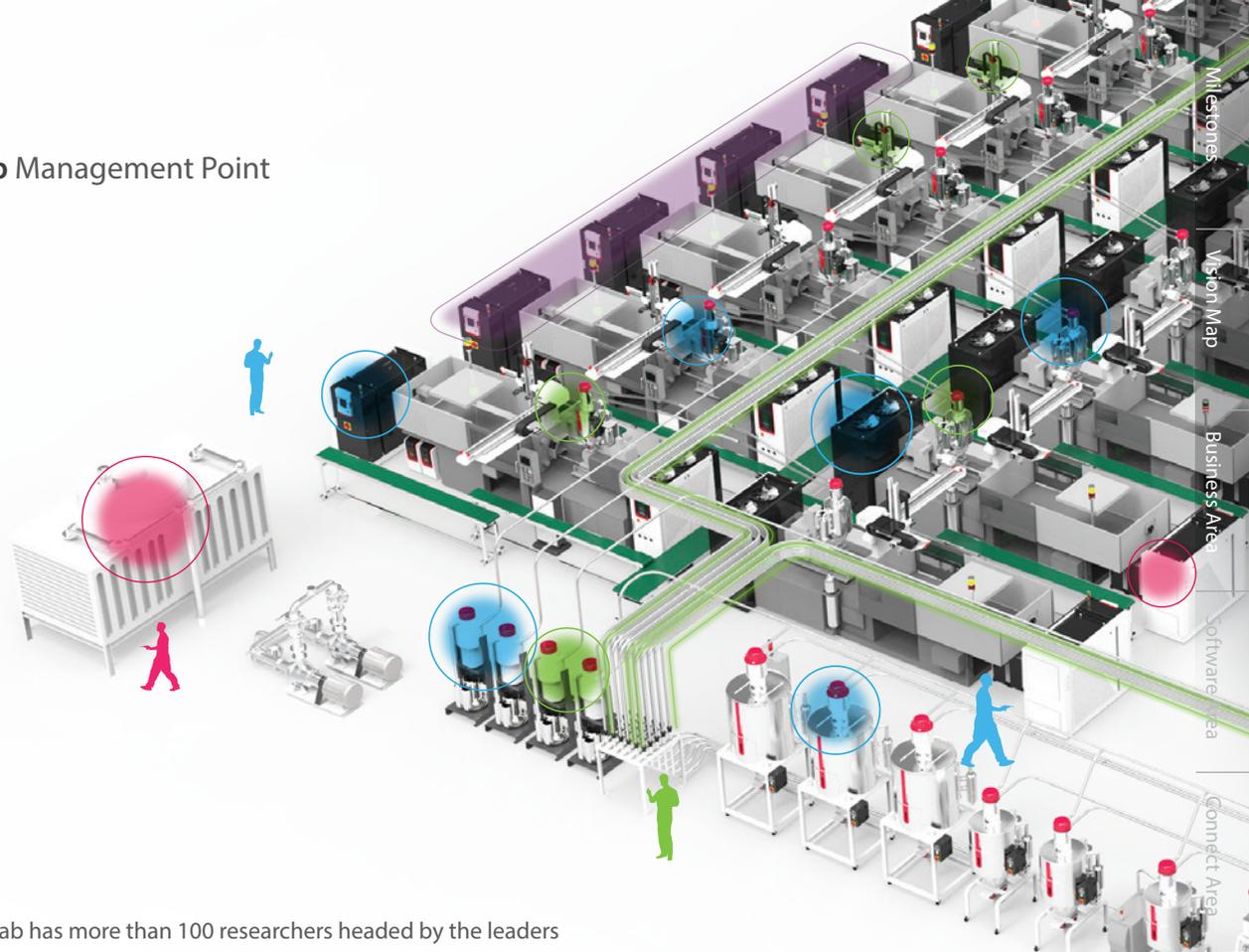
### Process

YUDO ValuePro Lab is a collaboration of 14 teams specializing in design, analysis, product development, material transfer, heating/cooling, and control development. Also the organic combination of all devices provides a new level of solution such as enhancing productivity, improving quality, resolving technical issue, and consulting.

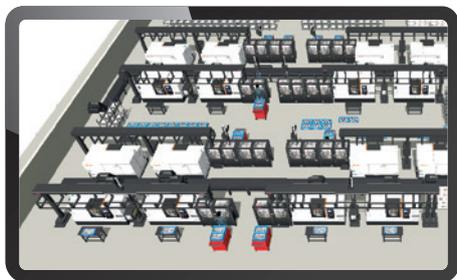


## ValuePro Lab Management Point

- Temperature
- Pressure
- Velocity
- Balance



YUDO ValuePro Lab has more than 100 researchers headed by the leaders with advanced degrees who have more than 20 years of experience in the Plastic Injection Molding business from hardware to software.



## Simulation Consulting

YUDO ValuePro Lab provides virtual adaptive simulation analysis consulting to estimate and verify the process improvement. While establishing new line, customer can set clear plan and save opportunity cost, and then prepare the optimum alternative based on improvement objective in productivity, facility automation, and logistics.

