Elmo
Motion Control

Patterning Machine Case Study

Cello Servo Drive Application

7 Cello Digital Servo Drives were integrated into an automated ceramic tile patterning machine. Mounted in the control cabinet, the Cellos control the position of the three patterning tools as they create effects on the surface of decorative tiles.

The Challenge

A leading manufacturer of ceramic tiles asked the Motor Power Company (www.motorpowerco.it) to help them create a new ceramic tile patterning machine that would meet the following objectives:

- simplified machine design
- total elimination of kinematic chains
- equal distribution of power and intelligence
- reduced machine assembly time
- reduced maintenance
- energy savings

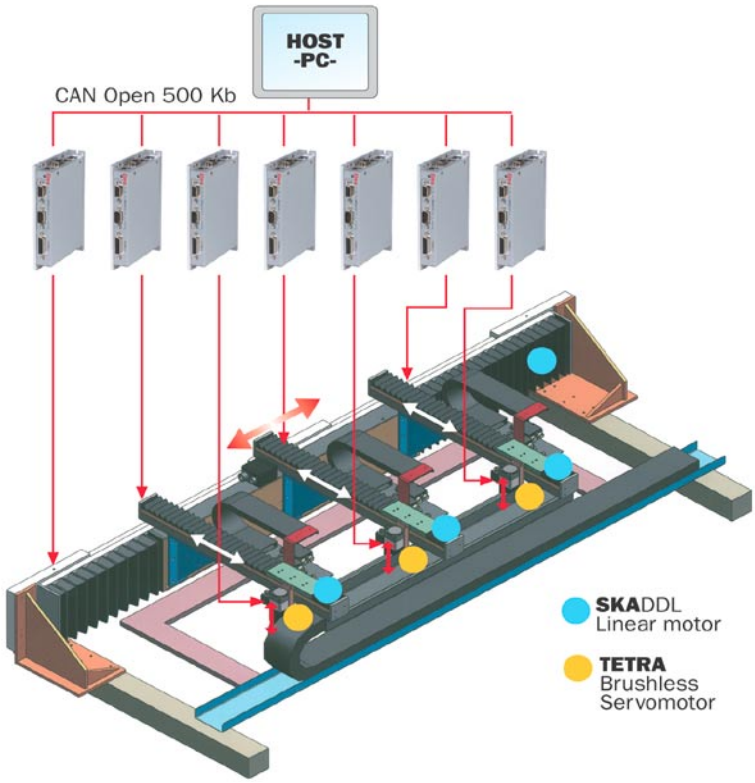
Existing effect and patterning machines were huge, expensive to maintain, and expensive to operate. Modern motors, drives and systems offered the potential to significantly improve upon these issues.

Motor Power's Solution

Application Engineers at Motor Power Company tackled all the issues at once.

Direct Drive Linear motors were used to eliminate the previous problems associated with vibrations. By using linear motors, extra support structures and dampers could be eliminated thus significantly reducing the size of the machine and its complexity.

Intelligent drives were added to each axis thus significantly increasing the machine's flexibility and capabilities. The "intelligence" in the servo drives enabled Motor Power Company to write application-specific software that enabled pattern profiles to be controlled by the drives alone, without the need for a centralized motion controller! In this implementation the profiles are generated on a PC and transmitted to the servo drives via a CANopen network.



A Cello digital servo drive is connected to each axis on a Ceramic Tile Patterning Machine

Design Simplification

The X and Y axes were respectively fitted with linear and torque motors that were able to carry their loads without any intermediary components. This decreased the component count and increased the machine's reliability.

Reduced Machine Assembly Time

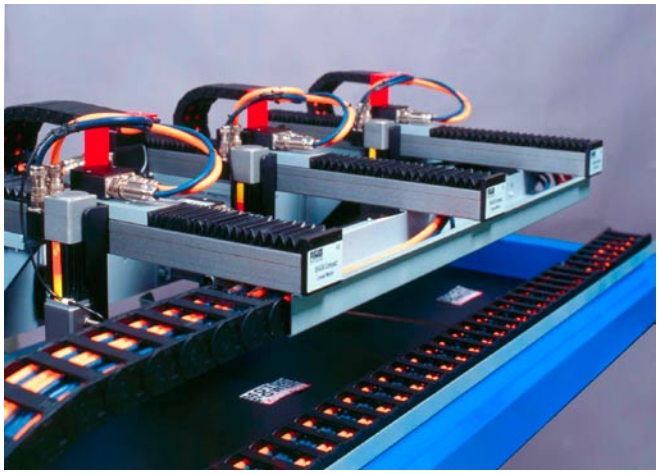
The use of motors that are connected to their loads without additional transmission components vastly simplifies machine assembly and maintenance tasks.

Reduced Energy Costs

Reduced component count also reduces the energy losses associated with transmission equipment.

Reduced Maintenance

Direct drive componentry simplifies maintenance tasks significantly by eliminating unnecessary components and linkages.



The Ceramic Tile Patterning Machine

Distributed "Intelligence"

An Elmo Motion Control Cello digital servo drive was used on each axis. These drives contain a digital signal processor for motor control, feedback and programming. By using Elmo drives, and custom-written software, Motor Power Company was able to eliminate the need for a centralized motion controller, at a significant cost savings. In this design, Motor Power Company uses a PC to generate motion profiles for each axis. The profiles are sent to the Cellos, in PVT format, over a CANopen link.

The CANopen bus also contributes to the overall cost effectiveness and reliability of the design, because it enables daisy-chain communications rather than a dedicated communication and control cabling for each axis.

Elmo
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Cello
Digital Servo Drive

The Cello is a fully digital servo drive that delivers up to 3 KW of continuous power (and 6 KW of peak power) for DC brush, brushless and linear motors. It can operate in current, velocity or position modes and functions with a wide variety of feedback options including Incremental Encoders, Resolvers, Interpolated Analog (Sine/Cosine) Encoders, tachometers and potentiometers.

The Cello features sinusoidal vector control, trapezoidal vector control, trapezoidal six-step and DC commutation methods. The Cello has an auxiliary feedback port for ECAM, Follower, Dual Loop and Pulse-and-Direction applications. Digital and analog ports are also available.

Integrated into the drive is highly efficient power switching technology aligned with Elmo's especially fast implementation of CANopen networking (DS-301/DS-402) protocol. Two CANopen ports are installed along with one RS-232 serial port for communications.

The Cello is fully programmable with Elmo Motion Control's programming language (32 KB of memory is available for storing programs). Using Elmo's Composer setup tool, Cello users can perform drive setup, configuration, tuning, analysis and drive programming quickly and easily.

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