LPP SYSTEM

Superior and Advanced High-productivity System

The LPP (Linear Pallet Pool) system can be equipped with multi-level pallet racks, providing a high level of automation. The system configuration can be customized to suit your needs. An LPP will make a great contribution to improving your productivity and the rate of operation of your machines.

**Reduction in setup time**
By placing multiple fixtures on the pallets in advance, no setup is needed when you receive repeat orders.

**Stable quality**
When you receive repeat orders, there is no need to re-attach fixtures, so there is nothing to affect stable machining accuracy.

**Reduced personnel costs**
Since the system allows long-term automatic operation, you can reduce personnel costs, for example by conducting unmanned operation at night.

**Easy production management**
The MCC-LPS III control system allows you to manage production schedules flexibly, and to respond to urgent job requests.

LPP’s features

Among all the various systems which are available, the LPP system is the most suitable for multi-item, small to medium-lot production.

<table>
<thead>
<tr>
<th>Characteristics of each system</th>
<th>Key points when selecting a system</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of machines</strong></td>
<td>RPS: 1 unit</td>
</tr>
<tr>
<td><strong>Number of workpiece setup stations</strong></td>
<td>CPP: Up to 4 units</td>
</tr>
<tr>
<td><strong>Number of pallet stations</strong></td>
<td>RPS: 1 station</td>
</tr>
<tr>
<td><strong>Number of pallet shelves</strong></td>
<td>CPP: Up to 2 stations</td>
</tr>
<tr>
<td></td>
<td>LPP: Up to 8 units</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RPS: Rotary Pallet Storage  CPP: Carrier Pallet Pool  LPP: Linear Pallet Pool
The pallet pool allows flexible construction of the ideal systems to meet the customer’s needs.

It uses the module design, which allows components such as pallet shelves, machines and setup stations to be added flexibly to meet the customer’s production requirements.

### Examples of additions
The system can be expanded after the LPP system is installed.

<table>
<thead>
<tr>
<th></th>
<th>Before additions</th>
<th>Expansion</th>
<th>After additions</th>
<th>Max. system size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine</td>
<td>1 unit</td>
<td>1 unit</td>
<td>2 units</td>
<td>8 units</td>
</tr>
<tr>
<td>Workpiece setup station</td>
<td>1 station</td>
<td>1 station</td>
<td>2 stations</td>
<td>5 stations</td>
</tr>
<tr>
<td>Number of pallet stations</td>
<td>16 racks</td>
<td>8 racks</td>
<td>24 racks</td>
<td>99 racks</td>
</tr>
</tbody>
</table>

We can customize the system to match your production conditions.

### Comparison of operating rates and productivity
In order to help you understand the LPP’s features, we have conducted a simulation comparing operating ratios and productivity under the same production conditions.

#### Assumptions:
- We are making the comparison under the following operating conditions:
  - Cycle time / 1 pc.: 881 sec. × 4,000 pcs. = 979 hours (3,524,400 sec.) / month
  - When machining 4 kinds of workpieces at the same time.
  - Material: JIS: A5052 (Aluminum)
  - JIS: Japanese Industrial Standard

#### Examples of additions
The system can be expanded after the LPP system is installed.

#### Stand-alone machines <NHX 5500> (with 2-station APC)
- Number of machine operating days / month: 24 days
- Machine operating time (manned + unmanned): 9 hours (8 hours + 1 hour)
- Machine operating rate: 0.85
- Actual operating time / day: 7.65 hours
- Actual operating time / month: 183.6 hours
- Number of machines required to run 4,000 pcs. / month [total]: 6 machines
- Comparison of equipment costs: 100%
- Number of operators required: 3
- Comparison of personnel costs: 100%

#### LPP (32LPP)
- Number of tooling used: 9 tools
- Material: JIS: A5052 (Aluminum)
- Comparison of operating ratios and productivity
  - Number of machines required to run 4,000 pcs. / month [total]: 32LPP (2 machines) × 1 set
  - Comparison of equipment costs: 50%
  - Number of operators required: 1
  - Comparison of personnel costs: 33%
MCC-LPS III (Linear Pallet Pool Control System)

The system is controlled by the MCC-LPS III application system. Flexible scheduling allows it to adapt fluidly to changes in production planning.

