How the plant twin not only preserves values, but creates new ones

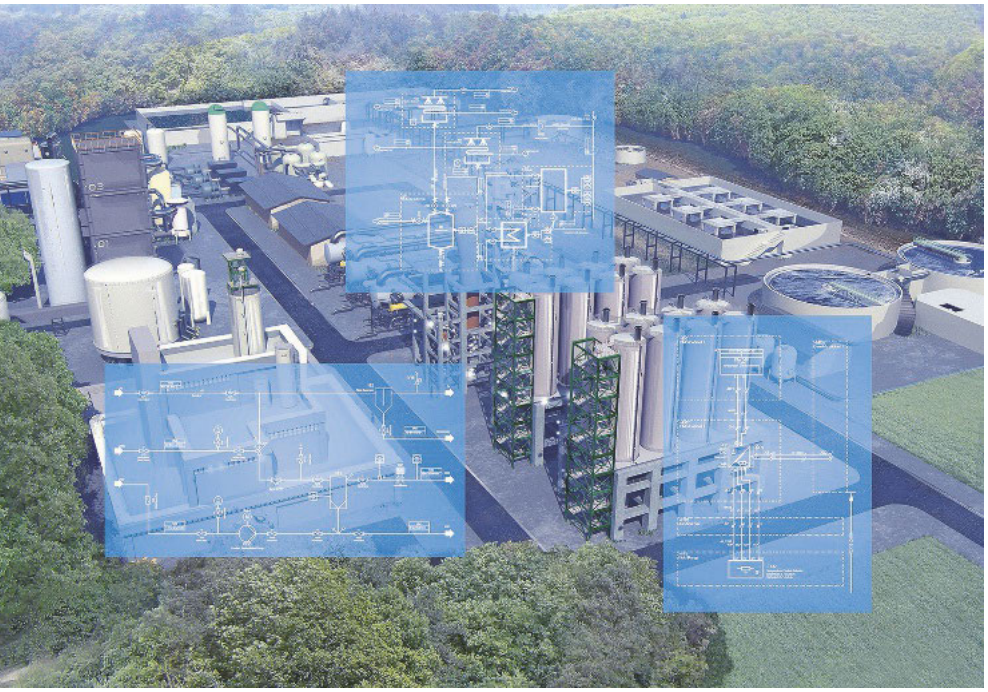
Digital twin: adding more value

In plant engineering, millions of data are generated, changed, updated and documented through the years. This costs a lot of money, time and know-how. And then what? The plant is delivered and in operation, but the documentation lies dormant in various files or even cardboard folders. With every repair or plant optimisation that is not added, the plant loses more of its value. Yet up-to-date plant data opens up a wealth of opportunities for value creation.

For Reinhard Knapp, Head of Global Strategies at the software provider Aucotec, the most important prerequisite for being able to use these opportunities is the principle of data instead of documents. This requires a single source of truth (SSoT), in which all data from basic, process and detail engineering to the control system configuration are united in a versatile model – this is the only way that documentation can become a comprehensive digital twin. "It not only maps the entire plant reality with all logics and associations across all disciplines, but can also grow consistently in the lifecycle of the plant with all its physical changes," says Knapp. Every entry, which includes every change, is immediately visible to all those involved, without manual transfer or interfaces. "A digital twin that is only a static snapshot would do as little justice to the value of the data as keeping it in discipline-oriented containers," he points out.

Half the reality – twice the work

Still widespread are chains of special tools that can give a discipline-specific representation e. g. only P&IDs with containers, pipes and flanges or only the electrical model including wiring. A tank with a sensor and pump, but without an associated loop and without the knowledge from and up to what value the pump should operate, only shows half the reality. And it takes twice as much work to plan it as it does to operate it, because in a tool chain, each compartment system must be fed individually, even with the inevitable changes. Interrelationships are not recognisable, not to mention consistent data navigation. The maintenance staff must later gather the relevant information from several sources. Tool chains are also the reason why the inevitable plant changes, for example due to repairs, often do not reach the documentation at all or only inadequately. Consistent updating in various special tools is very time-consuming and error-prone. If only paper documentation or dead PDFs are available, and these are already overloaded with the red entries of previous changes, the current status can be hard to discern. This is particularly fatal in the event of an incident, but also when a conversion is pending or a new operating licence is due after a shutdown phase.



