Data - the basis of digitalization (Part 1)

Everyone is talking about digitalization, and yet there is no universal definition of the fourth industrial revolution. Of course, there is no question that data and networking between machines, the mapping of the real in virtual worlds (so-called cyber-physical systems) will lead to new business models and services that will rapidly change the status quo. But how can owner/operators – from small to very large plants – participate in this? More importantly, what do they gain from digitalization?

A comparison of plant owners' top goals from 30 years ago (in the middle of the third, microelectronic industrial revolution) to today would yield fairly constant results: productivity, cost efficiency and plant availability.

But new additions to these goals made possible by new technology in this fourth industrial revolution include flexibility, networking, transparency, and support in using artificial intelligence.
This duality is clearly reflected in current recommendations, e.g., from NAMUR, the interest group for automation technology in the process industry. The NE 175 „NAMUR Open Architecture - NOA Concept", for example, describes how the data of smart field devices can be transferred to a monitoring and optimization domain without repercussions, while retaining the generally accepted advantages of traditional automation structures and enabling new use cases there.
In addition, there are countless areas in the digitized automation world where data plays a fundamental role. Three general developments of this role - the "triple jump" of digitalization, so to speak - include:

» the generation of increasingly comprehensive data in the field thanks to smart field devices,

» the transmission of data at ever-lower margin costs,

» the use of data in networked systems, both in the field (edge) and in the cloud, in such a way that they contribute to value creation.

Let's take a more detailed look at these three areas of development below.

First: smart field devices

Intelligent Sitrans field devices or even actuators such as the Sipart PS2 positioner from Siemens process data digitally and not only record (analog) process values in ever better quality, but also generate additional vital data, e.g. service, quality and production-relevant information about themselves and their direct environment. For example, by transmitting data such as the quality of echo signals in radar-based level measurements or the wear of valves, they create a significant plus in transparency and traceability.

It's therefore difficult to understand why this data still remains unused in many places in the field. Intelligent, often platform-based field devices are flexible in terms of the desired form of communication. For a cost-effective entry into the digitalization of automated plants, the widely used 4-20 mA devices without any communication can be replaced by those with an additional HART protocol.

Existing industry standards such as Profibus also provide easy access to vital data. However, digitalization will then receive an enormous boost with new standards such as Profinet or Ethernet Advanced Physical Layer (Ethernet APL), as these will increase the transmission bandwidth many times over.

But there are other developments as well: today's and future generations of devices use wireless connections (including Bluetooth) for safe parameterization and monitoring from a distance. All that's needed for this is a commercially available mobile device (e.g. smartphone) and the download of a corresponding app.

What does this mean for field devices? If control buttons and large displays are eliminated, they can be manufactured much more cheaply. As well, the device operator gains enormous increases in convenience and safety: maintenance technicians no longer have to work on the physical device itself - i.e., climbing onto a tank or crawling into tight spaces - but can conveniently connect to the device from a short distance.

In addition to significantly more efficient commissioning and maintenance, this also has particular advantages for the safety of maintenance personnel, who are now no longer exposed to the risks of scaffolding or shafts. This technology is already standard in some Siemens devices, such as those in the Sitrans LR1xx radar level line, and will soon be available as an option for the Sipart PS100 positioner or the Sitrans Probe LU240 ultrasonic level transmitter.

Second: transmission of data at steadily decreasing marginal costs

Let's move on to the second development phenomenon of digitalization that makes Industry 4.0 possible: the permanent decline in costs. Today, it is possible to transport and store data at marginal costs and in such a way that the main task of automation - safe plant operation – isn't impaired in any way.

In modern process plants with control technology from Siemens, this functionality is already integrated today. The Simatic PDM Maintenance Station can be used to efficiently monitor the status of intelligent field devices. Existing plants can also be retrofitted with the system, regardless of the automation and control systems used. Even in plants without any communication infrastructure, access to vital data can be opened for individual plant components: the Sitrans CloudConnect 240 industrial gateway, for example, can integrate up to 64 HART devices and convert and pass on their data in a harmonized data model based on NOA.

