

# *Asprova* *Industry Solution*

Catalogue with case study reports and samples



## Industrial Machinery and Components

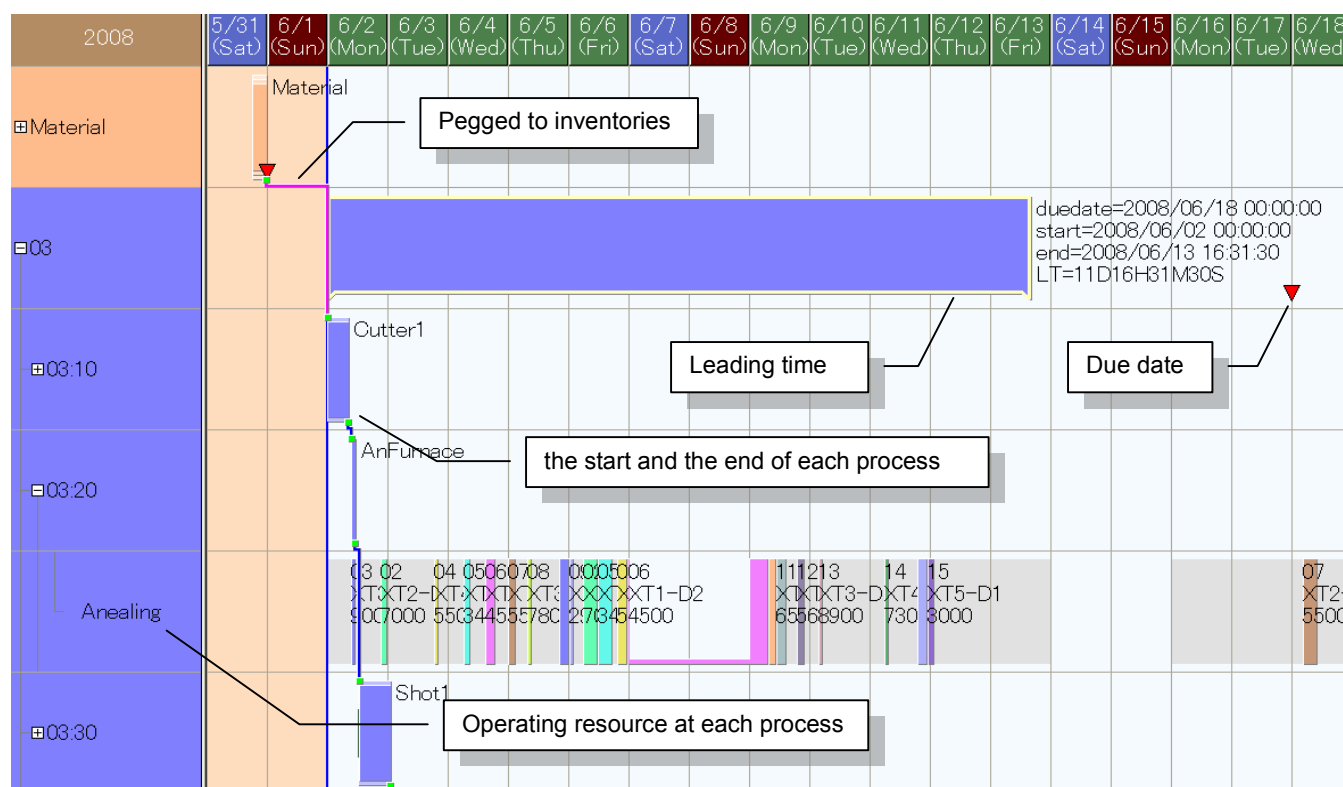
## The problems of Industrial Machinery and Components companies

One of the current important issues in the field of production industry is how to deal appropriately with external factors such as demand changes, and internal factors such as production leading time, yield rate, and break-downs, reducing inventories at the same time. The solution includes two points: visualization and reduction of lead time. "Visualization" and "reduction of lead time" are realized by installing a scheduler with finite capacity. Schedulers with finite capacity make production schedules as to reduce lead time, considering facilities and workload. Having Scheduling result, production progress, and future schedule accessible for anyone to see realizes "visualization".

Asprova's high speed production schedulers which enable "visualization" of schedules have served our clients' needs. The following is the introduction of Asprova's solution.

## Finding the due date by schedulers with finite capacity

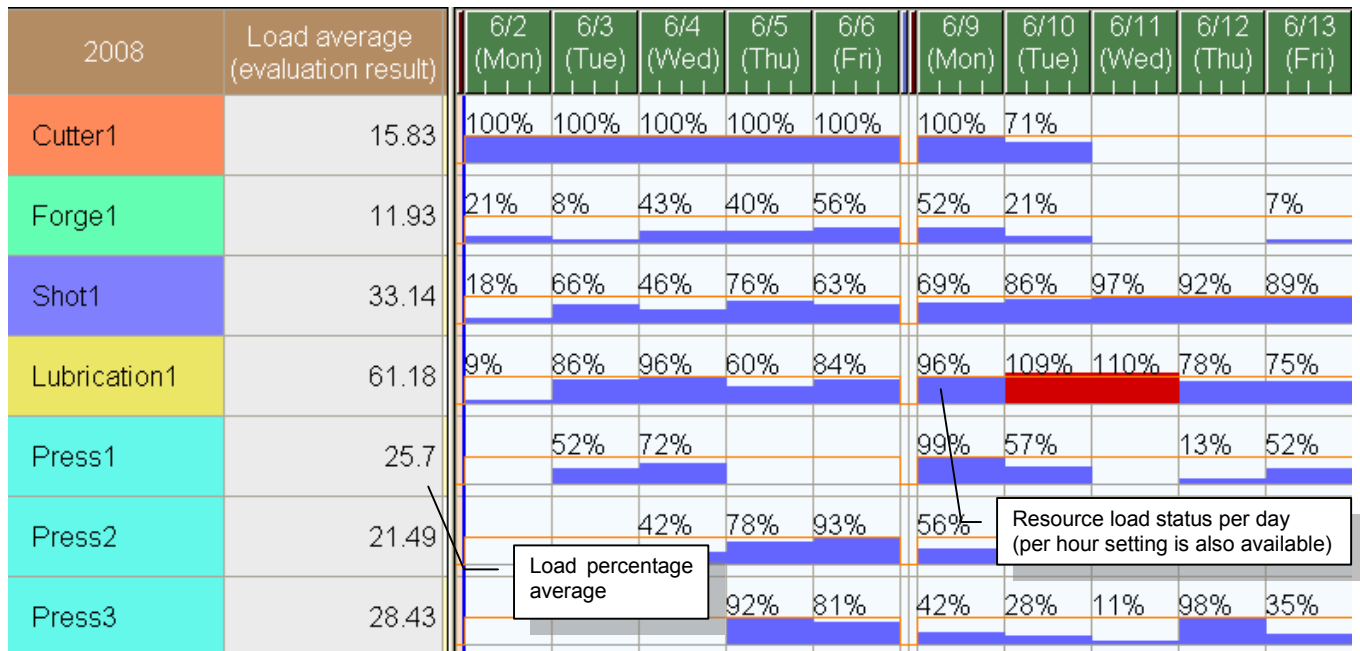
Schedulers with finite capacity make production plans which can be directly used as work instructions. Schedulers can manage urgent orders and due date changes, allocating inventories.



◆ Order Gantt Chart: enables checking of overdue orders, wait times of each process, inventory allocation. The Order Gantt Chart's standard feature includes a Resource Gantt Chart, an Instruction Gantt Chart, an item Gantt Chart, overdue flags. The Order Gantt Chart is easily operated with mouse.

## Efficient load adjustment

Asprova is capable of efficient load allocation to multiple production lines. Asprova also manages to take into account facility investment simulations and manpower employment planning. Shift changes per facility or worker are easily operated with the mouse.



◆ Load graph: current load status is recognizable in one view. Displayed periods, displayed resources, and text display are customizable at your will. In addition, inventory graphs and leading time graphs are included as a standard feature.

## Skill map to manage workers capacity

The "Skill map", a table to set up process skill of employees, is provided as a standard feature. It enables managing of employees' capacity, ability/inability and processing speed, separate to integrated master tables such as the BOM(Bill of Materials) and resource capacities.

	Resource code	Resource name	Recieve	Inspect 1	Cut 1	Treat 1	Cut 2	Forge	Die	Fix 1	Join	Fix 2	Treat 2	Adjus t	Inspect 2	Deliver
1	0001489	Smith	○				○	○	○	○						
2	0001857	Johnson	○				○	○	○	○					○	
3	0001899	Williams														
4	0001945	Jones	○	○	○											○
5	0101938	Brown			○					○	○	○				
6	0101959	Davis											○	○		
7	0102848	Miller			○					○	○	○				
8	0102859	Wilson														○
9	0102933	Moore			○					○	○	○				

◆ Up to 999 skill types can be added. Displays and input means are also easily customized.

## Production Scheduling pegged to inventories and order information

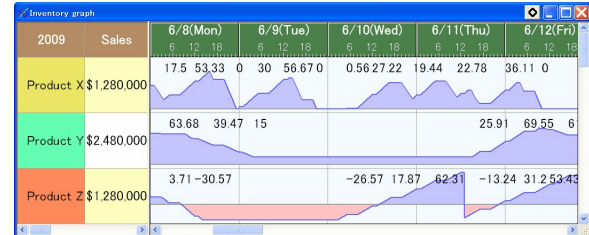
Registering orders not only per production unit/lot but also per sales order unit/lot is possible. Production schedules planning, eliminating unnecessary inventory, can be made while taking into account safety inventories.

Daily sales plan table

Item	Mo	Customer	Type	Qty	Sum	1	2	3	4	5	6	7	8	9	10	11	12
AX100	6	ABC Ltd	Company forecast	600	600	24	23	23		23	23	23	23	23	23		23
			Customer forecast		720	24	23	23		20	30	30	30	30	30		30
			Firm orders		90	24	24	22		20							
			Production		920.4	0	20	60	0	59	40	40	49	50	40	0	40
			Remainder		200		12	70	55	55	35	15	5	-4	-24	-24	-24
7		ABC Ltd	Company forecast	600		24		23	23	23	23	23	23	23	23		23

◆ Sales plan table: The information on orders for a certain period can be registered with the accuracy of company forecast, sales forecast, customer forecast, and confirmed orders.

\*Sales order option is required.



◆ Inventory graph: inventory changes and material requirement can be calculated at one view. In addition, production graphs and consumption graphs are available. Calculation functionality for each term is also included.

