# Automation and Integration of Engineering Processes

Tim Valachovic, Technical Manager for EASA, Inc., explains how new software is enabling companies to reduce costs by automating and integrating some of their processes.
Key words: analysis, automation, integration, KBE, Knowledge Based engineering, web-based, deployment, best practices.

Through the application of software tools over the last ten to fifteen years, almost every company in the manufacturing sector has improved key metrics such as time to market, product quality, and manufacturing costs. However, a considerable amount of time and effort is often required to complete a given process involving one or more tools such as CAD, FEA, CFD, and even in-house codes and spreadsheets. In addition, employees capable of using these tools proficiently usually have limited availability – like every other employee, they tend to be busy people.

The first observation regarding the time and effort required suggests that companies could save a significant amount of money if some of the processes involving software tools could be automated. The second observation regarding the availability of experts suggests that simply automating a given process using existing technologies such as scripts and macros is not optimal; what is really required is a method to both ***automate*** the process, and then to easily ***deploy*** that process in such a way that others in the organization can safely execute it.

The smart approach

Companies are finding that a commercially available product called EASA – Enterprise Accessible Software Applications – can help them overcome both of these issues. "Process experts" – those familiar with executing a given process – can use EASA to quickly and easily author custom web-enabled applications that automate and simplify the execution of the entire process, which may involve one or more steps involving technical software applications, databases, in-house and commercial codes.

The custom applications created are specific to a company's processes, and provide capable graphical user interfaces that encapsulate the knowledge of the company's experts. The resulting libraries of applications are available over the intranet – a sort of corporate toolbox (*Figure 1*) that gives authorized users throughout the enterprise fool-proof access to their company's processes, best practices, expertise and software assets.

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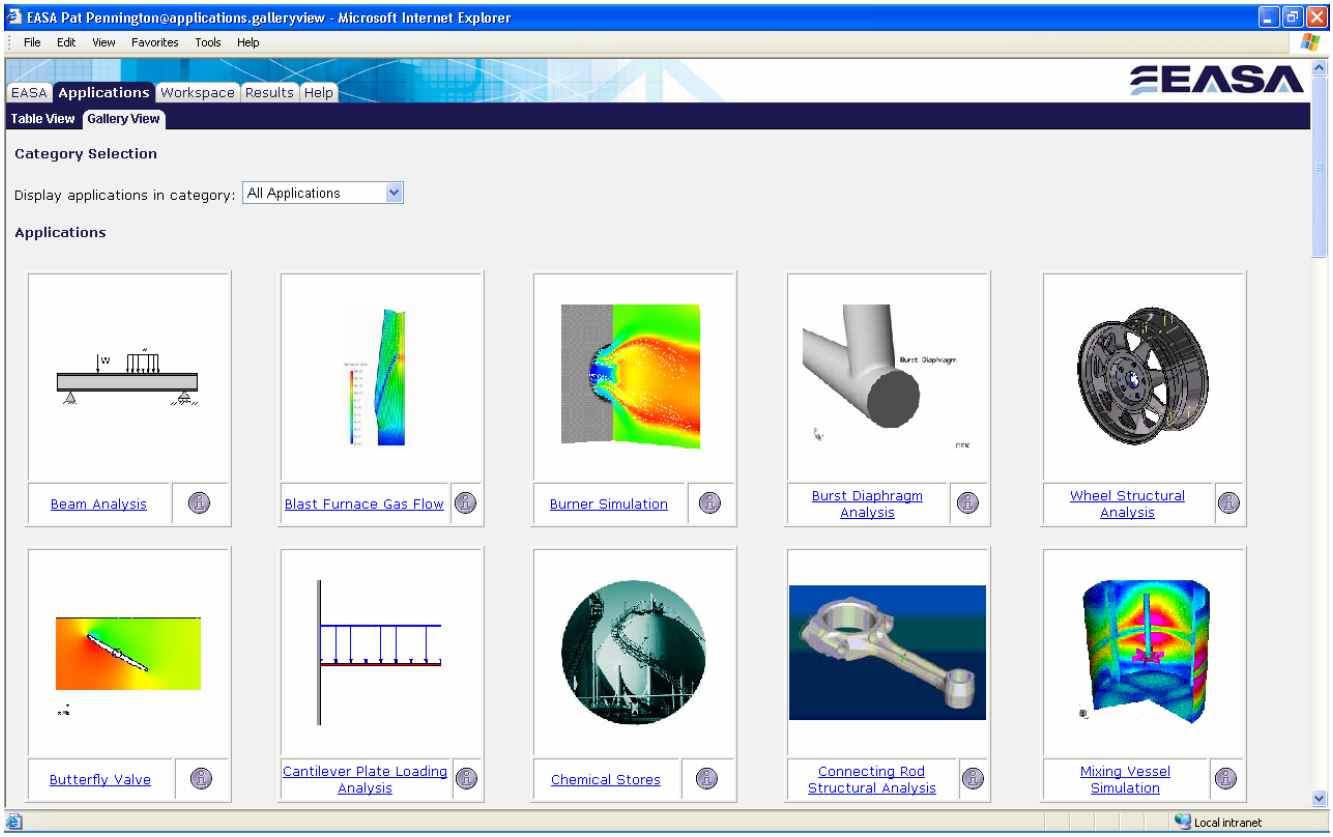


