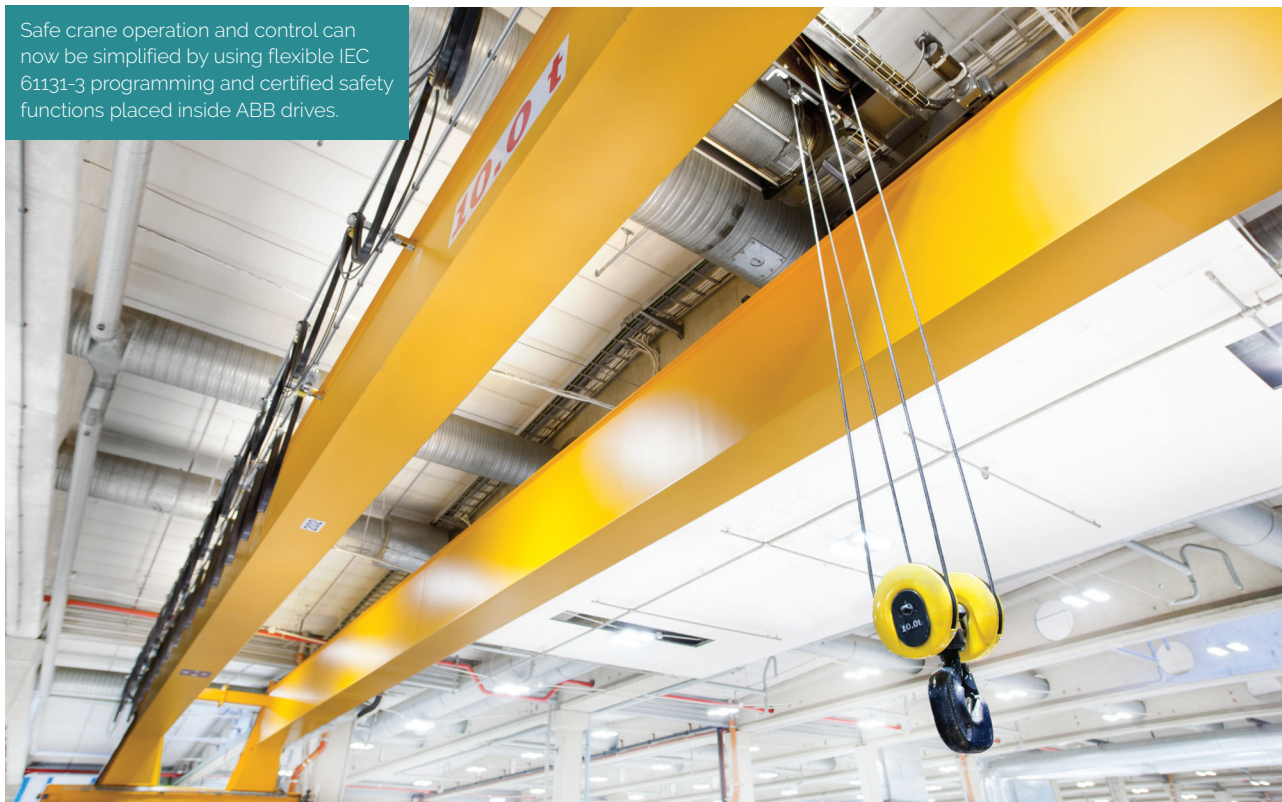


Safe crane operation and control can now be simplified by using flexible IEC 61131-3 programming and certified safety functions placed inside ABB drives.



DRIVING SAFETY

Sotiris Kanaris visited ABB's drive factory in Helsinki, Finland, and talked to product manager Risto Tiihonen about the company's products and applications.

ABB has been offering variable frequency drives and programmable logic controllers to the crane industry for decades, gaining the trust of some of the largest crane manufacturers.

It has developed a comprehensive range of fully integrated crane technology solutions including AC drives, controls and safety engineering.

Among the crane types served by the product range are overhead cranes, process cranes, rubber tyre gantry cranes, marine and offshore deck cranes, hoists and tower cranes.

In the spacious and modern ABB factory in Helsinki, employees work along with

robots to produce the drives, which are then shipped internationally. The facility also includes laboratories for testing the equipment and simulating applications.

Risto Tiihonen, product manager at ABB, says the company has two types of customers, those who purchase the drives with built-in application software, and those who buy the drives and create the solutions for crane applications inside the drive by themselves or using the programmable logic controller.

The ACS880 drive is built for indoor cranes and has built-on crane control software as well as a number of safety functions. For those customers wanting to develop their own solutions, ABB offers the

AC500 range of PLCs. For tower cranes the company developed its own application software for ACS880 drives.

Tiihonen says some of the largest crane manufacturers have been their customers for over two decades. He says the company is able to make some adjustments to the software to meet the customer's needs.

"We will put most of the requirements to the crane software but then we have a special tool to customise it. By 'customise' I mean we can set different defaults and access levels for the parameters, get different views and customer logo for the control panel, and OEM customer own labels — this is called brand labelling."

Waste handling crane's trolley and long travel movements benefit from the anti-sway control built into ABB's industrial drives, which prevents the load swinging, such as at this waste-to-energy plant in the Netherlands.



He says the company could create new software for a client but advises them to use the ready-made application software with some adjustments according to their needs, as it will facilitate maintenance.

"It is better if they use our ready-made application software because most of ABB service engineers globally know it and they can offer support, like engineering, commissioning, troubleshooting, life-cycle management and training."

ABB operates in more than 100 countries, therefore clients in these countries are able to use its after-sales services.

