Case Study

# Norwood Sawmills

## About Norwood Sawmills

In the early 1990s, Peter Dale designed and built his own portable sawmill to help with the construction of a new log cabin. Recognizing a gap in the commercial market, he promptly founded Norwood Sawmills. More than twenty-five years later, it's a thriving company that continues to specialize in rugged sawmills for customers such as builders, landowners, and furniture makers. Reflecting the company's roots, Norwood Sawmills has established an enviable reputation for innovative, high-quality product design, and currently holds over 50 patents. To date, the company has produced in excess of 35,000 sawmills at its factories in Canada and the USA, supplying the equipment in flat-pack format to customers in more than 100 different countries.

## Challenge

Committed to a program of continual improvement, in early 2019, the company began to explore the possibility of switching to a new method of manufacturing its best-selling and largest model, the HD36. Specifically, Norwood Sawmills was looking for a more efficient means of producing the log deck. As the name suggests, the deck is the base of the sawmill, on which logs are placed ready for the cutting blade to pass through them. It needs to combine strength, stiffness and structural integrity with the lightness and simplicity essential for a self-assembled, portable product.

Traditionally, Norwood Sawmills has fabricated this frame from a series of stamped components that are then bolted together. However, in principle, migrating to 'roll-forming' these components could deliver important benefits. Essentially, roll-forming involves pressing a continuous coil of steel between two rollers to create the required sheet or profile. As a result, it offered obvious potential to reduce build complexity, and realize significant improvements in the cost-efficiency, consistency, and accuracy of manufacturing.

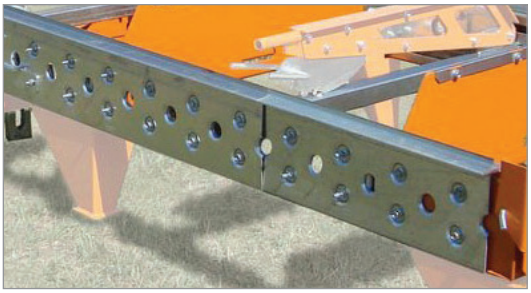
Investigating the merits of roll-forming presented the company's in-house designers with a fresh set of challenges. Notably, roll-forming would require a major up-front investment in tooling of well over $100,000. Moreover, prior to full production, this approach would not allow for the building of physical prototypes to prove that the new log deck matched or exceeded the high standards of structural integrity achieved by the existing design. To determine whether roll-forming did indeed represent the future, a completely new testing methodology was needed.

## Solution

Typically, designers dealing with these issues employ virtual testing through finite element analysis (FEA). This analysis allows users to simulate the performance of new products that have been designed using CAD. However, conventional FEA tools have considerable drawbacks, particularly for organizations with limited internal design and engineering resources. Above all else, the process is slow and requires the skilled and labor-intensive conversion of CAD geometry into the mesh on which simulation is performed. To avoid such pitfalls, Norwood Sawmills engaged Altair on a consultancy basis. On learning of the work to be done, Altair's consultants quickly identified Altair's mesh free simulation tool, Altair SimSolid™ as the ideal solution for delivering accurate results within a realistic budget and timeframe.

Norwood Sawmills' designers were already familiar with Altair's capabilities in this field, and SimSolid is increasingly recognized in the design community for its ability to perform highly accurate and detailed simulation from CAD geometry. Best of all, SimSolid accomplishes this in a fraction of the time that a traditional FEA tool takes. Altair's consulting team took CAD files from the Norwood Sawmills' designers and used SimSolid to simulate the performance of the proposed design against a series of benchmark

*Norwood HD36 Sawmill*



*Stamped and Bolted Side Rail Assembly*

*Roll-Formed Side Rail Assembly (Rendering)*

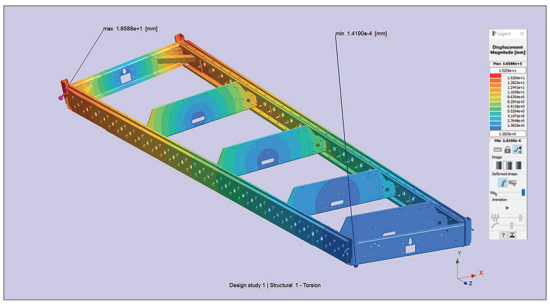
figures. Despite the apparent simplicity of the log deck, the design was extremely complex, with 647 individual parts, including 264 bolts and 35 stamped components. However, the baseline model was created in SimSolid within just a few hours.

