### MELSERVO-J4 Solutions

**vol.08 Eco-friendly Conveyors and Product Handling Equipment**

#### MITSUBISHI ELECTRIC

**For your all production needs**

#### Issues at production sites

1. Managing of total power consumption
2. Reduction of power consumption
3. Minimizing waste of power

#### System Example

![System Diagram](image)

#### Issues

1. **Issue 1**
   - Managing of total power consumption

2. **Issue 2**
   - Reduction of power consumption

3. **Issue 3**
   - Minimizing waste of power

#### System Configuration Settings

- **Step 1**: System Configuration
- **Step 2**: Settings for Optional Data Monitor
- **Step 3**: Creation of a Sequence Program for GOT Display

#### PLC CPU
- Q06UDEHCPU
- GOT 1000 series
- Main base unit: Q35DB

#### GOT Functions
- Simple Motion: QD77MS16
- Servo amplifier: MR-J4W3-B, MR-J4W2-B
- Servo motor: HG-KR
- Linear servo motor: LM-H3

#### Application

- Conveyors and handling equipment
- Packing machine
- Motion alignment
- Pick and place robot

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**Control Flow**

- **Robot 1 (X, Y, Z-axis)**
  - Robot 1 moves to its wait position.
- **Robot 2 (X, Y, Z-axis)**
  - Robot 2 moves to its wait position.
- **Robot 1 (X, Y, Z-axis)**
  - Robot 1 grabs a workpiece and places it on the pallet.
- **Robot 2 (X, Y, Z-axis)**
  - Robot 2 grabs the workpiece in the pallet and moves it to Line 2.
  - Operation is then repeated.

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**Mitsubishi solution**

- Robot 1 X-axis
- Robot 1 Y-axis (Linear)
- Robot 1 Z-axis
- Robot 2 X-axis
- Robot 2 Y-axis (Linear)
- Robot 2 Z-axis
- Line 1 Belt Conveyor Drive Axis
- Line 2 Belt Conveyor Drive Axis

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**Changes for the Better**
Offering the Best Solution

Solution 1: Power Monitor Function

Managing Power Consumption with a Visualization System

The MR-J4 series servo amplifiers can calculate power consumption itself without a power measuring instrument, and can send the data to controllers for monitoring.

- Parameter setting (Optional data selection)
  - Effective load ratio
  - Load to motor inertia ratio
  - Regenerative load ratio
  - Position loop gain
  - Peak load ratio
  - Equivalent disturbance torque
  - Bus voltage
  - Module power consumption
  - Module integral power consumption
  - Optional data monitor: Data type setting with GX Works2

- Displaying power consumption
  - User-created GOT screen
  - Displays the current power consumption, etc., on GOT to help improve saving energy

Solution 2: Multi-axis Servo Amplifier

Contributing Energy Conservation Using Regenerative Energy

The multi-axis servo amplifier can store regenerative energy when motors decelerate. Those regenerative energy is used to drive another motor, contributing to energy conservation of the machine. In this system, the regenerative energy from the Y-axis is used to accelerate the Z-axis.

- When Y-axis decelerates, Z-axis accelerates.
  - Y-axis motor speed
  - Deceleration
  - Time
  - Z-axis motor speed
  - Acceleration
  - Time

- Regenerative energy is temporarily stored to be used as driving power energy.

Solution 3: Capacity Selection Software

Easy Selection of a Suitable Motor for Your Machine

The "Capacity selection software" (free software) selects a suitable rotary servo motor, linear servo motor, and direct drive motor for your machine using various data, such as mass of the table and the load, the operation pattern, etc. After the selection, it shows the calculation process and results.
Setup Procedure

**Step 1**

**System Configuration Settings**

Set servo amplifier.

- **System Structure**
- **Amplifier Settings**
  - **Amplifier Operation Mode:** "Standard" for the rotary motor, "Linear" for the linear motor, "DD motor" for the direct drive motor

**Double click**

- **Axis-1 parameter**

**Step 2**

**Settings for Optional Data Monitor**

Set the "Optional data monitor" with the parameter. If you select "Module power consumption" or "Module integral power consumption", the amplifier power consumption is monitored.

- **Double click**

**Step 3**

**Creation of a Sequence Program for GOT Display**

Create a sequence program to calculate the data to be displayed on GOT, such as, "Peak power consumption", "Peak integral power consumption", and "Peak motor current".
Saving Total Power Consumption with Various Functions for Energy-conservation

Energy Saving
Optimal Energy-conservative Machine System

PN Bus Voltage Connection + Power Regeneration Common Converter

Regenerative energy is used efficiently when multiple servo amplifiers and inverters are connected through common PN bus to the power regeneration common converter.

* System only with common PN bus connection is also possible to be configured without using the power regeneration common converter. However, there are restrictions depending on the system. Contact your local sales office for more details.

* Refer to MR-J4-Bi-(RJ)/A(-RJ) Servo Amplifier Instruction Manual for selection of power regeneration common converter FR-CV series.

Energy Saving
Advanced Function and Performance for More Energy-conservation

Reduced Energy Loss of Servo Amplifier and Servo Motor

< Servo amplifier >
Efficiency is increased by the use of a new power module.

< Servo motor >
Motor efficiency is increased by optimized design of magnetic circuit.

Energy-saving Due to the Improved Machine Performance

Thanks to the driving system configured by servo amplifier and servo motor with industry-leading level of high performance, machine tact time and operation time are reduced, achieving energy-conservation.

Reduced Motor Driving Power

LM-H3 has achieved a reduction of 25% in motor driving current due to a new magnetic design with optimized magnet form, contributing to power conservation for machines. The motor coil is lighter as compared to the prior model, which also contributes to saving energy for driving the moving part.

* For 720 N rated linear servo motor.

Space Saving

For LM-H3, widths of the motor coil and the magnet are reduced by 10% from the prior model. Increased thrust to current ratio results in using the servo amplifier in smaller capacity, contributing to more compact machine (the reduction of materials).

Mitsubishi Electric Corporation

Man, machine and environment in perfect harmony

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