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# GAINING A STRATEGIC EDGE THROUGH INTERDISCIPLINARY, COMPUTER-AIDED ENGINEERING SOFTWARE

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**PRODUCTIVITY.** IT'S THE LIFEblood OF ANY ORGANIZATION. THERE ARE SMALL PROCESS IMPROVEMENTS THAT CAN BE MADE OVER TIME. BUT AT TIMES, A REVOLUTIONARY CHANGE CAN HELP MAKE ALL THE DIFFERENCE. THIS PAPER FOCUSES ON HOW A CHANGE IN CAE SYSTEMS CAN BRING INDIVIDUAL AND BUSINESS-WIDE PRODUCTIVITY TO AN ENTIRELY NEW LEVEL.

## THE POWERFUL CAPABILITIES OF A COMMON DATABASE IN INTERDISCIPLINARY ENGINEERING

Computer-aided design (CAD) tools have traditionally been well accepted by businesses worldwide since their introduction over 25 years ago. For example, each successive generation of electrical CAD software has empowered the individual user to be that much more productive. Legacy CAD systems will continue to perform as advertised, but companies relying on them risk falling further down the productivity curve at the expense of their competitiveness. A new generation of computer-aided engineering (CAE) tools incorporating a powerful database has been shown to deliver cost savings of up to 80 percent and significant improvements in design integrity and order turnaround times. Unlike legacy systems that support only one discipline, these advanced CAE systems internalize all design tools and report generators required by multiple disciplines, ensuring greater speed, accuracy and flexibility in product development and order fulfillment. While this new database-centric approach offers more ways than

ever to make individual electrical, fluid and process control engineers more productive, far greater efficiencies and cost savings are being realized by using their advanced capabilities strategically to restructure workflows, facilitate information-sharing among departments and automate creation of product content. These stretch benefits can be worth tens of thousands, even hundreds of thousands of dollars or more annually.

This latest generation of CAE tools is creating a new operating model for project design. In the

traditional model, each engineering discipline works separately, like an island. Project design work moves sequentially from discipline to discipline, volleyed back and forth as content is added or changed. This back and forth can be the source of delays and inefficiencies. If the process engineer wants to add a solenoid valve, the fluid engineer has to design it in and the electrical engineer has to control it. Each does his work separately, often using different software, yet the contributions of all disciplines must fit together seamlessly to create an integrated build package.

The advanced CAE concept creates a new paradigm for structuring design workflows. Its database, or platform, supports integrated CAE tools for multiple disciplines such as electrical, fluid power and process control engineering. The capabilities introduced by the database represent the game-changing aspect of this technology, creating new pathways to much greater cost and time savings by:

- vastly improving workflows among engineering disciplines, enabling them to work simultaneously on a project instead of sequentially
- fostering closer collaboration among designers at multiple locations, between manufacturers and customers, suppliers and service technicians
- permitting storage and reuse of data to an extent not previously possible, encouraging standardization and modularization of product content

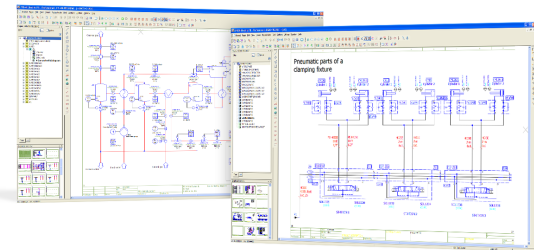
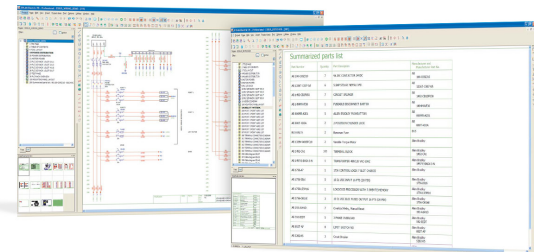
UNLIKE LEGACY SYSTEMS THAT SUPPORT ONLY ONE DISCIPLINE, THESE ADVANCED CAE SYSTEMS INTERNALIZE ALL DESIGN TOOLS AND REPORT GENERATORS REQUIRED BY MULTIPLE DISCIPLINES...