## Simulation Consulting Process



### Set Objective

Conduct field interview  
Recognize problem  
Define KPI



### Build Model

Analyze PQRST / 4M  
Create process model  
Verify model validity

PQRST: Product, Quantity, Route, Service, Time  
4M: Man, Machine, Material, Method



### Diagnosis / Analysis

Perform simulation by condition  
Review effectiveness by condition  
Suggest improvement plan



### Execute Alternative Plan

Select improvement plan  
Implement final model  
Estimate effectiveness

# Technology

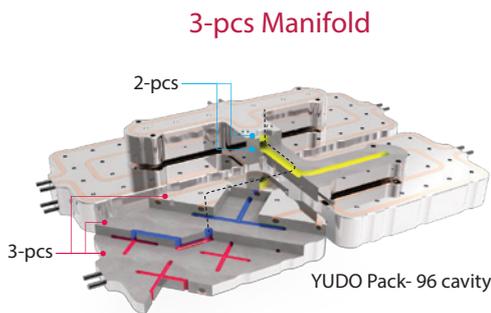


Flow Channel Coating Technology

ISO technology creates Flow channel & Cooling channel based on the 'Conformal Design' that reflects shape of parts.

Diffusion Bonding Technology and Insert Core Technology allow us to create free curved line that was unable to process with conventional linear gun-drill. Furthermore, according to resin property, ISO technology can apply channel coating of excellent wear resistance and lubrication to provide technical solution optimizing Plastic Injection.

