Milestone Software

Consistency Redefined

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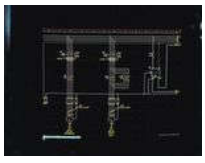
All planning phases and trades at a glance thanks to Engineering Base. (Source: ©krunja - stock.adobe.com)

From the Elcad CAD system to Engineering Base, the cooperative engineering tool, the German software designer Aucotec has often set trends in software development – and it wants to maintain this trailblazing position in the age of digitalization, too. The SME's recipe for success is based on constantly thinking outside the box, picking up on industry trends and a cooperative management structure and culture that put the emphasis on flexible, agile teams.

On a historical scale, the 35 years that have elapsed between 1985 and today are just the blink of an eye. Looking at the history of software and computer technology, though, the same period of time seems full to the brim with development and innovation.

This is true not only for the development of hardware such as PCs, mobile phones and laptops, but also for computer architecture, operating systems, software programs and programming languages. Storage capacity and computing speeds especially have multiplied dramatically over this period – digitalization and Industry 4.0 would be inconceivable without this explosion in performance.

GALLERY



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Back in Time to Foundation in 1985

But let's turn the clock back 35 years. In 1985, the year Hanover software designer Aucotec was founded, we were miles away from what today's developers are used to: just 5 MB of hard disk space and 640 KB of working memory — it's impossible to imagine having to cope with such limitations today. Now every single mobile phone offers a multiple of these figures.

Those were precisely the challenges, though, that Aucotec's two founders, Horst Beran and Dr. Lex Bedijs, had to overcome when developing their first electro-CAD for mechanical engineering. The two founders are still on board today, as chairman of the board of directors and as chairman of the supervisory board and software developer respectively, but now they tend to remain in the background and leave the stage to director Uwe Vogt and his team. It is rare for the two of them to appear before the trade public, as they did at the press conference Aucotec held in 2015 during the Hanover Fair to mark the company's 30th anniversary, but when they do so it is in a quiet, understated manner.

The Beginnings: One Idea — One Product

Aucotec started off as a typical "one-product company", reports Reinhard Knapp on the company's history. He has been with the software firm for more than 30 years, first in charge of development and now setting the strategic focus of Aucotec as Head of Global Strategies. He played a key role in the development of what is now its flagship product, Engineering Base.

As so often in the history of innovation, the very first product, Elcad, owed its origin to the inventive spirit of two courageous pioneers. In 1985 CAD (Computer Aided Design) systems were primarily used as drawing programs in architecture and product design. While CAD software existed, mapping the complex circuit diagrams in mechanical engineering was far more complex than drawing the ground plan of a detached house.

None of it was usable, Horst Beran discovered when looking for a suitable CAD program for mechanical engineering. That led Beran and Lex Bedjis, who had got to know each other at a trade fair, to quickly set about developing their own system, the electro-CAD system Elcad, which could thus already do more than the computer-aided drawing of circuit diagrams.

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Start-up as an Ideas Factory

Their company, "Automatisierungs- und Computertechnik AUCOTEC GmbH", was created more or less on the side with the aim of enabling implementation of the ideas that came to the founders in their programming work. There were more than enough challenges in those first few years: although the industry was already using workstations, their development was still in the early stages and the cost of PCs — around 70,000 German marks — was eye-watering, to say nothing of graphics programs.

So the fresh-faced founders put in some night shifts and programmed the pixels manually. Even Windows was then still in its infancy, and no one could have foreseen the triumph of Microsoft. Nevertheless, Beran and Bedijs put their faith in the new operating system with its interactive user interface because it not only removed the need for graphics tablets, drivers, printer drivers and graphics cards, but also opened up new graphics options for Elcad.

The leap into the process industry then followed at the start of the 1990s with the company Hoechst, which was looking for a program that would enable it to plan the I&C (instrumentation and control) of its processing engineering systems. "That gave us an entry into data modeling and marked the birth of Aucoplan," Knapp recalls, who as the pioneer was in charge of software development at the time.