## Evaluation of the result of scheduling and simulation by KPI

Key Performance Index ("KPI") including sales, profits, profit rates, the material cost can be calculated by each cost per item and working cost per each resource. Calculation formulae can be freely customized. Also, standard cost breakdown can be calculated. It can be used to verify the result of facility investment simulation as well.

\* KPI option is required

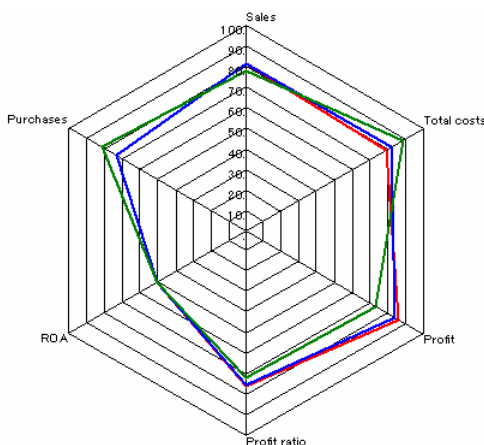
Edit KPI evaluation result

Property	Value	Description
Evaluate KPI(09/12/24)	Evaluate KPI	
Earnings	\$16300000	Total monetary value of sales orders with
Material cost	\$7400000	Total monetary value of purchase orders
Outsourcing cost	\$1240000	Total outsourcing cost for resource durin
Labor cost	\$3800710	Total labor cost for resource during the s
Total cost	\$12440710	Total cost during the specified period.
Profit	\$3859290	The profit during the specified period.
Profit ratio	23.7%	The ratio of profit and earnings during the

KPI Common All properties

OK Cancel

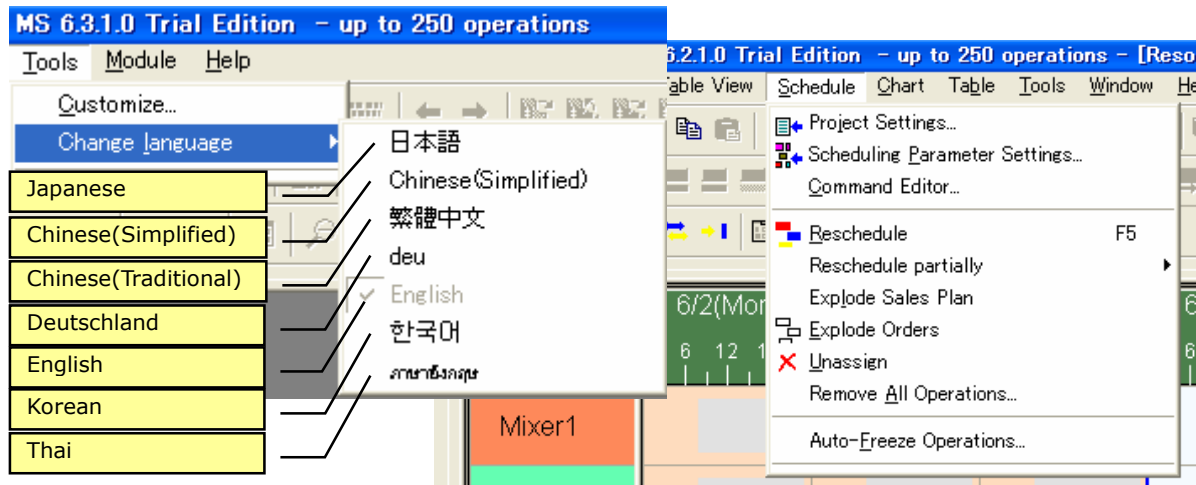
◆ KPI(Key Performance Index): KPI can evaluate the calculation result and keep records.



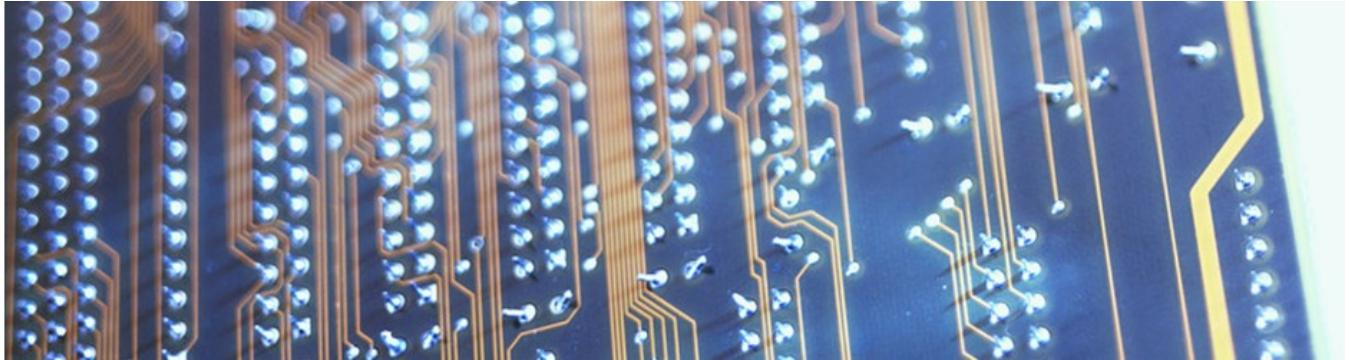
◆ KPI radar chart: KPI radar chart enables comparison of the simulation result by radar chart. (with HTML View)

## Adaptable to global network

Asprova is available in Japanese, English, Chinese(Simplified Chinese and Traditional Chinese), Korean, German, Spanish, Portuguese, and Thai. Using the same package enables very close co-operation and understanding between different plants.



◆ Adaptable to Multi-languages: Displayed languages can be changed during running.



## Introduction to the case studies

To read our latest case study, please go to

<http://www.asprova.com/en/case/index.html>



Kihara Manufacturing Company, Ltd.

## Pipe Manufacturer Chooses Asprova for Scheduling Speed Achieves Load Leveling and Major Inventory Reduction



The Ibaraki factory of Kihara Manufacturing Company specializes in production of piping and tubing, including truck exhaust pipes, engine pipes, and hydraulic pipes for construction equipment. Production scheduling is performed twice each morning, first for products and then again for parts. Weighed down by the complexity of handling a large number of customers and product varieties and the resulting large number of order changes, they were drawn to Asprova's ability to maintain fast scheduling speed in the face of overwhelming data size. Due to the flexibility of the Asprova program, they were able to deal with the large number of customers and products while keeping customization to a minimum.

### Problems Prior to Introduction

- MOUNTAINS of paperwork due to complicated scheduling procedures
- CONFUSION on assembly line due to contradictory instructions from different process managers
- PROCESS managers hoarding inventory to avoid missed deadlines

### Reason for Introducing Asprova

- ASPROVA's scheduling speed
- MINIMAL need for customization
- QUALITY of response from Scheduling System Laboratory

### Benefits of Introduction

- ASPROVA's load calculations enabled scheduling to be performed centrally every morning without exchange of paperwork.
- CONTROL of factory floor through reliable schedules led to inventory reduction of more than 200 million yen.
- CLARITY of priorities and accuracy of load calculations in Asprova's manufacturing instructions eliminated need for corrections by process managers.

### Production Scheduling in State of Confusion

Up till now in the Ibaraki factory of Kihara Manufacturing Company, process managers for each customer carried out instruction-based production which depended on the exchange of considerable paperwork in the form of production plans, work charts, missing item lists, and instruction supplements. Since it was not feasible for detailed factory-wide production schedules to be drawn up centrally on a daily basis, much of the burden of scheduling was placed on the shoulders of the process managers themselves, who were often unable to set appropriate priorities to the requests for needed parts coming in simultaneously from numerous other managers. As the factory floor and production management office became increasingly swamped in paperwork, the problem was worsened by managers making unnecessarily large request for parts or hiding inventory stock for fear of missing deadlines. Although a production management system had been installed on the factory mainframe for more than 20 years, the reality of the factory's production scheduling was that it was in a state of confusion.

"For more than 10 years," explains Masami Satoh, Chief of Production Management, "we had been looking into introducing a scheduling management system, and in fact we tried several different ones, but none of them reached the stage of actual installation." The main reason, he says, was that most of the systems were unable to handle the large number of customers and product varieties. They decided on Asprova because of the high speed of its scheduling computation, and because they valued Scheduling System Laboratory's quick response to all of their needs. Concerning the speed of computation, Satoh says, "We saw the demo and were amazed."

#### Data Volume

Finished products	3,400
Total items	10,000
Resources	100
Processes	3
Scheduling period	58 days
Scheduling cycle	once / day
Lots in scheduling period	6,000
Jobs in scheduling period	15,000

#### Kihara Manufacturing Company, Ltd.

Main office: 6-14-9 Soto-kanda, Chiyoda-ku, Tokyo 101-0021 Japan  
Ibaraki factory: 5166 Uchimoriya-cho, Mizukaicho-shi, Ibaraki-ken 303-0042 Japan

Company established: February 1943, Factory established: July 1954

Representative director: President Tsuneo Kihara

Capital: 107 million yen, Employees: 270 (as of June 1998)

Annual sales: 5 billion yen (in 1997)

Since its establishment, Kihara Manufacturing Company has specialized in producing a diverse range of low-pressure to high-pressure pipes for use in motors, industrial machinery, ships, and other machinery.

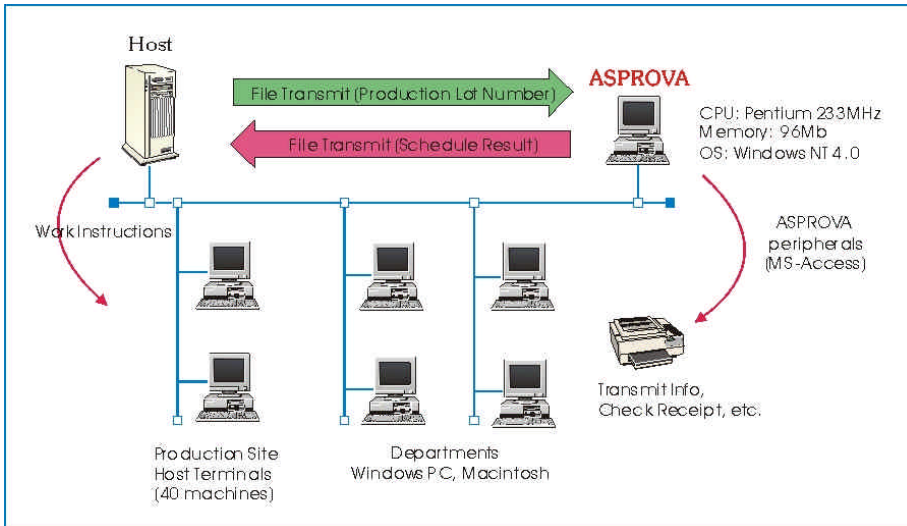


Figure 1: System structure

Data is transferred with the office mainframe twice daily in order to carry out scheduling, first for the customer-side plans, and then for the factory's internal requirements. The mainframe explodes requirements for parts, determines due dates, and outputs manufacturing instructions.