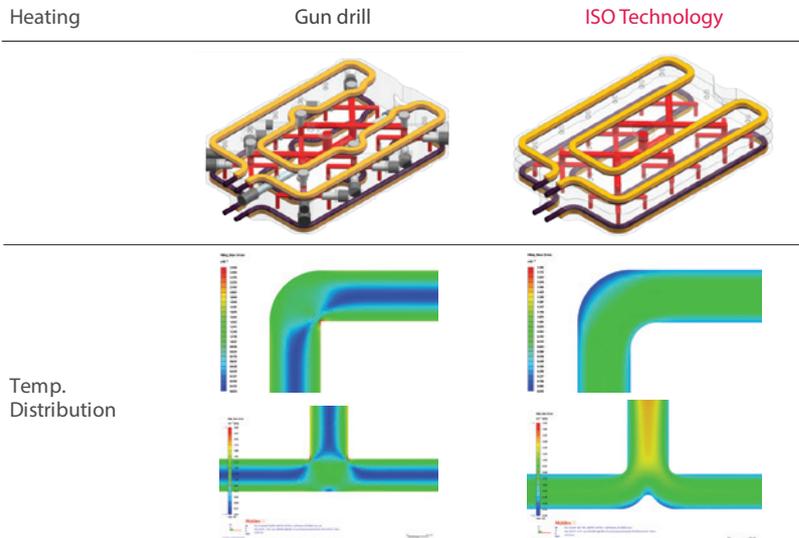
## Flow Channel



## 3-pcs Manifold

Channel Design & Processing Optimization

Configure ideal fluidized layer considering shear rate



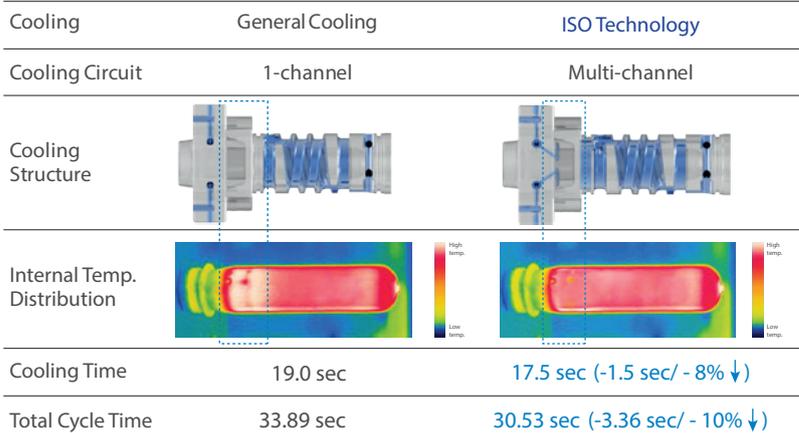
## Cooling Channel



## PET Preform Cavity Set [ Shoulder & Neck ring ]

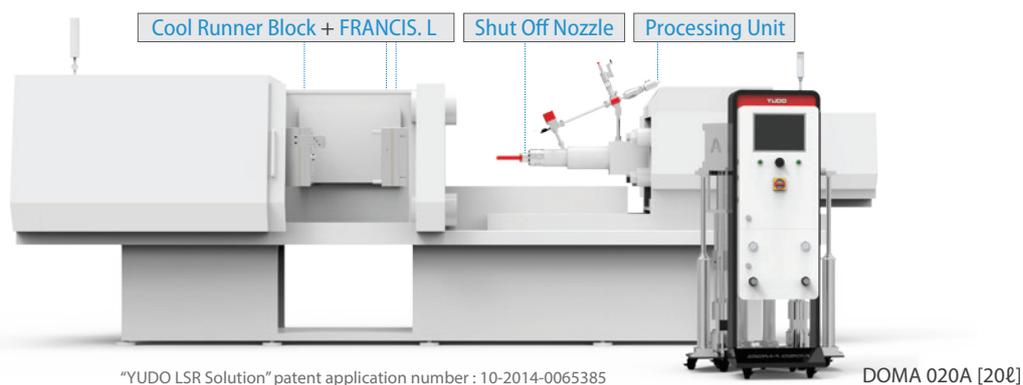
Effective Mold Temperature Control

Design cooling channel freely / Shorten cooling & cycle time



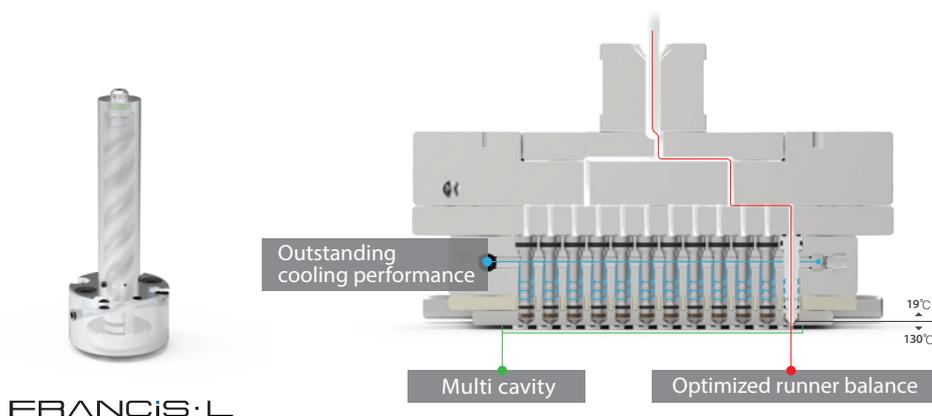
## LSR Injection Turn-key System

As the silicon market continues to expand, we shed light on the LSR market that is being applied in various fields. In today's market, we offer the Cool Runner Block (CRB) type of injection system that is able to mold of products in various shapes, provide cost savings and has quick cycle times. We also provide the processing unit / DOMA series (200ℓ / 20ℓ), which is capable of safe material mixing and precision discharge rate control, and the specialized Cool Runner System, with the nozzle FRANCIS.L for LSR applied, as a Turn-key solution.



## Cool Runner System

Cool Runner System is designed for continuous injection by maintaining thermosetting resin always in liquid state at Sprue & Runner of Mold



## Processing Unit

### a. Pressure Limiter

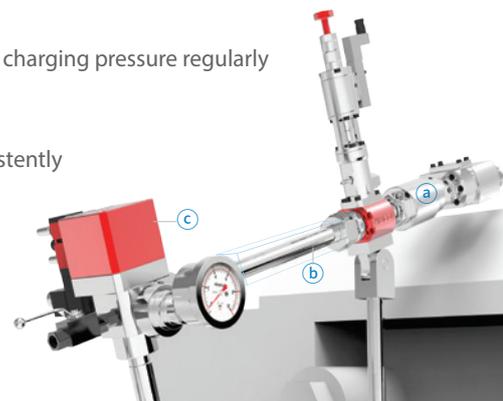
\_ Deliver material of precise shot & weight by maintaining charging pressure regularly

### b. Static Mixer

\_ Mix 2 kinds of silicon raw material & additive(color) consistently

### c. Shut Off Valve

\_ Realize precise measurement amount  
by supplying material only during metering time  
\_ Easy purging of mixing unit



# Technology

## In-Mold Labeling System

for Process Innovation & Quality Improvement

YUDO's IML system implements the complex process of IML injection quickly and accurately through module-type system configuration using main devices such as side entry robots, film feeding devices, and loading / conveying systems. FLEX can change IML production process any time according to demand for product and produce high quality product quickly and consistently with the most advanced motion control and verified equipment performance. It implements the best IML Injection solution for productivity improvement by providing flexible production process and just-in-time production.

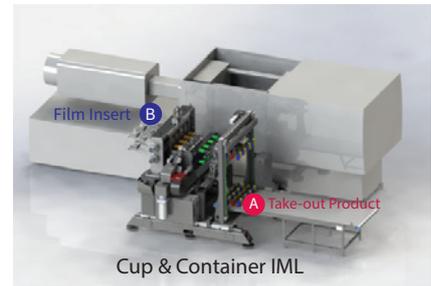


### FLEX

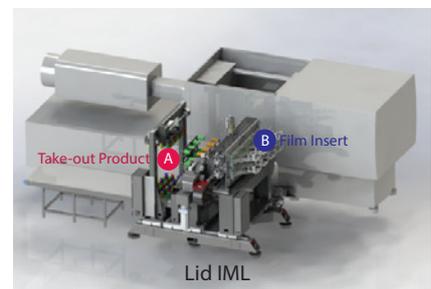
Maximum flexibility & Absolute productivity  
In-Mold Labeling system



#### Module Configuration

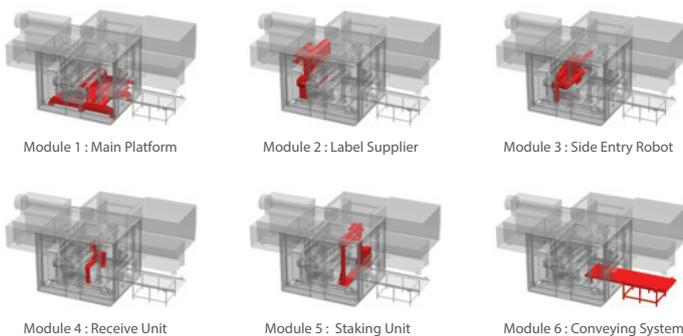


Cup & Container IML



Lid IML

Combination of FLEX Module



It is possible to rationally reconfigure the main module devices depending on the mold structure. It is also possible to add additional modules for inspection and assembly in addition to the basic devices. Customers can save on the cost of facility investment and reduce preparation time for parts modification.

## Smart Function for Productivity Improvement

YUDO Factory Automation system (Take-out robot, Gantry loader, etc.) provides efficient quality management by real-time data gathering / analyzing key influential factors to quality and productivity based on Smart Function. (Weight detection, Temperature detection, Static electricity removal, etc.)

Moreover, data collected through Smart Function connects to IMC.lite, YUDO's production efficiency management system, and can be monitored and managed easily. Customer can implement stable production environment and ideal quality management through eliminating hindrance factor of productivity and quality in the field beforehand and managing in real-time.

