Infopaper

AUCOTEC

Issue 2 | 2021

Much more than the sum of its parts

Engineering consolidation creates automatic consistency

Households, businesses, supposedly even marriages can be consolidated. But engineering? It not only can, but should be consolidated. Especially if, like energy, procurement and construction contractors (EPC), you have to deal with a wide range of tools, standards and suppliers. Consolidation means "bringing together several parts to form something whole" or put simply: unifying. And, just as an artistic mosaic is created from different colours, materials and shapes cut to fit, bringing together the core and complementary disciplines in engineering results in an exceptionally comprehensive picture of the plant, with data consistency without any effort at all.

Consolidating input

Right from the start, EPCs juggle with diverse, different sources of information of highly varying quality: XLS files, PDFs and DOCs with default, capacity or documentation specifications and much more and these are collected in folders, document management systems or similar. But this way the information is only archived, it usually does not fit together, nor can it be used further directly. The diversity cannot be changed, but the usability of the data can. They can all flow directly into the Engineering Base (EB) cooperation platform. Ambient pressure data, templates, designation lists, functional structures – all this can be set up as an object in EB without having to create a single document. In this way, users consolidate the diverse input, and the original documents no longer need to be consulted.

Effortless consistency

As an authoring system, EB consolidates all inputs virtually by itself. As the platform is THE single source of truth (SSoT) for all parties involved – from the initial concept to process design, detail engineering and automation support – EB cannot do otherwise. For example, if PFDs and P&IDs are developed in different tools, they are never based on the same data, even if the tools come from the same manufacturer. EB, in contrast, saves active consolidation "by its very nature". All further entries automatically follow the structure once created and everyone sees the results of the other disciplines, without waiting times and transmission errors. In this way, "effortless consistency", EB's very special plus for EPCs, is created almost incidentally.

Automated consolidation

EB's consolidation principle also applies to the numerous complementary systems, such as 3D, RP and control systems or simulation tools (see page 2). Since different chemical processes are simulated with sometimes very specialized tools, EPCs must also be able to handle this diversity. For large plants, certain sections are also simulated module by module. And different simulation configurations result in a correspondingly large number of scenarios that need to be compared. So there is plenty to consolidate. But transferring data "manually"? Putting tables next to each other and sifting through them? With EB, all that is history. The system takes over simulation and calculation results automatically and flags up the differences, nothing is overlooked. Modular simulations, for example, are consolidated into continuous flowstreams. And the finally selected scenario is already in EB for seamless further processing by the engineering specialists. Changes are seen immediately by everyone involved. All integrations and comparisons take place in EB's data model, which thus has central access to the entire plant knowledge, including the

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Editorial

Engineering outside the box

Dear Readers,

Our Infopaper always highlights from different angles how the engineering of plants can be made significantly more efficient. This time the focus is on solutions for energy, procurement and construction contractors (EPC), because the global competitive and price pressure on plant manufacturers continues to grow: they have to react promptly to dynamically changing social and political conditions and implement new technologies quickly. Plants are becoming increasingly complex and need to be planned, offered and built in an even shorter time. Different disciplines such as process engineering and automation no longer work sequentially, but in parallel. This makes, for example, consolidating the many unavoidable changes in the planning process even more challenging. In addition, the teams and subcontractors involved are increasingly globally distributed and need to be coordinated.

This issue describes how Engineering Base supports all this, also with concrete examples. But beyond the actual engineering, EB's complete digital data model also represents immense value for plant operators. The interview with process performance expert Dr Stefan Krämer makes it clear that this central data availability is a basic prerequisite for efficient optimizations, even in plant operation. "Pushing the boundaries" from page 3 is not just a heading; it is EB's programme not only to think outside the box, but to provide concrete support.

Uwe Vogt
Management Board

AUCOTEC will be there!

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4 - 8 April 2022

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relevant external data. Thus, the extraordinarily comprehensive digital twin in EB always consistently reflects the current status of plant planning.