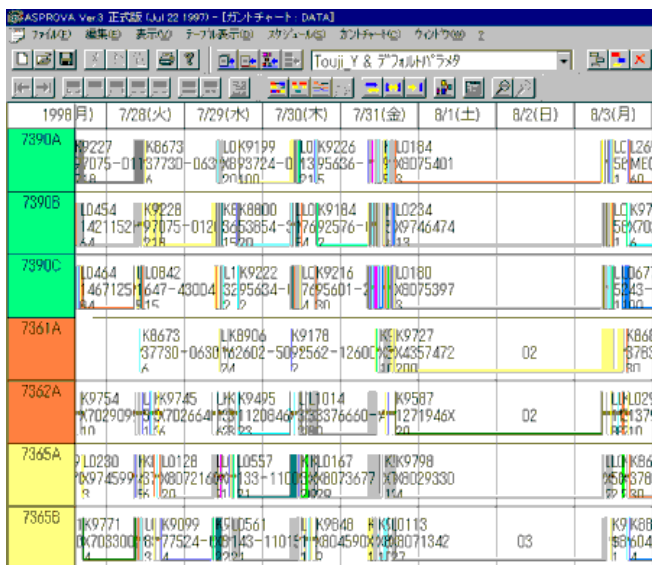


Figure 2: Gantt chart showing results of scheduling with Asprova.

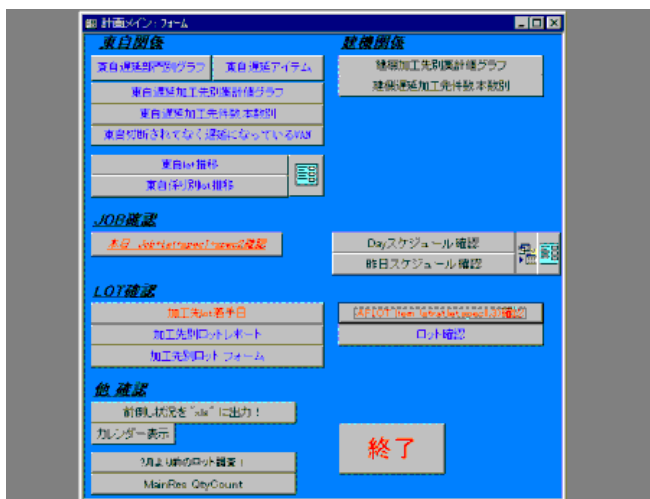


Figure 3: Main menu from Asprova peripheral utility, developed by Kihara Manufacturing Company in response to various needs from the customer relations department.

Satoh says their appreciation was further increased upon finding that Asprova's standard version was able to deal with the continual thorn in their side -- the huge number of product varieties -- with a minimum of customization.

## Can't Operate Without Asprova

Now scheduling is performed twice a day, first to schedule the final products, and then again to schedule the component parts based on those results. Although performing daily scheduling on a scale as large as the Ibaraki factory's means some daunting demands on the scheduler for computational speed, Asprova easily met the challenge by generating a schedule in only 10 minutes.

At the same factory, during the investigatory stages of the scheduler introduction, managers had described their hopes for the role of the scheduler in a list including such tasks as integrating customer-specific manufacturing instructions, generating reasonable instructions based on resource load planning, guaranteeing that following the schedule will finish lots on time, producing only the required items, facilitating frequent re-scheduling, and ensuring timely completion of job preparations. Asprova, they say, has fulfilled nearly 100 percent of their hopes.

Not only that, but Asprova has also allowed them to effect a drastic reduction in inventory. "Up till now," explains Satoh, "process managers were only managing to stay on top of demand by producing hundreds of pipes at a time. Now that we have scheduling under control, we've started producing smaller lots to cut down on inventory." On a price base, he says, this inventory reduction has totaled about 30 percent.

With this growing list of achievements, Asprova is rapidly becoming an indispensable element of the Ibaraki factory. As Sumio Sakamaki, Chief of Systems Development in the Production Division, says, "Asprova has become so much of part of our production management system, I don't think work in this factory could even go on without it."



## Hitachi Metal Inc., Kuwana Factory

# Metal Manufacturer Chooses Asprova For Scheduling Speed Reduces Scheduling Time and Scheduling Cycle Time

The Kuwana factory of Hitachi Metal, Inc. primarily manufactures plumbing system parts for gas pipes, drainage, water supply, fire hose, etc. Before using Asprova, a mainframe computer was used for scheduling, but it took a lot of time and unnecessarily put heavy workload on scheduling managers and on-site workers. On top of that, there was a need to reduce scheduling cycle to meet customers' needs. After introducing Asprova, they were able to reduce their scheduling time by about 3 hours, and cut schedule cycle time from 1 cycle per month to 1 cycle per week. In addition, with the added functions of Asprova's COM interface, rescheduling workload was also reduced.

### Problems Prior to Introduction

- LENGTHY 3 to 4 days schedule drafting time, caused by mainframe computer's long processing time
- INFLEXIBILITY of mainframe computer to sudden order changes, leading to tedious manual calculation and direct on-site adjustment
- EXTRA workload for on-site workers
- ONE-MONTH base scheduling that cannot meet customers' needs

### Reason for Introducing Asprova

- ASPROVA's fast scheduling speed
- ASPROVA's user-friendly GUI
- ASPROVA's diverse master settings

### Benefits of Introduction

- REDUCED scheduling time to 3 hours.
- CUT scheduling time to 1 week.
- SIMPLIFIED rescheduling work, as a result of Asprova's fast scheduling speed.
- REDUCED schedule correcting workload, through development of Asprova peripheral functions such as plugins and automation.

### Scheduling With Mainframe Computer Began to Show Its Limitations

Until recently, the Kuwana factory of Hitachi Metal, Inc. had been using a mainframe computer to make a schedule on a monthly basis. Usually the main computer had to be run at night, as it takes 5 to 6 hours of machine calculation for a scheduling job, and on the next day, 5 schedule managers usually spend a day making corrections to match delivery times, setups, and machine operation time. This cycle would then be repeated several times, so it would take about 3 to 4 days to do one scheduling job. In cases where there was a sudden change in orders, since the mainframe computer is not flexible enough to respond to it, the calculation results would be modified manually, and in many cases direct adjustment at the production site were needed. On more complex adjustment processes, on-site workers would need to cooperate, thus adding workload outside scheduling team. Moreover, monthly basis scheduling was proven to be ineffective in answering customers' needs, so it was also necessary to reduce cycle time. To deal with these problems, introduction of a scheduler was considered.

On the basis of package selection, Hitachi Metal, Inc.'s Production System Research Department recommended Asprova. The department did compare various production management programs before choosing Asprova. As Hiroaki Simizu of Production System Research Department says, "After attending a lot of seminars and evaluating different packages, I was attracted by Asprova's speed." And after trying Asprova's trial package, they decided to recommend Asprova based on its diverse master settings, user-friendliness of its GUI, and the ability to specify alternate machines.

#### Data Volume

Finished products	9,000
Total items	60,000
Resources	900
Processes	15
Scheduling period	2 months
Scheduling cycle	weekly
Lots in scheduling period	about 20,000
Jobs in scheduling period	about 150,000
Single rescheduling time	about 15 minutes

#### Hitachi Metal, Inc., Kuwana Factory

2 Daifuku, Kuwana-shi, Mie-ken 511-8511 Japan

Year of Establishment: 1937

Employees: 900

Monthly Sales: 3 million yen

Since its establishment, the factory has primarily been manufacturing plumbing parts for gas pipes, drainage, fire hose, water supply system, etc., as well as air conditioners, water supply machines, and precision instruments. Following the diversification in material and process needs recently, the factory is doing R&D on new technologies and materials, such as polyethylene pipe system and metal diaframe bulb.

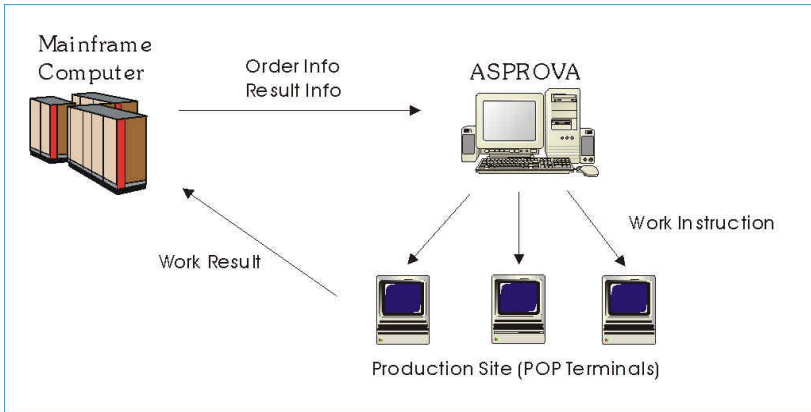


Figure 1: System Configuration

Order information and production result data are transmitted once a week to Asprova's PC from the mainframe computer. The schedule will then be set to POP terminals at the production site. Production result data is inputted from POP terminals at the production site and set back to the mainframe computer.

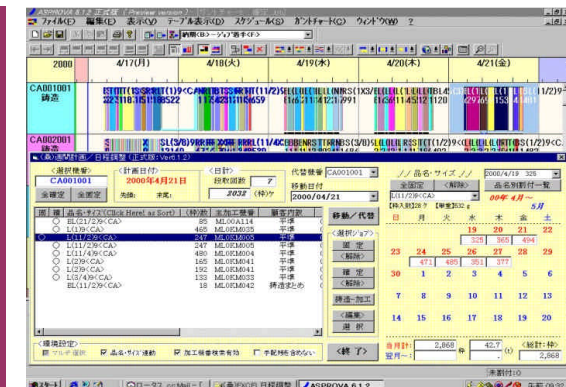


Figure 2: Personalized screen of Asprova and a plugin. Schedule can be checked and modified while verifying items' detailed information.