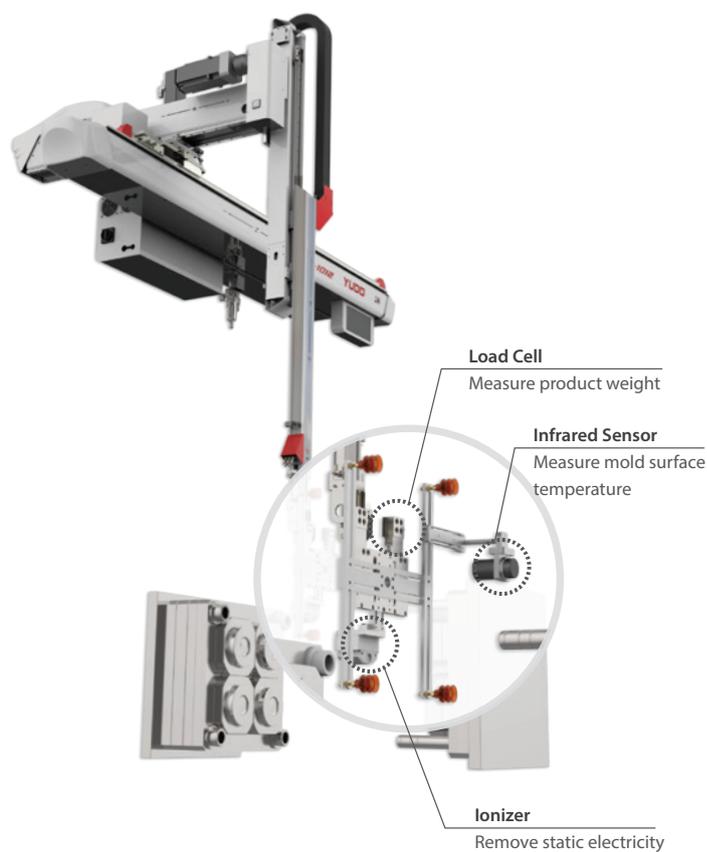
IMC lite\*



Value : Data Monitoring



Record : IoT History



### Shot Balance

Check shot balance based on the weight of material injected from each cavity

## Multi-ES for Bumper Automation

Multi-ES is a variable smart EOAT that can apply to more than 8 product ejection shapes only with a single chuck unit. Multi-ES can change jig shapes to take out product with various designs by precise control of position and speed of vacuum unit. It also contributes to productivity improvement and cost reduction of customer business with reasonable design considering the weight-lightening of device and maintenance.



# Technology

## Multi Layer Barrier Solution

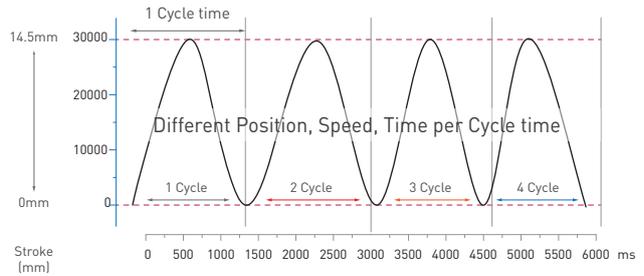
YUDO's Multi-layer system is optimized barrier solution that helps package manufacturing to preserve taste and flavor of the content by creating a barrier layer in plastic container through multi-phase injection to block oxygen and ultraviolet ray, prevent the content from spoilage, and extend expiration date.



### Pneumatic Cylinder

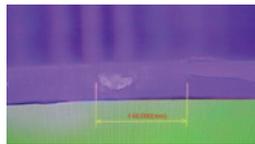


EVOH layer  
non-injecting section  
3.24mm  
Pneumatic Cylinder

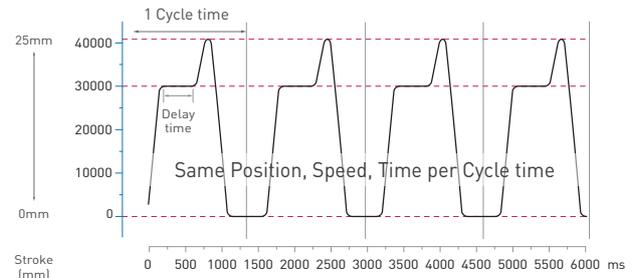


Cylinder Valve Pin Position Graph

### SEVA Cylinder



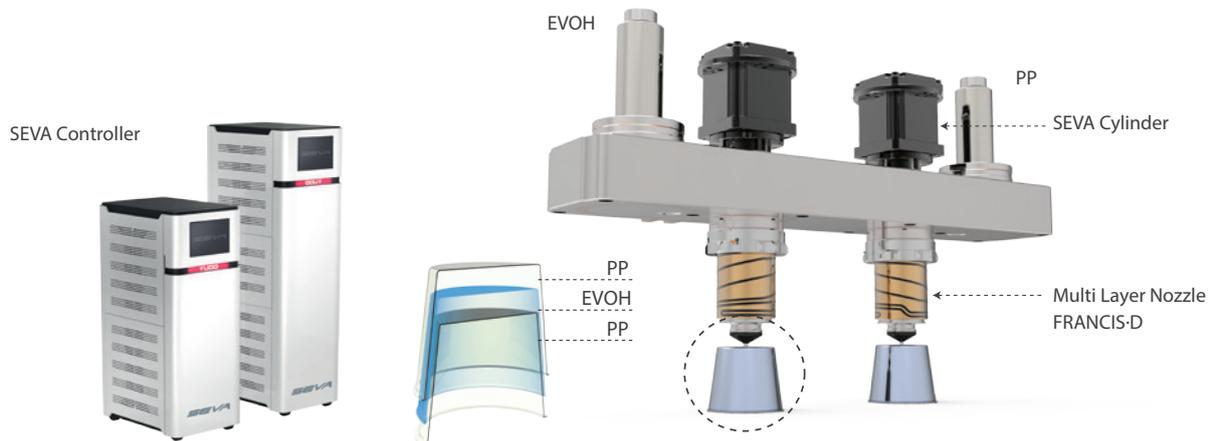
EVOH layer  
non-injecting section  
1.46mm  
SEVA 20 Cylinder



Cylinder Valve Pin Position Graph

As special technology of SEVA cylinder, the multi-level control of a valve pin is possible up to 25 mm. Through free control of valve pin, Multi-layer provides perfect Gate sealing.