Neutral data hub

No matter how many simulation tools, phases and scenarios, how many calculations, which 3D, ERP or control systems are in use, EB "can communicate with them all", also thanks to the standardized EBML communication interface. And the platform passes on the consolidated information in a comprehensible way for each linked system. For example, EB combines different terms for the same object into one name or converts different units of measurement from various tools into neutral ones. Users do not need to know how other systems "tick", EB ensures consistency.

Data from the many suppliers EPCs have to deal with also needs to be integrated and consolidated. But the suppliers need a specific brief beforehand. For example, if an EPC wants to send a hardware request to different manufacturers, they pull all the relevant specifications from EB's central model into a smart data sheet. Suppliers complete it according to their capabilities and the changes are immediately identifiable from the automated revision of the datasheets. With a document management system, the sheets would only be "filed" as documents, but the data itself ends up in EB – directly usable.

EB also passes on its neutral data to other systems, for example for calculations or control system (DCS) configuration. In addition, the platform can output signal assignment lists or "feed" a predictive maintenance system with the information that enables it to correctly interpret the signals from the running plant. AUCOTEC is currently implementing a further consolidation stage: project data from various suppliers can be automatically merged even if they use EB with different specific adaptations.

Consolidation therefore has many aspects, but always one result: an enormous gain in consistency and time through numerous synergies - with EB it's a piece of cake!

Opening doors to more efficiency

Standard portals for data consolidation

While engineers elsewhere still have to check Excel tables row by row for errors, lay graphics from different tools next to each other or transfer the umpteenth simulation manually, EB users are well ahead of them.

The data consolidation with supplementary systems described on page 1 takes place with EB via standardized interfaces – we call them EB portals. They open up new possibilities for cooperation in the planning, construction and operation of plants and create a previously unknown level of consistency, especially for EPC contractors - with almost no effort. This is how consolidation works today!

Process scenario management at its best

The initial phase of plant development (FEED) occupies a special position in terms of possible efficiency gains. This is because the simulation work increases with the number of conceivable system scenarios. Thanks to EB's interfaces to Aspen, Pro II, XLS and similar tools, many scenarios can be documented and automatically compared in a very short time; the time-consuming and error-prone manual transfer of simulation data to the engineering tool is no longer necessary. In addition, the tender for the selected scenario can be prepared in no time at all, and the engineering department already has all the necessary basic data for the next planning stage. In addition to the certainty of building the ideal plant at the right price, the focus is on the enormous time saving in the FEED phase.

Integration of ERP and PLM data

From product to process innovation via the control of company resources, solutions for Enterprise Resource Planning (ERP) and Product Lifecycle Management (PLM) are now important efficiency levers in contemporary digitalized companies. AUCOTEC's platform for the integration of both system types connects the engineering experts with these central data pots of a company – with perfect data consistency in real time without any user interaction. In practice, the bidirectional connection to EB benefits the management of material master data as well as BOMs and document management or project administration.

DCS - controlled programming

The programming of control systems of complex industrial plants also benefits from consistent plant models. The control logics are usually created at the end of the engineering process under high time pressure – which is exacerbated when recurring manual cross-checks and data transfers have to compensate for the lack of a common data source. Via EB's DCS portal, the programming of the most diverse automation systems such as PCS 7 or 800xA receives all design changes live, automatically, error-free and chronologically traceable.

3D - a picture of a data model

Mechanics, layout, piping, civil engineering – 3D plant designers use a variety of discipline and trade-specific tools. They also take into account information from two-dimensional planning – just as 2D planners rely on details from the 3D design. Here EB's XML-based 3D portal creates a bidirectional bridge to all common 3D tools. The XML structure always remains the same – and all information merges in EB's central data model. An important plus: this can be done completely automatically 24/7 via web service (DaaS), without the intervention of a client. It's as easy as that only with EB!

There is so much more in EB

Moving faster with Smart Diagrams and Asset 360

An all-round overview of all your devices, subsystems and other assets and, on top of that, intelligent diagrams and drawings with direct reference to the overall system – do you think that's not possible? AUCOTEC offers exactly that with the new highlights of the Engineering Base (EB) cooperation platform: Asset 360 and Smart Diagrams.