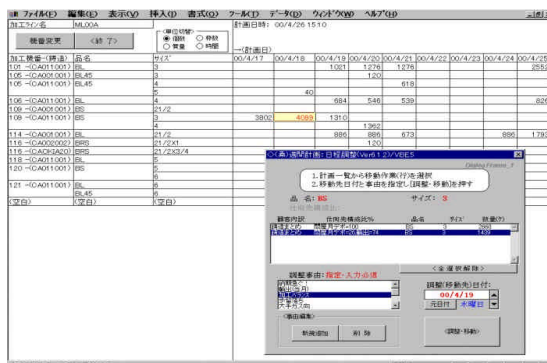


Figure 3: The company made a utility on their own using Excel to enable every manager to check and adjust Asprova's schedule. The adjusted schedule is sent back to Asprova through COM.



Figure 4: Main menu of production schedule. A range of demands from the production site is reflected. Asprova's processing can be executed automatically using the automation function.

"[When implementing Asprova], we spent time checking interface between the output result and the existing POP system," said Kenichi Masita, Chief of Factory Manager, Kuwana Factory. The check was done together with on-site production staff, and the system managers also got down on production floor to familiarize themselves with the production site situation. This cooperation between the system department and on-site workers was the key to the successful introduction of Asprova.

## Surprising Benefits

Before introducing Asprova, there was a target to transmit data once per week from the mainframe computer. The plan was to improve it first to a one-per-month level, and then progress to the one-per-week goal. However, changes in facility conditions delayed this process. But to everyone's surprise, Asprova was useful in simulating changes in the facility condition.

After introducing Asprova, the time it takes from scheduling to instruction output decreased to a mere 3 hours. The weekly data transmission from the mainframe computer was also put into practice. And since rescheduling can be done in no time using Asprova, repeated rescheduling is much less exhausting than before. Customer satisfaction has also improved, as a result of the reduction in order-to-production lag time.

## Extend Asprova's Function on Their Own. Reduce Rescheduling Workload.

Hitachi Metal's employees are extending Asprova's functionality on their own using technologies including COM interfaces, plugins, and Microsoft Excel. This has reduced the workloads of schedule managers and on-site workers. Furthermore, they have prepared a system for gathering information on common modification and reflecting them in Asprova's lot priorities and scheduling parameter settings to improve the accuracy of the schedule.

In the future, the factory aims to transmit data on a daily basis from the mainframe computer, cut scheduling time to 1 hour, reduce lead times and setup times, and decrease inventory by 20%. The way to do this is to effectively use Asprova along with its peripheral functions, while synchronizing the system and the production line.

## Mitsubishi Electric Corporation

Founded: January 15, 1921

Capital: 175,820 million yen

Annual turnover: 3,604,185 million yen

Number of employees: 99,444

### Nagoya Plant

Production of: heavy electric machinery systems, industrial mechatronics, information and telecommunications systems, electronic devices, manufacturing and sales of home electric appliances, etc.

URL: <http://www.mitsubishielectric.co.jp>



## Shortening Scheduling Time and Reducing Implementation Overheads with Asprova

Mitsubishi Electric Corporation's Nagoya Plant manufactures equipment related to Factory Automation (hereafter referred to as FA), and holds a workforce of about 5,000 employees. This plant manufactures a diverse range of products including electrical discharge machines, laser processing machines, sequencers, programmable indicators, inverters, servo machinery, NC equipment, and industrial robots.

The plant which manufactures electrical discharge processing machines is a model plant for the Mitsubishi Electric Corporation advocated FA integrated solution "e-F@ctory". The introduction of this e-F@ctory took place in 2001 when the plant facilities were refurbished. At that time, Asprova was adopted as a production scheduler. Yoshihiro Kato, Manager of the Electrical Discharge Machine Tool Department, Mechatronics Machine Tool Division, comments on the issues prior to the introduction of Asprova, the reasons why Asprova was adopted, and the effects on its introduction.

### "Scheduling took up to 5-10 minutes with the old in-house developed scheduler"

For electrical discharge processing machines processed at this plant, the number of processing parts per machine is about 8 parts. Asprova schedules the manufacturing processes that are divided up into about 1,300 orders every monthly. For these operations, use of Asprova allows optimization of the operational planning taking into account the set up work such as the tool replacement of the machining centers, etc.



Yoshihiro Kato

Electrical discharge Machine Tool  
Department Manager,  
Mechatronics Machine Tool Division

Although we have developed our own in-house scheduler in the past, it required a great deal of troublesome work in establishing a system. In addition, scheduling took a long time when it is put in actual use. In order to solve such problems, we considered the introduction of the packaged solution Asprova.

### Introduction of Asprova coincided with FA system refurbishment

The "e-F@ctory" is a solution based on the concept of utilizing computerized technology to allow visualization of the plant status, and aims at improving productivity at the shop floor. On-site information such as production results, operational results, and quality information from facilities and equipment is streamed in on a real time basis. This information system is used to support improvements in quality, construction schedule and productivity. Mitsubishi Electric Corporation cooperates with a number of partners and provides access to e-F@ctory to the plants of our user companies.

The electrical discharge processing machine plant of Nagoya Works is known as a model plant where this e-F@ctory has been introduced. Given these circumstances, we are continually receiving requests to visit the plant and study our implementation.

This plant manufactures electrical discharge processing machines, which literally grind down metal materials through the utilization of the "electrical discharge" phenomenon and are commonly used in producing dies and moulds. The Nagoya plant manufactures both "wire-type electrical discharge processing machines" which employ a wire with the thickness of a hair at their processing electrode and "shaped electrical discharge processing machines", which employ an electrode that fits the shape of the product.

Asprova is used on the production line which processes parts such as the columns and beds that compose the bulk of electrical discharge processing machines. This production line consists of automated warehouse where materials are stored, unmanned transport vehicles that transport parts, two horizontal machining centers and one "5 face processing machine."

The 4 types of processing treatments - milling, end mill, boring, tapping - are carried out while the product is kept in a fixed position. In this situation, no processing can be undertaken on the side which is currently clamped down. Following the completion of the first processing, the remaining processing is undertaken after turning the product over.

As stated earlier, the said plant renovated the plant facilities and equipment in 2001. The introduction of Asprova for line scheduling was carried out at the same time as the e-F@ctory changes were made.





# Asprova APS

Points highly rated by Mitsubishi Electric Corporation :

- Scheduling time reduction
- Implementation schedule reduced by about 80%

The aforementioned production control system manages the overall production planning for electrical discharge processing machines. After taking into account the receiving orders status, it also determines the number of units to be manufactured monthly, and prepares a "rough schedule" plan that extends until the point of shipping. The manufacturing period per machine is set up for three to four days, based on which the instructions are to be given on both starting date and completion date.

Asprova first excludes the machines that need to be outsourced, and then sets up the schedules for both starting date and completion date. Then the required parts will be calculated, along with the manufacturing processes necessary. After that, those results will be assigned to the processing machine.

Scheduling by Asprova is run both once a month and once a week. Yoshihiro Kato comments on the timing of scheduling.

"Scheduling is done once a month in order to make the detailed planning for manufacturing processes based on the rough schedule planning. Electrical Discharge Processing Machines are produced by so-called "lot-based production". After their production planning is set up once a month, it normally remains unchanged.

Scheduling is then done once a week on Saturday in order to make changes on the type of operations, based on the busyness of input work. Employees normally work at the plant on Monday through Friday either on a 2 shift system or with a daytime work plus overtime system. The shift type for the coming week is decided on Saturday. This is where the weekly Asprova schedule is applied."

Prior to the introduction of Asprova, the plant depended on the in-house developed COBOL language based system to carry out this kind of scheduling. Around that time, each scheduling took up to 5 to 10 minutes at a time.

"Back then, the scheduling was not undertaken for the whole month but was done on the case-by-case basis. That is to say, the orders were first sequenced up based on their due dates. After a certain order was dealt with, the remaining ones that were in need of scheduling were carried out one-by-one, with

consideration given to their priority and whether the necessary parts were actually available at the time. However, such scheduling took 5 to 10 minutes at a time," says Mr. Kato.

In addition, the facilities and equipment that had been in place before 2001 were introduced at the plant in 1982. The aforementioned COBOL based scheduling system was also established at that time. It was estimated that that it would be necessary for 24 senior engineers to spend about 1 year in order to re-establish a similar system, including software and peripheral interface portions.

## **"Asprova not only shortened scheduling time down to 1-2 seconds but also reduced our implementation schedule by about 80%"**

"After the introduction of e-F@ctory, there were times when we utilized the new information system. At that time, we were considering using package software which would allow for faster scheduling and require neither an extra introduction lead time nor an introduction cost," says Mr. Kato. In response to these needs, Asprova was introduced.

"We started the project after the introduction of e-F@ctory. Around that time, we began studying schedulers and the first information we received was about Asprova. So we made a thorough investigation on this product, and learned that our plant in Nakatsugawa had already purchased 8 packages of Asprova. To find out more about it, we went there and heard that they hadn't purchased all of them at once but instead had gradually increased the extent to which Asprova was applied. With these repeat purchases of Asprova indicating that our sister plant had found the package very beneficial, we attended Asprova seminars and were also convinced that this product could be of great use."

Scheduling speed was the foremost point considered when evaluating Asprova. "The scheduling speed of Asprova is really fast. It produces results within 1 or 2 seconds," says Mr. Kato.

By replacing our in-house developed scheduler with Asprova, "our implementation schedule has been reduced by 80%" says Mr. Kato. Asprova has not only improved the scheduling time a great deal but also drastically shortened the implementation overhead.

Asprova Corporation

Location: Gotanda Mikado Building 8F, Hiratsuka 2-5-8,  
Shinagawa-ku, Tokyo

Phone: (03)5498-7071

Fax: (03)5498-7072

<http://www.asprova.jp/>

**ASPROVA**  
join the WINNERS

## Mitsubishi Heavy Industries, Ltd.

Main office address : 2-16-5 Konan, Minato-ku, Tokyo  
3-3-1 Minato-mirai, Nishi-ku, Yokohama

Established : November 1, 1950

Capitalization : 265.6 billion (as of March 31, 2008)

Annual sales : (Consolidated) 3,203 trillion (April 1, 2007 to March 31, 2008) Mitsubishi Heavy Industries Ltd (MHI)

Nagoya Guidance and Propulsion Systems production at 160.9 billion (April 1, 2007 to March 31, 2008)

Number of employees : 33,089 (as of March 31, 2008)

At Nagoya Guidance and Propulsion Systems : 1,810 (as of April 1, 2007)

Business areas : Development, production and sale of products for energy, aeronautics and aerospace

Nagoya Guidance and Propulsion Systems : Development, production and repair of air body components, aircraft and aerospace engines, controllers

URL : <http://www.mhi.co.jp>



## MHI installed Asprova to automate scheduling work and, with the addition of the Sales option, found it very effective in making production planning more uniform.