***Figure 1. The "corporate tool-box".***

A typical custom application authored with EASA offers a tab-based, tree-based or wizard-based interface that leads the users through the data entry process, as in *Figure 2*.

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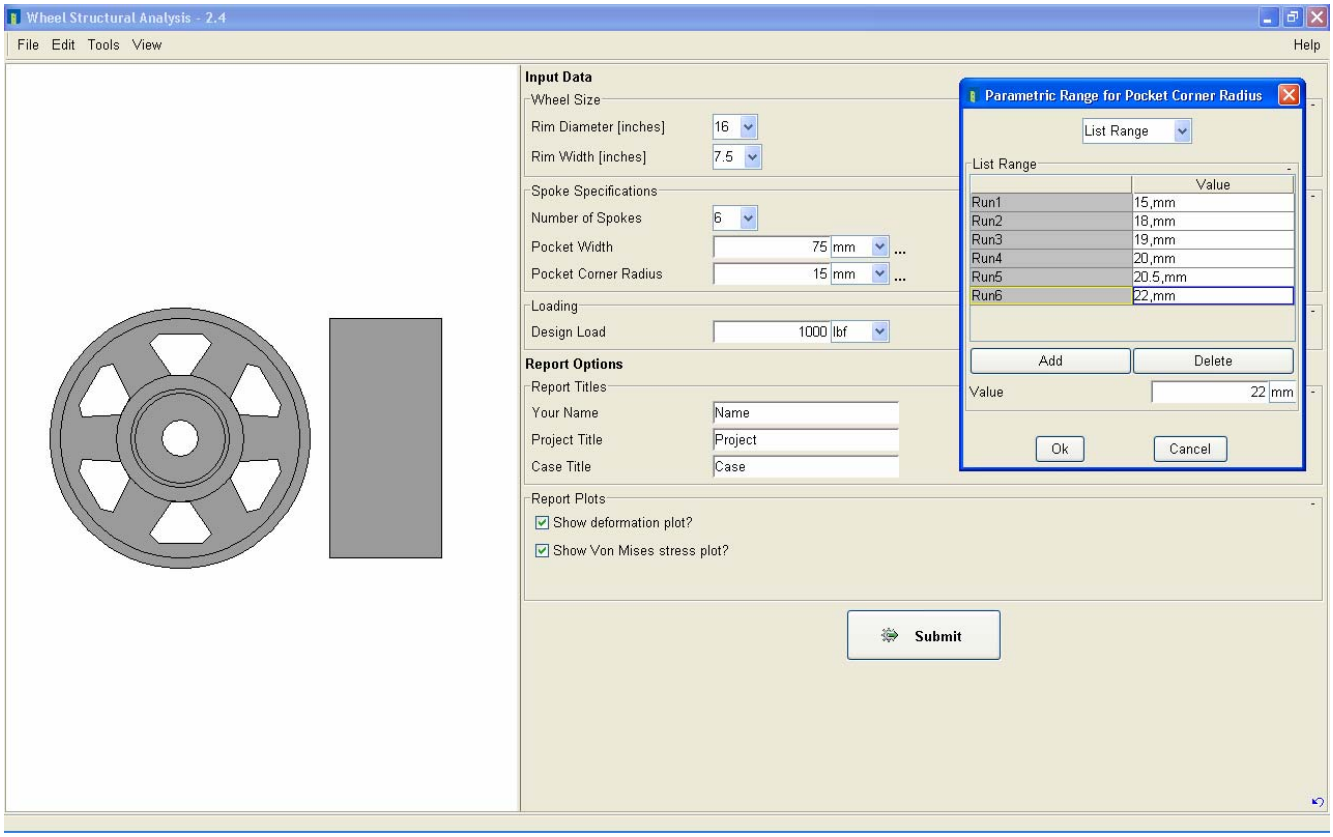


