



The Sweet Spot of Industry 4.0

Real M2M Communication in Confectionery Manufacturing and Packaging

In the confectionery industry and beyond, everybody is talking about “line monitoring systems”. Previous practice has been complicated, however. Since no standardized M2M communication exists to this day, the integration of individual machines via higher-level systems takes a lot of work. The joint ChoConnect project demonstrates how this long-held dream can become reality thanks to the open OPC UA Industry 4.0 standard.

How it started
It all started when Winkler+Dünnebier asked Bosch Rexroth, their OEM partner of many years, about the general possibility of creating a standardized M2M interface during one of their regular visits. A short time afterwards, colleagues at LOESCH Verpackungstechnik wanted to know the same thing. Following further discussions, it soon emerged that there were even more mechanical engineering companies for subprocesses in confectionery manufacturing who were interested in a pilot project on real M2M communication. The idea of a standardized interface was born. In addition to WINKLER+DÜNNEBIER Süßwarenmaschinen, mechanical engineering companies LOESCH Verpackungstechnik, SOLLICH

and THEEGARTEN-PACTEC participated in the project. Bosch Rexroth assumed the role of coordinator and technology consultant.

Four mechanical engineering companies, one M2M interface

It is hard to believe: we mechanical engineers prefer to think about big issues such as “smart clouds” instead of ensuring in earnest that our machines can finally communicate properly with each other! However, once the individual system modules of a production line can simply “talk” to each other in a cross-platform and standardized manner, our customers will be able to respond to faults much faster and achieve a sustainable improvement in overall equipment effectiveness. We as the

suppliers will then benefit from reduced installation costs for each individual machine and will also be able to improve our competitive position compared to providers of complete lines.

ChoConnect: virtual production line at interpack

We intend to demonstrate this potential with the “ChoConnect” project, presented at the interpack trade fair. ChoConnect is a virtual production line for chocolate products consisting of individual machines exhibited by the aforementioned manufacturers at the trade fair. Serving as an example of future M2M projects, ChoConnect demonstrates, among other things, how the complete line can be centrally activated from standby and how its readiness can be visualized by means of standardized status diagnoses. With regard to automatic power adjustment, it can be seen how the speed of the line automatically adapts to the weakest link of the chain in each case, increasing overall availability and effectiveness.

Continuous communication at the shop floor level

As opposed to previous integration practice, which merely delivers rudimentary information, such as input and output signals, ChoConnect demonstrates a continuously transparent value stream. From preparation and molding to primary and secondary packaging, each individual machine directly forwards its machine status information. The system is not intended to replace MES systems, but rather is used for communication on the shop floor level. The groundbreaking aspect is that no existing mechanisms of control systems are copied or substituted for this purpose.



Specific application of OPC UA

In addition to the new functionalities and the resulting benefits for mechanical engineers, ChoConnect also demonstrates how simple and practical the implementation of the open I4.0 OPC UA standard for cross-platform M2M communication can be. Since OPC UA was developed for the secure, reliable and platform-independent exchange of information via the Internet and across firewalls, Winkler+Dünnebier considers it a good addition to the established standards packML and Weihenstephan Standard. Regarding its scope of communication, the ChoConnect project is based on WS Food.

ChoConnect holds considerable potential for the sector

Thanks to its cross-platform approach, we hope that the ChoConnect project is capable of initiating development across the entire sector, ultimately resulting in an official M2M standard for the confectionery industry. All parties involved could benefit from this, as the suppliers in the field of M2M have not taken advantage of the technological capabilities to the extent that other sectors with a higher cost pressure, such as the automotive industry, have done. This means that the supply potential by far exceeds current customer demand.

Faster commissioning, benefits in process technology

A standardized interface would mean that machines and systems could be commissioned faster in the future; coordination work would take many fewer days. Instead, all the manufacturers would have to do in a best-case M2M communication scenario would be to exchange XML files. Without having to shut down systems, the processes could be stabilized, the production modes could be smoothened and the entire line processes could be optimized. For example, the ChoConnect project already demonstrates how, in case of a lack of capacity, packaging units can curb the performance of the preparation module in case of a lack of capacity in order to prevent rejects. Vice versa, material preparation units can curb the performance of the packaging modules when pumps are operating at reduced performance due to a fault.

No multiple upward interfaces

A system which is integrated in this manner would no longer require the creation and implementation of multiple upward interfaces. It suffices that the higher level, e.g. the MES system, communicates with one of the line partners in order to start a new job. The contacted module distributes the new job across the entire line. When the material preparation unit changes over to “milk chocolate with nuts”, for example, it automatically notifies the operating staff that the packaging will have to be changed in an hour. In the more distant future, a completely



interactive line is conceivable, in which the product itself will control the system modules.

Service-oriented architecture with Weihenstephan Standard

The hardware of the current ChoConnect showcase consists of a cluster of embedded Ethernet controllers and industrial PCs of the individual machines. Bosch Rexroth controllers, which have already implemented the OPC UA client, are particularly well-suited as additional interfaces. Together with the associated OPC UA server, they form the service-oriented client-server architecture used by ChoConnect. Thanks to user and application authentication, message signing and embedded encryption mechanisms, OPC UA permits secure communication across different domains. Maximum availability and reliability of communication of the open standard via configurable timeouts, redundancy features and automatic mechanisms for error detection and troubleshooting, also provide optimal conditions for use in the project.



A pioneering effort in combination with WS?

For 20 years, all actors in the sector have demanded standardized technology across all control levels. Unfortunately, this desire did not become reality with the introduction of Ethernet-based controls. OPC UA as a communication protocol in combination with the Weihenstephan Standard now offers a good, new opportunity for standardization. Thanks to the active support provided by Bosch Rexroth, we can blaze the trail in this direction. Without their technical consulting, interface experience and interest in coordination, this would not have been possible for us alone as machine suppliers. Bosch Rexroth has detailed knowledge of the industry and of OPC UA and can jointly outline and implement a solution.

In addition, Bosch Rexroth solutions use the Sercos automation bus. This real-time technology tried and tested a million times, the universal application possibilities and high security of investments make the Ethernet system the first choice in mechanical engineering and construction. Sercos has established itself as the de facto standard in all large automation markets when dealing with challenging applications that place great demands on dynamics and precision.