Additions to Your Drive System

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Abstract

Many existing web handling lines have outdated drive systems. "*Outdated*" not a problem if the drive system performs satisfactorily and you have adequate spares. The outdated drive system becomes a challenge when an upgrade is required due to process changes on the line.

This presentation discusses some of the options available for adding new drives to your existing system describes the challenges with each option. These issues include cost, downtime, combining analog and digital technology and ensuring that an expensive upgrade provides 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.
It may be possible to add the drive, but the system can only communicate with an obsolete HMI.

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

2. **What You Get**

The drive comes with the new printer.
You must integrate this into the drive system.

3. **Staged Approach**

This new drive forms the initial step in a program to upgrade the entire drive system.

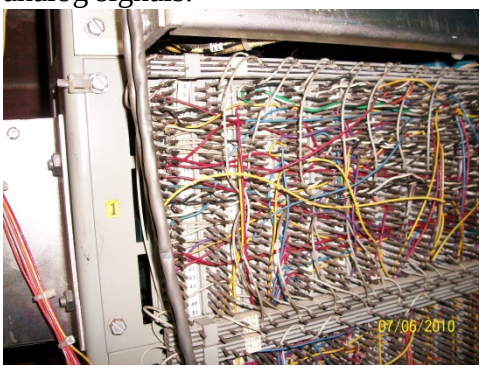
4. **Cold Turkey**

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)

1930-1959 Motor-Generator Sets
Motor Generator sets drove the dc motors on the line. Speed control achieved with low power electronics through the motor and generator fields. Tension loops were open loop. Where these drive systems exist, we expect they have had several upgrades over their lifetime.
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 and used analog circuitry. Early analog drives used 30 VDC signals and operational amplifiers made with discrete components. Later analog drives uses integrated circuit amplifiers and standardized on ±10VDC signals. These drives took special care with grounding and shielding and low thermal drift components to provide accurate analog signals.



1980-1989 Digital DC Drives
Digital came into drives slowly. Some "digital" drives used a lot of analog circuitry. The first digital drives used a pulse train speed reference. The pulse train reference looked like and was compared with the pulse train from the encoder to regulate speed.

The next digital drives used a speed reference broadcast from a digital master to each of the drives. The drive system communication was demanding compared with communications networks of the time. Thus proprietary drive network protocols were implemented. The coordinated drive master was also proprietary equipment. 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, but not all 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 HMI. Fieldbus communications began to be used. Safety became a big concern.

Basic Signals for Drives
In all cases we need the speed SP & PV, start and stop signals, tension SP & PV, Torque PV, and drive status (Run, stopped, fault).

Adding a Drive to an Analog Drive System
Bad as an analog drive is, a digital drive can make it worse.
Digital Drives have and analog speed SP input – 12 bit (0.05%)

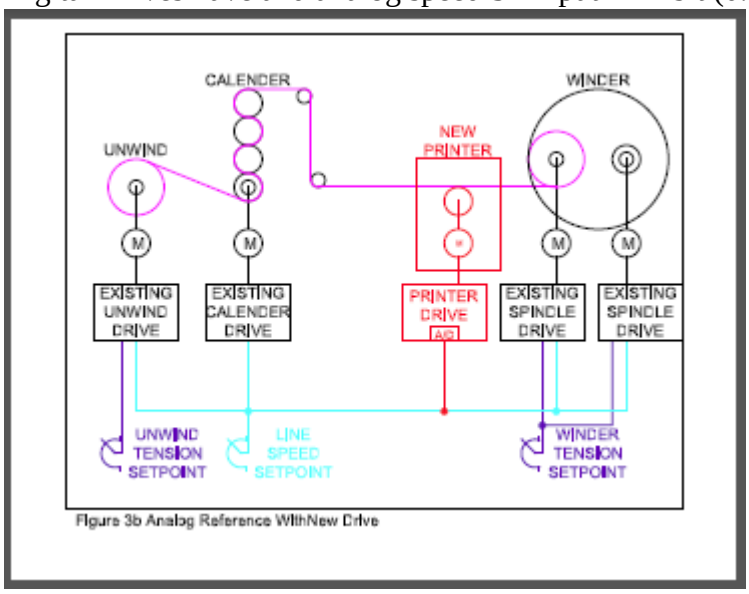


Figure 3b Analog Reference WithNew Drive

Add a new Master for Analog Drive System

Add a new master with precision A/D input and comms to the new drive.