\*SEVA (servo valve cylinder) is a compact-size electric cylinder developed in-house with YUDO's original technology. It can adjust balance for each cavity and control valve pin speed optimally with individual control / precision quantitative control of valve pin up to 0.01mm. SEVA can be applied to various products from small to large size thanks to its excellent reproducibility.



## PVC Fitting Hot Runner System

YUDO built the world's first Hot Runner System for PVC.

At first, it was difficult to apply Hot Runner System to PVC fitting because PVC resin is very sensitive to shear heating and easily gets solidified. However, the development of Nozzle / Manifold structure specialized for flow channel management and maintenance management made continuous injection possible. By applying 2-Plate split structure to Manifold, it is easy to disassemble after injection and assemble back after cleaning the solidified resin inside channel. Moreover, the resin channel is protected with special Hard Chromium Plated for strong corrosion resistance. YUDO can supply Hot Runner System optimized for PVC resin.

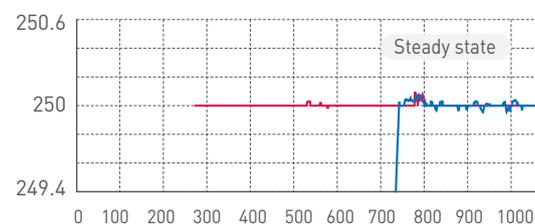
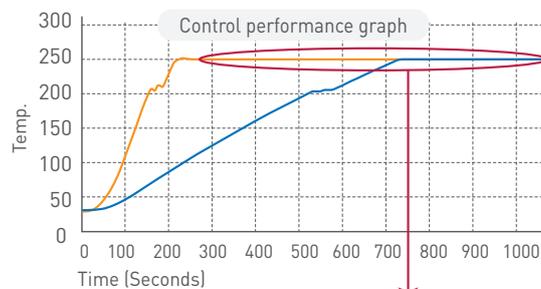


## Precise Temperature Control

YUDO Hot Runner Temperature Controller is equipped with precise control system of high speed PID control algorithm suitable for various injection environments, and it is operated based on factors such as temperature increase / decrease and time. When controlling heater temperature, auto-tuning is automatically activated to keep the temperature at a precise and stable level within  $\pm 0.1^{\circ}\text{C}$  and no overshooting occurs. (Within  $1^{\circ}\text{C}$ )

Also, due to its excellent response time, quick and precise temperature control is possible even after changing setting temperature. (Measurement cycle: 20ms)

YUDO Temperature Controller can control temperature by quickly detecting external environment temperature, therefore, it provides excellent performance especially for controlling Hot Runner temperature of high-temperature mold such as Steam Mold, Electrically Heated Mold, and so on.



CW992 Temperature Test ( $250^{\circ}\text{C}$ )



# Technology

## Scoring System

for In-Panel  
Precision Machining

Scoring system is precision machining equipment that performs 3-dimensional milling process along with shape of product through high speed precision control. (Precision:  $\pm 0.05$  mm, Repeatability:  $\pm 0.02$  mm)  
It is verified system in uniform machining of Automobile In-Panel Airbag Line.



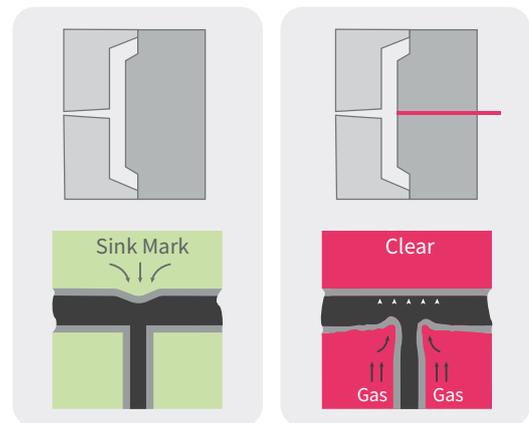
In-Panel Airbag Line

## Air-Assisted Molding

for Flawless Product Surface

Air-Assisted Molding creates high quality surface and removes surface defect like sink mark by blowing Air to opposite side instead of Holding pressure which is attributed to shrinkage and deformation after injection completion.

YUDO Air Pusher can supply Air pressure up to 100bar and adjust pressure inside mold based on product shape and injection speed with multi-channel Air in/out function.



Standard Molding

Air-Assisted Molding

Improve shrinkage  
without Flash / Discolor

**AIR PUSHER**



# Factory Intralogistics Solution



YUDO Factory Intralogistics Solution consists of TAGON, an Intralogistics Transportation Robot, and Integrated Logistics Controlling (ILC) system.

TAGON can be used with various attachments. It automatically transfers all forms of logistics units such as container, carton box, cart, rack, pallet, etc. safely and precisely to make production without down time and maximize logistics efficiency.