***Figure 2. A typical application allows the user to drive almost any underlying software tool via a custom browser-based interface; the user can select only valid options pre-defined by the author.***

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Finally, the application automatically generates a report in HTML and print-ready PDF formats that is archived to a central repository (*Figure 3*).

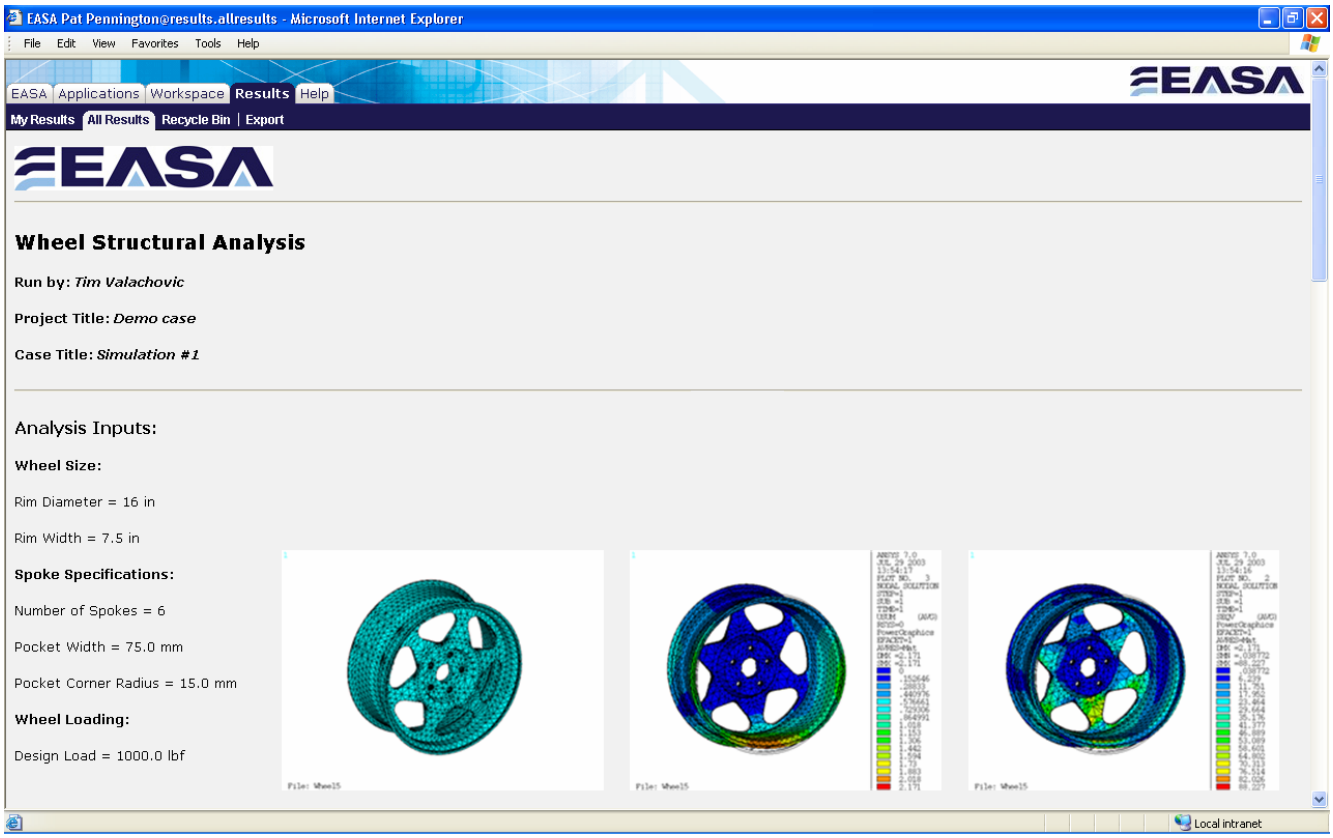


***Figure 3. The custom report summarizes key results and is automatically archived to a central repository.***

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Authors, or "process experts", can build applications without having to write any code. A graphical application builder (*Figure 4*) is used to create a user interface, to link the interface to underlying software and databases, and finally to create a custom report. This eliminates complicated and time-consuming coding of custom applications with tools such as C++, VB, and JAVA, which might take days or even weeks. By comparison, EASA's application builder allows new custom applications to be created, tested, and deployed in a few hours.