First Virtual Model at the Start of the 1990s

The newly designed software was based on the graphic Elcad elements and — for the first time — integrated spreadsheet management. That was because instrumentation and control then, as now, relied on spreadsheets with measuring and consumption points and parts lists. Huge volumes of data were generated, which the PLT planners had to keep track of and which were later to flow into a system model.

Reinhard Knapp, Head of Global Strategies (Source: Aucotec)

At the same time, Namur had defined the first requirements on a CAE system of the future, set out in its NA 50 entitled “Specification of a CAE system for PLT planning”. “We took that as our guide and used it to map a virtual data model for the first time,” Knapp explains.

Ruplan for the energy supply

The product portfolio had thus doubled with the Aucoplan PLT planning software, and soon Aucoplan became an in-demand PLT planning tool in the process industry which is still being used today. With Ruplan — the term is a synonym for “computer-aided drafting” — in 1997 came a further CAD tool that was developed for the supply of energy. Thanks to the add-on module Kabi, it is also a standard tool for the planning of wiring harnesses in trucks and diesel locomotives. Consistent refinement made Ruplan the first engineering software that was able to implement the international DIN EN 81346 standard.

Another contribution to the success story came from the energy supply company working group, which consists of Aucotec experts and a large number of users from the energy sector and has played a key role in shaping the development of the software. Since the turn of the millennium, the emphasis of Ruplan's enhancements has been on improving efficiency in the documentation process.

Engineering Base and Object Orientation

Back to the 1990s, though, and the question of where to take Aucoplan next. “Aucoplan was essentially organized as a set of spreadsheets with columns and rows, but without a database in the background, which brought us to the limits of the system relatively quickly,” Knapp explains. An exacerbating factor was that Elcad, Aucoplan and the rest were quite complicated and not intuitive to use. “German minded, you could say,” Knapp smiles.

During this time both, software design and the development of databases experienced a leap in technology. Within a database, process variables, thresholds, consumption points, measuring devices and much more are stored in spreadsheets — a flexible and efficient way of accessing structured information. There was a crunch point, however: databases that are easy to create, such as Windows Access, which can be used even without any programming skills, did not exist at the time.

Oracle was then the technical ne plus ultra, but expensive and complicated to use. As a result, development began to stagnate until the issue of object orientation, which at this time brought new languages and programming options, opened the way to radically different approaches. “At the end of the 1990s we then decided to develop an entirely new database and Windows-based software platform,” Knapp recalls.

With a Microsoft SQL server as the database server and a graphics interface, a software architecture was created which was already so forward-looking by the end of the 1990s that it is still viable today and able to implement even a complex standard such as IEC 81346. Easyelectric was the name of the predecessor, which was first tested in Great Britain and from 2003 was to enjoy success as a database-driven and object-oriented tool under the name Engineering Base.

Graphic Representation and Alphanumeric Data Model Have Equal Rights

What was so special about it was that, “For the first time graphic representation and alphanumeric data model had equal value and equal rights. Changes to the graphics are reflected in the alphanumeric data model, and vice versa,” Knapp emphasizes.

The consistently object-oriented architecture was also pioneering: the developers opted for a three-layer structure with a Microsoft SQL server as the database. Objects and their logical relations are formed above it, in the application server, and these can be represented in Explorer as a structure tree, spreadsheet or edit mask. This allowed a complete virtual system model to be created for the very first time.

The Early Bird Doesn't Always Catch the Worm

The whole thing had a catch, though, as Knapp explains, “We were too early with our development. Companies didn't recognize the added value that our object-oriented, database-centered approach offered.” Essentially, the market was not yet ready for Engineering Base. Today, in an age of agile project organization, the hurdles that appeared before the software developers then are difficult to imagine. At the start of the millennium, though, the planning worlds of a process engineering system were still strictly separated.

Whether electric wiring diagrams or P&ID schemata, there were many, many Excel lists and plans drawn with a variety of graphics programs that often enough were located on distributed computers. “Right from the start, however, we had the goal of bringing all files of a project together in a data model and also linking all graphics with this model,” Knapp explains.

The first digital twin, if you like, had already been born by then, although this term was not even in existence at the time. The topic of digitalization and Industry 4.0 was still far in the future, but in Hanover/Germany Engineering Base (EB) was already being used as the basis for the development of digital workflows.