The Nagoya Guidance and Propulsion Systems of Mitsubishi Heavy Industries, Ltd, was founded in 1920 as the Nagoya Plant of Mitsubishi Internal Combustion Engine Manufacturing Co. Ltd. (*Mitsubishi Nainenki Seizo KK*). Up to the end of the Second World War, Mitsubishi built the A6M Zero fighter plane. In the postwar period, it restarted its aircraft division and also began the repair of aircraft engines. Since then MHI has participated in a wide variety of aircraft and aerospace development and in the launching of rockets. At the present time, more than half of its production goes into missile related products such as anti-aircraft missile guidance systems (for the Patriot missile).

In 2003, NGPS installed Asprova to get greater efficiency out of the planning they had been doing manually up to that time. In 2007, they added the Sales option to obtain more uniform production planning. Kazuhiro Yoshino, manager of the Production-engineering Department at NGPS Works told us about the background for Asprova installation, the efficiencies gained through installation and the future outlook for the program.

## We installed Asprova to achieve greater precision in automating our scheduling work

The subject for today's installation of Asprova installation is the production line that builds a device known as a disk, a component that is part of the structure of aircraft engines used in private aircraft and is used to convert the force of combusting gases within the engine into dynamic power. The flow of production is one in which NGPS produces a wide variety of parts that include these disks and supplies them to the engine manufacturers. The engine maker assembles those parts into final form and ships the engine to the airline company.

Since 2003, NGPS has been working on increasing the efficiency of scheduling, which until then was done by hand. At that time, manual scheduling often required a complete reworking of the schedule, which led to a constant problem of delayed operations. Then, when the revisions were complete, they would find that the very situation for which the revisions had been made was completely different preventing them from making accurate forecasts of completion. That was the situation that led to NGPS's decision to install Asprova. They also wanted to lighten the operational load and make schedules that were much more precise. Kazuhiro

Yoshino, manager of the Manufacturing Department's Production Engineering Section gave the reasons that they selected Asprova.

"The first reason for our selection was the large number of parameters that we, the user, could assign for ourselves. I'm sure that this is the case at any plant, but there are particular conditions and requirements here that are unique to us. Asprova's flexibility really fills the bill in that regard."

We tried a lot of other schedulers, and almost all of them support the production lines that are part of the assembly system, but we judged that Asprova was the one product that best took care of the main lines in our process system. (Yoshino).

We placed the focus for the installation of Asprova on our disk production line, and the reason for placing there was that the equipment is fixed, the line is limited, and a decrease in the number of items will hold down and variable factors. In short, the flow of disk manufacturing goes through cutting material → grooving → drilling holes → rounding → aperture polishing → inspection -- a total of about 15 processes including detailed items.



#### ■Comments from the customer



Kazuhiro Yoshino  
Manager,  
Production-engineering  
Department,  
Manufacturing Division of  
NGPS Works,  
Mitsubishi Heavy Industries, Ltd.

Our initial intention in installing Asprova was to automate the scheduling of work, but we were unable to fit in maintenance of master data and that did not lead to the result we had hoped for. However, a smaller core system, and the arrival of the Asprova Sales option gave greater incentive to use Asprova to the utmost extent that we could. We have now broadened the ways in which the system is used and that includes leveling our production planning. Asprova uses opportunities gained through releasing the order-receive option to smooth out production planning

#### ■Points on which Asprova was highly praised

- Automates scheduling operations that had been done by hand led to greater efficiencies.
- Makes production planning more uniform
- More precise production plans

After installing Asprova, work conditions required that NGPS reach an operational level at which it would have sufficient forward motion. But that led to snags caused primarily by the human element. As Mr. Yoshino tells it, those snags arose from the enormous time and effort required by employees to assemble and collate data.

"Our core system at that time was centered on a host computer, and its data was incorporated automatically into Asprova, but the work of creating master data was quite difficult. We dealt with the problem by getting the data through batch processing and then manually, but there were limits to what we could do. Asprova would conduct master maintenance and our people who were in charge of the system would have to learn how to operate it. But that created a situation in which they were the only people who knew how to run it. The everyday work was what got the highest priority and maintenance was frequently neglected. We were not doing very well in our use of the new system."

We broke through that bottleneck in 2006 when Asprova encouraged us to replace that core system with a more downsized system. That again placed the spotlight on Asprova. It was very easy for us to incorporate the master data and the progress data in Asprova through linkage between servers.

And under this timing for moving to a smaller system, Asprova released the "Sales option" that pegged and linked production planning within the factory to Sales data. This is another of the factors further spurring on our active use of Asprova.

"I was one of those working in the production planning department and we wanted to make our planning more uniform. We build a predetermined number of engine frames annually, and we can manufacture new items on an ordered production basis. However, we also repair components and overhaul engines. The replacement parts that we need for those jobs and the number of orders we have for them can fluctuate wildly depending on what the situation is with the airline companies so we really need to have forecasts on production. That was another of the reasons we thought we would be able to make good use of Asprova for setting up production planning." (Yoshino)

This is why Sales data had to be incorporated in Asprova and linked to draft planning operations, something that was made possible with the release of the Sales option. "The time at which our core system was reduced in size and the time when the Sales option was released coincided very well. We were able to solve the problems previous to that in operations with Asprova and at the same time achieved the new goal of making production planning more uniform," says Mr. Yoshino

### Developed a user interface for easier operation, one that takes into consideration ease of use at the plant site

Replacement of the core system was completed in February 2007, and the adjustments made in Asprova, with its object as the disk production line, were finished in June 2007. NGPS then embarked on the development of an interface that would improve Asprova operability. Yoshino explained to us what was behind that move:

"We had a problem with the direct viewing of Asprova during actual operations. To use Asprova, one has to be trained in its operation and that provided to be quite

an additional load for people on the floor. Any situation where only designated persons are able to operate equipment is something to be avoided. So a new user interface was developed that allowed anyone to use the Asprova."

The easiest way to operate for people on site is to not have them directly manipulate Asprova but to enter conditions, click on a button and generate a schedule automatically. We developed the interface for that purpose, and it was completed at the end of 2007.

### Installing the Sales option gave faster speeds and greater precision to production planning

NGPS started installing the Sales option at the end of November 2007, completed installation in about one month and then took two or three months to tune it before putting it into online operation. That made it possible to draft a production plan from order data, all the while taking safe inventory into consideration.

"Now, for example, we assign quantities in inventory and everyone knows exactly what that data is. Before, we had to go directly to the people in charge and ask them. Now, management people can look at the data and debate the adjustments needed in production planning. Another thing is that we can accurately measure the number of lots for each part that flows buy in whatever number of units, one or two, and that greatly enhances the precision of production planning. Each supervisor reviews the various details of the operation, and if, at that time, they find any factors responsible for fluctuations, those factors are be organized together and the work rescheduled. We must repeat the detailed approach toward work on site that is the Asprova parameter known as conditional assignment, otherwise we won't get results like those shown in the image. This is an operation that cannot be avoided if you intend to get the best use out of Asprova," says Yoshino

NGSP reexamines its production planning in three month units, but the use of the installed Sales option, has allowed operations that once took a total of one week to accomplish are now be done in one or two days. When different parts enter the same process or when there is a conflict between equipment in the production process, each employee in charge must get together and work on a solution. However, that was not getting done well enough. Yoshino says, "The plans were getting made, but there were scheduling problems that made them difficult to execute. "Creating a production plan that took everything, even equipment planning, into account, solved these problems.

"At the present time, we are devising a production plan using Asprova once every two weeks. Then we make manual adjustments of the created plan every week. Ideally we would like to run Asprova every day to make adjustments in the schedule but we have a pretty firmly established tradition of handing out work instructions to the work floor that are written on paper and we just can't change that too quickly. We are going to start taking more time to set up and transmit daily instructions electronically. If we do that we will also be raising the frequency with which we operate Asprova.

"In the future, we are going to have more automatic understanding of performance and by building a structure that will reflect more on Asprova we will further raise the level of precision in Asprova production planning."

## Asprova Corporation

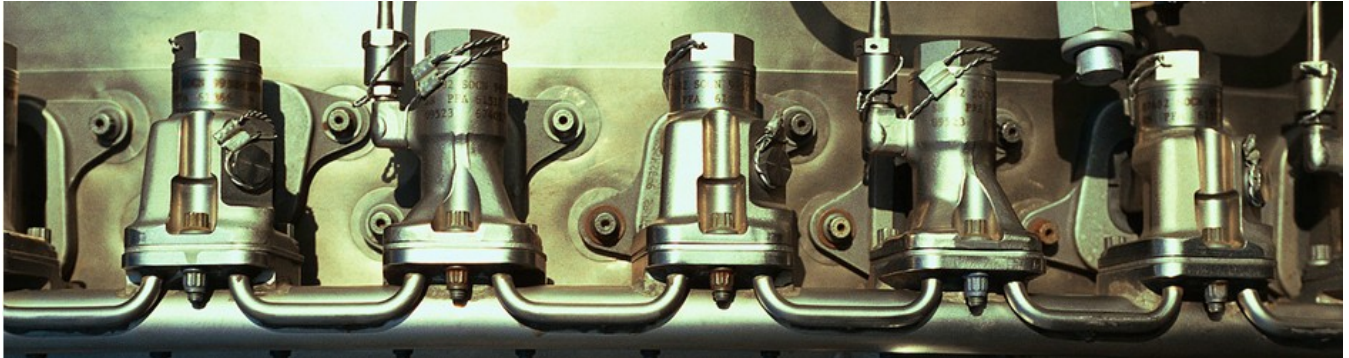
Location: Gotanda Mikado Building 8F, Hirasthuka 2-5-8,  
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## Introduction to the sample data