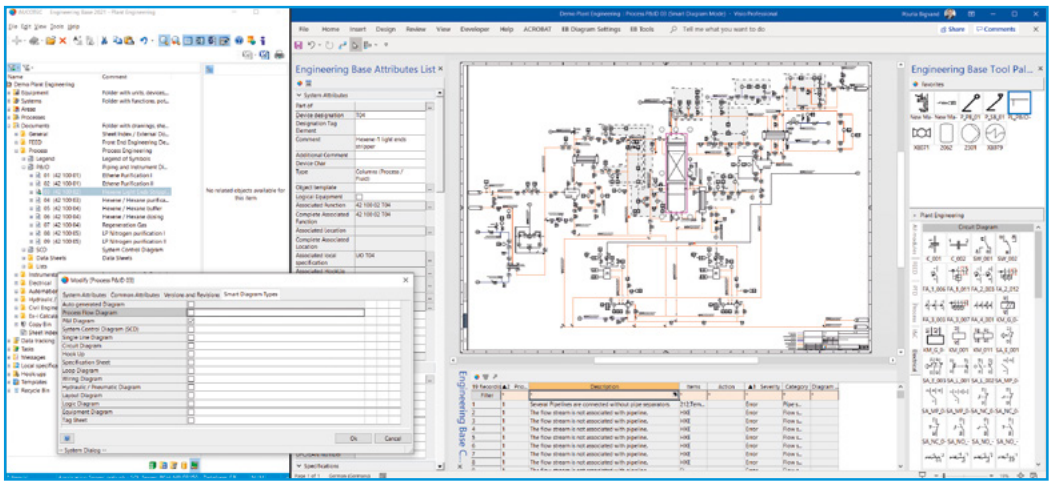
It ticks all the boxes

Whether for P&IDs, circuit diagrams or single-line diagrams – pure drawing programmes have one very big disadvantage: the drawings in themselves are stupid – they are mostly just lines on a white sheet, with no reference to the objects they represent. In EB it is different – in the object-based platform even "normal" drawings are intelligent, because there is a lot of data and information behind the objects. And the Smart Diagrams are even smarter. With just one tick, the designers can select their discipline in an upstream checkbox, for example "P&ID". The necessary intelligent functions are immediately available – users can then find device templates, modules and components directly in a suitable tool palette, which they can also optimize individually with their most frequently used symbols, for example.

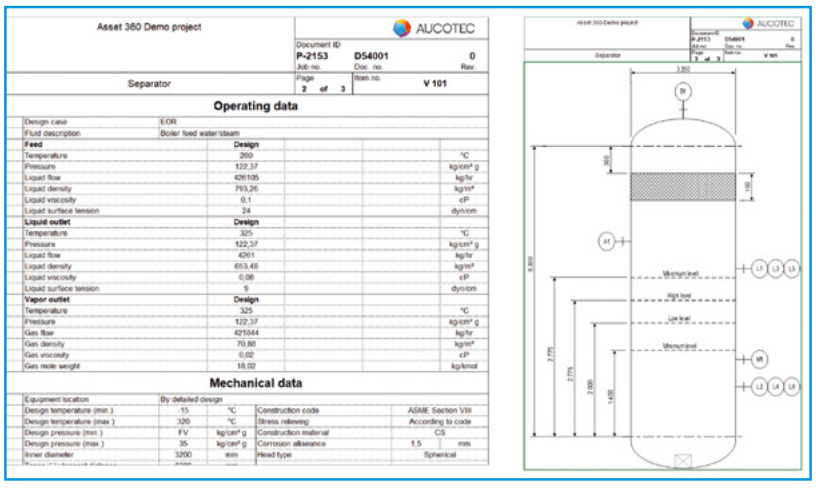
In addition, the Smart Diagrams enable a rule-based design. They report immediately if the data model presented does not comply with the previously defined rules and logics. In addition, the P&ID can be frozen. It is then protected against changes and accidental deletion. Nevertheless, new devices, e.g. instrumentation, can be added by other areas, and continuous cooperation remains assured. And not only in P&IDs, but also in other Smart Diagrams such as logic diagrams.

