

Synchronized crane wheels cut maintenance costs

A case study from Emotron





The Emotron electronic flange control ensures fully synchronized crane wheel speed. The life span of the wheels is greatly extended and noise levels are reduced.



The retrofit of this portal crane at concrete manufacturer MBI Beton BV involved replacing the controls as well as the drive motors. Emotron provided a complete solution which requires less maintenance thanks to minimal wheel wear.

Retrofit reduced maintenance

The Dutch company MBI Beton BV manufactures concrete blocks used as facade bricks, paving blocks and garden stones. MBI was founded 60 years ago and employs about 200 people. The head office is situated in Veghel. Production and sales take place here as well as at the company's site in Kampen. As it was no longer possible to maintain the portal crane based at Kampen and used for moving gravel and sand at a reasonable cost, the decision was made to retrofit it. MBI turned to Emotron with its 20 years of experience in the field of crane modernization.

The retrofit involved installing a new complete electronic control system based on the Emotron VFX variable speed drive. The eight drive motors, each with a power of 22 kW, were also replaced. The new solution requires considerably less maintenance. The wear to the wheels has been minimized, contactors no longer have to be replaced, fewer shocks are generated in the drive mechanism and the high-maintenance slip ring AC motors have made way for standard squirrel-cage AC motors.

Synchronizing the wheels is a challenge

A wide rail-mounted crane often does not travel completely parallel to the rails. The load transported being

unevenly distributed over either side of the crane causes the motors to work at slightly different speeds, pulling the crane towards the side. Temperature variations can also cause the distance between the two rails to vary over the travel distance.

These factors will result in the wheel flanges coming into contact with the rails. A piercing sound clearly betrays the serious wear suffered as the wheels quickly grind themselves down against the rail. For the MBI crane this mechanical problem was solved using the electronic flange control and the Emotron VFX variable speed drive.

Electronic flange control minimizes wear

The speed of the crane wheels is now completely synchronized, offering parallel travel. Maintenance costs and noise levels are reduced and the life span of the wheels is greatly extended. The wheels will need to be changed about every five years, compared to as often as every three months with unsynchronized travel, with at least a day's standstill each time.

The electronic flange control prevents contact between the wheel flanges and the rails by guiding the crane at a virtually constant distance from the rails on either side. This is handled by the distance regulator (centre guide) calculating the ideal travel line on the basis of the readings received. The correction to be applied (angle guide) alters the crane's offset to compensate for the differences in distance. The software for this control is incorporated into the Power Panel (PP41) control system included in the Emotron crane package.

Easy setup without a PC

The efficiency of the system greatly depends on the accuracy of the signals from the four ultrasonic distance

Cover photo: The retrofit of this crane at concrete manufacturer MBI Beton considerably reduced maintenance costs.

sensors. The sensors have to be fitted with great care, both mechanically and electrically. Special attention should also be paid to the signal cable shielding.

The measured values of the sensors are shown in the PP41 display as a number in millimetres and as a graph. The regulators can be shut down if necessary and the drives can be operated manually from the master controller. The parameters for the regulator are easily configured using the setup menu of the PP41 without the need for a PC. The settings are password-protected.

Soft starts even with heavy loads

The Emotron VFX variable speed drive ensures instant yet smooth starts and fast acceleration without jerky movements, even with very heavy loads. This enhances safety and minimizes mechanical wear. Matching rapid direct torque control, fast pre-magnetization of the motor and precise brake control makes sure the motor has enough power to deliver the torque needed at the very moment the mechanical brake is released.

A HCB (Half Controlled Bridge) ramping up of the DC link voltage ensures controlled start-up and detects phase errors and asymmetrical power supply loading. The risk of component breakdown, e.g. charging circuit failure, is minimized. This could otherwise be the result of frequently switching the AC power supply with an external contactor, which is often the case in crane applications. The absence of built-in resistors or contactors saves on both space and maintenance.

Direct torque control for high reliability

The direct torque control of the Emotron VFX ensures reliable and efficient crane operation without interruptions caused by abrupt load changes or incorrectly set parameters, such as ramp times. The direct torque

control reacts extremely quickly to any variation in load and instantly regulates the torque in relation to speed to protect the process. The response time is extremely short since the actual and required torque is compared 40,000 times a second!

An internal speed controller increases efficiency. It reacts immediately to load changes that cause deviation in motor speed and quickly adjusts speed to the set reference value. The controller works without external feedback and an auto-tune function reduces set-up time.

Safe and efficient braking

An integrated brake chopper ensures quick and soft braking, even with heavy loads. It works together with the direct torque control of the Emotron VFX and keeps up the required torque to prevent jerking. The speed is continuously reduced towards zero and the crane can be stopped safely before the mechanical brake is activated.

Valuable time is saved and safety is increased thanks to an end position control automatically stopping the crane just before it reaches its end positions. The operator can drive the crane faster, knowing that it will stop smoothly without jerkiness before reaching the end buffer.

Facts

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|-------------------|----------------------------|
| Hoisting capacity | 14 tons |
| Hoisting speed | 60 m/min |
| Travel speed | 120 m/min |
| Crane rail length | 240 m |
| Crane rail span | 40 m |
| Crane span | 55 m incl. 15 m projection |



The retrofit involved installing a new electronic control system based on the Emotron VFX variable speed drive, as well as replacing the eight drive motors.



Contact between the wheel flanges and the rails is prevented. The accuracy of the signals from the four ultrasonic sensors is vital to the operation.

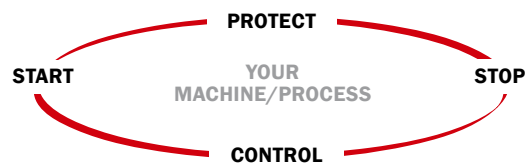
Dedicated drive

Emotron develops products for starting, protecting, controlling and stopping machines and processes driven by electric motors. Our drive is to create measurable benefits for our customers through reliable, cost-efficient and user-friendly solutions. By focusing on selected applications, such as pumps, cranes and lifts, we can offer functionality optimized for specific needs.

Since 1975 we have established a solid position as an innovative and pioneering company. Research and development takes place at our head office in Sweden and at our subsidiaries in Germany and the Netherlands. Germany is also the location for the Emotron technical centres for lift and crane solutions. We have sales offices in Sweden, Germany, the Netherlands, China and Latin America, as well as a worldwide network of authorized service partners.



Products for your specific needs



Our complete product portfolio offers optimum solutions for your specific needs. The products are all based on the same technology platform and can easily be integrated in complete solutions. Wide power range, high protection class and compliance with global standards mean they fulfil the highest demands.

- *Shaft power monitors* – protect your process from damage and unplanned downtime.
- *Softstarters* – ensure smooth starts and safe stops.
- *Variable speed drives* – minimize energy consumption and wear.



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