

## Perfect, shaftless printing possible with new press design

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Anyone who has gone to a large printing industry trade show lately is totally aware of the newer printing press designs that are replacing mechanical line shafts with electronic versions. Some of the designs are totally void of mechanical line shafts and others are taking a hybrid approach.

Aside from reliability and durability, a key advantage to presses with partial or complete elimination of the line shaft is flexibility. This modular concept allows adding or replacing the web "train" using free-standing web components (i.e. slitter, sheeter, etc.) without disturbing the other components, or compromising the overall web performance. Secondly, it affords system designers the luxury of being able to pick and choose how much of the mechanical line shaft they want to eliminate in the overall system.

The press designer can totally redesign the existing mechanical line shaft product so that all the components are synchronized through an electronic link alone (shaftless), or they can keep the line shaft where the designer feels a hybrid approach is the

best solution.

Working closely with Siemens, Didde Web Press, Inc., recently introduced a new perfecting web press that is bringing the best of all worlds to specialty web printing industries. It has eliminated the line shaft for all the units in the web except the printing units. Having the capability to



deliver outstanding registration control in the printing units through a common drive shaft, the mechanics of the printing units did not need redesign or added cost

from individual motors. This system eliminates the downstream mechanical problems associated with single drive shafts that extend throughout the entire web. Called the "Excalibur," the press is a blanket-to-blanket design available in widths from 21 to 27 inches and cylinder repeats from 17 to 28 inches. It has a running output of 1,200-fpm.

Offering press configurations in up to six colors, six printing units can be connected via a common drive shaft. The electronic drive operating the shaft is a

175HP/250A inverter drive specifically designed for motion control. It uses an asynchronous AC induction servomotor with a built-in high-resolution sine/cosine encoder. Downstream from the printing units, the chill stand, processor units and sheeter are totally shaftless. Each has its own SIMOVERT® MC inverter drive from Siemens rated at up to 21HP/35A each. These drives use permanent magnet synchronous servomotors (1FT6) with built-in sine/cosine encoders.

### **11 Mbaud optic fiber communications bus**

One of the reasons the control system used in the Didde press design is so successful, is its high-speed fiber optic communications bus SIMOLINK®. It is a dedicated bus that has one purpose: providing an effective electronic link between the shaftless components of the web. This linkage is often referred to as the "virtual shaft", because even though the shaftless units are not joined physically, they are able to function as if they were. The high-speed bus has three main tasks:

- Fast, synchronous set-point cascading from an

- external virtual master
- Fast communication between the drives
- Synchronization of the drive's individual processors for time slices of everything connected to SIMOLINK

This bus system is capable of synchronizing up to 200 motors, so it can easily handle the small number of motors utilized in the printing web train. At the end of every bus cycle, the SIMOLINK Master/Dispatcher configuration transmits a special synchronization telegram. This telegram triggers an interrupt on the interface board. The interrupt synchronizes the time slices in each drive unit. This ensures that all the set points are read at the same time and calculations are performed simultaneously among the drives.

### **PROFIBUS DP® for field devices, PLC communications**

The servo drives communicate with the system's soft programmable logic controller (PLC) over a high speed PROFIBUS DP communications system. It operates at 12 Mbaud and provides the appropriate commands to the drive units. SIMOLINK and PROFIBUS operate independently. The PROFIBUS DP master (5412 ISA card) is mounted in the Didde industrial PC. In addition to handling routine I/O operations, the soft PLC provides important safety and interlock functionality, diagnostics, and data logging. A Siemens S7 214 PLC with an I/O expansion module also provides important safety and interlock functionality. The PLC along with several safety relays, provide redundancy for the press safety and motion control circuits which is necessary for CE compliance.

### **HMI for press operations, monitoring**

Human Machine Interface (HMI) is provided via a touchscreen interface provided on a modern central control console. The completely object oriented HMI software was developed in-house by Didde using the C++ programming language. Using this HMI system, the operator is able to access press functions (including drives) through a flat menu system that allows any feature to be reached in four or less screen touches.

### **Adding printing units to the existing configuration**

Expanding the system with additional press modules is no problem with the Didde design. The drives are housed in an electronics cabinet that has room for the addition of extra drives. After new units are installed all that remains are few changes to the configuration files in the systems software and the unit is ready to use. All the drives communicate over the SIMOLINK fiber optic ring to provide synchronous distribution so, after setup, the new unit will now follow the virtual master just as if they had always been a part of the system.

### **CAN Bus System**

As with previously designed Didde Web Press systems, press communications (other than Drives) utilize a Controller Area Network (CAN) bus. CAN was chosen for its high data reliability characteristics. The Didde control system consists of a network of distributed processors attached to the CAN bus. The main console processor is a Pen-

tium( based industrial computer and it communicates via CAN with Didde-built processor boards for each unit. This puts a CPU in each unit that is then connected through the board I/O devices to the solenoids, stepper motors, and other devices on the system. Having a processor in each press unit gives

Didde unprecedented flexibility to add value for their customer by being able to rapidly add custom features. Since the CAN implementation was a proven design, Didde opted to reduce design time by implementing PROFIBUS only on the drives as a first step.



### **Conclusions**

Web printing manufacturers, teaming with leading drive system suppliers, are re-defining the levels of equipment now available for specialty printers. For web printing press OEMs, the additional options available through AC motion control technology make transitioning to "shaftless" designs less drastic in nature. Hybrid systems are offering enhanced features plus servo registration capability at affordable price slots. End-users reap the benefits. Print cycles can now be more efficiently handled with the perfecting web technology. There is less associated maintenance, and there is a level of flexibility never before possible.

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