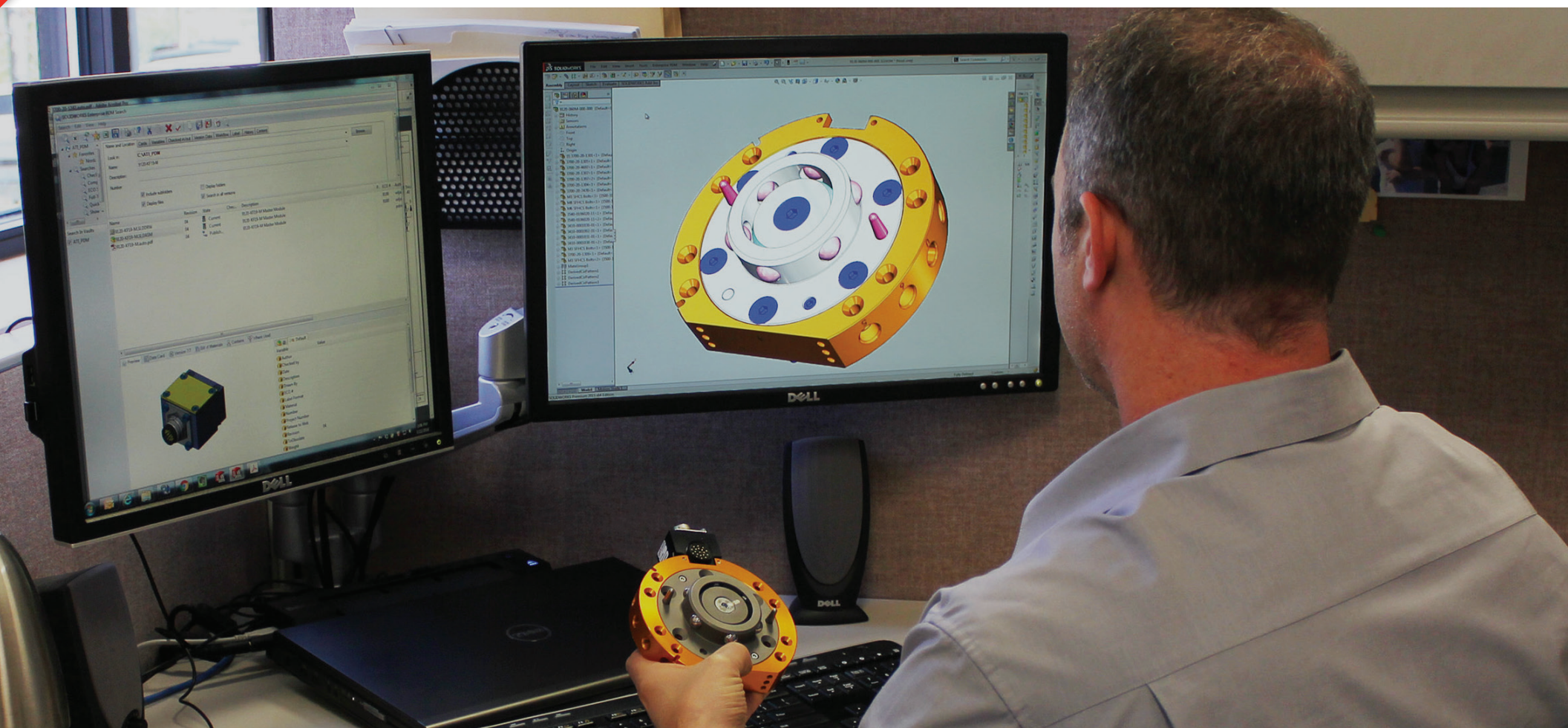




CHAPTER TWO

STEP-UP TO SIMULATION: TACKLING COMPLEX ENGINEERING CHALLENGES





CHAPTER TWO

STEP UP TO A SMARTER WAY TO DESIGN

Contrary to popular belief, simulation is one of the simplest and easiest ways to perfect your designs and ensure a product that exceeds customer expectations. And simulation plays perfectly well into the old adage, “Work smarter, not harder.” Think about your products in the real world for a moment. If they don’t work in the real world, then the product is a failure. That’s why there’s physical prototyping where we can test products to failure, go back and fix them in design, then start with a new prototype. That process is expensive and slow. And in today’s real world market place, expensive and slow is a failure.

Thankfully, there are simulation tools that can provide the insight needed to create a truly optimized product at an affordable cost and great time savings.



