Printing machine for corrugated board

Products, Features
- Machine overview
- Requirements and Solutions
- Drive concepts
- Communication
- Special functions for corrugated boards
- Register control
- Safety Integrated
Typical products which are produced on printing machines for corrugated board:
Final packing of cardboard for nearly all sizes
Characteristics

- Up to 8 printing units per machine
- Every production has a different set of printing plates (klischee)
- The press can be extended by additional slotters, punchers, stackers or folding units
- Machine speed up to 350m/min
- Material thickness from 1 up to 16 mm
- Size of corrugated board from 450*500 mm up to 5500*1900 mm

Advantages of flexo printing technology for corrugated board printing presses

- Different printing formats can be printed on the same machine by different length and width of printing plates
- Many different kinds of printing colors can be used
- Wide scale of different material thickness applicable
- Simple printing principle

Limitations

- Lifetime of printing plates
Printing principle: flexo printing

The printing plates consist of flexible “printing blocks” (Klischees), which are mounted on the plate cylinder.

Low viscosity ink is transferred from the anilox roller to the “Klischees”.

With low pressure the print is transferred from the plate cylinder to the printing substrate (“kiss printing“)

Flexographic Print Unit
1 Impression cylinder
2 Plate cylinder
3 Printing plate (soft)
4 Anilox roller
5 Ink supply (chambered doctor blade system)
6 Printing substrate
7 Elastic printing plate with raised image elements
8 Inked up image element
9 Cells of the anilox roller filled with ink
Machine configuration

- non-stop stacker
- printing units
- feeder
- charging
- slotter, punch
Machine part: printing machine

- Slotter/Punch
- Feeder:
  - Feeder
  - Conveyor
- Printing Unit:
  - Impression cylinder
  - Klischee roller
  - Anilox roller
  - Cylinder adjustment
- Slotter/Stanze:
  - Punch
  - Slotter

Servo drive
Machine part: stacker

- board stop
- transfer
- stack
- Servo-drive

drive for:
- Conveyor belt
- Board stop
- Seperator
- Stack
- X-axis
- Y-axis
## Requirements and solutions

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Drive Concepts

AC/AC Drives
Single-Axis Applications

0,25–90kW Blocksize Design

DC/AC Drives (with infeed)
Multi-Axis Applications

1,6–107kW Booksize Design

110–250kW Chassis Design

75–1.200kW Chassis Design

SINAMICS S120 has been designed to meet the requirements of both single and multi-axis applications.
Machinery with SIMOTION D
Power units for decentralized structures

Each module has its own feeding unit. Based on this modular concept each separate module allows individually commissioning.

- Power unit for stacker
- Power unit for flexo-printing units
- Power unit for feeder/charging

3*AC 400 V
Machinery with SIMOTION D
Power units for centralized structure

With the use of a central feeding unit all motor modules are connected to the common DC link. An energy compensation between the drives via DC-bus coupling is possible.

- power unit for stacker
- power unit for flexo-printing units
- power unit for feeder/charging

3*AC 400 V
Machinery with SIMOTION D
Drive equipment for printing unit

PROFINET IRT

- impression cylinder
- klischee cylinder
- anilox roller
- cylinder adjustment

3*AC 400 V
Machinery with SIMOTION D
Communication

All units are connected together with PROFINET IRT. The complete communication is done via just one bus system: PROFINET

- Normal communication to the control panels
- Synchronization between the drives

control-Unit for stacker
control-Unit for flexo-printing units
control-Unit for feeder/charging

PROFINET IRT
Special functions for corrugated board can be realized in the drives

- **Extended slotting**
  Slotting of products which are different from the circumference of the cylinder by using cam curves (which allow online changes).

- **Extended diecutting**
  Punching of products which are different from the circumference of the cylinder by using cam curves (which allow online changes).

- **Printing length correction**
  Compensation of longitudinal failure of the “Klischee” by online adjusting of cam curves in the drives.

- **Register control (optional)**
  It is possible to implement a camera based register controller into SIMOTION D.

- **Feeder**
  Substitution of mechanical cam curves at the feeding unit by electronic cam curves. Online changes possible, no mechanical cam curve wear.
Principles of register control

Visualization / Operation

Measurement of register marks
Visualization of register difference
Register control
Corrective actuation

Calculation of register deviation control loop algorithm

measurement
Sensor/ Camera
printing marks
register deviation

corrective actuation

Corrugated board
The camera system is the key component of the register control system.

The flash and complete analysis of the picture is implemented in the camera system.

Intelligent Camera System\(^*\) = Picture recording, analyzing and flash triggering.

transmit the measured to the closed control loop of the drive system.
Closed loop control

- The closed control loop is realized in a SIMOTION Control Unit.
- The camera is directly connected to the SIMOTION controller.
- The register controller are interconnected by the drive bus system.
- The integrated implementation is superior to existing systems.
Safety Integrated

Fail-safe drives – SINAMICS S120, the flexible drive system for sophisticated drive tasks

SINAMICS S120 offers following Safety-Integrated-applications: (terms acc. to IEC 61800-5-2)

- Safe Torque Off (STO)
- Safe Brake Control (SBC)
- Safe Stop 1 (SS1 => at n=0 → STO)
- Safe Stop 2 (SS2 => at n=0 → full torque available)
- Safe Operating Stop (SOS)
- Safely Limited Speed (SLS)
- Safe Speed Monitor (SSM)

Safety Integrated increases security at machines
Safety Integrated
Enabling of safety functions through failsafe communication

- Acquisition of sensor signals through failsafe periphery
- Processing of signals through failsafe CPU
- Enabling of drive based safety functions via PROFIBUS with PROFIsafe telegram

Safety Integrated reduces costs
Safety Integrated
Enabling of safety functions via failsafe terminal module TM54F

- **Acquisition** of sensor signals through safety devices
- **Processing** of signals through safety devices
- **Enabling** of drive-based safety functions via failsafe terminal module TM54F

Integrated Safety even with hardwired solutions