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The planning of oil and gas plants becomes much easier und safer with Aucotec's platform Engineering Base (EB)

Versatile data model for individual requirements

Cooperative engineering for EPCs and operators

Whether EPCs, operators or a mixture of both – Aucotec has been able to acquire new customers from all areas thanks to the extraordinary consistency of its platform Engineering Base (EB). The bandwidth extends from basic engineering with FEED integration to in-plant conversion support. Yet no matter how different the user groups in the oil and gas industry, EB's versatility allows all of them to be satisfied in an individual way.

The oil and gas industry is characterised by a wide variety of highly complex plants. However, the drilling rigs, refineries and plants for petrochemical end products have one thing in common: the highest requirements apply in terms of reliability and safety. Engineering experts and operators must accordingly be confident that their engineering systems offer maximum reliability and data quality – for the entire design process as well as throughout the plant's service life. In view of the multiple disciplines and subcontractors which tend to be involved in the design and documentation of oil and gas plants, therefore, the software's collaboration capability must be highly developed. After all, reliable data shortens the planning phase.

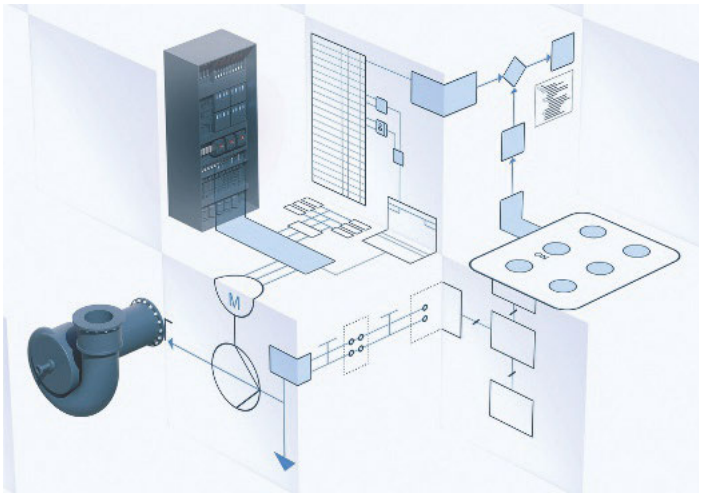
System developer Aucotec has faced up to these challenges: its platform Engineering Base (EB) solves them with a versatile data model whose range, collaboration capability and consistency are unique today. EB was first presented at Achema 2018 and covers all core disciplines of plant design in an object-oriented manner – from basic engineering, including simulation integration, via the entire process and detailed engineering to commissioning with consistent cause & effect tables at the touch of a button.

This is achieved without manual data transfer, interfaces or synchronisation, even when cooperation takes place across several sites. The related elimination of errors and the optimised data quality have benefits for both designers and operators – and hence also for a third category acting as an engineering, procurement and construction (EPC) provider and operator in one. At the same time, there are individual requirements.

EPCs: Optimal operating mode

For EPCs, true consistency also means support for the FEED phase, in which the optimal operating mode of a plant is developed. Simulations „act out" different operation scenarios, and the results previously had to be entered into the engineering system manually. It was also expensive and complicated to test other variables in addition to pressure, temperature and recipe.

EB supports FEED by providing clear documentation and automated comparisons of scenarios, irrespective of whether they are created in EB or in a simulation tool. The central data model supports simulations of any engineering discipline. "An EPC from Norway, which is currently designing one of the largest offshore oil drilling projects in Europe with EB, is working with a specially developed tool that simulates the entire plant dynamics, including the control and electrical logic", says Dr. Pouria Bigvand, Aucotec's Head of Product Management. "But it was only when they discovered EB, as a single source of truth for all core disciplines, that they found a system which integrates the results automatically. If process and detailed planning are performed in different tools, this is impossible."



Picture: Aucotec

Model based plant engineering: central object storage allows design and maintenance across different disciplines

Picture: Aucotec

Dr. Pouria Bigvand, Head of Product Management at Aucotec

Who talks to whom and when?

Another issue with EPCs is the complex communication with, and between, the various disciplines and contractors as well as the dialogue with the operator. This issue is likewise solved by Aucotec's cooperative platform and its versatile data model, which enables parallel work on the same project anywhere in the world using a web service or cloud. Special change and version management functions ensure that all changes are traceable. Everyone involved immediately sees when something has been changed somewhere in the model, regardless of the view of the changed object, and can continue developing it directly.

"That was crucial for the oil rig experts. EB minimises the usual interfaces and time-consuming coordination across different disciplines, which is often further complicated by the cultural differences between subcontractors spread around the world", Bigvand continues.

The user also identified another aspect as an advantage. Irrespective of the automation system a client is seeking, EB's DCS portal enables the software modules of each control system to be automatically "fed" and configured with engineering data. This flexibility saves weeks of manual work.

Up-to-dateness is almost everything

Because of the long service life of oil and gas plants their diagrams are often outdated. However, operators need the latest "as-built" documentation level to obtain an operating permit. They also have to have it instantly available in the event of a malfunction in order to take appropriate action without delay. The same applies to efficient operation, maintenance, modifications and downtime. The proverb "time is money" is particularly true here. A crude oil cracker which is down for just one day can mean around one million euros in lost profit. Downtime must frequently be scheduled over a year in advance. This is why efficient communication is no less important for operators. "No-one should have to wait for information from colleagues, other disciplines or suppliers", Bigvand adds. EB manages cooperation and provides an app giving users an overview of the status of all project tasks, even if they have been outsourced.

EB ensures that maintenance work is always carried out on time and that it is up-to-date. Service experts can access the diagrams directly online on-site using a tablet. They use redlining, comments and photos to make their changes available to the engineers, who can then immediately include whatever is necessary in the new as-built documentation.

The twin's belly

Unfortunately, many operators are still struggling with old documentation. Digitalisation – that much-cited buzzword – is the only remedy here. "Digital, data-driven services will more than triple their market share by 2025", claimed a study by the German Engineering Federation (VDMA) and consulting firm PwC in May. This presupposes suitable data: PDFs and other "dead" formats are of no use, even if they are digital documents in a folder system. Just as a GPS cannot do anything with a PDF city map, a truly digital system needs an object-oriented model to be able to "touch" and use each individual item of information. "Interdisciplinary data must be available because a digital P&ID without any loops or other details does not constitute a digital twin, but merely represents its 'belly'", Bigvand explains. It was for this reason that Aucotec developed an intelligent migration solution for legacy data. When importing, EB summarises all object information from different disciplines in one object model. In doing so, the system compares the data with the allocation lists in the control system, which always reflects the current status of an operational plant, and shows the delta. All combined objects, from the pump in the P&ID to the terminals in the cabinet, then form the typical, comprehensive EB plant model with all logic links.

More than 80,000 loops were automatically created in this way from three crackers and around 25,000 circuit diagrams intelligently adopted and revised for a German petrochemical operator. Frank Seemann, Managing Director of service provider Ipro, which has migrated about 20,000 loops and 1000 P&IDs for a global chemical company, comments: "EB was able to clean and supplement many data records. In other words, the data had a higher quality after the conversion than before it."

Do it yourself

Finally, assuming the operator stores the complete digital twin in the data model, "do it yourself" applies to more than just maintenance changes. A Scandinavian oil rig owner, for example, also operates small unmanned rigs that are 95% identical. EB can easily copy those 95% and let the owner engineer the remaining 5% himself. Using individual tools for each discipline, it would firstly not be possible to map the entire plant configuration and secondly, it would be very complicated to add data to different disciplines. What's more, each tool would also need its own experts.

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