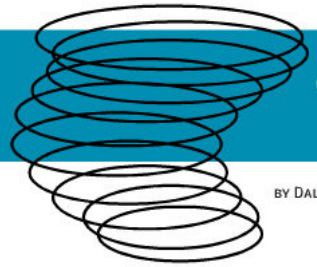


WHY IS THE WAVE THREAD IMPORTANT?

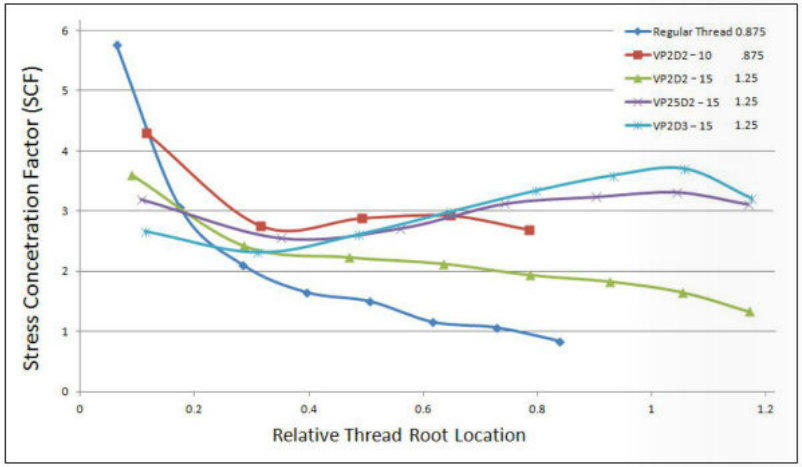
BY DALE E. VAN COR

The graph shown below encapsulates why the wave thread is important. The straightest line in VP2D2 -15 1.25 demonstrates the wave thread's ability to evenly distribute stress across its surface. As a result of this ability, the load carrying properties of the wave thread will increase the strength across a nut and bolt connection. The typical thread concentrates stress, which is why they break at the beginning of the nut and bolt connection.

The wave thread is total surface contact which makes it highly resistant to vibrational loosening because there is no clearance space. It is also an inherent seal, replacing or enhancing gaskets. It cannot be over-tightened; the next threshold is to break the bolt. There is no training; you screw it in until it is tight.

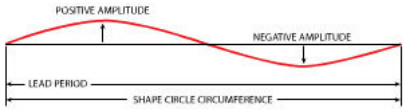
The wave thread is a box of tools that allows resistance to stress to be a function of design. This will apply to the side loading of pipe connections, pressure differentials of tubes and thermal variances.

Who needs a fastener that is 25–30% stronger with the same weight? Please contact Dale E. Van Cor at 603.239.4433 or dale@wavethread.com. •



Graph based on Finite Element Analysis by Jigarkumar Patel, PhD ME candidate, UMass, Amherst, Massachusetts

Single lead wave thread



A class of graduate engineering students at the University of Massachusetts Amherst is collaborating with a local inventor to reinvent the very nuts and bolts that hold together the machinery of modern life. This cooperative project is developing a brand new kind of "wave thread," which could transform the strength, performance, and sealing ability of nuts, bolts, pipes, containers, valves, and other types of "fastener" products. The designer of this novel wave thread is inventor Dale E. Van Cor, who last spring contacted faculty member Sanjay Arwade of the UMass Civil and Environmental Engineering (CEE) Department for help validating the proof of his concept.

Dr. Arwade, in turn, asked nine members of his first-year graduate class in Finite Element Analysis to build computer models of a bolt prototype, which was manufactured by Van Cor and features his wave thread design.

"Basically, Dale wanted to know if his bolt would perform better than a regular bolt," explains Dr. Arwade. "He was looking for some engineering assistance to analyze how his thread would perform in a mechanical setting."

In any fastener containing wave threads, the threaded portion is not cylindrical, as in standard fasteners, it's conical, and the configuration of the threads is sinusoidal, much like the shape of a wave. Wave threads also change pitch to alter their spacing, as opposed to the regular spacing in standard threads.

Such was the bolt presented to Arwade's class. The resulting finite element analyses, performed over several months by mechanical engineering Ph.D. Student Jigarkumar Patel and eight of his classmates from the Mechanical and Industrial Engineering and CEE departments, calculated the stresses, loads, and other strains placed on the wave threads after being screwed together.

Their sophisticated computer analyses gave some very promising results for Van Cor's invention. Van Cor's wave threads created what he calls "total surface contact," meaning the threads, after being screwed into place, fit snugly at every point. Compare that with the 30-to-35 percent surface contact created by standard threads.

Van Cor believes that the more complicated geometry in his wave threads is what generates total surface contact and gives his wave threads "three times the frictional hold of standard threads," thus making a stronger connection and tighter seal. His wave threads would therefore seem perfect not only for nuts and bolts, which require a robust fastening mechanism, but for various pipes, which require a tight seal to prevent leaking liquid or gas. Total surface contact also eliminates the need for gaskets and other rubber or plastic sealing material.

After working on the bolt project in class, Patel enjoyed the project so much that he kept researching it. "He really liked getting his hands on a real mechanical invention," says Arwade.

The key finding generated by Patel is that stress concentrations appear to be significantly lower in wave threads than in standard threads. This indicates that wave threads will make a stronger connection.

Van Cor would like to turn his prototype bolt into a bolt of lightning for the fastener industry. He is in the process of forming a new company to manufacture and market fasteners featuring his new wave threads. In that context, his software for making rapid prototype nut and bolt molds is operational, and his software for machining the wave threads is in its second out of three stages of development. Van Cor is currently looking for investors.

For Arwade, Van Cor's prototype also created a prototypical learning experience for his class. It gave his students the rare chance to work with a real object for their finite element analysis, and also the opportunity to see their computer modeling and its results applied to real products.

"Once you run the analysis and get all these data about stresses, strains, and displacement, the interpretation of those results is where the thinking, skill, and learning come in," explains Arwade. "That's the real learning experience. It was a perfect exercise for us."

July 2011,
http://engineering.umass.edu/news/engineering-students-help-tailor-new-wave-threads