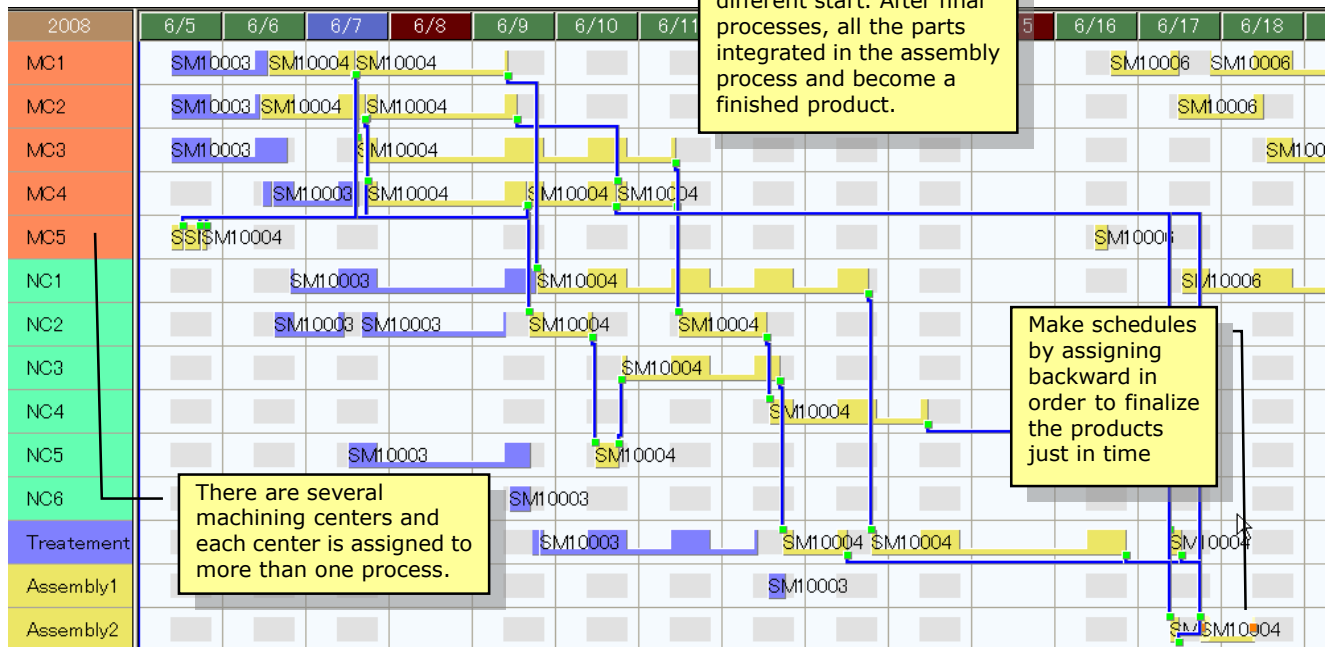
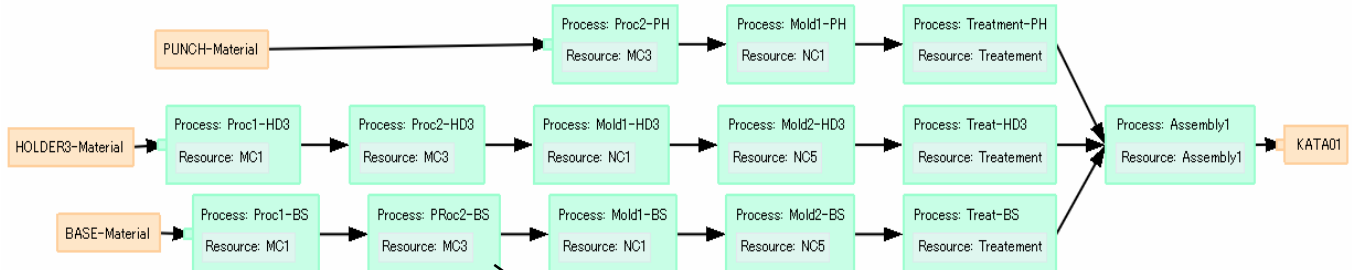
The sample data, the case studies of our clients who installed Asprova, is introduced here. If Industry sample data is needed, please sign up at the membership registration page of our website or at

[http://www.asprova.com/en/asprova/document\\_library.html](http://www.asprova.com/en/asprova/document_library.html)

# Mold and Die Production (Assembly process)

Asprova MS+ Options not in use

## Process Flow



## Integrated Master Editor

	Item	Process code	Instruction type	Instruction code	Resource/Item	Setup	Production	Teardown
1	KATA01	Proc1-BS	Use instruction	M	MC1,MC2		14hp	
2		Proc2-BS	Use instruction	M	MC3,MC4		3hp	
3		Mold1-BS	Use instruction	M	NC1,NC2		8.5hp	
4		Mold2-BS	Use instruction	M	NC5,NC6		17hp	
5		Treat-BS	Use instruction	M	Traitement		1hp	
6		Proc1-HD3	Use instruction	M	MC1,MC2		16.5hp	
7		Proc2-HD3	Use instruction	M	MC3,MC4		13hp	
8		Mold1-HD3	Use instruction	M	NC1,NC2		6hp	
9		Mold2-HD3	Use instruction	M	NC5,NC6		6.5hp	
10		Treat-HD3	Use instruction	M	Traitement		1hp	
11		Proc2-PH	Use instruction	M	MC3,MC4		11hp	
12		Mold1-PH	Use instruction	M	NC1,NC2		11.5hp	
13		Treatment	Use instruction	M	Traitement		13.5hp	
14		Assembly1	Use instruction	M	Assembly1,As		5hp	

Same resource is allocated to each process

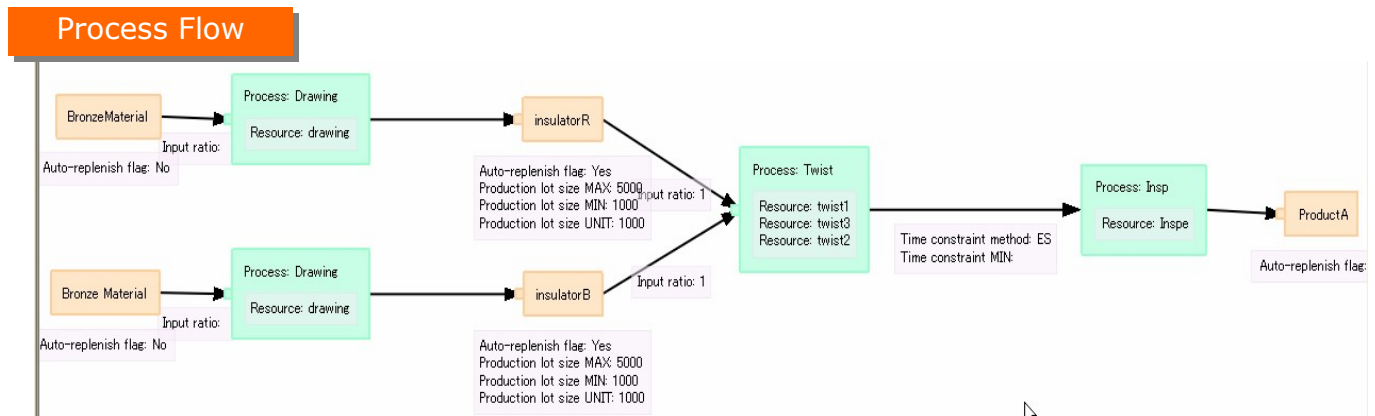
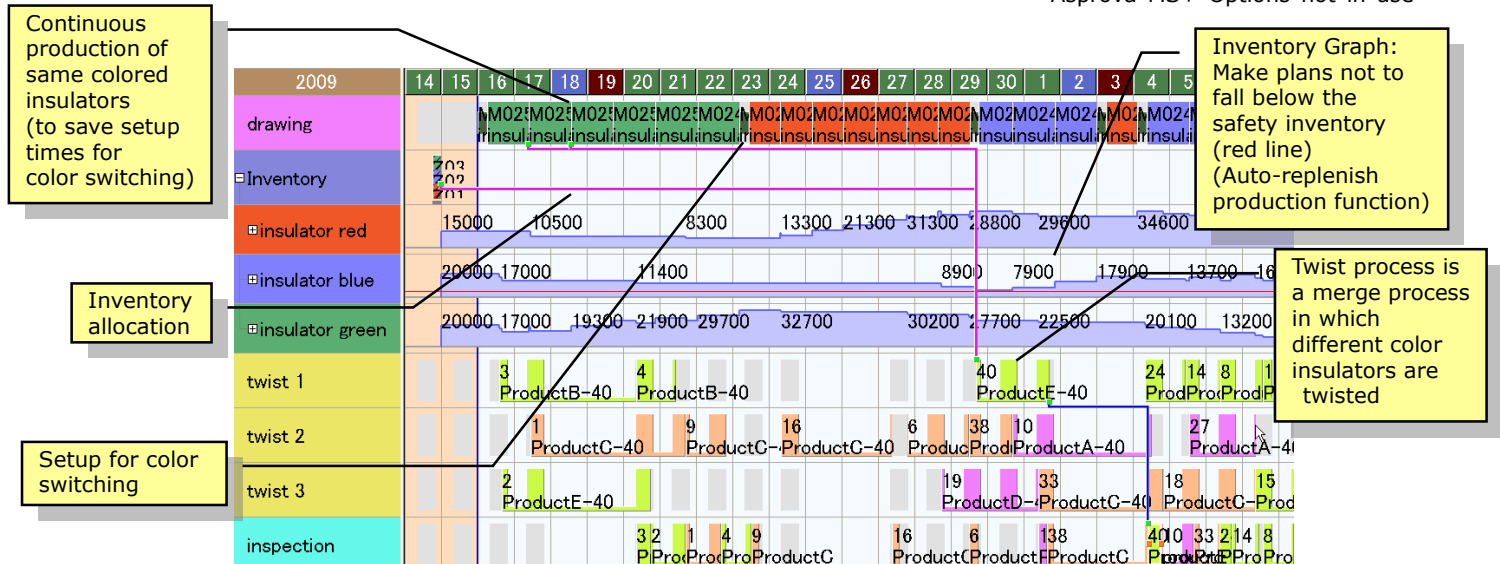
Resources are allocated to each process

## Data

The above data is Sample 4, which is installed from Asprova trial version.

# Electric Cable/Wire(Twist/Inspection)

Asprova MS+ Options not in use



## Auto-replenish production and safety inventory setting

	Item code	Auto-replenish flag	Production lot size MAX	Production lot size MIN	Production lot size UNIT	Inventory MIN
1	insulatorR	Yes	5000	1000	1000	0
2	insulatorB	Yes	5000	1000	1000	5000
3	insulatorG	Yes	5000	1000	1000	0

Producing insulators by colors. Safety inventory settings ensure adequate material management.

