Film Slitting Machine

PN Bus Voltage Connection +
Power Regeneration Common Converter

(a) Unwinding Axis
(b) Rewinding Axis 1
(c) Rewinding Axis 2
(d) Cutter Axis

1. Unwinding Axis
2. Roller Axis
3. Rewinding Axis 1
4. Rewinding Axis 2
5. Cutter Axis

Issue 1: Sending film with a constant speed or tension
Issue 2: Utilizing regenerative energy

Speed Control, Torque Control

PN Bus Voltage Connection +
Power Regeneration Common Converter

System Example

(Mitsubishi solution)

PLC CPU: Q06UDEHCPU
GOT: GOT 1000 series
Main base unit: Q35DB
Motion CPU
I/O module: QX40,QY40
Analog input module: Q64AD
Tension meter

(MELSERVO-J4 Solutions)

Servo amplifier: MR-J4-B
Power regeneration common converter: FR-CV series
Tension detector: LM-10PD

(Application)

- Packing machine
- Printing machine
- Laminator
- Wire drawing machine
- Slitting machine

Step 1: Wiring of the Power Regeneration Common Converter
Step 2: Servo Parameter Settings
Step 3: Speed-Torque Control Data Settings
Step 4: Control Mode Settings
Various Controls Flexibly Applied for the Better Operation

Film needs to be sent with a constant tension, preventing from stretching or shrinking. To achieve that, as the equation below shows the relationship among force, torque, and diameter, the torque has to be changed according to the unwinding roll’s diameter.

The current torque of the unwinding axis, taking the diameter into account, is measured with the tension detector and is used to compensate the difference from the original torque command, and the data for compensation is sent to the amplifiers.

\[
\text{Force (F)} = \frac{\text{Torque (T)}}{\text{Radius (D/2)}} = \frac{2 \times \text{T}}{\text{D}}
\]

\[
\text{Torque (T)} = \text{Force (F)} \times \text{Radius (D/2)}
\]

Solution 1: Speed Control, Torque Control

Various Controls Flexibly Applied for the Better Operation

溶液 1

速控・トルク制御

各种控制可应用于更好的操作

Film needs to be sent with a constant tension, preventing from stretching or shrinking. To achieve that, as the equation below shows the relationship among force, torque, and diameter, the torque has to be changed according to the unwinding roll’s diameter.

The current torque of the unwinding axis, taking the diameter into account, is measured with the tension detector and is used to compensate the difference from the original torque command, and the data for compensation is sent to the amplifiers.

\[
\text{Force (F)} = \frac{\text{Torque (T)}}{\text{Radius (D/2)}} = \frac{2 \times \text{T}}{\text{D}}
\]

\[
\text{Torque (T)} = \text{Force (F)} \times \text{Radius (D/2)}
\]

Solution 2: PN Bus Voltage Connection + Power Regeneration Common Converter

Contributing Energy Conservation by Utilizing Regenerative Energy

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

**Step 1**

Wiring of the Power Regeneration Common Converter

Wire the Power regeneration common converter.

**Step 2**

Servo Parameter Settings

Set the PC20 parameter when using the Power regeneration common converter.

**Step 3**

Speed-Torque Control Data Settings

Set the parameters for the unwinding axis, rewinding axis, and all of the roller axes to perform the Speed-Torque control.

**Step 4**

Control Mode Settings

Create the Motion SFC program to switch the control mode of each axis to speed or torque control. Set each axis to "10" (Speed control) or "20" (Torque control) in the program, according to the application of each axis. The example on the right is a Motion SFC program switching the unwinding axis to torque control, and the other axes to speed control.
Achieving High Operation Stability and Reliability with a Wide Variety of Excellent Functions of Mitsubishi MR-J4

**Features**

**High Stability**

Robust Filter

Achieving both high responsiveness and stability was difficult with the conventional control in high-inertia systems with belts and gears such as printing and packaging machines. Now, this function enables the high responsiveness and the stability at the same time without adjustment.

The robust filter more gradually reduces the torque with wide frequency range and achieves more stability as compared to the prior model.

**Robust Filter**

[Machine with a high-inertia ratio]

(Ex.) Printing machine

**High Stability**

Reduced Torque Ripple During Conduction

By optimizing the combination of the number of motor poles and the number of slots, torque ripple during conduction is greatly reduced. Smooth constant-velocity operation of machine is achieved.

**TCO Reduction**

Large Capacity Drive Recorder

- Servo data such as motor current and position command before and after the alarm occurrence are stored in non-volatile memory of servo amplifier.
  - The data read on MR Configurator2 during restoration are used for cause analysis.

- Check the waveform of 16 alarms in the alarm history ((analog 16 bits × 7 channels + digital 8 channels) × 256 points) and the monitor value.

**Torque ripple**

(As compared to the prior series.)

[Prior model (HF-KP series)]

[Prior model (HG-KR series)]

*For 400W

---

Man, machine and environment in perfect harmony

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE: TOKYO BUILDING, 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS: 1-14, YADA-MINAMI 5, HIGASHI-KU, NAGOYA, JAPAN

New publication effective March 2013.
Specifications are subject to change without notice.