- systematically reducing errors and time devoted to error-checking content
- shortening design timelines for more reliable production scheduling
- ushering in more efficient parts sourcing and inventory management
- automating machine setup for processing wires and manufacturing enclosures
- creating a digital work environment for mechatronic design
- allowing engineers to merge data with 3D modeling software to create virtual simulations and validate designs before manufacturing begins

Instead of separating or localizing data collection and retrieval, the new database-centric CAE globalizes it on a common platform allowing the engineering disciplines to work concurrently and collaboratively rather than separately. Projects can proceed much faster. Data is automatically cross-referenced within and across disciplines. Changes are transparent and well understood by all participants. Electrical, fluid power and process control engineers can work on the same project simultaneously, from different workstations. They can share data in real time with their colleagues at different locations, even half a world away. They can bi-directionally exchange data with popular mechanical engineering, PLC and other software tools.

By far the biggest benefits of these advanced systems are realized by companies that leverage the database to change how design workflows are structured and standardize product content to fully exploit the capability of the common platform to store and reuse data. The CAE database can be linked via a company's PLM, PDM, ERP or other enterprise systems to the sales, purchasing, accounting, manufacturing, service and other departments. Thanks to the power of the database, these CAE systems can effortlessly convert project documentation in minutes to the language that customers, vendors and

subcontractors require, and export it in one of many common file formats including smart PDF. This high level integration, functioning like a digital causeway to link engineering disciplines with each other and with other vital business functions and even customers and suppliers, is a major reason these advanced CAE products are a catalyst for transformative change in the relationship between engineering and other project stakeholders. So is their ability to automate the creation of recurrent content.



**AUTOMATION.** IT'S THE ULTIMATE SOURCE OF PRODUCTIVITY. MAKING CERTAIN EVERY JOB BUILDS ON THE LAST, CREATING A PRODUCTIVITY SNOWBALL EFFECT. IT STARTS WITH THE DATABASE. THEN STANDARDIZATION. AUTOMATIC SCHEMATIC GENERATION. INTEGRATION WITH OTHER ENTERPRISE SYSTEMS. IT ALL ADDS UP TO MASSIVE GAINS IN PRODUCTIVITY OVER TIME.

## AUTOMATING THE CREATION OF RECURRENT CONTENT ACCELERATES PRODUCT DESIGN

For companies that must generate variants or configurations of the same product, the possibility to archive and reuse blocks of validated data presents tremendous savings and efficiencies. Legacy CAD tools have a limited data storage capability, meaning that a great deal of data has to be manually keyed in, cross-referenced and error-checked by designers with each project, even for repeat orders of the identical product. This is extremely time-consuming, low-value work. With a database-centric CAE system, a company can create an archive of standardized design elements or modularized product options for immediate access and use, all pre-validated and therefore error-free by definition. This archive

can contain any number of commonly used parts or complex macros of entire product assemblies, like a motor or loader, even make them scalable, so they can be inserted into a project with just a few key strokes to build out or re-size variants of an existing product. With scalable macros, the user simply inserts the appropriate graphical representation of the macro in the schematic page and selects the desired data set from the predefined value table to complete the definition of that macro. The system automatically re-sizes all of

the variable elements and propagates the necessary changes in the engineering data throughout all schematics and lists, in fully cross-referenced state. Working with complex or scalable macros or entire product templates is such a time and cost saver in design engineering and error-checking that forward-

**WORKING WITH COMPLEX OR SCALABLE MACROS OR ENTIRE PRODUCT TEMPLATES IS SUCH A TIME AND COST SAVER IN DESIGN ENGINEERING AND ERROR-CHECKING THAT FORWARD-THINKING COMPANIES ARE APPROACHING THIS CAPABILITY STRATEGICALLY.**

thinking companies are approaching this capability strategically. They are building large component archives within the database and altering entire product lines to contain as much standard (and often common), pre-defined content as possible with the ultimate goal of largely or fully automating variant creation and order fulfillment. Instead of the traditional practice of offering a few base models of a product and manually modifying the design for each order to accommodate options or custom features, these companies are offering numerous standard configurations that incorporate these features and options already, all pre-engineered, validated, stored and readily reusable.

In the case of the EPLAN Platform, engineers have a number of standard and optional tools and procedures to automate the creation of new products or new configurations of existing ones. These configuration tools allow the engineer to produce a new variant in a fraction of the time – in some cases, minutes or hours instead of days or weeks – that would be spent doing the same job on a legacy CAD.

