

# Drive & Motion **Solutions**

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[More Drive & Motion \*\*Solutions\*\* by Industry/Application](#)

**Industry:** Printing/Converting

**Application:** Flexographic Printing

## **Gearless Retrofit Optimizes Flexographic Envelope Printing**

EMC Industrial specializes in enhancing and maintaining systems for the envelope industry. Acting on a request for proposal from a major envelope maker to upgrade a 5-color press feeding an envelope machine, EMC contacted its local distributor for a Control Techniques solution.

Registered in-feeds allow the envelope manufacturer to accurately feed pre-printed web into an envelope machine so the envelope is cut and formed relative to the pre-printed image. In addition to an accurate in-feed, the envelope company wanted to be able to offer its envelope customers a sharper and more colorful printed product with tighter color registration, and to obtain greater job flexibility out of its aging F.L. Smithe press and envelope converter.

EMC had been very happy with the Control Techniques solutions developed for other projects, and was excited as the client about the new Control Techniques solution being proposed.



With Control Techniques' presence in the printing industry, the distributor-integrator was aware that Unidrive SP drives with absolute positioning encoders and CTSync were being used in Europe to build revolutionary gearless 8-color and 10-color CI-Flexographic presses capable of holding registration for more than hour at a maximum speed of over a 1,100 f.p.m. They proposed that EMC use this leading-edge technology from Control Techniques in upgrading the envelope printing towers.

Several innovations have come together to make higher speeds and tighter registration possible on flexographic printers. Unidrive SP's with servomotors provide the shaft control accuracy to eliminate most gears and gearboxes. Absolute SinCos encoders provide the drives with the necessary feedback (up to 1.6 million lines of resolution per revolution) for precise positioning. SM-Applications modules provide microprocessor support and memory for user code (IEC-61131 Function Blocks and Ladder Logic); CTNet; and CTSync support. The electronic line shafting with CTSync provides drive-to-drive synchronization within 1-to-4 microseconds, mitigating jitter.

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## Drive & Motion **Solutions** (continued)

The retrofit consisted of six Unidrive SP's in servo mode with Unimotors on the pull roll and the five color stations of the stack printer. The original DC motor on the pull roll of the envelope machine was replaced with a 30HP AC induction motor and a Unidrive SP, this one operating in closed-loop vector mode, for tight and accurate speed regulation.

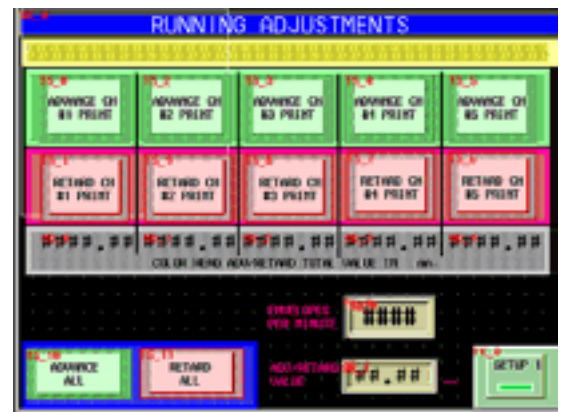
All the Unidrive-SP's are equipped with an SM-Applications module which provides:

- CTSync connection for drive to drive synchronization and Virtual Master data distribution
- CTNet connection for distributing system data easily at high speed between drives
- Advance Position Controller for:
  - a. Electronically gearing the drives to the virtual master position and with Phase Advance/Retard
  - b. Homing
- User Code (IEC-61131 Function Blocks and Ladder), for:
  - a. Sequencing logic & scaling
  - b. Network Management
  - c. Generation of Virtual Master Reference (Envelope Drive only)