## Attachment

Cart towing

Conveyor type

Telescopic type

Robot type

Flatbed type

Shuttle

Lifting type

## Advantage

- moves Dynamically**  
 Flexible logistics by change in production environment  
 Utilization of various attachments
- moves Consistently**  
 24/7 production without down time  
 Stable Flow Production through timely transfers
- moves Intelligently**  
 Productivity improvement with precise transfer based on data and logic  
 Maximization of warehouse logistics efficiency through efficient space management
- moves Safely**  
 Prevention of collision between logistics caused by irregular flow  
 Protection of equipment, facility inside factory as well as logistics within a factory
- moves Transparently**  
 Visualization of all data through ILC to display logistics flow through real-time computation management  
 Seamless management of logistics flow without loss inside/outside factory

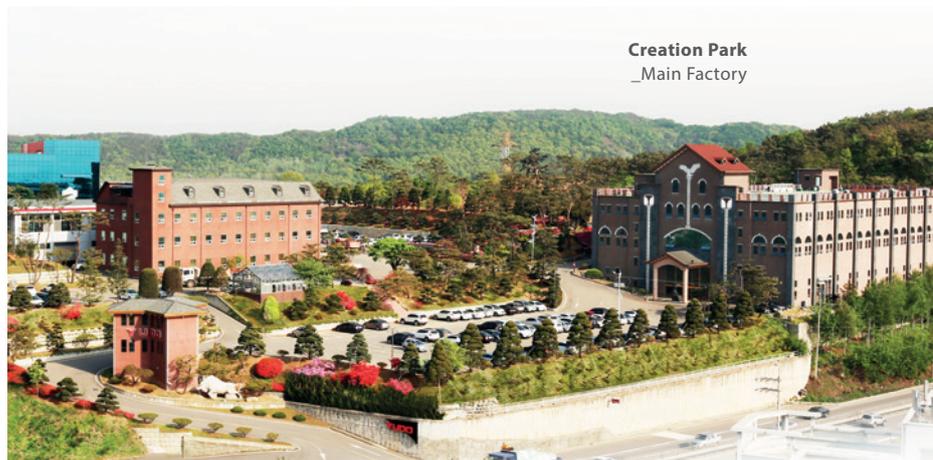
# YUDO Company

## YUDO GROUP

Since its foundation in 1980, YUDO has strived to develop and produce Hot Runner System and acquired Global No. 1 market share through its efforts to obtain original technology and provide product with excellent quality. Furthermore, from Injection Auxiliary Equipment and Factory Automation System of YUDO-SUNS, Precision Machine Tool Automation System of YUDO-ROBOTICS to PET & Packaging Turn-key solution of PETONE, YUDO expanded its business to all areas and achieved various solutions that can fulfill any demands from customer. YUDO will continuously create value beyond technology and bring satisfaction to customer with our passion melting a soul.



Creation Tower  
\_HQ, R&D Center



Creation Park  
\_Main Factory

## YUDO

Measurement : 49,360m<sup>2</sup>

Employees : 440

Items : Hot runner systems, Heater, Thermocouple,  
Smart factory solutions

YUDO specializes in Hot Runner system, which is the core components of mold, and manufactures all essential parts internally including Nozzle, Manifold, Mold Base, Heater, and so on.

YUDO manages excellent quality management system through in-house R&D, Design, Manufacturing, Assembly, and Customer Service. It realizes Smart Factory for customer satisfaction with optimizing the overall production process and maximizing efficiency through Integrated Monitoring & Controlling / Business Management System.





## YUDO-SUNS

Measurement : 11,672m<sup>2</sup>

Employees : 247

Items : Take-out robot, Auto-feeding system, Heating & Cooling system, Factory Automation system

YUDO-SUNS has core technology and accumulated know-how in Auxiliary equipment improving productivity of Plastic Injection. It is the only company that can provide Consilience Technology optimized for Plastic Injection Molding Industry and implements Factory Automation that realizes unmanned factory and production automation. It leads the paradigm for Factory Automation System focusing on improving quality / productivity and reducing energy consumption.



## YUDO-ROBOTICS

Measurement : 4,960m<sup>2</sup>

Employees : 67

Items : Factory Automation for Machining Industry  
Fachinery solution

YUDO-ROBOTICS offers Industrial Precision Machine Tool Automation system including Multi-axes Robot, Gantry Loader, Bar Feeder, Stocker and Shuttle system based on Motto of Human, Quality, and Technology. Its accumulated Factory Automation technology and productivity improvement in Machine Industry are well- proven in domestic market as well as in global market among Japan, China, Russia, Singapore, and so on.