### **Bridging effective parts management and design**

Parts procurement and inventory management is an area where money can easily slip through the cracks. Manually entering component specifications represents another opportunity for errors to infect a project. An advanced CAE tool allows the engineer to import manufacturers' component data containing the necessary technical and commercial information directly into a project from a convenient and reliable source, prompting all pertaining schematics and reports to update automatically. Project documentation such as bill of materials and assembly reports and lists that match the designs 1:1 are transferred to purchasing and production departments for further processing. This effectively puts an end to a lack of communication between engineering and purchasing that can lead to costly consequences such as excessive stockpiling of parts, restocking fees or shortages that can halt production. One solution rendered more feasible by the new CAE technology is creating a universal database of authorized components with access to available inventory that engineers can draw upon. This parts database can be either located in the CAE database or linked to it, creating a level of transparency for all departments concerned that is essential for keeping projects on time and on budget.

### **Automating the steps between a machine concept and panel build**

Advanced CAE systems go a step further than meeting discipline-specific engineering needs really well. They also offer ways to interface and integrate with other tools to compound a company's time and cost savings. Take the entire engineering process of configuring enclosure manufacturing; a powerful database-centric CAE tool not only handles schematic design, parts data integration, automatic reports

|| and manufacturing documentation creation with the utmost efficiency as  
|| previously discussed, but also generates precise data files for various NC  
|| and wire processing machines for automated enclosure manufacturing.  
|| The undeniable benefit for the customer is productivity and quality gains  
|| resulting from eliminating the inherently error-prone and time-consuming  
|| tasks of manually inputting data or manually manufacturing enclosures.  
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### **Fostering international collaboration**

|| Corporations with multiple locations around the world often end up using  
|| different design tools due to decentralization of engineering operations.  
|| However, with globalization of manufacturing and trade, projects are  
|| increasingly being developed jointly on different continents. Replacing  
|| various legacy systems with a single advanced CAE solution enables  
|| seamless data transfers and real-time collaboration by teams that are  
|| geographically separated, resulting in a more efficient use of a company's  
|| human and software assets. A world-class CAE software system transcends  
|| geography and language barriers by automatically converting projects  
|| to different languages and output formats, making it easier to collaborate  
|| with colleagues, customers, and suppliers in different parts of the world  
|| and bring projects to a conclusion faster.  
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**VALUE.** IT'S ABOUT REDUCING TIME. REDUCING ERROR. ADDING TECHNOLOGY THAT AIDS IN YOUR BUSINESS PLAN INSTEAD OF ADDING ANOTHER LAYER TO IT. OUR CAE SYSTEMS CREATE VALUE ON A SCALE THAT CANNOT BE REALIZED UNTIL IT'S IMPLEMENTED. AND THEN, YOU'LL WONDER HOW YOU EVER MANAGED WITHOUT IT.



## PUTTING A NAME ON THE TECHNOLOGY

Now imagine a manufacturing environment where,

- with one mouse click, a salesperson can generate a complete set of design documents to fill an order because the equipment has been pre-engineered and stored in the CAE software
- all engineering time is optimized, like creating a new variant of a machine in minutes instead of weeks using what are essentially project building blocks
- there is virtually no risk of design errors to impact the build process or finished product

What would all that be worth in terms of quality and efficiencies gained, costs reduced and customer satisfaction achieved to a company? What would it be worth to your company?

This kind of cutting-edge technology that allows companies to capture the stretch benefits of the database-centric CAE concept is already available from EPLAN Software & Services. EPLAN has been providing pioneering CAE solutions to manufacturers from all industries and their suppliers in six continents of the world for more than 25 years. EPLAN products are based on the EPLAN Platform, a unique data management technology that makes the sharing of design data and many core functionalities possible across the powerful CAE product line to meet the collaboration needs of various engineering disciplines. This capability effectively allows the electrical, fluid power, instrumentation and process control, and enclosure designers to have one universal tool to achieve maximum efficiency and accuracy levels—both individually and collaboratively.

EPLAN software solutions foster collaborative workflows, interdepartmental and global integration, standardization and reuse of content, data reliability and consistency, and mechatronic design.

