



With nexofox, Dunkermotoren has its eye on digitalization

"Motor control and data collection are now very easy"

Digitalization promises added value for system operators and component manufacturers, especially in conjunction with the Industrial Internet of Things (IIoT). However, to offer services such as predictive maintenance, it should be easy to collect the data. This is not as easy as it sounds. However, Dunkermotoren GmbH from Bonndorf, a brand of AMETEK Advanced Motion Solutions, is exactly addressing this issue and now offers with its brand nexofox software solutions that make it very easy to implement drive control and data collection, as Markus Weishaar, Head of Systems & Services, explains in an interview with KEM Konstruktion.

Interview: Johannes Gillar and Michael Corban, Editor-in-Chief, KEM Konstruktion

KEM Konstruktion: Dunkermotoren bundles its range of solutions for smart motors under the brand nexofox - what is the objective behind?

Markus Weishaar (Dunkermotoren/nexofox): Digitalization starts now - our customers want to take off. Nexofox offers support for exactly this area, from motor configuration and programming to field IIoT communication to device cloud and smartphone apps with intelligent solutions and services. Our BLDC motors can be configured - even without programming knowledge -, programmed and monitored with the nexofox offering – directly from the desktop. In this way, the user can manage configurations, firmware and MotionCode very easily without having to be on site. Nevertheless, it is ensured that motors and systems receive the necessary attention, and that all information is available quickly and easily in case that the worst happen.

KEM Konstruktion: Does this make the manufacturer of electric motors interchangeable?





Weishaar: Not in the short term - the drives are still the decisive machine elements. Software and IIoT complement these, for example with remote functionalities and decentralized control topologies. In perspective, however, it is certainly true that the greater progress will be made particularly in this area. This was precisely the reason for us to combine our range of forward-looking software solutions under the brand nexofox and to create a holistic solution offering - covering everything from the use and networking of smart motors to the robot and automation systems of our subsidiary EGS Automation.

Digital services facilitate commissioning and operation

KEM Konstruktion: Can the nexofox portfolio also be used for drives from third-party manufacturers?

Weishaar: This is an option - our control electronics can certainly also control other motors. However, the initial goal is to make it easier for the users of our drives to use them - by making it very easy to implement IIoT functionalities via nexofox. With nexofox, we want to offer digital services for our motors and support customers in operating the motor as well as collecting available data and making it available in automated form in higher-level systems.

For example, a service technician can not only see live whether the engine is working properly, but the data made available can also be used to set up digital services. One of the most interesting topics here is certainly predictive maintenance, but with nexofox we are also laying the foundations for applications that go well beyond this. There are no limits to the variety of ideas that can be developed - but no one must worry about how to read the data digitally from the motor, because we can make them available in a standardized way. In this way, our electric motors can be integrated into digital tools and support targeted interaction with machines in the sense of Industry 4.0.





Control programming becomes easier - especially in distributed systems

KEM Konstruktion: With nexofox, you are targeting both control programming and aspects of the IIoT - does the IIoT topic dominate?

Weishaar: For us, both topics are equally important, and both belong together. In addition to the IIoT, we also see great short-term opportunities in control technology and the question of how "simple" drive control can be implemented, especially in distributed systems. However, great synergies can be tapped above all by combining both topics.

KEM Konstruktion: Can you give an example to make this tangible?

Weishaar: Yes – just think of smaller machines or devices, such as a strapping machine. These usually have 4 to 5 axes, which can already be completely programmed on our motors, each axis separately. This no longer requires a higher-level control system. However, you can still dial in via a laptop and diagnose the machine. All of this can also be easily transferred to AGVs, for example, or to machines and systems of limited complexity in general. With regard to the control architectures, we are completely variable - for example, everything can be programmed on the motor, so that the PLC can be omitted. Of course, it gets interesting with distributed systems according to IEC 61499, where the MotionCode runs distributed over several motors or where the edge is also part of the control - and can thus also map the process logic. The topic of safety is also covered - we can already do Safe Torque Off (STO) today, and in the future Safe Speed and others will be added.