Automatic overview

In order not to lose track of the many devices, subsystems and other assets in EB's extraordinary cooperation capability and to facilitate communication, especially with external parties, the individually configurable "Asset 360" datasheets were developed. All the accessories, connectors, flow media, values, operating modes and substructures – one click is all it takes for EB to enter all this information independently, including that about the asset, of course. And always in the right place, no matter how the layout is configured. Since EB combines all data from the core disciplines of engineering, but also from external systems, together with the associated links and logics in its central data model, the Asset 360 datasheets can simply draw all the information they need from this single source of truth. The benefits of EB are obvious – with these highlights, users not only save an enormous amount of time, but also resources and errors.



> Smart Diagrams instantly gives you the right tool palette and matching attributes.



> Click to view 360-degree panorama of all assets – including accessories and subsystems

Images: AUCOTEC

Image: Alex from the Rock/ stock.adobe.com

Pushing the boundaries

Seamless and cross-disciplinary working

Engineering Base (EB) has been successful on the market for more than fifteen years. Numerous companies from very different industries with a wide range of requirements use EB today – from SAIPEM to Voith and Haldor Topsoe.

Growing together

Together with customers and partners, EB is constantly being further developed. In working groups and on technology days, customers can clearly formulate their requirements and fine-tune things for new versions. For example, in the EB-EVU working group. "Employees from different companies and with different views work together to develop ideas and solutions for complex requirements. This body of experts, which is so valuable because of its diversity, makes decisions for global specifications. They enable the consistency of projects across company boundaries," says Andrea Hoch, Project Manager Engineering Base at Siemens Energy and a member since 2015. AUCOTEC has been working with plant manufacturers, engineering service providers and plant operators for more than three decades – all this experience is incorporated in EB.

Flexible and modular

One thing appears again and again: the cooperation between plant manufacturers and operators is a challenge. While some like to work in a modular way, it is important to others that everything functions to in-house standards. Both are possible with EB. The modular design as well as the integration of EB into existing systems – such as at Voith. "Engineering Base enables communication with other systems used at Voith, such as the ERP, and can map our modular product portfolio well. This way, Engineering Base provides us with continuous support from the initial quotation through the project itself to service," reports Dr Reiner Schneider, Senior Expert Product Improvement & Engineering Excellence.

All in one place

Everything comes together when it reaches the operators. They need a reliable basis for documentation – this is where the data model as a digital twin is particularly valuable: all conversions and maintenance work can be traced in the twin – across all disciplines. "The cross-disciplinary principle of EB enables synergies in the areas of data transmission, interfaces and IT input. It also ensures that we avoid mistakes when working with suppliers," says Dr Robert Schleich, Head of Engineering at Infraserv Höchst, a leading site developer and expert in chemical-related services.

From A to Z

Whether in-house engineering or not – EB is made for a wide range of operator profiles. For example, for Holcim, one of the world's largest manufacturers of building materials. There, EB is used in process engineering and process automation. The offshore EPC SAIPEM is also reinforcing its engineering with EB from FEED to Process, Electrical and finally Instrumentation. EB also serves as the source and management system of their engineering catalogue. They all have one thing in common: more and more projects with more complex requirements. The degree of automation is growing, implementation times are becoming shorter. In addition, there is a growing skills shortage in Europe – resources are limited. Modular working and international cooperation are becoming increasingly important.

This is also the case at the Danish plant manufacturer and electrolysis and catalyst expert Haldor Topsoe. "The introduction of this system is a crucial milestone in our digital transformation," explains CIO Niels Keller-Larsen. "With EB our work is finally truly data-driven, across all engineering phases and disciplines on one data model!" A data model to overcome boundaries – globally, between tools *and* companies!

"The most important and simplest thing is a single point of truth"

Dr Stefan Krämer on process optimization of plants and how engineering can provide support

Image: Krämer

> Dr Stefan Krämer

Chemical engineer Stefan Krämer is an expert in improving process control and resource efficiency through digitization.