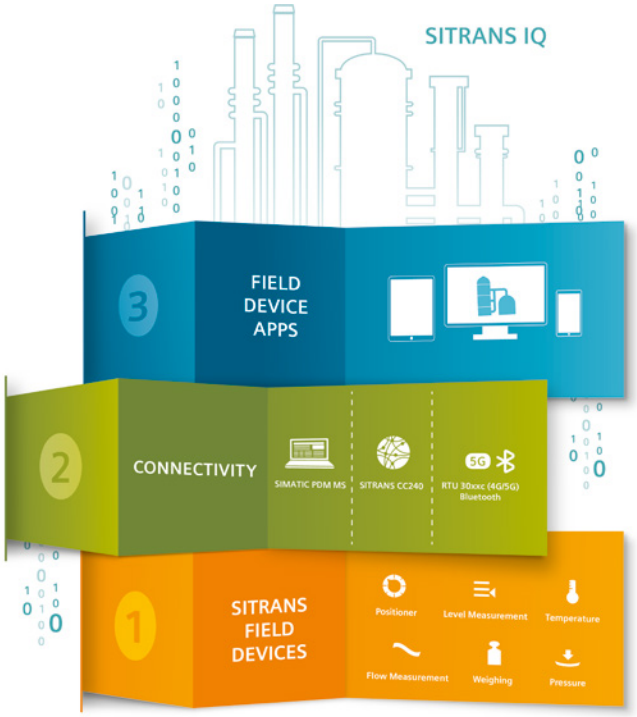

Figure 1: Digialization of the process industry opens up added value at all levels.

However, one important aspect needs to be highlighted here: more data does not automatically mean more knowledge. And to be able to use data, it is important to select the ‚right' data as early as possible and, ideally, to actually transport only this data.

In addition, data today differs from instrument to instrument and from manufacturer to manufacturer. In order to be able to use them sensibly despite this, standardization is required, e.g., on the basis of the NOA Information Model (NOA-IM) based on OPC UA or PA-DIM (Process Automation - Device Information Model), an object model in which all devices are to be mapped in the future.

Measuring points that are still isolated today (like a silo filling level, the flow rate in an irrigation system, or measuring points in general that were previously read manually), can be accessed and networked securely and cost effectively with the help of connectivity elements (Simatic RTU 3041c or retrofittable mobile modules) with the cloud or an „on premises" solution such as Sitrans Serve IQ.

Third: the use of data

DThis brings us to the last step in our triple jump: after generating data and making it available in a standardized way, we generate added value from it. As shown, diagnostic data is provided in addition to process values. With the vital values of hundreds of devices, which do not have to be read individually on site, users can set up completely new strategies in maintenance and servicing.

Even in plants that do not have their own maintenance crews or operators on site, plant availability can be increased in

this way. This requires systems that aggregate and analyze this data and relate it to parameters, tools that provide algorithms, visualize information in a user-specific way, and so on. Siemens provides a growing number of apps for harnessing data, which are developed jointly with co-creation partners. The possibilities are manifold, and in this respect, we will learn many entirely new ways of making use of data in the coming years, such as using modern methods like machine learning.

Conclusion and outlook

Process sensor technology and instrumentation play a central role in digitalization efforts. Data generated in the field by intelligent field devices, collected consistently by connectivity elements and passed on in a standardized manner, and then processed and visualized in an integrated manner via apps in an IoT ecosystem, can become the new oil of the 21st century.

Processed and systematized appropriately, data will contribute to greater productivity, improved product quality, higher plant availability and more efficient maintenance strategies. Agile development environments in which operators, users, IT and OT specialists work together on solutions will open potential in the future and enable new business models.

And as a reliable digitalization partner offering automation, communication, field instrumentation and services from a single source, Siemens is in the business of breaking new ground with its customers.

In part 2 of our series, you will find out in the next issue what potential you can leverage with the help of cloud-based applications and apps in the acquisition and evaluation of measurement data.

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