## Results

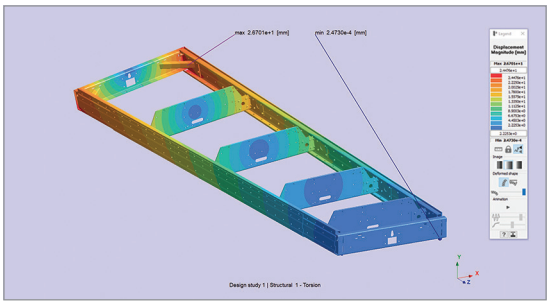
Analysis of the deck's structural integrity by SimSolid provided accurate and detailed results across all of the performance benchmarks set for the new design. In the initial iteration, the deck's stiffness in torsion was much lower than what was required. But, by highlighting the problem areas, SimSolid enabled the designers to address them quickly in the next iteration. In contrast to a traditional FEA solution, SimSolid was able to return the results of these subsequent iterations in a matter of minutes. Crucially, 'simulation at the speed of design' meant more iterations could be performed within the consultancy time budget. This, in turn, enabled the design to be progressively fine-tuned and, in particular, facilitated identification of any components and processes that did not actually contribute to overall structural integrity. For example, SimSolid demonstrated that a proposed strengthening structure inside a steel bracket could be removed completely. On the production line, that would equate to a saving on each and every log deck manufactured, over the entire lifetime of the product.

From start to finish, the process took less than two weeks. Using conventional FEA tools, the same number of iterations would have likely taken several additional weeks, or even months, which would have jeopardized the launch date. Moreover, by engaging Altair as consultants, Norwood Sawmills ensured that it enjoyed the support of a team with unrivalled insight into the functionality of SimSolid. It provided an affordable route to the expertise and capability needed, clear visibility of costs, and avoided any requirement for investment in new software and associated training.

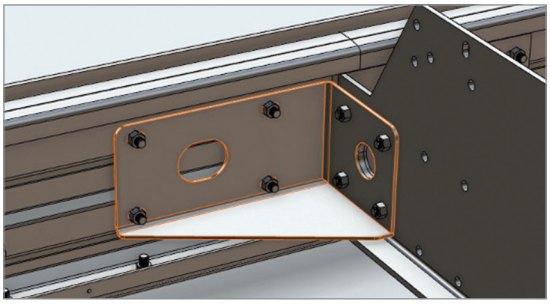
Swift and successful simulation has proven to be an important milestone on the journey to a more efficient manufacturing technique. In January 2020, Norwood Sawmills expects its new log deck design to go into full production, safe in the knowledge that it will maintain its hard-earned reputation for providing customers worldwide with durable, go-anywhere products. In doing so, the company will also demonstrate that the spirit of innovation originally responsible for creating Norwood Sawmills is still very much part of its DNA.



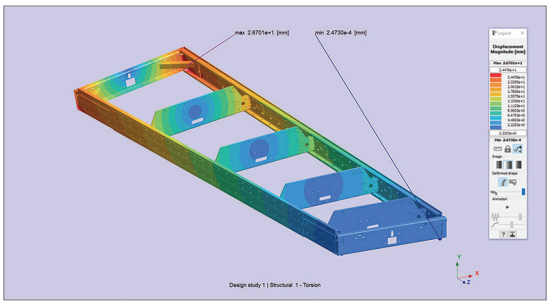
*Baseline Torsional Deflection – 16.6 mm*



*Initial Iteration Torsional Deflection – 26.7 mm*



*Unnecessary Gusset (Orange Highlight)*



*Final Iteration Torsional Deflection – 16.9 mm*