IPCO steel belts are designed to provide reliable, stable operation at even the highest speeds. Independent research has been carried to put this performance to the test. This brochure details the remarkable results.

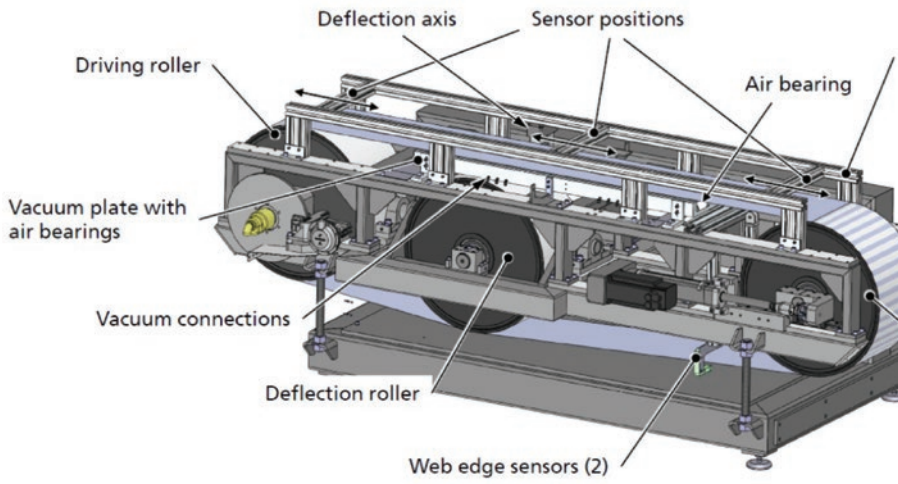
VIBRATION ANALYSIS OF STEEL BELTS IN DIGITAL PRINTING

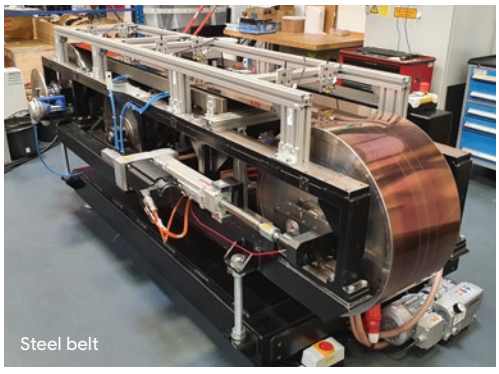
—STEEL BELT PERFORMANCE TO MEET THE NEEDS OF HIGH SPEED DIGITAL PRINTING

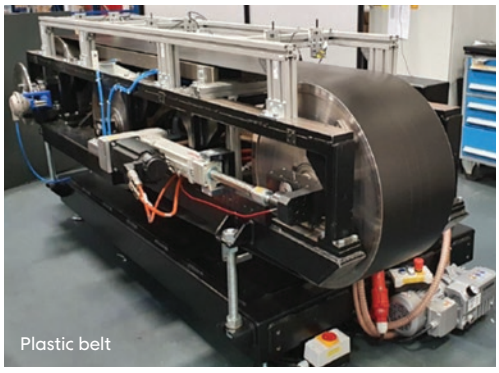
Steel belts are used for conveying applications across many industrial sectors, from paper mills to chemical processing, from wind tunnels used to test F1 cars to the huge presses used in the production of MDF and other wood-based panels.

Their unique combination of properties – straightness, flatness, durability and, above all, stability – also makes them ideally suited to the needs of digital printing. This is an application where high speed means high productivity, but not all conveyor belts are capable of delivering the stable operation necessary to maintain high precision printing at these speeds.

Contract research company Fraunhofer Institute for Production Technology IPT (Fraunhofer IPT), was commissioned to investigate the performance of steel belts compared with plastic belts.