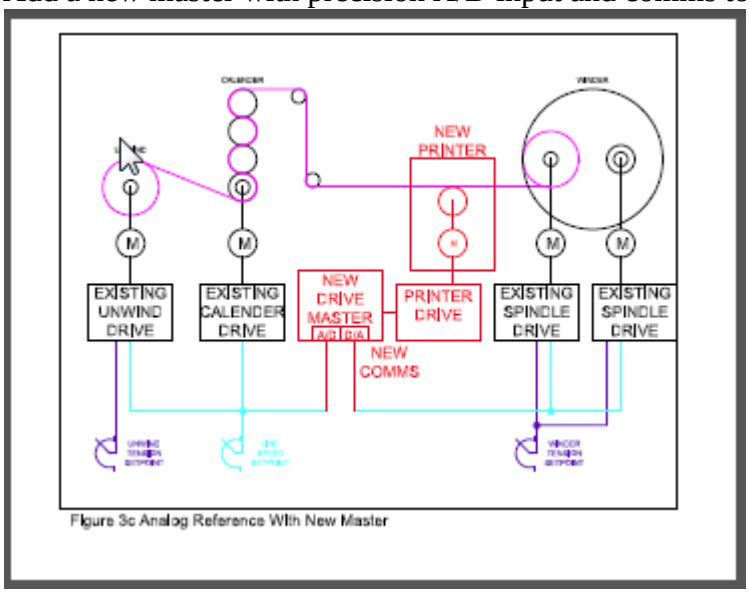


Figure 3c Analog Reference With New Master

Adding a Drive to an Pulse SP Drive System

Digital Drives don't have pulse train input for the speed SP

Add a new master with pulse input and comms to the new drive.

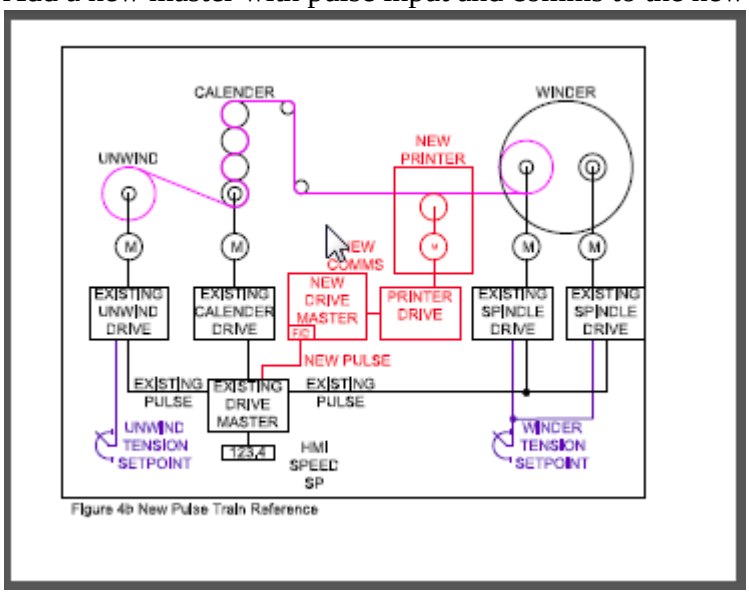


Figure 4b New Pulse Train Reference

Adding a Drive to an Early Digital Drive System

Add a new master compatible with comms to the existing and new drive.