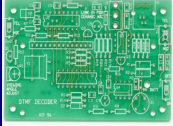
## setup for changing spec in drawing process (switching colors)

	Resource	Previous spec	Next spec	Setup time	Sort order
1	insulate process	*	*	360M	0
2	insulate process	=	=	0S	10

## Data

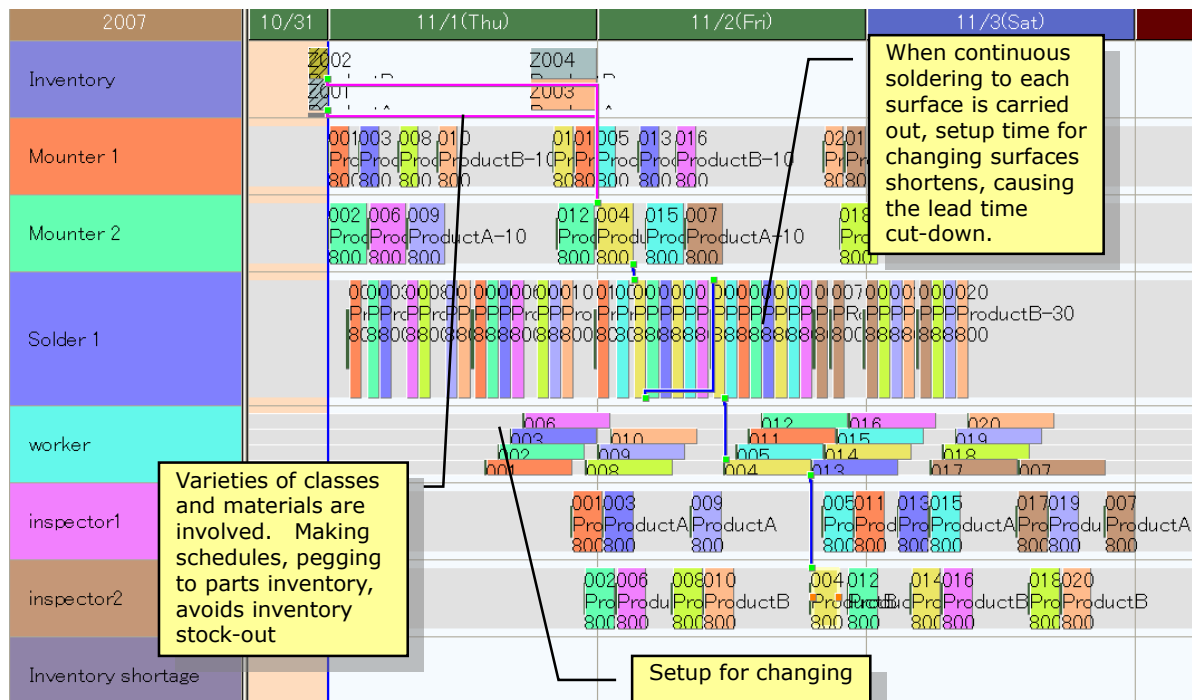
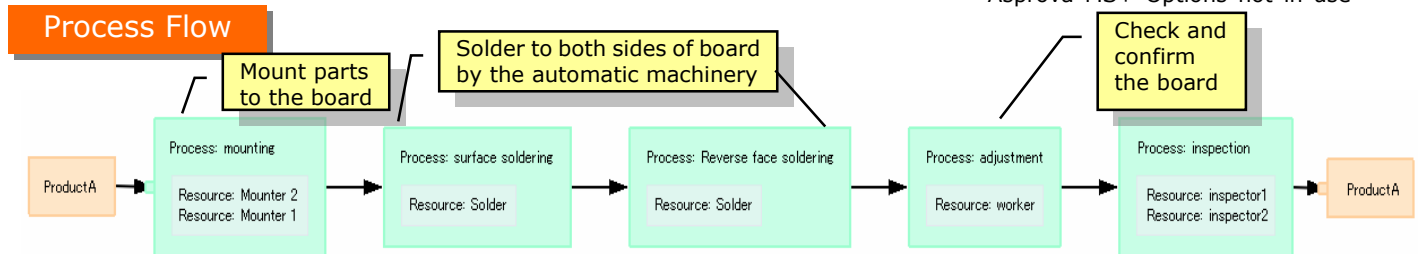
Electric cable and wire.ar4





# PC board(soldered)

Asprova MS+ Options not in use



## Scheduling parameter to optimize the soldering process

	Code	Dispatching rule	Filter orders	Filter operations	Resource selection method	Temporary operation fix
38	scheduling parameter					
39	default scheduling parameter	ME.Work_Order.Order			Optimal re	None
40	soldering process	Roundup((ME.Work_S		ME.Opera	Current re	None
41	solder-mounting process	ME.Work_Order.Order			Current re	Bottleneck
42	re-assign off limit orders	ME.Work_Order.Order	ME.Start		Optimal re	None

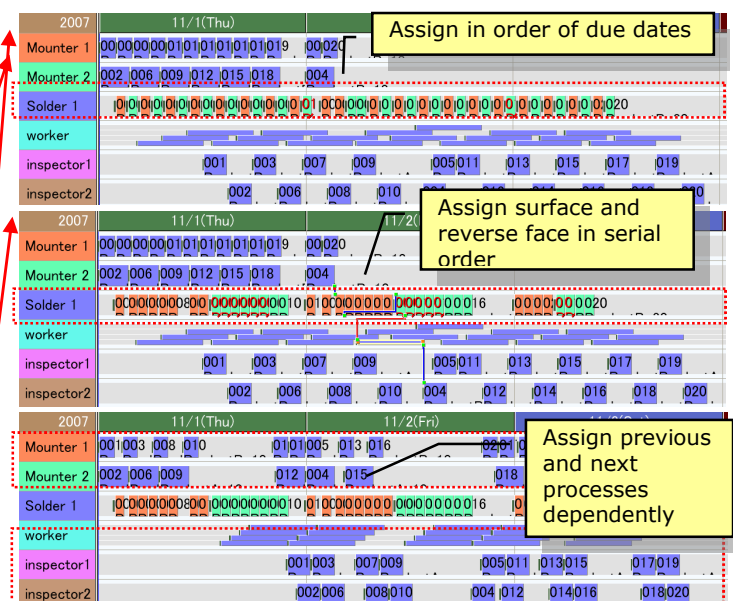
## Setup for changing in soldering process

	Resource	Item L	Item R	Setup time
1	Solder	*	*	20M
2	Solder	!	*	20M
3	Solder	Surface	Surface	0S
4	Solder	Reverse face	Reverse face	0S