If you then add the topic of IIoT and imagine a service case for an AGV, for example, it is sufficient for the service technician to scan the QR code on the drive and he receives all the information about the drive from the cloud on his mobile device. The scenario can then be extended as desired in the direction of predictive maintenance. Here, we are not primarily concerned about the electric motor, as our brushless motors are maintenance-free. However, each motor is part of a drive unit, and in many cases a gearbox and other mechanical





components are also involved. If a fault occurs in the entire unit, this can also be seen in the motor data - for example, if a wheel becomes more sluggish or even blocks completely. Of course, it's helpful to be able to recognize early on that a wheel is becoming more sluggish, so you can take corrective action before it fails.

Communication prefers open standards

KEM Konstruktion: Does nexofox use proprietary interfaces for communication or is the data made available in open formats?

Weishaar: Openness is our goal - on the control side, support CANopen as well as PROFINET, EtherCAT and Ethernet/IP for a long time already, which are used for communication between the motors. The MotionCode on the motors opens a door: Either it is given each motor its own program or commands are sent back and forth between them, where one can work as a master or all motors can also act as equal partners. Currently, CANopen or PROFINET are mostly used for communication in the direction of the higher-level process logic, but the other interfaces are also possible here.

In the IIoT area, we also fetch the data of our motors via CANopen and PROFINET, then read it out via a software adapter on the edge and make it available in MQTT format. Here we take care that everything is OI4-compliant according to the specifications of the Open Industry 4.0 Alliance and thus all integration options are open. The customer can then collect the information via the OI4 MQTT bus or we can add our cloud adapter on top to transfer everything to the cloud. Here, we also deliberately rely on the Asset Administration Shell (AAS) and thus, again, quite clearly on open standards. We are not the navel of the world - but our engines should be very easy to integrate into various ecosystems via the nexofox solutions.





Getting more out of sensor data

KEM Konstruktion: You mentioned that disturbances in the driveline - such as a sluggish wheel - also show up in the engine data. How much sensor technology does that ultimately require, and which ones do you use?

Weishaar: Specifically, we can record the phase currents as well as speeds, positions, position deviations or even the temperature. Likewise, the error registers can be read out. As you can see, there is already a range of data available. We are also in the process of carrying out tests with the recording of vibrations to be able to draw conclusions about the drive train by means of analytics. With an understanding of physics and mathematics - or machine learning, AI and data science - a lot of information can be extracted. Incidentally, this is also one of the reasons why we are very active in terms of openness in the direction of various ecosystems – whether it is MindSphere World, the IDTA, or the Open Industry 4.0 Alliance, which we joined at the end of 2019. Only if all participants in these ecosystems speak the same language and there is no need for complex integration can the opportunities of digitization be exploited. That's why cross-manufacturer collaboration in the sense of coopetition is also emerging.

KEM Konstruktion: Does this mean that the digital twin is also gaining in importance?

Weishaar: Yes, because it allows me to store the basic data of the drive as a digital twin in such a way that it can be retrieved and used for further tasks. Specifically, for example, information on the CO2 footprint, which then are included into the figures for the complete machine. This can then include values from the production of the drive as well as those from operation. Making such data available is becoming increasingly important.

Security is mandatory

KEM Konstruktion: How does nexofox deal with the issue of IT security?



Interview

of Dunkermotoren GmbH in May 2022



Weishaar: You can't offer software solutions today without taking IT security into account - IT security is mandatory for us. We already take this into account when developing our solutions and use common security mechanisms - for example, to detect anomalies. In addition, our edge software also offers appropriate access protection, and we are planning to be certified accordingly, for example in accordance with IEC 27001.

KEM Konstruktion: In parallel to the drives from Dunkermotoren, you are also expanding the nexofox range within the group regarding the robots and systems from EGS Automation - what are the next steps here?

Weishaar: Of course, we are gradually building up know-how that we can also apply to the EGS Automation portfolio. There will be an initial demo by end of the year, with which we will show that we can support digitization not only at the drive level, but also at the machine and plant level. In the end, however, it is always a question of the specific application, which is why we are currently investigating this together with the first EGS customers.

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