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Brief Review of the Self-Tightening, Left-Handed Thread

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Abstract : Loosening of bolted joints in rotating machines can adversely affect their performance, cause mechanical damage, and lead to injuries. In this paper, two potential loosening phenomena in rotating applications are discussed. First, ‘precession,’ is governed by thread/nut contact forces, while the second is based on inertial effects of the fastened assembly. These mechanisms are reviewed within the context of historical usage of left-handed fasteners in rotating machines which appears absent in the literature and common machine design texts. Historically, to prevent loosening of wheel nuts, vehicle manufacturers have used right-handed and left-handed threads on different sides of the vehicle, but most modern vehicles have abandoned this custom and only use right-handed, tapered lug nuts on all sides of the vehicle. Other classical machines such as the bicycle continue to use different handed threads on each side while other machines such as, bench grinders, circular saws and brush cutters still use left-handed threads to fasten rotating components. Despite the continued use of left-handed fasteners, the rationale and analysis of left-handed threads to mitigate self-loosening of fasteners in rotating applications is not commonly, if at all, discussed in the literature or design textbooks. Without scientific literature to support these design selections, these implementations may be the result of experimental findings or aged institutional knowledge. Based on a review of rotating applications, historical documents and mechanical design references, a formal study of the paradoxical nature of left-handed threads in various applications is merited.

Keywords : rotating machinery, self-loosening fasteners, wheel fastening, vibration loosening
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