## Data

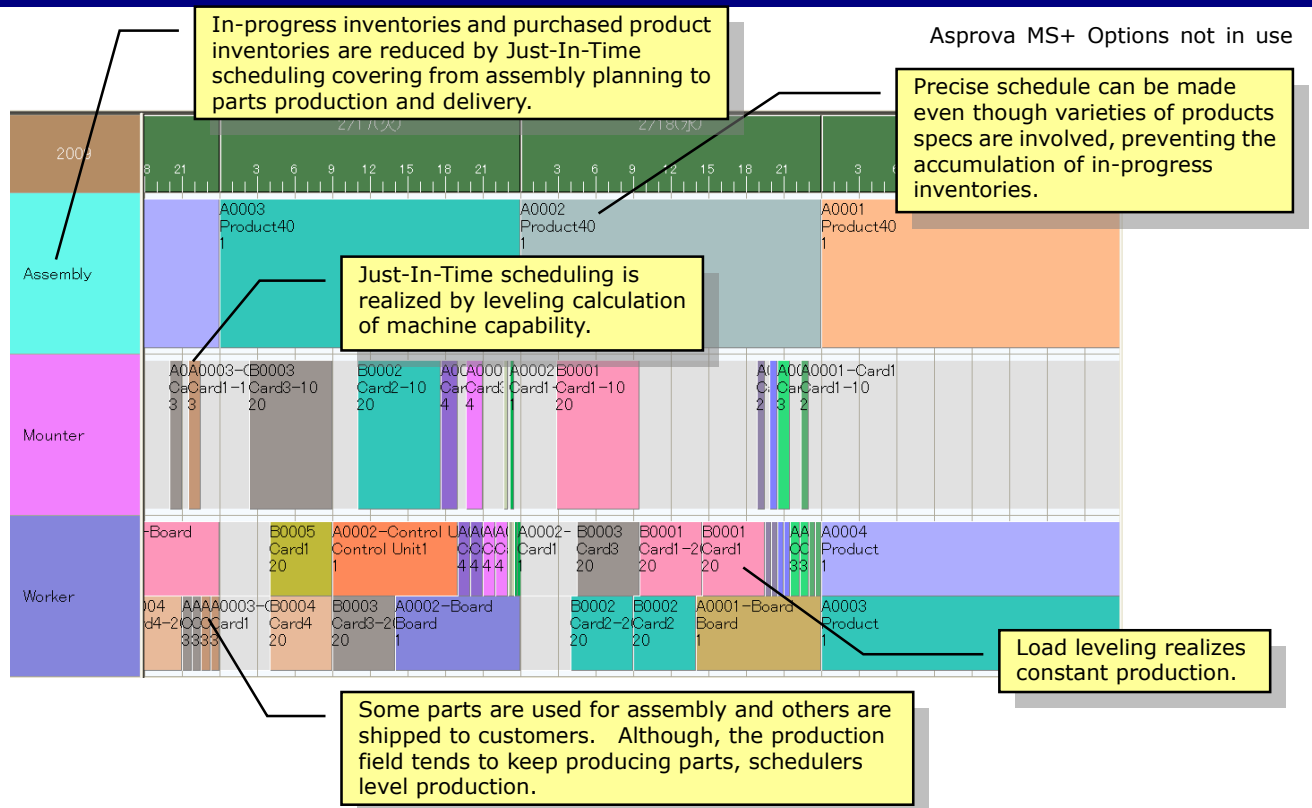
PC board.ar4

## The screenshot of optimization of soldering process

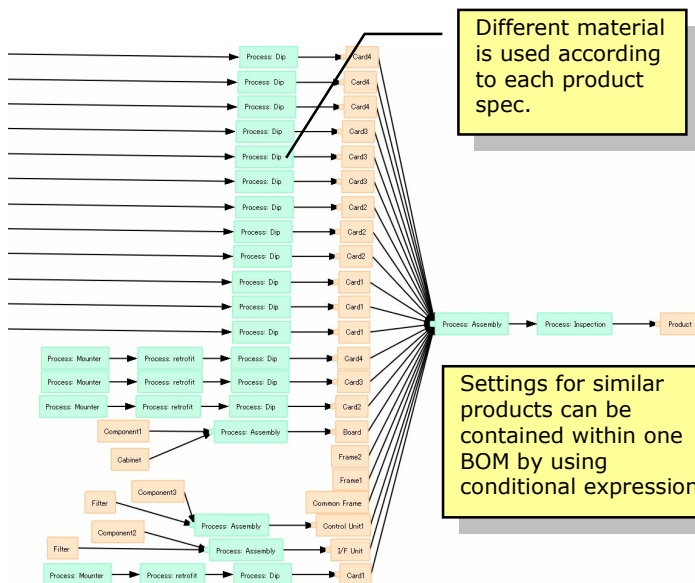




# Large Equipment (make-to-order)



## Process Flow

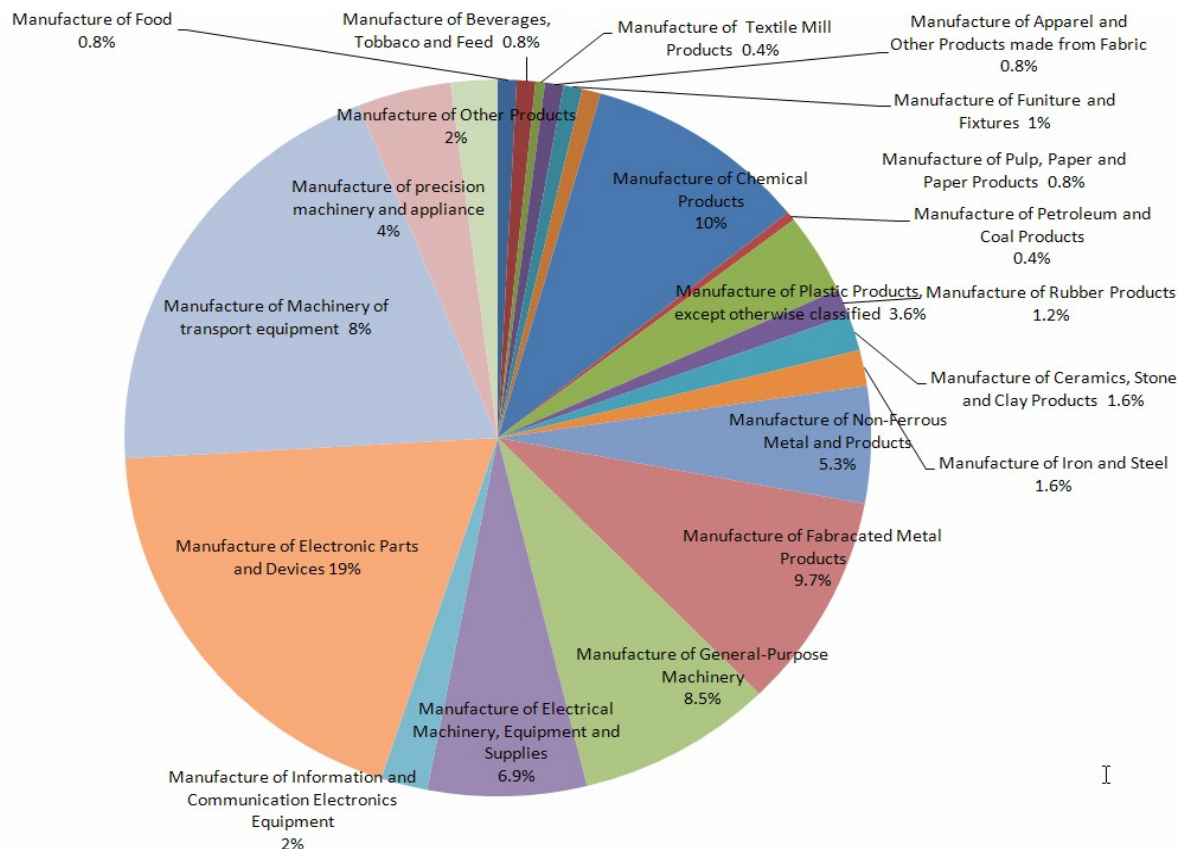


## Setup for changing spec in drawing process (switching colors)

Item	Process number	Process code	Instruction type	Instruction code	Resource/Item	Valid condition	Setup	Production
30	Product	40	Assembly	Input instruction	In0	Card1	ME NumSpec1==4	4
31				Input instruction	In7	I/F Unit	FValid(ME NumSpec7)	
32				Input instruction	In8	Control Unit1	FValid(ME NumSpec8)	
33				Input instruction	In9	Common Frame		
34				Input instruction	In4	Frame1	FValid(ME NumSpec5)	
35				Input instruction	In5	Frame2	FValid(ME NumSpec6)	
36				Input instruction	In6	Board		
37				Input instruction	In1	Card2	ME NumSpec2==4	4
38				Input instruction	In2	Card3	ME NumSpec3==4	4
39				Input instruction	In3	Card4	ME NumSpec4==4	4
40				Input instruction	In0	Card1	ME NumSpec1==3	3
41				Input instruction	In0	Card1	ME NumSpec1==2	2
42				Input instruction	In0	Card1	ME NumSpec1==1	1
43				Input instruction	In1	Card2	ME NumSpec2==3	3
44				Input instruction	In1	Card2	ME NumSpec2==2	2
45				Input instruction	In1	Card2	ME NumSpec2==1	1
46				Input instruction	In2	Card3	ME NumSpec3==3	3
47				Input instruction	In2	Card3	ME NumSpec3==2	2
48				Input instruction	In2	Card3	ME NumSpec3==1	1
49				Input instruction	In3	Card4	ME NumSpec4==3	3
50				Input instruction	In3	Card4	ME NumSpec4==2	2
51				Input instruction	In3	Card4	ME NumSpec4==1	1
52				Use instruction	M	Assembly		24hp
53		50	Inspection	Input instruction	In0	Product40		
54				Use instruction	M	Worker		24hp

## Data

## The fields of Asprova users



<b>Electric Electronics</b>	LEDs, connectors, solderless terminals, microprocessors, printed circuit boards, silicon wafers, air conditioner cases (plastic molding), speakers, ceramics, watches, semiconductors, lead frames, CD-ROMs, CD-R / DVD / CD-ROM drives, electric wire, LCDs, stereos, photo masks, WF cables, sockets, mobile phones, connectors for mobile-phones, IC packages, aluminum electrolytic capacitors, photoresist, TFT modules, piston rings, needles, piano wire, printer pins, automotive meters, photoelectric board, digital cameras, car navigation systems, refrigerators, light fixtures, sensors, signal controllers, solar-powered battery modules, vacuum fluorescent displays, batteries, multipolar connectors, power cables, mainframe computers, projection equipment, quartz transmission equipment, desktop PCs, carbon electrodes, projectors, printers, power boards, heating equipment controllers, solar cell wafers, medical electrical equipment, SD cards, portal media players, connectors, bar code readers...
<b>Automotive</b>	Engine parts, doors, chassis, interior (plastic molding), metal molds, shock absorbers, vehicle inspections, pipes, tubes, engines, cranes, rubber, aircraft parts, test bodies, brake parts, high-pressure hose, seat fabrics, wire rope, transmissions, camshafts, crankshafts, cases, wire harnesses, motorcycles, bicycles, railway carriages, external parts for ships, anti-vibration equipment for vehicles, tires, movable cranes...
<b>Machinery</b>	Looms, kitchen appliances, machine tools, agricultural machinery, industrial machinery, optical instruments, light fixtures, air conditioners, heating appliances, plastic parts for office equipment, control computers, material handling equipment, power transmission equipment, power-driven hand tools, internal combustion engines, in-line instrumentation systems, wafer visual inspection equipment, centrifuges, sewing machines, heat treatment equipment, tanks, water tanks, turbines, condensers, model engines, vacuum pumps, wafer precision equipment, food products machinery, electric facilities, gas and water-related tools, water supply-related instruments, electric welders, stage lighting fixtures, sewing machine parts, pumps, ultrasonic diagnosis equipment, CNC, robot transfer machines, nuclear equipment, crystal units, rubber hose. Fire alarm equipment...
<b>Metal</b>	Drills, screws, cannons, wire, plumbing fixtures, guard rails, pipes, magnet wire, steel, sheet metal parts, fences, metal bridge parts, blades, connecting rods, nuts, industrial precious metal products, drawing alloys, aluminum for beverage cans, blades for cutting machines, gears, metal springs, timer parts, precision gears, aluminum foil, sheet copper, ship plates, drawn copper products, specialty steel products, cutting tool tips, lubricating oil packaging, beverage cans, magnets, seamless pipes, large scale pumps, process pump, coupling, clad steel sheet, transmission gear...
<b>Non-metal</b>	Corks, packaging, textiles, paper, shipping blocks, camera films, rubber products, ABS resin, synthetic resin, UV ink, gravure ink, printing of packing materials, coated abrasives, resin hose, coating materials, dental materials, film sheets, ceramic base for electronic parts, tiles, firebricks, new ceramics, catalysts, paper clay, fasteners, glass for LCD displays, adhesives, packing tape, stencil paper for wigs, sensitized resin, natural resin, cosmetics materials, inorganic pigments, lenses for microscopes, nonwoven fabric, aluminum foil, man-made leather, aluminum cans, resin mold, silicon wafer...
<b>Consumer goods</b>	Fermented soybeans, detergent, flour, plastic bags, plastic food containers, plastic models, office goods, fishing reels, microwave dinners, wood processing, socks, cans, cosmetics, rubber stamps, ballpoint pens, shampoo, shopping bags, cardboard, home exterior products, drinking water, entranceways, underfloor storage units, fixture components, shoes, toy parts, necklaces, stockings, office furniture & fixtures, coffee beans. Labels, envelopes, stationery, candy, gummy, seasoning, steel furniture, toner cartridge, curtains, food trays...
<b>Medical</b>	Medical products, test drugs, medical equipment, laboratory testing reagents, granulated powder, pills, endoscope, dental materials, clinical test medicine, chemicals...
<b>Chemical</b>	Adhesives, plastic, asphalt, silicon, motor oil, polyethylene, polypropylene, molding materials, rubber, fluorine chemical products, polyvinyl chloride, polyvinyl chloride paste, plastic paint products, make up products, chemical substances...

## System requirements

Item	Requirement
Memory	At least 1GB
Hard Disk space	At least 300MB hard disk space
CPU	Faster than 1GHz(If 64bit, it's compatible to x64)
OS	Windows Server 2003 Windows 2000 Server Windows Vista Windows XP Professional Windows 2000
Other	It's compatible to 64bit-CPU (x64)

※The requirement of Memory, hard disk space, and CPU depends on its usage and the amount of data dealt with.



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※Product specs are sometimes changed upon version-ups.

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