

# Calculation Management Done Right

## Treating your Calculations as an Essential Company Asset

In the marketplace of technical products, growing competition has required faster design cycles and iterations in almost every sector. Companies take great steps to invest in the products they deliver. These products are the results of various designs, techniques, and intellectual property, all of which are managed across an organization with careful thought and attention.

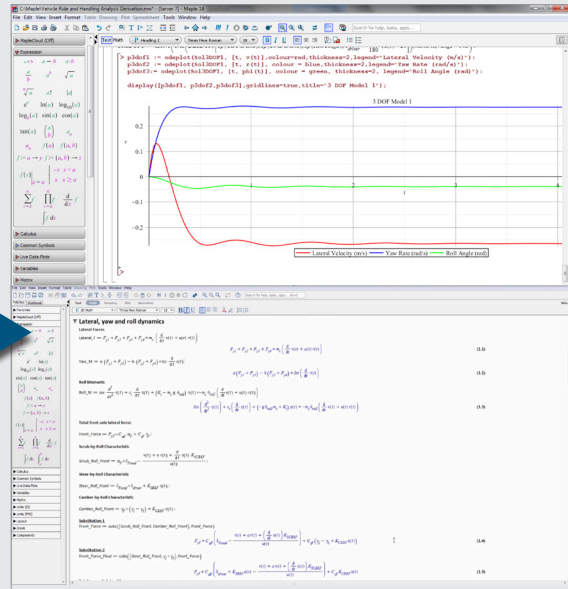
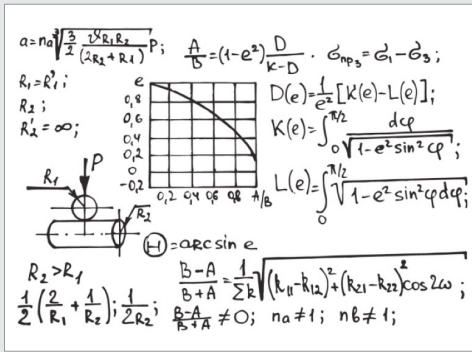
There's a fundamental process behind these company assets that is often overlooked, and its lack is responsible for aches and pains that most engineers face on a regular basis. What's often missing is calculation management, a process that treats your calculations like the vital, valuable company asset they are.

Consider the workflow of many engineers or technical professionals. During beginning stages, there's a lot of scratchpad work to be done as the concept moves closer to reality. Without enough care and attention, these calculations find themselves spread out over

notepads, spreadsheets, and simply in the engineer's head. As the design moves forward, these calculations become bundled into all future decisions – for better or worse. What happens if an engineer moves on, or is on vacation? Without the original author, engineers can be left scratching their head and wondering where “that” number came from.

Calculation management is a strategy that systematizes the way an organization manages its mathematics and knowledge, from start to finish. With best practices and proper software, calculation management promises to:

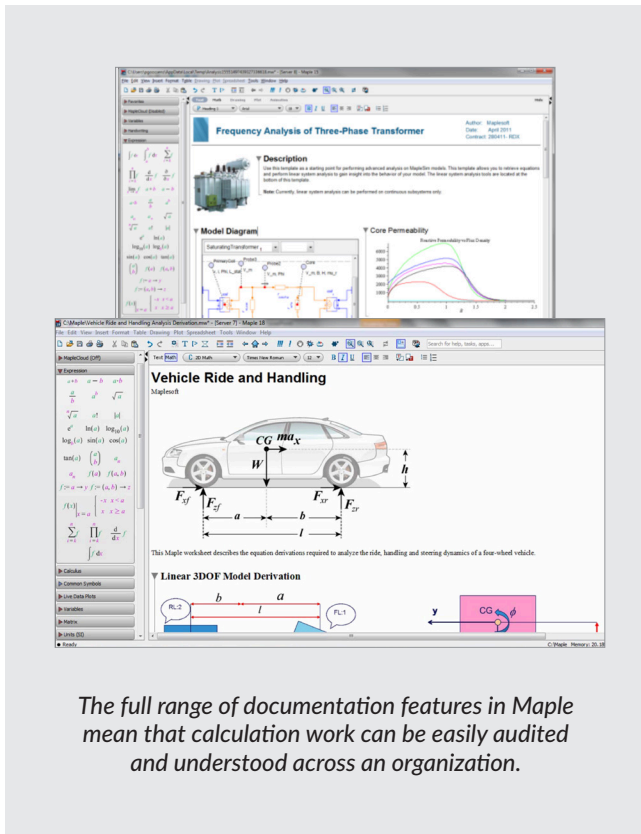
- Treat calculations as a valuable, structured asset,
- Enable the tracking, validation, and reuse of calculations,
- Prevent redundant calculation work, even across groups,
- Allow deployment of calculations and tools across an organization.



Using a calculation management tool like Maple allows for easy, intuitive derivation work without many of the human errors found in scratchpad calculations.

It's important to understand that the nature of engineering calculations often requires more than a spreadsheet tool. While these tools are useful for simple computations, they don't provide the abilities to make calculations a robust, long-standing asset in a company. Engineering calculations are both a function of complex mathematics and physics-based computations, complete with specialized functions and a wide spectrum of units. For these calculations to be reliable in large designs, they'll typically undergo a validation process, so they must be in a tool that allows the full range of derivations to be transparent, well-documented, and easily updated. The calculations themselves are often a description of real, complicated physics, so they are best performed using tools that are optimized for efficient calculations – even better if these tools can support the power of cloud computing.

Here at Maplesoft, we've heard first hand of how companies benefit when they take a more structured approach to calculation management. Recently, a renowned automotive parts company decided to deploy Maplesoft's calculation management software, Maple, to various teams across the organization. Using Maple, they were able to use a single tool to connect teams who worked on different aspects of any given project. Engineers used Maple to explore their design space, and their proposals could be audited since their calculations were fully documented and transparent. Application authors would create highly specialized tools within Maple that had easy-to-use interfaces, allowing other technical employees to move forward on their projects without requiring the expertise necessary to create the calculations themselves. Very quickly, the company noticed an increased ability to perform advanced analysis, and a stronger preservation of all the corporate knowledge their projects contain.



*The full range of documentation features in Maple mean that calculation work can be easily audited and understood across an organization.*

serves to automatically take care of common tasks across most engineering domains. This frees up an engineer's time to develop specific solutions, explore new design ideas, and collaborate with others using their Maple worksheets.

Many engineers have their own personal preferences for where to do their calculation work, and adopting new tools can be hard to justify. Spreadsheet-based tools have become ubiquitous for quick and simple mathematical needs, but many companies only explore new tools as a reaction to the problems they've run into. By that time, they're already experiencing losses from their underperforming tool, and pressures to find a replacement run high. The current pace of modern engineering requires a proactive approach to managing calculations properly, in a way that cuts out the redundancies and downtimes associated with the often-disorganized techniques of the past. It's time to treat your calculations as an essential company asset, and manage them with the attention they deserve.

Adopting a calculation management tool like Maple is an essential step when making calculations a structured, validated set of assets across a company. Maple is a high performance mathematics environment that also functions as a documentation system, ensuring that calculations are understood and accessible across an organization. Using natural math notation, engineers can perform their calculations just as intuitively as by hand, while using plots, diagrams, and text to create mathematical documents that are report-ready. As a specialized tool for engineering mathematics, Maple