Steel belt

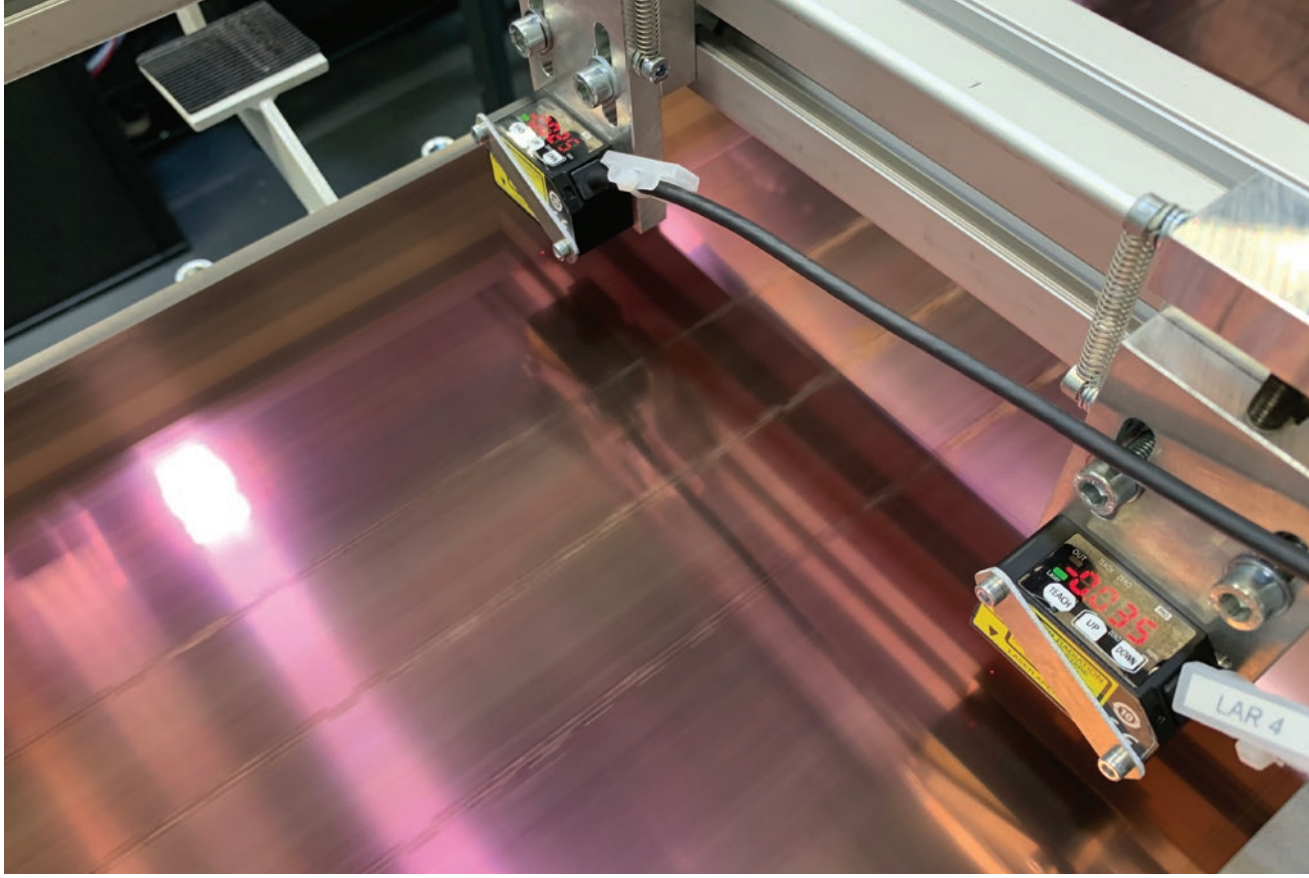

Plastic belt

Vibration analysis methodology
The tests looked at steel and plastic belts of the same size and perforation pattern and were carried out on the same conveyor system, using belts 310 mm wide.

