

Mechanical Case Study (The Wiremold Company, Inc. – Load Bearing Structures)



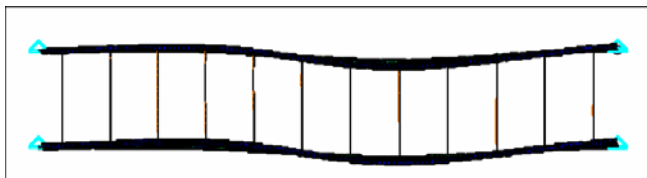
TEST – Gross Buckling of a Fully Loaded Ladder Tray

The Wiremold Company (www.wiremold.com) demonstrated the advantages of using stochastic analysis tools in optimizing load-bearing structures. The tools were complimented by structural testing as well as finite element simulation.

Wiremold invested in a new product line referred to as ‘overhead ladder tray systems’. Large buildings contain miles of such structures to carry power cable, data cable, and other conduit along ceilings. This new product was the subject of the stochastic analysis study.

After stochastic analyses were performed, the shipping container costs were dramatically reduced, which greatly reduced the overall cost. Moreover, the manufacturing tolerances were softened which also helped reduce cost. The impact of those decisions is now well understood to have no impact on structural integrity.

In all finite element analyses, NEi Nastran for Windows software was used to analyze the ladder trays for static and buckling capability. The FEA results were within 2% of the mean of failure data. The same FEA models were able to identify the load carrying capability if ultimate strength were the limiting criteria and were also able to identify the 2nd and 3rd buckling modes as well. Once these margins were established, then one could state a ‘robust’ design was obtained.



FEA – Top View of FEA Buckled Model

Instead of adding margins of safety or making conservative requirements on tolerances, one can measure such variables and observe their effect on component life. Doing so, always reduces costs, increases confidence, and allows the engineer to build statistical databases that can be applied to similar systems. In this particular case, all the ladder tray designs were similar and it was observed a consistent coefficient of variation on such systems.

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NEi Nastran *for Windows*
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