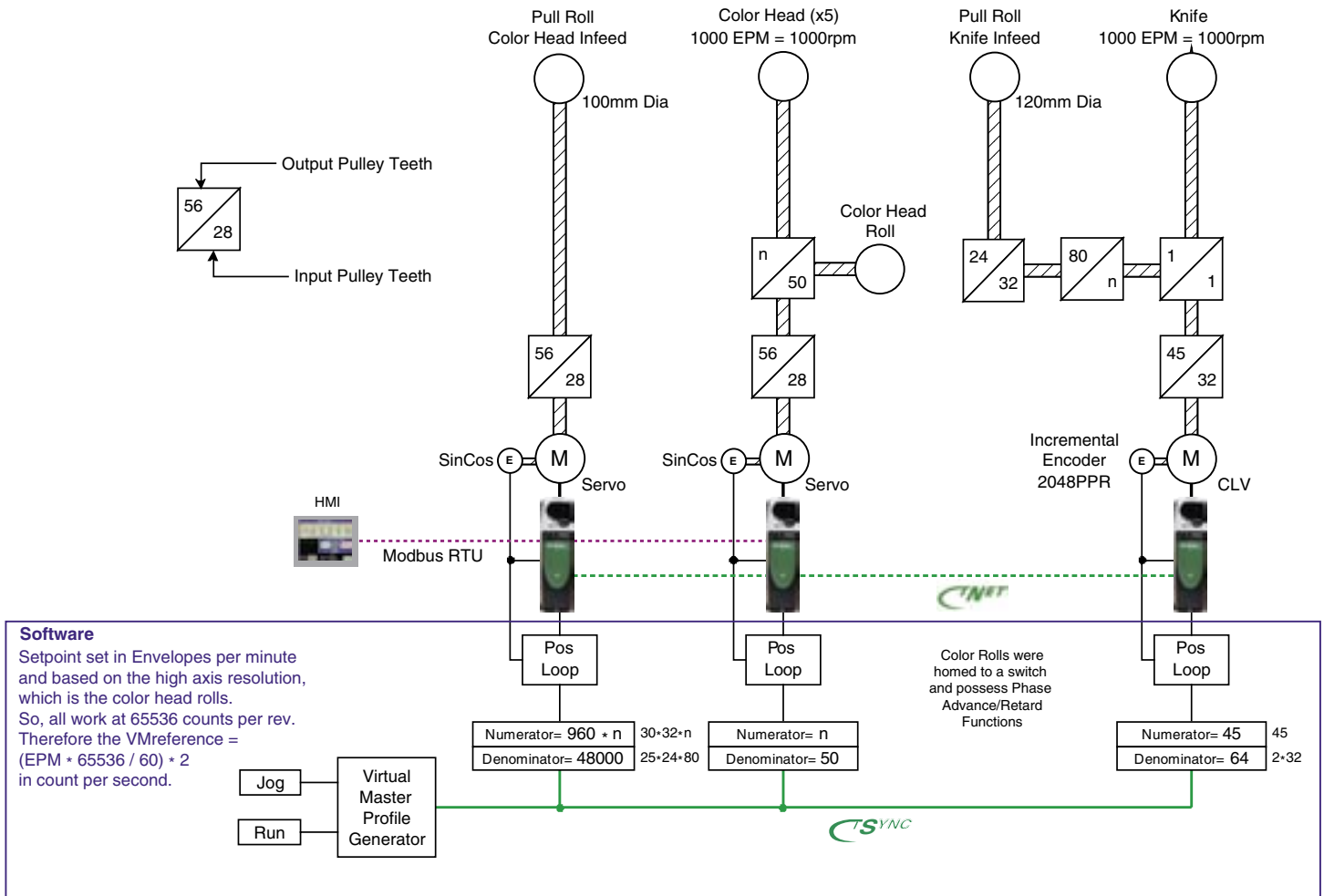
(See single-line diagram on following page.)

An HMI color graphics panel connected via Modbus RTU to the color stack drives and pull roll provides operators with advance/retard control for each of the five color stations. It also enables operators to choose which and how many color stations are run for a job.

At the midwestern envelope plant, test runs at startup have shown the Unidrive SP system performing as advertised. The precision of the gearless system has prompted mechanical improvements, a truing of the rolls, to achieve resolution tolerances of between 0.003 in. and 0.005 in., as the tolerance is currently 0.007 in.



## CTSync Virtual Master and Gear Ratio Overview



### Plug-and-Play Electronic Line Shafting

CTSync is designed to give machine and system builders an easy way to achieve precise synchronization between drives for multi-axis position control. Multiple Unidrive SP drives are synchronized by running RS485 serial cable between the SM-Applications modules mounted in each drive, and selecting CTSync mode.

CTSync is a standard feature on SM-Applications modules, which fit inside the drive and allow programming of customized solutions. Typical applications for CTSync include printing, converting, packaging, and other automation applications requiring highly accurate synchronization.

## Drive & Motion **Solutions** (continued)

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CTSync delivers the ‘Virtual Master’ synchronization messaging, created by the Advanced Position Controller in the software, from any one of the interconnected drives (see drawing: Virtual Master and Gear Ratio Overview). The Virtual Master can be reassigned dynamically, along with any other configuration changes, using Control Techniques’ high-speed CNet, or another fieldbus—Modbus (standard), DeviceNet, Profibus-DP, Interbus-S or CANopen.

CTSync eliminates the hardware costs and problems associated with encoders or “real” masters. For example: where it would be difficult or impossible to fit one on the machine; stability is low, position references need to be adjusted; electrical noise is high, or feed-forward is required.

CTSync enables deterministic control of multiple Unidrive SP drives. Using the RS485 port, the feed-forward reference signal (i.e., speed, acceleration) gives better stability, reduces noise interference, and increases resolution. Also, a complex line reference signal for any profile is much easier to generate at the source rather than “downstream”.

Each CTSync message comprises two 32-bit values, plus an auxiliary 8-bit value. Users can use this data in any way they wish - for example, 32-bit for high-resolution position data, 32-bit for high-resolution velocity data, and 8-bit for sequencing.

Unidrive SP can be configured for one of 14 different feedback signal devices, including absolute encoders, as standard. Since Unidrive SP drives can be configured to accept any encoder signal and convert it to another format, or signal out, the Unidrive SP can be used as a universal gateway for encoder signals, making life much easier for the machine builder or systems integrator. Unidrive SP can accept up to four encoder inputs and generate up to three simulated encoder outputs, in a choice of formats.

The innovation and flexibility built into the Unidrive SP and its zero-space SM solutions modules enable users to tailor the drive both in terms of scalable control (for example, replacing a PLC), fieldbus communications, additional I/O, resolver or second encoder. The Unidrive SP operates in V/Hz, open-loop vector, closed-loop vector, servo, and, with another drive, regenerative mode. ■