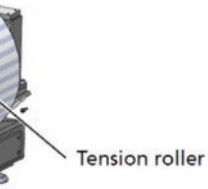
The steel belt was tested under three levels of tension (4600 N [25 MPa], 5500 N [30 MPa], 6400 N [35 MPa]); the plastic belt was tested at a standard tension force of 3000 N (~5 MPa). The test procedure covered belt speeds from 30 m/min to 300 m/min.

Laser-based sensors operating at a frequency of 660 Hz and accurate to 10 µm were used to measure movement on the Y-axis (up and down) and these were positioned in pairs, either side of the belt, with two located near the drive drum/roller, two at the centre of the test line and two near the tension roller/drum.

Steel belts are between 3 and 6x more stable than plastic, enabling high speed, high precision printing.



Sensor mount frame



Tension roller

Research findings

For both belt types, vibration was highest at low speeds and lowest at high speeds. In addition to the inherent flexibility of the plastic belt, the seam was a major cause of vibration.

At 30 m/min, the highest amplitude range recorded for the plastic belt was ~450 µm, while figures for the steel belt at the same speed ranged from ~130 µm to as low as ~85 µm.

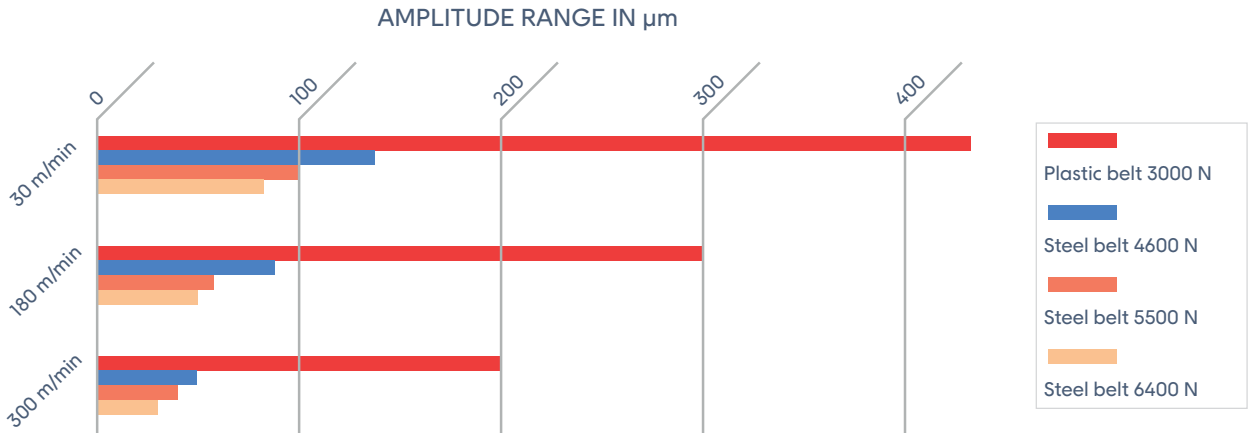
The contrast in performance was even greater at 300 m/min. At this speed, the highest amplitude range recorded for the plastic belt was ~200 µm, while the steel belt demonstrated amplitude figures ranged from ~60 µm to as low as ~30 µm.

In summary, the vibration amplitude range of the plastic printing belt was never less than 3x greater than that of the steel belt (depending on the tension of the steel belt). And at the highest speeds – the speeds that matter on a digital press – the steel belt performed more than 6x better at the highest level of tension.

Belt type	Tension	Highest amplitude @ 30 m/min	Median amplitude @ 180 m/min	Lowest amplitude @ 300 m/min
Plastic	3000 N	~450 µm	~300 µm	~200 µm
Steel	4600 N	~130 µm	~90 µm	~50 µm
Steel	5500 N	~100 µm	~65 µm	~40 µm
Steel	6400 N	~85 µm	~50 µm	~30 µm

Conclusion: steel belts offer superior performance

In tests carried out by Fraunhofer IPT, the world's leading applied research organization, the vibration of a steel belt was shown to be as much as 6x lower than that of a plastic printing belt. This exceptional performance means that the position of the print substrate is assured at all times, and press speeds can be maximised without compromising on quality.



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

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