SAFETY AND CONTROL

Tiihonen says safety is covered comprehensively through the drives. "You are able to add in more functional safety with the safety functions module integrated into the ACS880. It is the simplest and most cost-effective way to achieve SIL 3 and PL e safety levels," he says. A dedicated functional safety design tool (FSDT) can be used to define the final safety level with involved components.

The new electronic safety technologies have helped simplify the process of keeping people and property safe. They have replaced the use of traditional safety systems involving hard-wired logic and add-ons like relays and contractors.

ABB drives and PLCs integrate to the crane automation system using Profinet/Profisafe connectivity and the certified crane safety functions can be built directly into them.

The ACS880 and ACS380 have in-built safe torque off (STO) bringing the equipment to rest in a safe state following any upset.

IEC 61131-3 programming and certified safety functions are placed inside the drives to simplify safe crane operation and control. The company believes this is a particular benefit for OEMs.

"OEMs have historically achieved crane control by custom-made programming via a PLC. However this approach means that the OEM must essentially do everything by themselves which requires high manpower, dedicated in-house skills and continuity over a long time span, often making it very costly," says ABB.



A modern alternative to this approach is to use ready-made crane applications that provide the necessary crane control via variable speed drives. ABB has recently developed a platform that allows crane control via a variety of routes, all of which utilise the power of the drives.

One route is drive-based applications, through either ready-made ABB software inside the drives or do-it-yourself solutions with IEC61131-3 programming inside the drive. Another alternative is PLC-based control, where the crane application is running in the PLC controller which communicates via gateways with the drive. Here too with the AC500 PLC series the programming language is the same IEC61131-3 as in the new ACS880 industrial drives.

Through the new drive-based crane control, key crane functions are accomplished right in the drive. Advanced control features include: master/follower functionality, multiple hook synchro control and sensorless anti-sway, as well as advanced mechanical brake control.

The sensorless indoor anti-sway control calculates and automatically compensates for the sway in both trolley and long travel movements, eliminating any swing from the pendulum effect created when hoisting heavy loads, without the need for external anti-sway sensors.

When the crane has two hoists, both hooks need to move with synchronised precision. This is done with the master/follower set up, where several drives are interlinked with one of the drives operating as the master to the other follower drives.



ABB industrial drives with crane software provide enhanced operational safety and accurate slow speed control with high torque levels. They are used on the 200t charging crane at Ruukki Production's Raahel steel works in north-west Finland.

Tiihonen says that the master/follower set up is very important for process industries like steel and paper.

He explains: "In the steel industry you are moving melted iron to the production area, so in case of drive failure the cost is very high. You have to replace the drive very quickly, you can't wait for hours. We have the redundant solution of master/follower drives.

"For example, the master and follower are running with the hoist and when the master or follower fails there is a spare unit to replace it. If the master fails, we have control inputs to tell the follower that it is now the master and the failed drive that it has become the spare one."

CONNECTIVITY

By having the crane drives and programmable logic controllers connected, ABB drives make possible remote control and diagnostics. Ethernet-based modules are available for this purpose.

Tiihonen says that he is often able to remotely identify issues with a drive using his laptop, adding that ABB has a tool which allows real measurements to be done remotely.

"If the customer has a problem with our drive, they can create with one button a 'Help-file', which gives us all the information about the drive. They can send it to me via email, and I can see the parameters, monitor files, and other information.

"I can investigate and identify the source of the problem and email them back with the solution," he says.

Tiihonen adds that sometimes this process is done through Skype and sharing screens with the client.

In addition, the ACS880 drives include a memory unit for quick replacement or updating without the need of a PC.

"The whole software data is placed on the memory stick. It makes the life of the service people easier because in the case of an ABB drive failure, they can just remove the memory stick, replace the drive and place the old memory stick to the new drive," says Tiihonen.

LAB WORK

The facility of the ABB factory in Helsinki also hosts a customer drives test laboratory and an application laboratory.

The drives customer laboratory opened

earlier this year, enabling customers to have their own motors tested with ABB's variable speed drives (VSDs) to verify their impact on performance and energy consumption.

The decision to make the investment to create the new facility was based on ABB's successful experience with the customer application laboratory for crane and winch applications that opened in 2011.

This facility, also located at the drives factory in Helsinki, provides facilities for OEMs to test ABB's drive compatibility in cranes and winches in a simulated environment corresponding to actual application conditions.

"The laboratory has played a significant role in helping ABB to grow its business in this sector and it has recently been upgraded to increase its test capacity to cover a wider range of application areas," ABB said.

Tiihonen says that at the new customer application laboratory they can test important features of a crane like brake control. He adds that fieldbus testing can also be performed at the facility. "Let's say a customer has their own PLC and they would like to verify how we can manage to start the lifting operation or lowering operation. For example they may like to see is how long it would take to get this load moving."

"We can also test for safety features. We have our safety option modules so we can look into different situations. It is much easier to do it here in the lab than on the actual crane because the crane is always at the production line, so someone cannot spend days testing on a real crane."

ABB also provides training for maintenance and service staff of the company and clients. Tiihonen says that he has visited ABB offices globally to train ABB service people who work with cranes. The company also offers e-learning courses.

Tiihonen highlights that despite the fact that drives have a long life, they need regular maintenance. "Some customers think that with one commissioning they can run for the next 15 years without problem, but electrical drives need some maintenance." He says maintenance is very important especially in the process industry, where production downtime can cost a lot of money.

By offering customers flexible solutions based on a standardised technology, virtual testing, remote diagnostics, and training, ABB aims to help customers reduce development costs and end users to avoid downtime. ●



Master-follower arrangement and synchro control provided by ABB industrial drives, such as this one at an aluminium production facility in Belgium, ensure that the crane hooks operate in synchronisation, to avoid any slipping of the load.