STABILITY OF STEEL BELTS AND HIGH PRECISION TRACKING SYSTEMS

Marco Girlanda, Global Product Manager for Belts at IPCO, explains the role that steel belts and precision-tracking systems can play in the challenge of increasing productivity without sacrificing quality

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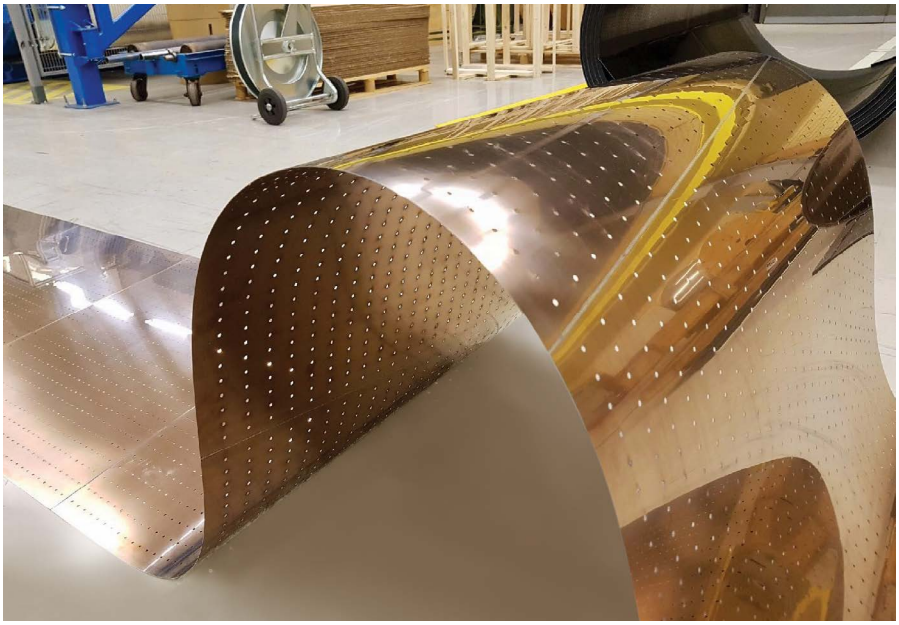


IPCO perforated steel belt ready for installation on a press

Whatever the motivation – to increase productivity, create additional capacity or simply meet ever-tighter deadlines – the drive towards faster printing is increasing.

Incremental gains can be made by tweaking processes, but major advances require investment in faster print-line technology. Every month, there are new developments in press technology and ink-delivery systems driving up throughput speeds.

However, speed alone is not sufficient. Press lines must also be able to deliver ultra-precise rendering. The type of belt traditionally used to convey substrates through the press thus becomes challenging.

CONVEYOR BELT RESEARCH

In 2020, contract research company Fraunhofer Institute for Production Technology (IPT) carried out research into belt stability and found that a plastic belt can move – or vibrate – as much as 450µm when running at 30m/min. This improves as belt speed is increased but even at 300m/min – when the belt is most stable – it can still demonstrate an amplitude range of around 200µm.

While this vibration may be microscopic, it can impact print quality. The same tests were carried out on steel belt technology and the results were very different.

APPLICATIONS FOR STEEL BELTS

Steel conveyor belts have a history in high-speed precision processing. Although, they are a relatively new concept in the printing industry, steel belts have a history that extends back more than 120 years. First introduced by IPCO in 1901, for heavy industrial processes, steel belts are now used in the manufacture of high-precision products such as films for LCDs and solar panels. They are also used for the membranes used in Li-Ion batteries at a thickness of maximum 10µm. In addition, in terms of speed, steel belts are employed in wind tunnels used to assess the aerodynamics of Formula One cars.

> *"Steel belts are up to six times more stable than plastic"*

Applications such as these, require a belt that meets extremely tight tolerances in terms of flatness, straightness, thickness and surface finish. These qualities are built into the belt during production. IPCO's steel belts are engineered at the company's factory in Sweden and can be manufactured in solid form or punched with perforations for use with vacuum systems.