![Machine and Technology](Image)

### Highlights

**Machine and Technology**

- **New Design with Beauty and Usability**
  - The LPP system is designed in pursuit of usability, aiming at reduction of operators’ everyday burden. The system with a beautiful new design cover provides operators a joy of machine operation.

- **MCC-LPS III** (Linear Pallet Pool Control System)
  - The system is controlled by the MCC-LPS III application system. Flexible scheduling allows it to adapt fluidly to changes in production planning.

- **Machine Specifications**

  - **New Design with Beauty and Usability**
    - Smoother door opening / closing to reduce operators’ burden
    - Improved visibility inside the LPP
  
  - **Easy operation / management of the pallet transfer system**
  - Machining programs can be managed and automatically downloaded
  - Able to flexibly change production priority in response to urgent requests

![Image](Image)
System Components for Highest Reliability

Each structure of the LPP consists of high-quality, durable components. When building a system, it is customized by combining these system components.

1. **Machine**
   - Uses the NHX Series horizontal machining centers
   - Uses standard machines + standard APC
   - Single pallet loader cell incorporates up to eight machine units

2. **Pallet racks**
   - Can be extended to a maximum of 99 racks
   - Pallets are moved using the fixed address method (random access method is also possible)
   - Multilevel stocker with open frame giving exceptional visibility

3. **Transfer AGV (Automatic Guided Vehicle)**
   - Pallet direct calling function enables prompt calling of the necessary pallets
   - Smooth and accurate positioning with NC control of axis movements, in both travel and transfer
   - High-speed travel is possible by using a rack & pinion and a guide rail

4. **Workpiece setup station (WSS)**
   - Up to 5 stations can be installed
   - Manual pallet indexing is possible in 45° increments up to 360°, offering easier setup
   - A coolant gun can be added (option)
A Wide Variety of Peripherals to Meet Your Needs

The combination of the high-performance system and the excellent peripheral equipment helps significantly improve operating efficiency and accuracy.

**Auto-coupler (option) <consultation is required>**
Compressed air is supplied to the setup station. Hydraulic fluid is supplied to both the setup station and the machining table. High pressure can be used with the anti-rising mechanism.

**Coolant gun (option)**
Use the high-pressure coolant gun to flush the chips from the machine and fixtures.

**Coolant collection unit**
The coolant collection unit installed around the LPP system.

**Tool ID* (option) <consultation is required>**
This system calls tool data, and automatically processes registered information to improve ease of setup.

**Robot (option) <consultation is required>**
The robot automates workpiece handling.

* A separate tool presetter is required.
* When using this, both MCC-LPS II and MCC-TMS are required.

* For mass production workpieces, this improves work efficiency by automatically attaching / removing unusually shaped or heavy workpieces.
Setup station tilting (option) <consultation is required>
A superb station that works with any kind of workpiece. The angle of inclination can be adjusted, facilitating setup change work and lessening the burden on the operator.

Washing station (option)
The washing station uses high-pressure coolant to remove chips attached to workpieces and fixtures during machining.

Protection functions
Emergency stop button
- Emergency stop buttons are installed at the machine side (●) and LPP side (▲).
- Machine emergency stop button stops the machine only (Each emergency stop button, for Machine 1 and Machine 2, stops the corresponding machine only).

Dangerous situations and ways to avoid them
Moving parts (entire cover)
- Prevention
  - Cover the entire work area.

Workpiece setup station (Workpiece setup station door)
- Prevention
  - We have attached a switch with a lock to the workpiece setup station door, so that the door doesn’t open when the machine is operating.
  - A center shutter has been added between the workpiece setup station and the area where the workpieces are transported. This prevents the operator’s hands from reaching the AGV. This shutter helps avoid the time wasted by stopping the AGV during setup.
  - Door opening / closing is detected and monitored. When the doors on both the workpiece setup station and shutter are open, the power to the AGV, forklift and AGV hoist is shut off.