## PETONE

Measurement : 29,752m<sup>2</sup>

Employees : 63

Items : PET & Packaging Turn-key solution

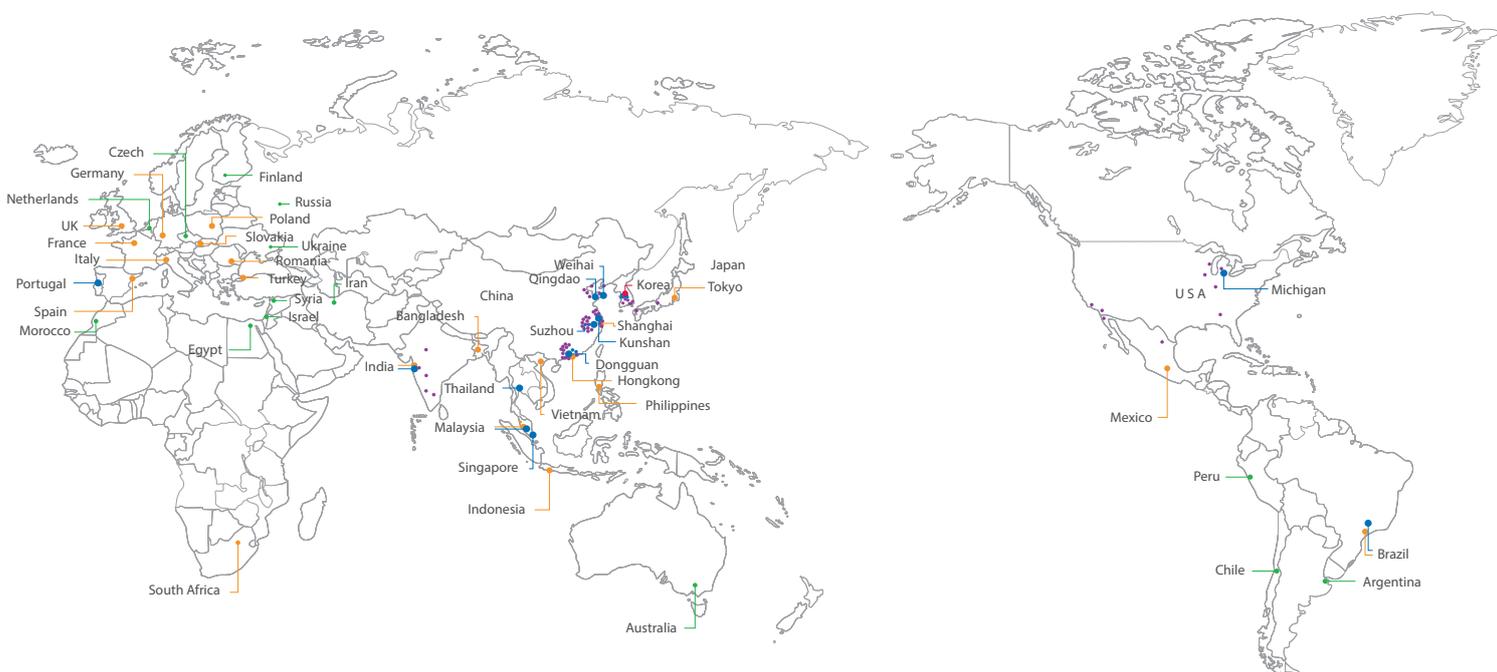
PETONE provides One-stop service for PET Preform and Packaging production. Also, it supplies all devices required for the process as Turn-key solution.

In order to achieve high quality, all the products are inspected at in-house reliability verification lab, and then distributed with basic inspection report including AA, IV and moisture content.

# Global Network

**YUDO is the company born in Korea for the global market.**

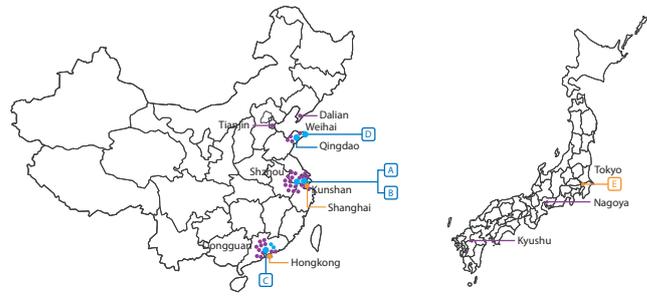
As the Hot Runner industry holding the No. 1 international market share, YUDO has 24 plants and 7 design centers in the Americas, Europe, and Asia. YUDO provides real-time responses to customers worldwide through global subsidiaries and agencies in more than 40 countries.



- Headquarters
- Manufacturing & Sales 24
- Sales subsidiary 27
- Sales office 63
- Agency 24

# NORTH-EAST ASIA

- Manufacturing & Sales
- Sales Subsidiary
- Sales office



**A**  
Suzhou-1/2/3. China  
Measurement : 17,214m<sup>2</sup>  
Employees : 525  
Items : Hot runner system  
Controller and so on



**B**  
Suzhou-4. China  
Measurement : 8,600m<sup>2</sup>  
Employees : 80  
Items : Hot runner system  
Controller and so on



**C**  
Dongguan. China  
Measurement : 4,000m<sup>2</sup>  
Employees : 202  
Items : Hot runner system



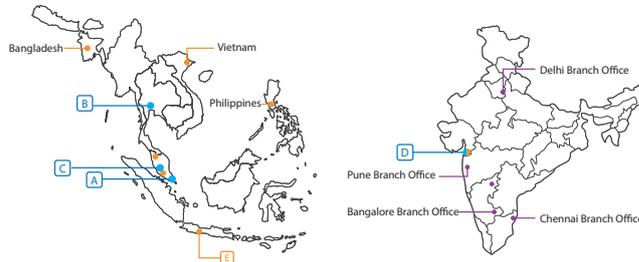
**D**  
Weihai. China  
Measurement : 34,528m<sup>2</sup>  
Employees : 163  
Items : Auxiliary system



**E**  
Tokyo. Japan  
Measurement : 811m<sup>2</sup>  
Employees : 28  
Items : Hot Runner System  
PET & Packaging

# SOUTH-EAST ASIA

- Manufacturing & Sales
- Sales Subsidiary
- Sales office



**A**  
Singapore  
Measurement : 5,960m<sup>2</sup>  
Employees : 32  
Items : Hot runner system  
Mold base



**B**  
Samutprakan. Thailand  
Measurement : 6,446m<sup>2</sup>  
Employees : 85  
Items : Hot runner system  
Mold base