He heads the Process Performance Improvement group at Bayer, which is globally concerned with the optimal operation and energy efficiency of production processes by means of simulation, data analysis and process control. At NAMUR, he is responsible for the field of "Process and Operation Management Systems" and also teaches "Batch Process Operation" at TU Dortmund University. Stefan Krämer has been involved in EU projects on resource efficiency and is co-author of a reference book on the subject. He currently represents Bayer in the KEEN project - Artificial Intelligence in the Process Industry. If the father of two children still has free time, he likes to use it to go gliding.

Dr Krämer, in theory and practice you deal with numerous topics related to the optimization of process dynamics: What information from plant engineering do you need for this?

In order to optimize the control and system operation, various data is required. For very simple problems, process data is often sufficient. But even with a simple flow controller, you sometimes also need the valve design data from engineering to be sure you are working in the right valve range. And it quickly becomes more complex. At the latest, when it comes to new apparatus or complex issues for which a dynamic model is needed, we need access to P&I flow diagrams, data on dimensions and fittings, as well as the thermodynamics of the material flows in order to predict behaviour. And we need to know where the measurements are placed. So we need data from PCT engineering, plant construction and, in the case of existing plants, also the knowledge of the operating team.

What quality is this data that you usually receive and from what sources?

Most of the time, the quality is satisfactory. Sometimes it is only after discussion and making enquiries that we get the necessary data in good quality, but typically analogue as drawings, data sheets and tables. We interpret it and then validate our models by asking further questions or comparing them with measured data. There can be many sources, such as P&I flow diagrams, equipment drawings, pump and valve data sheets, and measurement data from process control systems and plant information management systems. For many projects we also need live data from the process. They are also often spread far and wide and we need to bring them together.

Do you see potential for improvement in the information situation?

There are different levels. It becomes interesting when the required data is available digitally in the correct format, so that, for example, a simulation can be generated directly from the flow diagrams and equipment data of the engineering documentation. But a well thought-out and searchable data store alone would help in many places. But it is above all the elimination of data silos and the use of metainformation that will take us forward.

What needs to happen in the engineering tools used in your field to be able to optimize the operation of the plants more efficiently?

The most important and simplest thing is to have consistent data storage with a "single point of truth" so that you can rely on the information. We are working on an automatic connection of engineering data with simulation tools and the structuring of historical process data, which then enables an image of a plant to be created very quickly. On the other hand, it is not only important that the tools can do something, we humans have to also keep control, for example with clear specifications.

If you could wish for something from engineering system manufacturers, what would that be?

An open exchange between different tools that doesn't take any effort.

Given scattered and inconsistent data sources, how do you think AI could help process engineers and automators?

Once an AI is able to bring together the hard facts and figures about the plant and its structure and answer simple questions directly, I could ask my AI engineering assistant: "Which pipe goes from tank A to B? And please tell me the diameter, what flowed through at 15:00 and how much." That would be something – and will probably make the work even easier than the combined data storage. If I can then fully rely on what the AI tells me, we're there!

Thank you very much for the interview, Dr Krämer!

Read in the editorial how "engineering outside the box" helps to address precisely such challenges. Or how consolidating data with Engineering Base (p. 1/2) is already a crucial part of the solution.

Images: Haldor Topsoe

More projects, lower costs

EB's data centricity is a milestone for Haldor Topsoe's Engineering

The world's leading supplier of catalysts, technologies and services for the chemical and refining industries, Haldor Topsoe, headquartered in Denmark, serves customers around the world. By further developing chemical processes, the company enables its customers to successfully switch to renewable energies. The plant manufacturer, electrolysis and catalyst expert with around 2,100 employees is significantly involved in the green energy transition.

Moon landing for engineering

With AUCOTEC's Engineering Base (EB) platform, Topsoe has ushered in a new era of digital, collaborative engineering. "The introduction of this system is a crucial milestone in our digital transformation," explained CIO Niels Keller-Larsen at the go-live. "With EB, our work is finally truly data-driven, across all engineering phases and disciplines on one data model!" he emphasized. The switch to the platform is Topsoe's largest transformation project to date. "The equivalent of a moon landing for us," said the top IT manager. As a knowledge base for all participants, EB supports projects from their "birth" to the very end and offers customers a continuous customer journey. EB also unified Topsoe's system landscape and standardized engineering; numerous discipline-specific tools were replaced. According to the CIO, the transformation would not have been possible with them. As a single source of truth, EB also lays the foundation for the use of AI.