STEEL BELTS FOR DIGITAL PRINTING

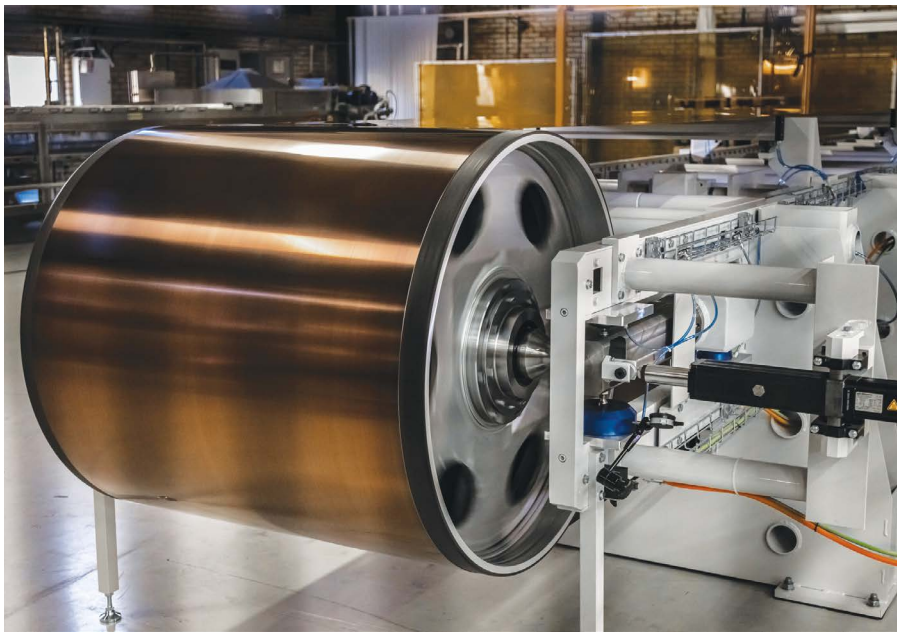
Around 10 years ago, digital printing was identified as a possible new application for this versatile technology and development partnerships were established to assess its potential. Today, the benefits steel belts can bring to wide-format digital printing are beginning to become clear.

Using laser-based sensors – accurate to 10µm to measure up and down movement – Fraunhofer IPT's research demonstrated that vibration/amplitude at 300m/min, ranged from 60–30µm. These parameters were exactly the same set-up used for plastic belts, meaning that steel belts are up to six times more stable than plastic. As a result, the position of the substrate is assured at all times and press speeds can be maximised without compromising quality.

The tests were carried out on steel and plastic belts of the same size and perforation pattern and on the same conveyor system. The steel belt was tested under three levels of tension –4,600/N (25 multi-perspective application selection [MPAs]), 5,500/N (30 MPAs) and 6,400/N (35 MPAs), with the plastic belt at a standard tension force of 3,000/N (approximately 5 MPAs). The test procedure covered belt speeds from 30–300m/min.

BELT STRETCHING

While belt stretching was not covered under the research project, plastic belts – operating under tension – can experience elongation which can be a potential issue. The advantage of steel belts is that they are virtually stretch-free.



Testing the High Precision Tracking system at IPCO's research and development centre in Sweden

"The advantage of steel belts is that they are virtually stretch-free"

STEEL BELT GRADES

Typical steel belt grades used in digital printing are IPCO's 1600SM and 1650SM. Both are made of martensitic stainless steel – a material that exhibits excellent mechanical properties, very good wear resistance and repairability. These grades can withstand heat up to 300°C and can therefore be used in certain drying steps. The typical thickness range of steel belts for printing is 0.4– 1.2mm, with widths available from 400mm–3m.

Steel belts for printing may either be solid or perforated, depending on the substrate to be printed. Thicker substrates such as corrugated board, ceramic tiles or board, require a vacuum to keep them fixed and flat during the inkjet-printing process. Perforated belts allow the suction forces from the vacuum table to fix the substrate to the belt.