SOLIDWORKS SIMULATION PREMIUM

Where the Rubber Meets the Roman God

The invention of Vulcanization—the process of turning natural rubber into a more durable substance—is a great example of how to streamline design processes. It was named after the Roman god of fire and first patented by American inventor Charles Goodyear in 1845. While history often derides the invention as an accident and not a discovery, Goodyear flatly denied that was ever the case. He claimed, that while the initial realization of fire-treating rubber was serendipitous, the entire process was the result of years of painstaking experimentation and observation. Goodyear had to answer questions like how long to apply heat, or whether it was better to roast like a marshmallow or steam with a kettle, by physically performing the experiments in his makeshift lab.

Today's designers and engineers have it a little easier. When testing how products and complex materials, like rubber, will react in a certain situation, simulation software can replace or enhance the process of physical testing. It allows teams to predict product performance and answer questions—saving time and money, which would otherwise be wasted on a physical model. And, while it used to be the case that simulation lacked the functionality and power necessary to solve large complex models and predict true product performance, modern solutions such as SOLIDWORKS® Premium, tackle these problems with ease.

Tackling Analysis Problems

Modern manufacturers deal with more than their fair share of complex issues. PROCAD Technologies, LLC is a great example. The company thrives on its ability to identify tooling and mold issues for its customers, to help optimize both tooling and design issues. They've been using SOLIDWORKS Simulation Premium since 1998 for that exact reason.

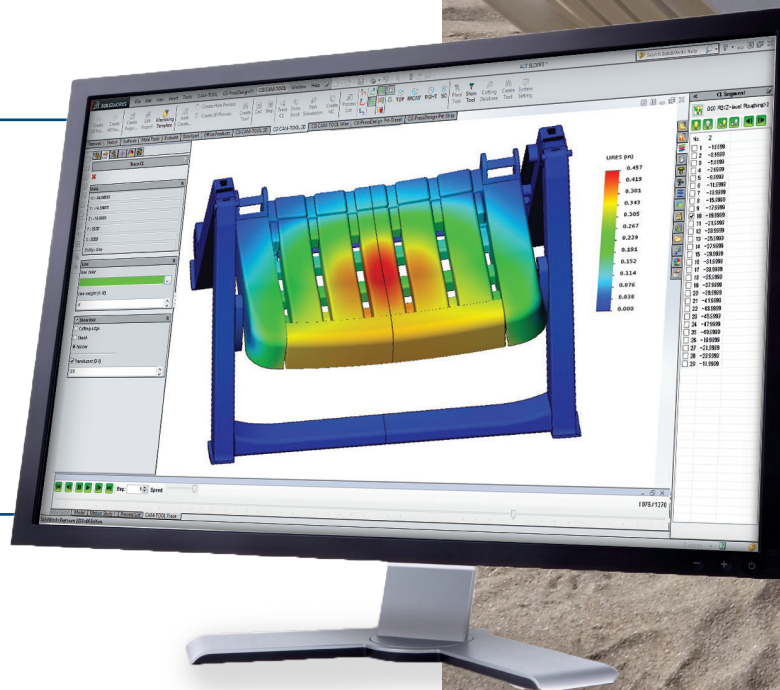
How Not to Break the Mold

Approached by a moldmaker struggling with extending the functional life of a mold, PROCAD utilized SOLIDWORKS Simulation Premium to test for and solve the problem. Robert Elwell, owner of PROCAD, recounted, "Our client wanted to use a high-pressure material to produce parts with a physically weak mold design. A quick SOLIDWORKS Simulation Premium stress analysis showed that the mold would bend 0.006 to 0.008 inches and would result in bent and broken inserts. We redesigned the cavity in the weak area to make it stronger and sent a SOLIDWORKS Simulation Premium analysis report to the moldmaker, showing simulation results before and after the fix."

By implementing simulation,
PROCAD easily helped the
moldmaker avoid what would
have been a costly problem —
saving an estimated
\$80,000.

"The integrated SOLIDWORKS Simulation Premium
finite element analysis (FEA) package gives me
the nonlinear analysis tools that I need to quickly
and effectively resolve mold production issues."

— Robert Elwell, Owner,
PROCAD Technologies, LLC



SCALABLE TOOLS FOR BETTER SOLUTIONS

Building on the suite of tools and features offered in the SOLIDWORKS Simulation suite, Simulation Premium provides more ways to test, validate, and ensure the performance of your designs. There are also additional features that give you specific insights on any material or environment.

Nonlinear Simulation

Nonlinear stress analysis enables users to solve complex structural problems without the simplifying assumptions in the linear methods in SOLIDWORKS Premium, Simulation Standard, and Simulation Professional.

