Additions to Your Drive System

Clarence Klassen. P. Eng. (ON)
KlassENgineering Inc.
Abstract

- Existing Web Handling Lines have outdated drive systems.
- Challenge when an upgrade is required.
- Issues include:
  1. Cost
  2. Downtime
  3. Combining analog and digital technology
  4. Upgrade must provide improved performance
Introduction

Difficulties integrating a new drive into an existing drive system:
- New drives do not have precise analog inputs.
- New drives do not have frequency inputs for the speed reference.
- New drives cannot communicate with proprietary communications networks.
- It may not be possible to modify the program in the existing drive system.
- An obsolete HMI may restrict options for the upgrade.
Installing a New Drive

- Replacing or upgrading either the front end (unwind, extruder) or back end (winder, sheeter) is easier than changing the middle of the line.
- There is a clean break between the old drive system and the new equipment.
- Installing a new laminator or printer drive in the middle of the line requires interfacing with Upstream (US) and Downstream (DS) sections.
- Recall tension is established between two traction points – 2 drives involved.
Options available:

1. Same Old
Same drive as you presently use in the system.
May be a safe, low cost solution.
Options available:

2. What You Get
The drive comes with the new printer.
You must integrate this into the drive system.
Options available:

3. Staged Approach
This new drive forms the initial step in a program to upgrade the entire drive system.
Options available:

4. Cold Turkey
Upgrade the entire drive system.
Best long term solution.
Highest cost, longest commissioning period.
Drive Interface Features

- Today’s drives are AC Vector or DTC.
- They use pulse encoders or no encoder.
- They use a reference sent over a fieldbus. Numbers are floating point.
- Safety is incorporated.
- They have a standard (12 bit) analog input.
- A drive master is generally required for web handling lines (system drive).
Motor Generator sets drove the dc motors on the line. Speed control through the motor and generator fields. Tension loops were open loop.

Control signal voltages are not compatible (too high) with modern electronics.
1960-1979 Analog DC Drives

- These drives eliminated the need for M-G sets
- Used analog circuitry.
- These drives took special care with grounding and shielding and low thermal drift components to provide accurate analog signals.
1980-1989 Digital DC Drives

- Some “digital” drives used a lot of analog circuitry.
- Pulse train speed reference.
- The next digital drives broadcast a speed reference.
- Proprietary drive network protocols.
- HMI’s were also proprietary for the drives.
1986 to 1999 Digital AC Vector Drives

- AC drives were fully digital from the beginning. They did use proprietary networks and drive masters.
2000 to Present Open Masters and Fieldbus Communications

- Some drive vendors began using industry standard hardware and software for the drive master.
- This may have been a PLC.
- The HMI could be an industry standard.
- Fieldbus communications began to be used.
- Safety has become a huge concern.
Basic Signals for Drives

• In all cases we need the speed SP & PV
• Start and Stop signals
• Tension SP & PV
• Torque PV
• Drive Status (Run, Stopped, Fault).
Adding a Drive to an Analog Drive System

Figure 3b Analog Reference With New Drive

Analog speed SP input – 12 bit (0.05%)
Add a new Master for Analog Drive System

New master – new comms to the new drive
Adding a Drive to an Pulse SP Drive System

Digital Drives don’t have pulse train input for the speed SP
Adding a Drive to an Early Digital Drive System

New master with comms to the existing and new drive.
Example 2 – Upgrade All Drives

The following example shows a staged approach for upgrading all 8 drives on a paper slitter (winder)
Slitter Drive Upgrade – Preparation

On Deck
- PAC
- UNWIND
- F DRUM
- R DRUM
- PAPER ROLL
- 4 MORE
- MAINTENANCE
- COMM

Retired
- UNWIND
- AUX PLC
- HMI
- 4 MORE
- PAPER ROLL
- R DRUM
- F DRUM

AT WORK

MAINTENANCE
Slitter Drive Upgrade – 1st Shutdown

On Deck

- UNWIND
- PAC
- F DRUM
- R DRUM
- PAPER ROLL
- 4 MORE

Retired

- HMI
- AUX PLC
- MAINTENANCE
- COMM
- F DRUM
- R DRUM
- PAPER ROLL
- 4 MORE
- UNWIND
Slitter Drive Upgrade – 3rd Shutdown

On Deck

- Master
- AUX PLC
- PAC
- MAINTENANCE
- HMI
- UNWIND
- F DRUM
- R DRUM
- PAPER ROLL
- 4 MORE
- COMM

Retired

- F DRUM
- R DRUM
- UNWIND
- PAPER ROLL
- 4 MORE
- COMM
Slitter Drive Upgrade – 4th Shutdown

On Deck

Retired

F DRUM
R DRUM
UNWIND
PAPER ROLL
4 MORE
COMM
Conclusions – Adding to a Drive System

- Serious and Difficult problem
- Time, Technical and Budget constraints
- With Good Engineering and Commissioning personnel, it can be successful.