Applications for steel belt-based digital printing range from large format corrugated packaging to high quality, full-colour branded materials and even furniture board, film wrap and ceramic tiles.

HIGH-PRECISION TRACKING

Upgrading to a steel belt is not simply a matter of replacing the plastic belt. The conveying system as a whole has to be designed to cope with the tensioning requirements of a steel belt.

Steel belts also require effective tracking if they are going to run as straight and true as they are flat and stable. This is particularly important in an application such as digital printing, where accuracy is crucial. This has been made possible by the development of a new high-precision tracking technology.

IPCO'S SOLUTION

The IPCO High Precision Tracking (HPT) system was specifically developed to meet the challenges of digital printing. Offering belt tracking accurate to +/-0.1mm, the HPT is suitable for use on presses with belt speeds of up to 300m/min. The system combines electric actuation cylinders with contact free optical sensors to deliver rapid system reaction times and correct belt positioning.

"The HPT is suitable for use on presses with belt speeds of up to 300m/min"

Besides delivering tightly controlled tracking, the HPT system also serves as a very simple and precise tensioning system thanks to its integrated load cells. The proprietary electronics package provides precision tracking and tensioning in one compact package.

IPCO has a team of engineers who can offer expertise in technical advice and calculations for conveyor design. The company can also design, manufacture and install custom-made conveyors for companies to use in pilot studies. ■

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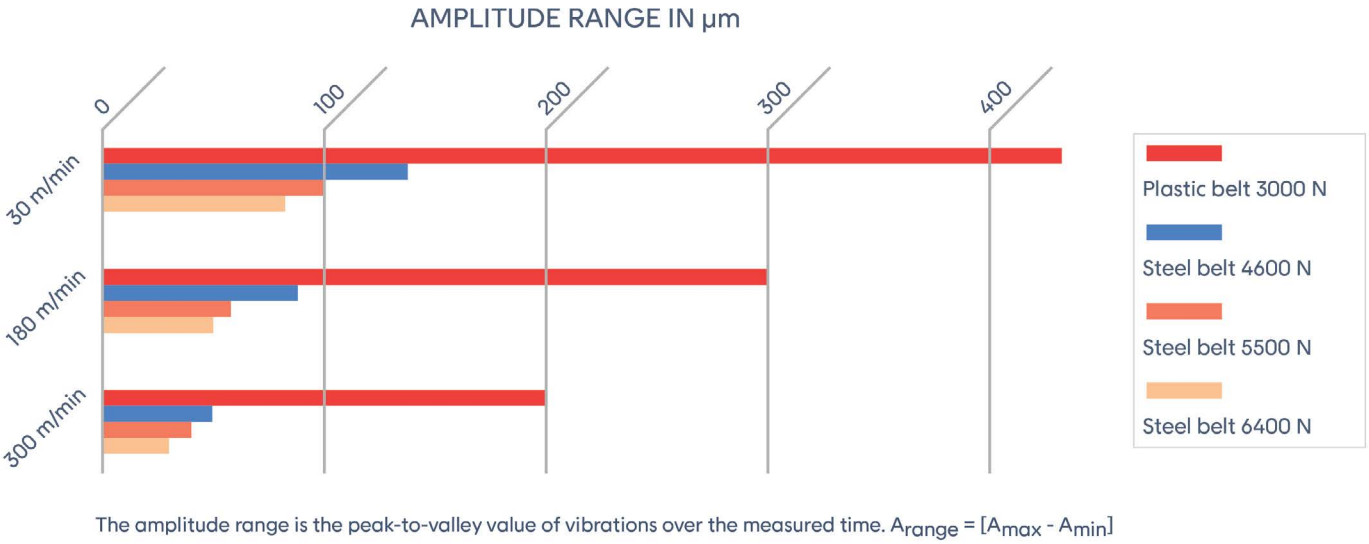

The amplitude range is the peak-to-valley value of vibrations over the measured time. $A_{range} = [A_{max} - A_{min}]$

Fraunhofer IPT Research results show the superior stability of steel belts