**C**  
Johor. Malaysia  
Measurement : 7,639m<sup>2</sup>  
Employees : 48  
Items : Hot runner system  
Mold base



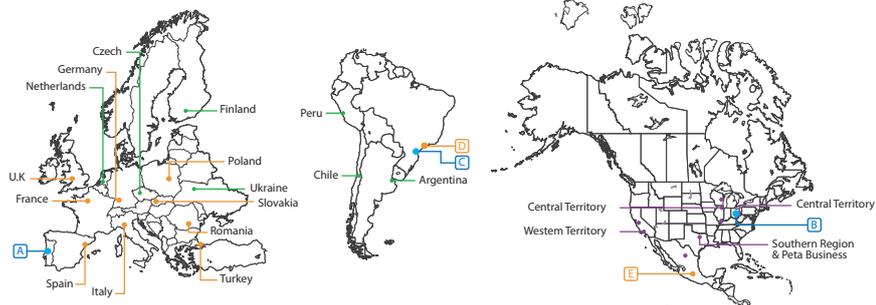
**D**  
Vasai-East. India  
Measurement : 1,500m<sup>2</sup>  
Employees : 35  
Items : Hot runner system  
Robot, Auxiliary system



**E**  
Jawa Barat. Indonesia  
Measurement : 153m<sup>2</sup>  
Employees : 19  
Items : Hot runner system  
Mold base

# EUROPE/ AMERICA

- Manufacturing & Sales
- Sales Subsidiary
- Sales office
- Agency



**A**  
Portugal. EU  
Measurement : 2,645m<sup>2</sup>  
Employees : 59  
Items : Hot runner system  
Robot, Auxiliary system



**B**  
Michigan. U.S.A.  
Measurement : 2,043m<sup>2</sup>  
Employees : 19  
Items : Hot runner system  
Robot, Auxiliary system



**C**  
Joinville. Brazil  
Measurement : 7,300m<sup>2</sup>  
Employees : 48  
Items : Hot runner system



**D**  
Sao Paulo. Brazil  
Measurement : 561m<sup>2</sup>  
Employees : 4  
Items : Hot runner system



**E**  
Queretaro. Mexico  
Measurement : 200m<sup>2</sup>  
Employees : 12  
Items : Hot runner system  
Robot, Auxiliary system

# Social Contributions

**YUDO makes considerable contributions to local communities.**



**YUDO shares compassion and care with commitment and sincerity.**

Each December YUDO employees commit to sharing with community neighbors in need. We practice neighborly care and compassion through local donations and create a meaningful culture.

This is YUDO culture. YUDO is dedicated to sharing with the community through a range of social contribution activities.

**NGO support for a wide range of social contributions**

YUDO is actively involved in NGO sponsored overseas programs as well as Korea based programs. With Global Art and Friends sharing love through art therapy program, YUDO keeps participating in sharing systematically.

In July 2015, we helped under-privileged children/youth in the Tacloban city, the Philippines to play with art, music and physical education activities and supported people who suffered from Typhoon Haiyan by providing Psychotherapy program with an inspirational offering of hope.



Milestones  
Vision Map  
Business Area  
Software Area  
Connect Area



Hardware Area  
Technology  
General Information

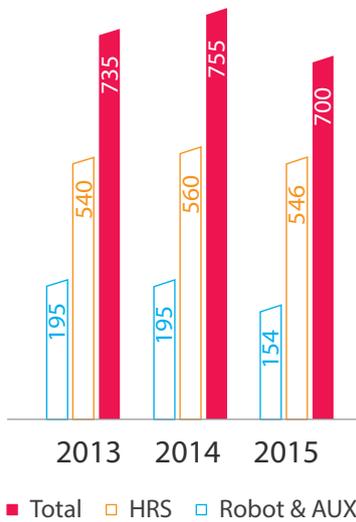


YUDO shares love and happiness.

# Facts & Figures

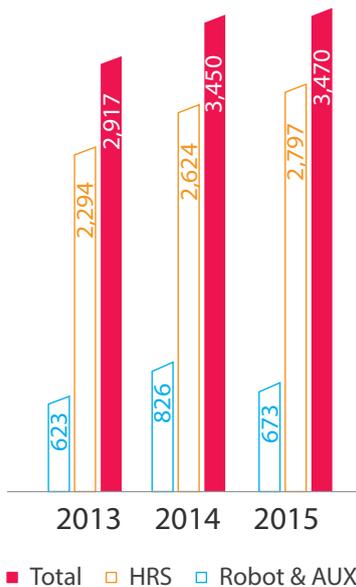
## Sales Turnover

In US\$ million



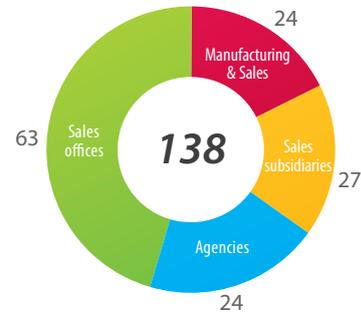
## Employees

In people



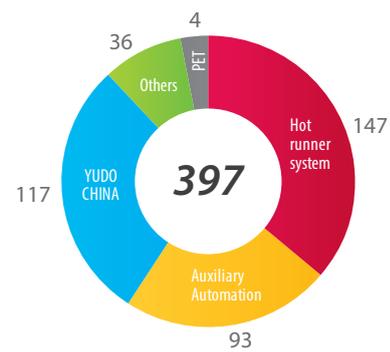
## Global Networks

In ea.



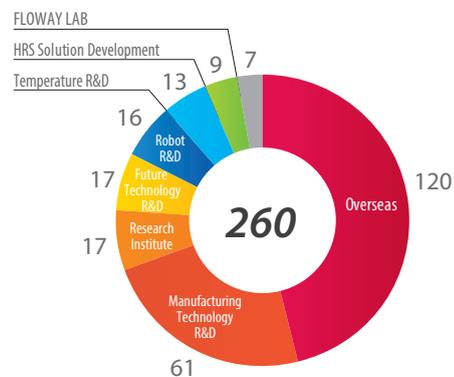
## Patents

In ea.



## Researchers

In people



## **YUDO GROUP**

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