Pictures: Aucotec

From the FEED phase and P&IDs to detail engineering and automation, the digital twin grows together in EB's central data model

Unity in the data model

For this reason Aucotec has developed a cooperation platform that with its versatile data model combines all core engineering disciplines in one SSoT. Each item exists only once in the Engineering Base (EB) library and each discipline can specify it from its perspective at any time. At the same

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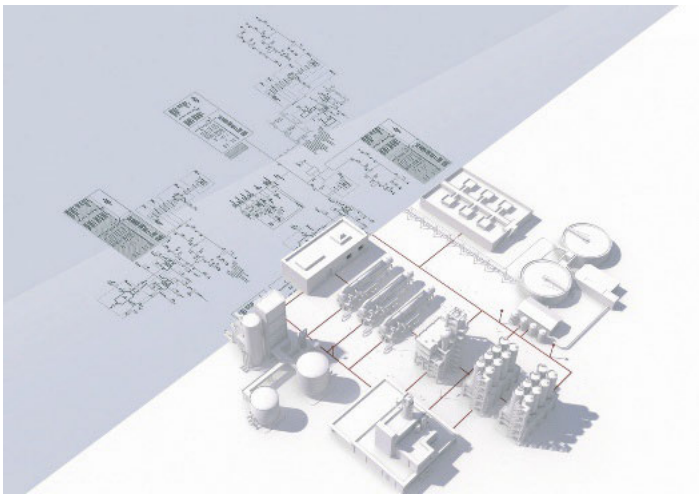

A digital twin that is only a static snapshot does not do justice to the value of the data

time, everyone sees what the other disciplines have already worked on and builds directly on it. Whether it's the drive, flow stream or wiring: the platform automatically shows all the consequences of changes because it knows the interrelationships. "In this way, the digital twin with all its aspects from the FEED phase to commissioning grows consistently into a single unit that continuously reveals the enormous treasure trove of plant knowledge," explains Knapp.

Twin instead of older sister

This unity in EB's data model also makes it considerably easier to keep the as-built documentation alive and up-to-date as a digital twin. Technicians can use EB Mobile View, a web service-based app, to pull all the relevant data for each area of the plant onto a mobile device in an instant instead of having to painstakingly search for it. In addition, the app allows change information to be entered directly on the objects via redlining and fed back to engineering, "so that the twin does not become the older sister of the plant with only a sorry resemblance, but earns its name," emphasises the Aucotec strategist. If OPC UA-capable devices are installed in the plant, they can even communicate directly with EB and thus report their existence or modification to the digital twin. This means that the service is always up to date. And a team does not have to scan the actual state of the plant and then add it before any conversions.

To ensure that this procedure is also open to operators of older plants with corresponding documentation, Aucotec has developed a migration concept for EB that checks existing data during its transfer, in some cases supplements or merges it and thus raises it to a digital twin level. An Aucotec customer once put the value of the existing data for a chemical plant at around five million euros. Preserving it was an important reason to switch to EB.

From data model to business model

But it is not only unnecessary to accept the loss of value of documentation, but also not to use the added value that up-to-date, easily accessible and usable existing data offers. With the data model in EB, manufacturers can become full-service providers, for example. Who knows a product better than its producer? And where, if not in the system with which a plant was developed, is the data on this most precise and comprehensive? A compressor manufacturer, for example, no longer sells the system, but the compressed air. It operates the sub-system itself; its know-how, manifested in the data model, is a guarantee for quality and reliability. The burden on the overall plant operator is significantly relieved and it is more likely to continue to rely on this supplier in the future.

Aucotec's developers have also equipped EB with web service technology that allows the system to be supplemented with browser-based front-end products for individual special tasks, i. e. apps that open up possibilities for further business models. This is where the SSoT, the central data model, comes into play again, making the objects directly usable, including for analyses and AI use. In this way, maintenance processes can be supported via the app or actual conditions in the plant can be recorded and optimisation solutions for the operator can be developed from this. Monitoring for specific target groups is also possible or the support of predictive maintenance. EB is able to do this because the system also manages abstract objects, so-called interpretations, which do not even appear in conventional documents. For example, measurement types for the functional description of a sensor. This enables a predictive maintenance system to automatically interpret condition data from the running plant correctly. With tens of thousands of signals, this is an enormous time-saver.

"As long as the digital twin remains a living image, growing with ‚its' plant, a lot of added value can be derived from it, instead of the value being exhausted in the documentation," concludes Reinhard Knapp.

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