A nonlinear approach may be applicable if your problem includes:

- Materials where the deformation is not proportional to the load
- The component deforms significantly
- The load or fixtures change over time

Nonlinear analysis calculates the stresses and displacements when:

- The components are made from an elastomer or a metal that has yielded
- The load direction changes or stiffens due to deformation
- Transient conditions are encountered

Dynamic Simulation

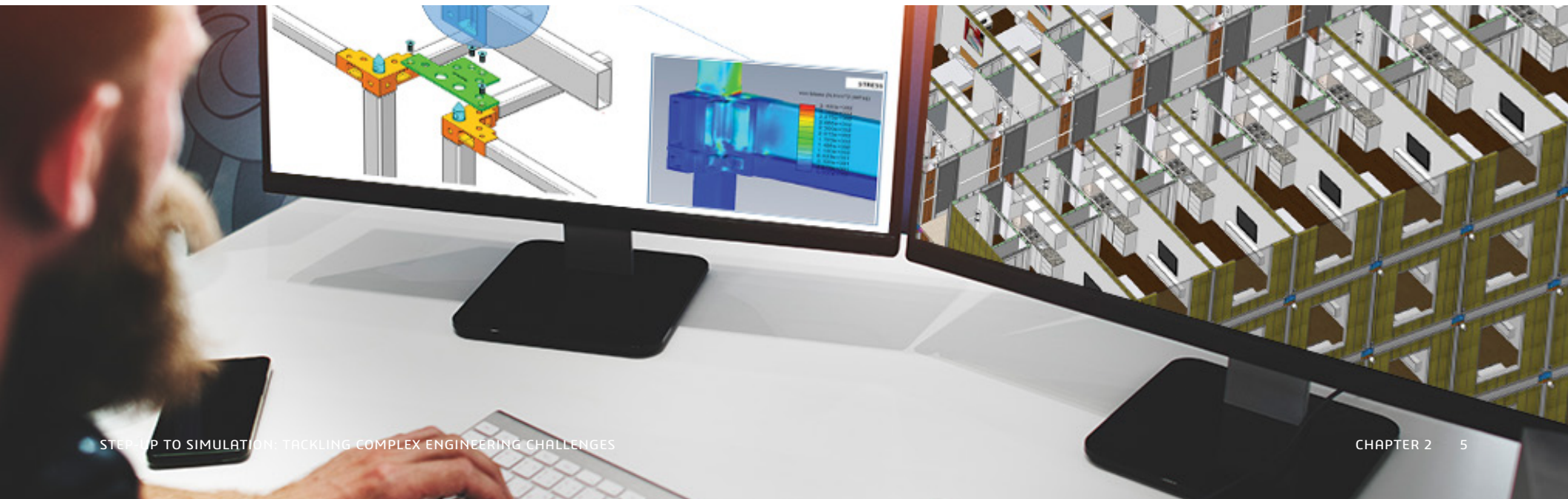
Dynamic analysis calculates the stresses and displacements of your design due to a time-varying load or environment. In addition to calculating the stresses and displacements, velocities and accelerations are determined. Many high tech components have acceleration, as well as structural and thermal, limits for safe operation.

Composites Component Simulation

Control and define composite layers, using a unique set of material properties and orientation, to determine optimum layup. Analyze symmetrical and non-symmetrical composite layups, as well as composite sandwiches.

Offload Simulation

Work from multiple computers by offloading simulation work from one computer to another on your local network domain. Create a static or nonlinear simulation study on the coordinator, and perform the task of solving the simulation equations on the worker agent. The contact detection during the analysis is performed on both worker agent and coordinator computers.