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Engineering Base also soon expanded the customer base: EADS, ABB, Holcim, Areva and Porsche, along with many others, installed the new electric project planning tool. In Hanover the program was now set for growth, with EB as the engine: a partnership in China (2003) became an 85 % subsidiary in 2012, while further subsidiaries were established in Italy (2004), Great Britain (2005), France (2012), and Poland (2015). The acquisition of Racos, a Constance company, in 2007 led to the creation of a further development center, and in 2011 a new branch in Munich was added in order to support the sites in Nuremberg and Stuttgart in southern Germany. In 2013 EB was already accounting for 90 % of the growth in sales and more than 60 % of new business.

The Future Lies in the Integrated Planning Process

In 2010, the 25th birthday of Aucotec, the company finally got itself fit for the future by publishing new corporate guidelines. Using the slogan “Create Synergy — Connect Processes”, it began to emphasize the full integration potential available in Engineering Base. Then, as they still do today, Aucotec’s strategists listened closely to their customers and identified what the operators needed.

Pressure on time had increased enormously for the companies, while process and data complexity was reaching new dimensions. Trades were now being planned in parallel rather than planning steps being taken sequentially as before. And at this time Engineering Base offered what others had not even begun to develop yet.

The platform enabled planners to handle all data of a project on a database completely, cooperatively and across disciplines — without the vulnerability of data transmission and interfaces. In the long term maximum efficiency could only be achieved with networking and

cross-disciplinary cooperation, said the technology and development director Uwe Vogt at the Hanover Fair press conference in 2010, marking the departure into a new age.

The Success Story Continues

Success proved the strategic thinkers at Aucotec right. Five years later sales had risen more than 70 % to 20 million euros, with the Hanover company achieving the lion's share of that total with the Engineering Base tool. At the same time, the international business had picked up speed again with a subsidiary in Sweden.

The Hanover software designer did not rest on its laurels, though: instead, it returned to the innovation offensive. The technical evolution of Engineering Base continued with the implementation of web services and mobile applications, reaching an initial high point at Achema 2018.

Developers had worked intensively on it for three long years, taking the biggest step since the launch of EB a good one and a half decades previously. The platform now covers all disciplines, from Front End Engineering Design (FEED) through detail planning and automation to operation of the systems, thereby combining all core disciplines for engineering.

A New Dimension for EPCs

The key feature for EPCs is that EB highlights all consequences of any desired scenario immediately, from the flow chart to the material balance — automatically and in separate documents. System planners took the opportunity of this enormous acceleration of scenario development to test significantly more alternatives in order to determine the really optimal system configuration.

Knapp, "From the start EB had this universal data model in which objects are linked to each other and with their graphical representations. Our developers used the various scenarios to add a whole new dimension."

The hot topic of digitalization is also playing into Aucotec's hands. "What this means for plant engineering is providing a virtual copy of the plant, its 'digital twin'," Knapp explains. And EB has been ready for that for years. Now that the platform supports all planning trades, the door is open to customer projects of unprecedented size.

A Project of a Special Dimension

Aucotec won a very special contract last year: an offshore project of Equinor, the oil drilling platform Johan Sverdrup.

350,000 documents form the basis for the digital twin of the Johan Sverdrup offshore platform. Engineering Base enables Equinor to transform the documents into highly digital, centrally managed lifecycle data. (Source: Equinor/ Espen Rønnevik/Øyvind Gravås))

More than 350,000 documents have to be kept up to date across the total plant lifecycle of an expected 50 years, making EB the backbone for the data on Equinor's plant and their maintenance — not the least reason why the internal name of the EB project is Spine.

Such projects based on the new version of Engineering Base have finally put Aucotec into the premier league of software companies.

Fittingly, as it looks to the future the new Aucotec headquarters in Hanover/Germany is also taking shape, right beside the current location. The new building will be ready for occupancy at the end of February, when it will then offer plenty of opportunities for further development. With its feeling for trends, the company is at any rate ideally equipped for further milestones in software development.