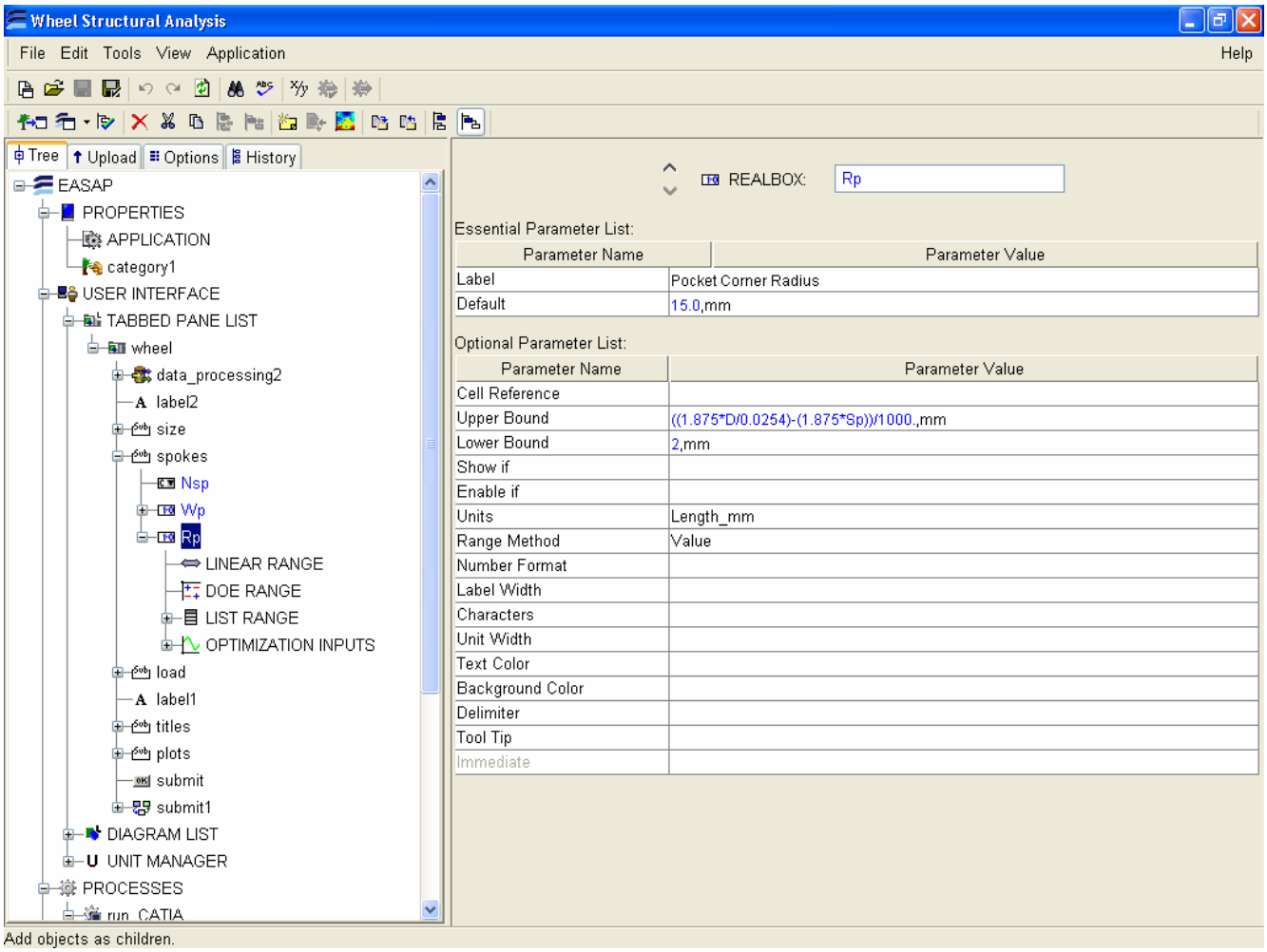


***Figure 4. The application builder lets "process experts" create custom applications of professional quality, and requires no knowledge of programming.***

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Before automation with EASA, the following table summarizes the process that this particular application automates, together with the amount of man-time which was required:

| Task | Person | Man-time |
|---|---|---|
| Existing design edited within CAD package to create new design | CAD expert | 0.2 – 0.5 hr |
| New design imported into FEA package & boundary conditions ap- | FEA expert | 0.3 – 1.0 hr |
| Key data extracted from FEA results file & standard report produced | FEA expert | 1.0 hr |

This process was executed 60 to 100 times annually, and was therefore costing the company up to 250 man-hours per year. In addition, because key experts were not always available to perform the tasks, the elapsed time to deliver a final report often stretched into weeks.

In contrast, once automated with EASA, the process can be executed by any authorized user in the company, regardless of their geographical location and whether or not they have the underlying CAD and FEA packages on their local machine. The user can select the appropriate options and dimensions in less than one minute of man-time, without having to wait for the necessary CAD expert or FEA expert to become available. The elapsed time to report delivery is now solely determined by the CPU time required for the FEA, which is typically less than an hour (the CPU time associated with the automated CAD and report steps are negligible).
Because the time saved is scaled by the number of processes a company decides to automate in this way, a company can save many thousands of man-hours per year.

Case study

