

MACRO PLASTICS, INC.

Optimizing the design of plastic agricultural bins with SolidWorks Simulation



Macro Plastics relies on SolidWorks Simulation Premium analysis software to optimize designs for its large agricultural bins, cutting material costs while maintaining strength.

Macro Plastics, Inc., is the leading manufacturer of large agricultural bins in North America. The company's products, which come in 70 different models, are a staple among fruit growers for picking, transporting, and bringing everything from apples and oranges to grapes and cherries to market. Bins from Macro Plastics are made from high-density polyethylene and polypropylene plastics, and are preferred over traditional wooden crates because they offer greater protection, delivering higher quality fruit, and are washable, reusable, and recyclable.

When your product is made entirely out of plastic, which continues to rise in cost, and you operate some of the biggest high-pressure plastic injection-molding machines in the world, optimizing designs for material usage is an important goal. Macro Plastics stackable bins must withstand significant loads, yet every ounce of material saved will positively affect the company's bottom line.

"It's natural for someone to think that we're designing a primitive product—a plastic box, if you will," notes Senior Product Development Engineer Todd Turner. "However, when you consider the lengths to which we go to reduce material while maintaining strength and how elaborate our ribbing patterns need to be, our product development effort is really quite sophisticated."

Macro Plastics benefits from using SolidWorks® Standard, SolidWorks Professional, and SolidWorks Premium design software in the development of its products. Turner says that design tools such as the rib command and draft and wall thickness analysis are very helpful, but that SolidWorks Simulation Premium analysis software plays the most dramatic role in helping the company produce agricultural bins using the minimal amount of material necessary to do the job.

"We wouldn't be able to do the type of product development we do without finite element analysis (FEA)," Turner contends. "I have used SolidWorks design software since its very first release, so the selection of an FEA package was easy. SolidWorks is easy to use. SolidWorks Simulation is fully integrated. It was a natural fit."

Challenge:

Expand the development of plastic container products while increasing efficiency, improving quality, and controlling costs.

Solution:

Implement SolidWorks Standard, SolidWorks Professional, SolidWorks Premium design, and SolidWorks Simulation Premium analysis software solutions.

Results:

- Cut development time from months to weeks
- Tripled new product offering
- Saved 30 to 60 percent in capital costs for new products
- Reduced product weight by 10 to 25 percent overall

The right-the-first-time factor

Macro Plastics uses SolidWorks Simulation Premium software as a design tool to optimize designs rather than in the traditional manner for design validation. "I haven't done FEA for validation in at least five years," Turner says. "For me, SolidWorks Simulation is a development tool. I know how the design is going to perform before I need to validate it because simulation is an integral part of the design process."

"Simulation helps me improve what I refer to as the right-the-first-time factor," Turner adds. "In the past, most engineers allowed time at the end of a design project to work out all of the unforeseen problems. With SolidWorks Simulation, I can identify and resolve potential issues during design, so that when we mold those initial pieces, they are right the first time. It's an incredible tool that has let us save 30 to 60 percent in capital costs in the development of new products."

Expanding product line, reducing material usage

SolidWorks design and simulation solutions have enabled Macro Plastics to triple its new product offerings, cut its development time from months to weeks, and reduce product weight. "It used to take three to six months to develop a new product," Turner explains. "Now, we're doing them in a matter of weeks. SolidWorks tools like interference detection, FEA, and PhotoView 360 all play a part."

"Optimizing designs for material usage is a big deal," Turner continues. "We want to use the minimum amount of plastic to support the loading conditions required. With SolidWorks Simulation, we can explore different approaches until we come up with the optimal design that uses the least amount of material. We've cut material usage by 10 to 25 percent across our new product lines."

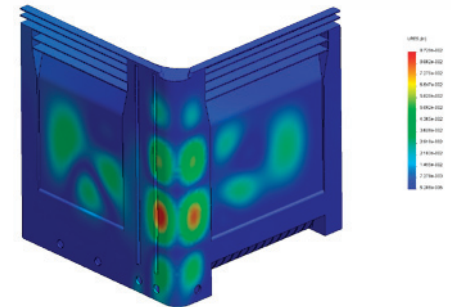
Rectifying issues in the field

Macro Plastics also relies on SolidWorks Simulation to resolve product issues in the field. For example, the company received photos from a high-load onion producer that showed a particular product failure with a distinct snakelike pattern.

"I ran a buckling study that revealed the same snakelike shape," Turner recalls. "I tried a bunch of different approaches: running ribs this way or that way, using four ribs or partial ribs. Ultimately, I was able to use SolidWorks Simulation to determine the exact rib size, pattern, and minimum weight to resolve the problem. I'm surprised every day by what I find out running simulations. I don't know that I could do my job anymore without it."

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Todd Turner
Senior Product Development Engineer



Using SolidWorks Simulation Premium software to simulate design performance, Macro Plastics can use the optimal amount of plastic to support each product's specific loading conditions, saving money while ensuring performance.



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