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|| The software is available in 16 languages and data can be translated into  
|| many more languages thanks to its Unicode compatibility. If desired, projects  
|| can be structured from the outset to allow for automatic conversion from the  
|| North American NFPA to the IEC or European DIN industry standards. All of  
|| these capabilities provide the kind of flexibility export-oriented manufacturers  
|| find particularly attractive.  
||

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|| EPLAN's automatic error-checking features, further refined in the current  
|| suite of engineering software products including EPLAN Electric P8 for  
|| electrical engineering, make it virtually impossible for errors to slip into  
|| project build packages and largely eliminate the time-consuming error-  
|| checking rituals necessary with legacy systems. Standardizing, validating  
|| and storing large amounts of recurrent content provide an extra layer  
|| of security against errors. For end-users who purchase equipment from  
|| various suppliers, EPLAN's Project Reference tool compares and contrasts  
|| incoming designs to ensure they adhere to established quality and  
|| technical standards. This way, new project planning doesn't set out on the  
|| wrong track and errors are detected early on before having potentially  
|| detrimental cost consequences in manufacturing and operation.  
||

|| The EPLAN Platform allows customers to store all their electrical and

fluid power parts as well as process instrumentation information in one common database, or for more sophisticated setups, provides the ability to link to PLM or ERP systems for real-time materials management. The latter can also be thought as a catalyst for instituting best practices in procurement, such as concentrating purchasing power on select vendors or ordering parts on a just-in-time basis. EPLAN's latest innovation for up-to-date component data accessibility is the Data Portal, a single-source web-based library of certified parts data from the world's leading manufacturers. It lets engineers import component data directly into projects. The data is always current, tested and verified free of errors. Users no longer need to leaf through multiple vendor catalogs to search for the right parts – another low-value use of an engineer's time.



**OPPORTUNITY.** AND OPPORTUNITY COST. WHAT IS THE VALUE OF IMPROVING YOUR SYSTEM? WHAT IS THE COST OF REMAINING STATUS QUO? IS IT WORTH THE TIME AND EFFORT TO RESTRUCTURE YOUR ORGANIZATION? IS IT WORTH IT TO YOUR CUSTOMERS TO BECOME LEANER, FASTER, AND MORE NIMBLE? THE OPPORTUNITY IS THERE. ARE YOU READY?

## IDENTIFY THE OPPORTUNITY, AND THEN ADOPT A STRATEGY

Prior to the advent of advanced, database-centric CAE systems, the cost-benefit analysis for investing in a CAE software package was relatively straight forward: estimate how its automation features would increase the productivity of a single user in a single discipline, then extrapolate that over all users covered by the license(s).



The same basic analysis can be applied to upgrading to a state-of-the-art CAE solution like EPLAN. Its extraordinary array of additional productivity-enhancing features for the individual user will repay the investment in short order. However, for many companies, that would be barely scratching the surface of the total potential benefit of ownership of what can be achieved using such a powerful tool strategically. That may involve

restructuring how products are designed or integrating engineering into their overall business and manufacturing IT environment so all departments can collaborate more effectively.

Some companies do their own strategic analysis, sometimes viewing a CAE purchase in the wider context of a review of their evolving IT needs. Others may be reluctant to do so, concerned they lack the expertise to plan and execute such a strategic overhaul or a change of that magnitude would be disruptive or prohibitively expensive. A reputable CAE software partner has a value-added role in helping companies identify their best-case scenario and demonstrate how to achieve it. Prospective customers can engage EPLAN to perform a comprehensive review of their engineering processes. Such analyses typically conclude that optimizing specific processes and practices can yield improvements of as much as

80% in each. Customers are presented with a concrete plan of action and expected ROI results along with a clear point-to-point roadmap to achieve the best-case scenario.

...OPTIMIZING SPECIFIC PROCESSES AND PRACTICES CAN YIELD IMPROVEMENTS OF AS MUCH AS 80%...



Ultimately, companies embracing an advanced CAE system determine the degree of change and the timetable for implementation with which they are comfortable. They can take all necessary steps soonest or implement them progressively over a period of time, with benefits accruing at each stage. Either way, companies that craft a well-thought-out strategy to use a database-centric CAE system like EPLAN as a strategic driver of increased productivity strengthen their competitiveness in the local, national and global marketplace. They also demonstrate serious intent to their customers to take maximum advantage of the newest available technology and remain relevant to their needs.



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