BUILDING TO LAST ONE MILLION CYCLES OR MORE

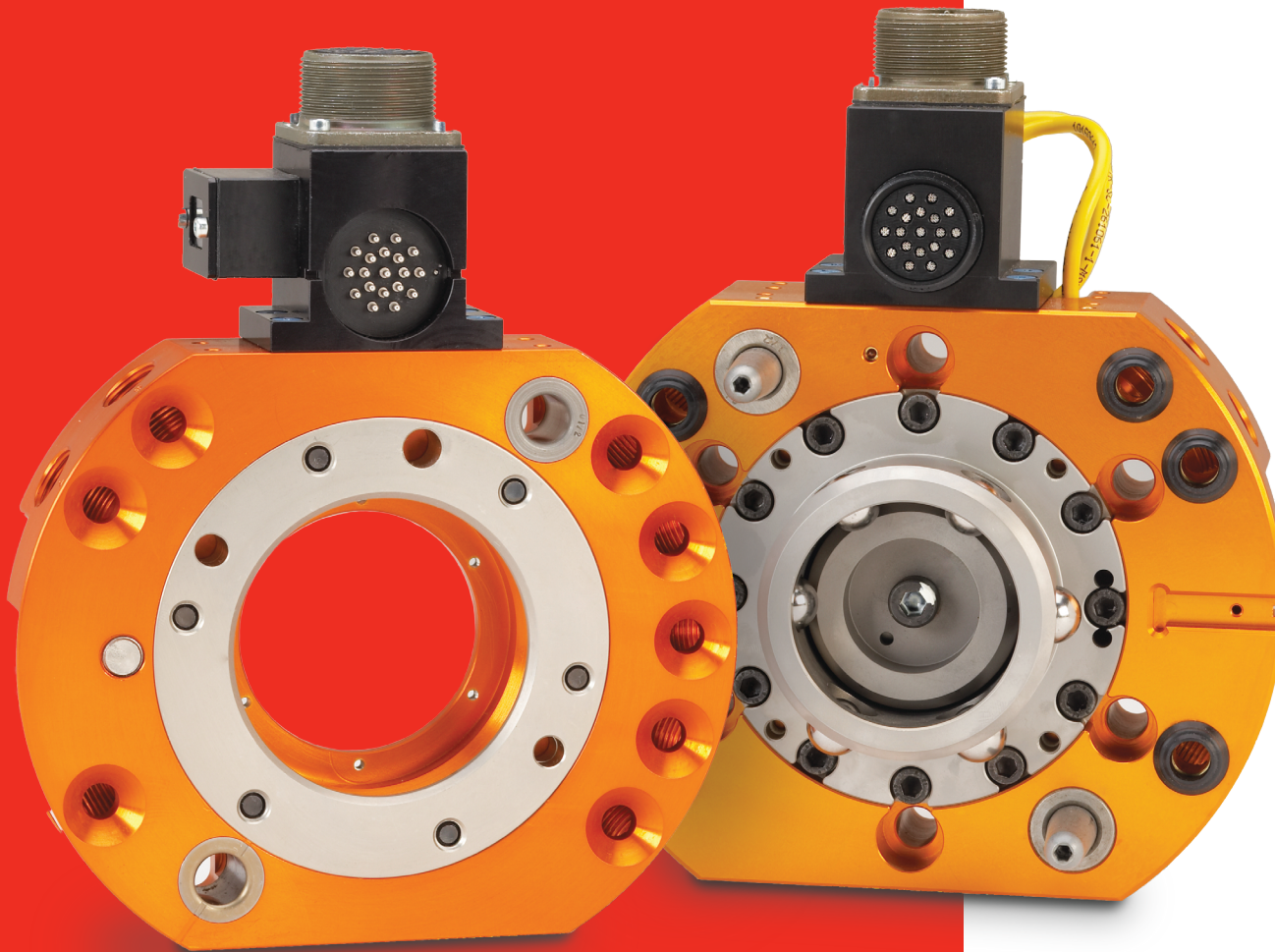
ATI Industrial Automation, Inc. develops a long list of robotic-arm tooling and robotic accessories including automatic tool changers, sensing systems, and utility couplers, just to name a few. Maintaining such an extensive product line is no small feat, so to reduce costs and save time during development, ATI implemented SOLIDWORKS Simulation Premium.

The entire ATI design team uses SOLIDWORKS Simulation Premium to conduct more complex analyses involving structural analysis of nonlinear materials. Simulation Premium supports teams by providing pre-populated materials that can be used by the simulation software, and is easily customizable to include your particular material requirements.

“With this type of simulation accuracy, we’ve reduced the number of design cycles required as well as prototyping requirements,” noted Chambers. By utilizing several of these sophisticated features, including vibration and fatigue, ATI cut its prototype requirements in half while maintaining the high level of quality its customers have come to expect.

“We’ve found SOLIDWORKS Simulation Premium results to be very accurate. For example, we ran a fatigue/lifecycle analysis that predicted failure after more than one million cycles. Our physical tests verified those findings.”

— Ryan Chambers,
Senior Mechanical Engineer, ATI



**DOWNLOAD
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Don't miss the next chapter in our
Step-Up to Simulation Series.

CHAPTER 3

FLOW AND PLASTICS

More Steps to Take

This is only Chapter Two of the Step-Up to Simulation series. If you haven't already, check out Chapter One to learn more about how you can save time and money with SOLIDWORKS Simulation, or continue to Chapter Three to learn more about Flow and Plastics, and how these tools can revolutionize your design-to-manufacture process.

Visit solidworks.com/STEPUP2OSIM for more!

Reference:

<https://corporate.goodyear.com/en-US/about/history/charles-goodyear-story.html>