System component specifications
<table>
<thead>
<tr>
<th>Number of machines</th>
<th>AGV travel</th>
<th>AGV fork</th>
<th>AGV hoist</th>
<th>Setup area</th>
<th>Manual turning</th>
<th>Index pins every 45°</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-8 units</td>
<td>120 m/min (393.7 fpm)</td>
<td>40 m/min (131.2 fpm)</td>
<td>24 m/min (78.7 fpm)</td>
<td>Turntable turning</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>105 m/min (344.5 fpm)</td>
<td>40 m/min (131.2 fpm)</td>
<td>15 m/min (49.2 fpm)</td>
<td>Turntable indexing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>90 m/min (295.3 fpm)</td>
<td>50 m/min (164.1 fpm)</td>
<td>18 m/min (59.1 fpm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>70 m/min (229.7 fpm)</td>
<td>50 m/min (164.1 fpm)</td>
<td>12 m/min (39.4 fpm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>60 m/min (196.9 fpm)</td>
<td>50 m/min (164.1 fpm)</td>
<td>15 m/min (49.2 fpm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>45 m/min (147.6 fpm)</td>
<td>50 m/min (164.1 fpm)</td>
<td>9 m/min (29.5 fpm)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of machines
- 1: Loaded
- 2: Not loaded
- 3: Automatic Guided Vehicle

The product in the photo is a special specification. For details, please consult our sales representative.
LPP SYSTEM

Simple, Convenient High-performance System

MCC-LPS III is the next generation cell control system to maximize productivity of LPP [Linear Pallet Pool] and other DMG MORI pallet transfer systems. It provides flexible interfaces for program creation / registration, system monitoring, job management including flexible management of rush orders and a variety of production reporting functions. It is a cell control system with integrated intelligent planning & scheduling capabilities.

The main window shows the status of the system at a glance
The main window displays the status of the system in real time. It uses colored animations so it is easy to understand the current status of the machine. It also allows manual transfer with Drag & Drop.

- Pallet information: When you click on a pallet, detailed information for that pallet will be displayed.
- Machine operating status: You can check the machine’s operating status by looking at the color of the machine’s status bar.
- History display: This displays the system’s operating history and pallet transfer history.
- Icon display: Each function can be called quickly and intuitively.

The Job data setting allows to set various process designs
You can register up to 400 processes in one Job data and do various process designs by combinations of these processes. Also, you can specify machines, setup stations, tools, fixtures, pallets, and machining programs to be used in each process. For workpiece information, pictures of finished products, materials, and setup information can be registered.

A wide variety of machining can be set quickly
Even machining which requires multiple fixtures, pallets and machines can be controlled with a single program. With this highly efficient operation there will be no unfinished parts.

- Face transfer
  For machining which requires transfer of part to different faces (fixture attachment faces).

- Pallet transfer
  For machining which requires transfer of parts between two or more pallets with different fixtures.

- Inter machine transfer
  For machining which requires transfer of parts to multiple machine tools.

<Start system operation in 3 steps>
The system is operated by entering the necessary information in 3 main steps.

Job data creation: Registration of details of machining / measurement / washing etc.
Pallet registration: Set the pallets and attachment surfaces to be used
Creation of orders: Set the target quantity and delivery date

Maximum number of processes that can be registered per job 400
You can select from 2 versions according to your application

**Standard**
The standard version of the MCC-LPS III. This version provides the fixture, material and tool reporting functions, and can be used in combination with MCC-TMS.

**Advanced**
Beyond “STANDARD”, this version offers the multiclient support function that enables the cell to be operated from multiple locations and the planning & scheduling function for optimized production management. *

* Simultaneous access to the cell controller from up to 3 locations (including external locations) possible. If access from more than 3 locations is required, please consult our sales representative.

Grouping of multiple jobs
You can register and manage multiple Job data by grouping. There are two types of grouping: Job group and Order group.

**Job group**
Job data can be grouped by unit, so you can make efficient plans to meet production schedule.

**Order group**
Workpieces which are machined all together on the same pallet can be grouped into an Order group, enabling efficient setup.