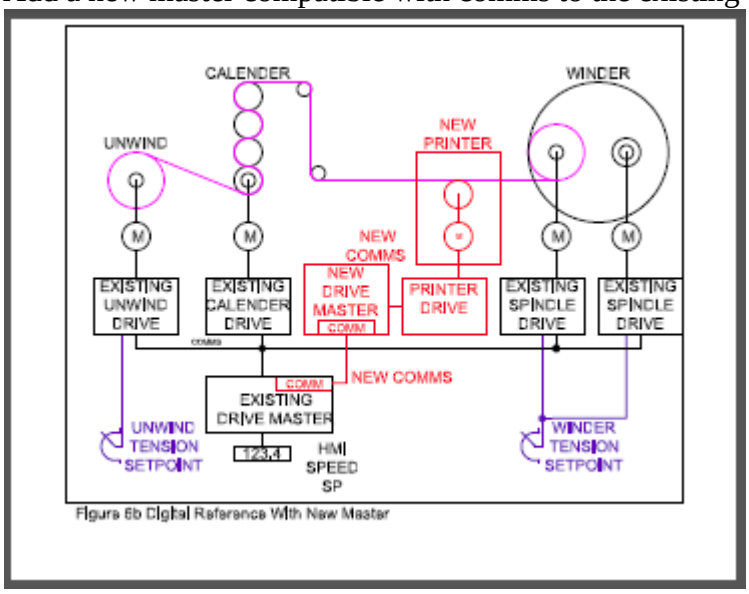
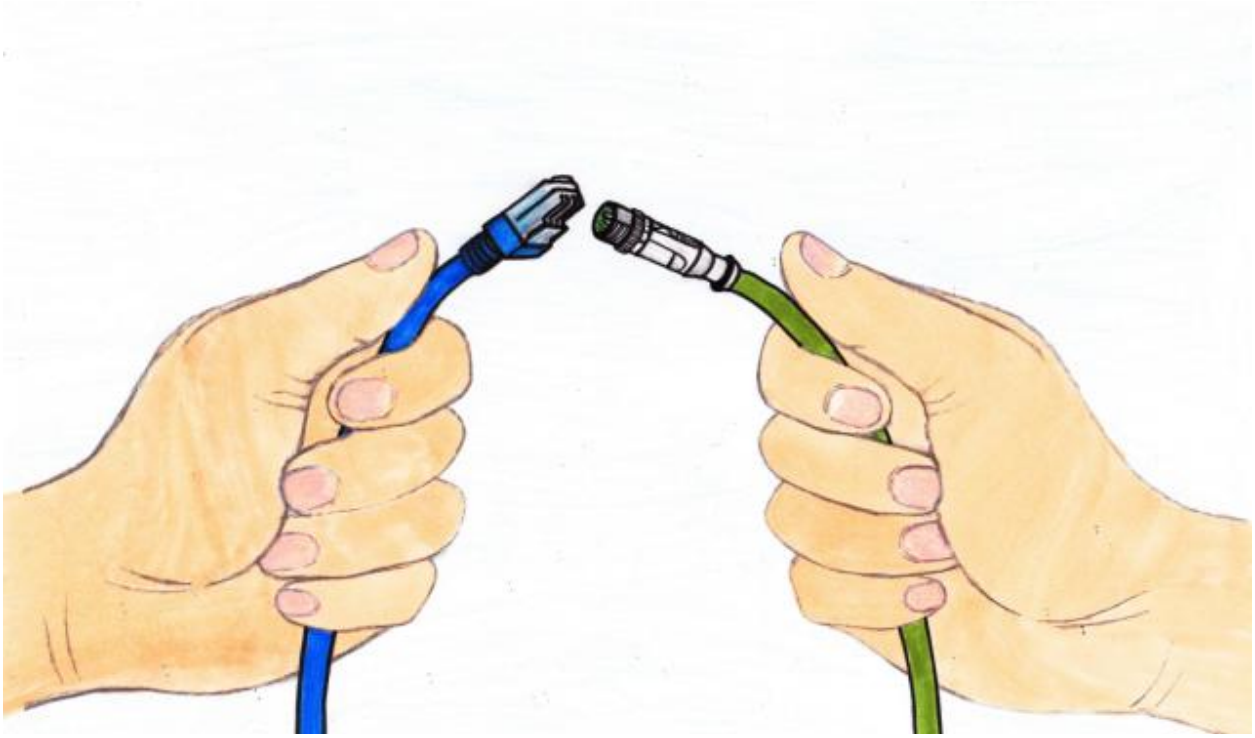


Figure 6b Digital Reference With New Master

Proprietary Communications



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.