Corus is a global steel-maker that uses various analytical tools which provide the ability to look closely at the steel-making process. However, the use of such tools has historically been limited to experts with extensive training in their use. To overcome this restriction, Corus's analysis experts used EASA to create simple web-based applications that provide company-wide access to various models. These applications can be used to generate and use simulation results by people who have never used the underlying applications, and can include several logical checks to ensure that simulation results presented to the inexperienced user are correct.

Tim Peeter and Rene Duursma of Corus Research comment: "These models allow engineers outside research and development to carry out heat transfer analysis, compositional chemistry calculations and metal weight requirements forecasts based on final product specifications. This leaves our experts free to act as advisors and to perform new model development and be truly innovative, rather than acting internal consultants."

Summary

The software includes features such as the ability to incorporate 2D and 3D dynamic engineering graphics. Best practices and standards can be encapsulated into these applications, ensuring they are used whenever a particular process is executed. In addition, a company's sophisticated software tools, previously only available to a small group of experts, can now be better utilized throughout the organization. Because processes have been automated, and because these processes can be deployed to those who need the resulting information, there is typically a workload reduction for the experts.

This frees them up to focus on innovation rather than repeatedly executing processes consisting of multiple, time-consuming steps.

In summary, companies can now save a significant amount of time and therefore cost by using EASA to author web-based applications that capture key engineering processes and the expertise needed to use engineering and other technical software tools. Knowledge and best practices can be encapsulated into

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