Partnership efficiency drivers

Another reason for Topsoe's decision in favour of EB was to have to commission as few special solutions as possible. Instead, a number of new developments have been worked out in collaboration that are now a standard part of EB's plant licence, and thus benefit all customers: for example, EBML for faster data exchange or Asset 360's automatic data sheets, both of which are important efficiency drivers for EPCs, plant manufacturers and operators. According to Keller-Larsen: "We wanted a partner, not a supplier. Implementation and pilot project have shown that this has been successful."

Six weeks instead of six months

Topsoe's transformation process was extensive and very democratic. "Never before have we brought so much competence and knowledge together," says the CIO. Everyone had to rethink, but now they have a uniform "data home" for all engineering and maintenance tasks. This increases flexibility and saves around 10 per cent of the costs. Thanks to considerable acceleration – some work now takes six weeks instead of six months – significantly more projects can be completed in the same amount of time in future, Niels Keller-Larsen is pleased to say.

Empowering Evolution – with AUCOTEC

Offshore EPC strengthens its engineering with central cooperation platform

The Italian company SAIPEM SpA, founded in 1957, has been a world leader in the engineering and construction of offshore plants for decades, from small to the largest in the world. These include fixed and mobile platforms, control systems for hydrocarbon production on the seabed, the world's longest underwater pipelines and robots for tapping deep-sea deposits. With the innovative power of around 30,000 employees and the motto "Empowering Evolution", SAIPEM also moves customers forward: from process and construction engineering to logistics planning, from procurement to plant construction, from maintenance, conversion and operation to decommissioning.

Wide bandwidth, one system

For this enormous spectrum, the E&C Offshore Engineering division was looking for a data-centred engineering system that unites the different disciplines in a common environment and digitally represents all assets as "smart objects" (SMO). The goal: better data consistency and quality. "AUCOTEC has fully met our requirements with the Engineering Base (EB) cooperation platform. All relevant data is processed cross-discipline on the same basis. This saves time, avoids errors and has a significant impact on process flows," says Alberto Paniale, Electrical Discipline Lead of the New Energies BU of SAIPEM's Offshore Division.

More than engineering

SAIPEM's FEED, Process, Electrical and Instrumentation departments not only benefit from EB's consistency. The platform can do more. Thus, EB also serves as a source and management system for SAIPEM's engineering catalogue, according to the data model specifications already defined in EB. "The direct data import from the material management system makes us enormously flexible. We can use EB for both smaller and larger projects without sacrificing application or stability," praises Stefano Cartocci, Business Application Manager in IT, and adds: "Customizing was also characterized by maximum flexibility, both from an application perspective and from AUCOTEC's consulting team."

State of the art in user-friendliness

Even after the first real-world project test with EB, SAIPEM's engineers particularly appreciated EB's easy-to-use data and graphics management functions, in addition to Excel-like operation and easy creation of complicated graphics such as P&IDs. SMO management has greatly facilitated material management, from creation to classification level definition and associations to other SMOs to BOMs. "All this, along with the collaborative environment EB creates, significantly simplifies our engineering," emphasizes Francesco Spaccavento, project manager for the functional implementation. In addition, EB's user interface is so flexible that it can easily be adapted to SAIPEM standards. "It doesn't get much more user-friendly than this," concludes the entire SAIPEM team.

Images: Saipem SpA

In addition, we would like to welcome the following new customers to the AUCOTEC family:

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Zwentendorf, Donau | Austria

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Energie- und Kraftwerk mbH
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Innsbruck | Austria

ILF Consulting Engineers Austria GmbH
Vienna | Austria

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Imprint
AUCOTEC-Infopaper

Publisher
AUCOTEC AG
Isernhagen

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Press and Public Relations

Layout
www.linienflug.design