Up to 32 fixture attachment faces on one pallet
Up to 32 fixture attachment faces can be installed on one pallet. From the Control Center, you can check the types, number, and conditions of workpieces loaded on the pallets with an easy access to each pallet data.

Since up to 32 fixture attachment faces can be installed, setup operation for multiple items can be integrated.

From the control center, you can access each pallet’s data just by clicking on the pallet and check progress in real time.

The status of Jobs on 32 faces can be displayed in different colors. By clicking each item, detailed information will be shown.

By right clicking, the picture of the workpieces will be shown.
Features of MCC-TMS

Central tool management
+ By centrally managing tool location and tool life, it optimizes tool preparation

Compatible with ID tags
+ Compatibility with ID tags precludes errors during tool data entry

Compatible with tool presetter interface
+ Tool measurement values from the tool presetter can be directly uploaded to the database

Standardization (sharing know-how, storing machining database)
+ We can incorporate cutting conditions in the tool information, so the same T-codes can be used for different machining programs

Max. 7-digit group numbers
+ Group numbers are 4 – 7 digits

Improved operating rate
+ When linked with the MCC-LPS III, it receives notification of tools to be used and checks the practicability of machining in advance, preventing machine down time

The tool presetter is compatible with DMG MORI’s UNO series and VIO series, and even with Zoller, etc. For details, please consult our sales representative.

Status display

1. Tree display:
   Cell production systems and machines are shown in a tree, and the tools for every machine can be displayed easily.

2. Tool life display:
   Tools whose remaining life is short are highlighted in yellow, and expired or broken tools are highlighted in red.

Smart remote monitoring

The tool life of the tools mounted on the machines can be monitored from a distance.
LPP SYSTEM

The Versatile Systems Resolve Production Issues

Compatible systems

**RPS system** (Rotary Pallet Storage)

This system features outstanding space savings and setup capabilities, and can hold more pallets per unit area than any other pallet pool system.

**CPP system** (Carrier Pallet Pool)

With its simple construction provided in predefined packages, this system is easy to introduce. For the system configuration, the customer can select the optimum specifications from 8 packages.

**LPP system** (Linear Pallet Pool)

It is a system with a high level of automation, equipped with multi-level pallet racks. The system construction can also be customized however you wish, achieving the optimum productivity and operation rate.

Pallet pool specifications

<table>
<thead>
<tr>
<th></th>
<th>RPS</th>
<th>CPP</th>
<th>LPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machines</td>
<td>1</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Work setup stations</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Pallet stand positions</td>
<td>4</td>
<td>29</td>
<td>99</td>
</tr>
<tr>
<td>Washing stations</td>
<td>—</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Faces / Pallet</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parts / Face</td>
<td>999</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processes</td>
<td>400</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Compatible software version

- Advanced planning and scheduling
- Multi-Client support function

All numbers are maximum values.

Functions by version

- Standard
- Options
- Not available

<table>
<thead>
<tr>
<th>Function</th>
<th>RPS</th>
<th>CPP</th>
<th>LPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPS III operation panel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job / Order data management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job / Order grouping</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job setup display</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workpiece attachment at different stations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machining program upload / download</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Offset program upload / download</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Access authority control</td>
<td></td>
<td></td>
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<tr>
<td>Diagnosis and recovery support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machining / Operating reports and graphs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixture management function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material management function</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Embedded tool data management</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Tool utilization and exchange reports</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interface with MCC-TMS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced planning and scheduling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-Client support function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-Client support function added total 4 clients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-Client support function added total 5 clients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethernet/IP interface</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote notification function</td>
<td></td>
<td></td>
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</tbody>
</table>

It is possible to upgrade from the previous systems, “MDRC-AC”, “CAPS-LPS”, and MCC-LPS II to MCC-LPS III. For details, please consult our sales representative.
<Precautions for Machine Relocation>

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This product detects machine relocation. Once the machine is relocated, it is not operable unless its legitimate relocation is confirmed by DMG MORI or its distributor representative.

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In that case, DMG MORI and its distributor representative do not assume any loss due to the inability to operate the machine or any liability during the warranty period.

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