

FASTENERS FOR ENGINEERING AND CONSTRUCTION

STAR FASTENERS

Huck® Fasteners: Redefining Strength and Reliability in Engineering

In engineering and construction, the demand for fasteners that can withstand dynamic forces, vibrations, and harsh environments is critical. Huck® fasteners, known for their strength and reliability, stand out as a preferred solution across various industries. This article compares Huck® fasteners to traditional threaded fasteners, highlighting the strengths and limitations of each fastener type, with a focus on durability, maintenance, and efficiency.

The Unique Engineering Principles of Huck® Fasteners

LockBolts® are a relatively modern innovation in the world of fasteners, developed in the 1940s by Louis C. Huck. Initially known as the HuckBolt®, this revolutionary concept was created for the U.S. Navy and railcar industries to address the persistent issue of self-loosening in conventional nuts and bolts subjected to severe vibration. Huck's groundbreaking design culminated in the first LockBolt patent granted in 1950, and he subsequently established the now-renowned Huck® brand.

This unique fastener design provided effective solutions to common challenges, including:

- Loss of preload under service load,
- Setting and relaxation effects in threads,
- Self-loosening under vibrational loads, and

- Relative movement in the thread-bearing area.

The innovative fastening technology quickly gained popularity among manufacturers of mechanical structures and transportation vehicles. Its advantages over traditional joining methods made it a preferred choice in industries demanding reliability and performance.

Today, LockBolts are utilized globally across a wide range of industries by manufacturers seeking to minimize maintenance on bolted joints, eliminate the hazards and risks associated with welding, or simply streamline their assembly processes for greater efficiency.

Huck® LockBolts

Huck® fasteners are engineered to deliver unmatched resistance to vibration and loosening, a feature achieved through their mechanical locking mechanism. Unlike traditional fasteners such as nuts and bolts, which rely on friction to maintain tightness, Huck® fasteners use a combination of pre-loaded tension and a swaging process to create a permanent, vibration-proof connection. LockBolts offer distinct advantages over traditional threaded fasteners. Their unique strength stems from two key principles:

Swaging Process:

The Huck® LockBolt consists of a high-strength bolt (also known as

a pin) and a corresponding collar made from a softer and more ductile material than the pin. The locking grooves are an essential feature of LockBolts and differ from conventional screws in their flatter groove geometry, which results in a larger stress cross-section with the same nominal diameter and a lower notch sharpness. As a result, LockBolts have a significantly higher fatigue strength than threaded fasteners. The collar is smooth (unthreaded) on the inside and, unlike a nut, is not processed by turning, but is axially pressed firmly into the grooves of the bolt by the processing tool, which generates the clamp force on the one hand and creates a non-detachable connection on the other.

- The swaging process generates a predetermined preload and clamp load. The result is a permanent, vibration-resistant lock that eliminates gaps or play between components, the end result creates a unified structure capable of withstanding extreme stresses.
- Huck® fasteners are manufactured from high-strength, quality materials, which provide superior resistance to shear and tensile forces. They have a high resistance to environmental factors, such as moisture and temperature fluctuations, this ensures long-term durability even in harsh conditions.

Consistent Clamp Force:

Traditional bolts depend on torque to maintain tension, which can vary significantly due to installation inconsistencies or material properties. Huck® fasteners are designed to generate a uniform clamp force during installation, ensuring joint stability and reliability.

These principles make Huck® LockBolt fasteners a secure, maintenance-free connection capable of withstanding high shear and tensile loads.

Examples of Huck LockBolts include, BobTail®, Magna-Grip®, C6L®, C50L®, C120L®, and Hucktainer®. Each differ in design, diameter, grip range, material, plating, and purpose.

Huck® Fasteners vs. Traditional Fasteners Vibration Resistance

Traditional fasteners, such as nuts and bolts, rely on friction to maintain their hold. Over time, vibrations, dynamic loads, or thermal expansion and contraction can cause self-loosening, compromising joint integrity and leading to potential failure. Consequently, joints secured with traditional fasteners require regular maintenance and re-tightening.

Huck® fasteners address this issue through their mechanical locking system, which does not rely on friction. For example:

- Huck® LockBolts: The swaging process creates a direct metal-to-metal lock.
- Huck® Structural Blind Rivets: These retain the pin within the rivet body (sleeve) post-installation for extra strength.

Additionally, blind rivets require access from only one side of the application, simplifying installation. This process is fast, clean, and safe, delivering consistent results without the need for skilled personnel.

Huck® structural blind fastener brands include Auto-Bulb®, BOM®, FloorTight®, HuckLok®, Magna-Bulb®, Magna-Lok®, Magna-Tite®, and Penta-Lok™.

Installation Process

The installation process for Huck® fasteners is another area where they excel:

- Traditional fasteners require precise torque control to achieve the correct tension, with over-torquing or under-torquing potentially leading to

failure or unnecessary stress.

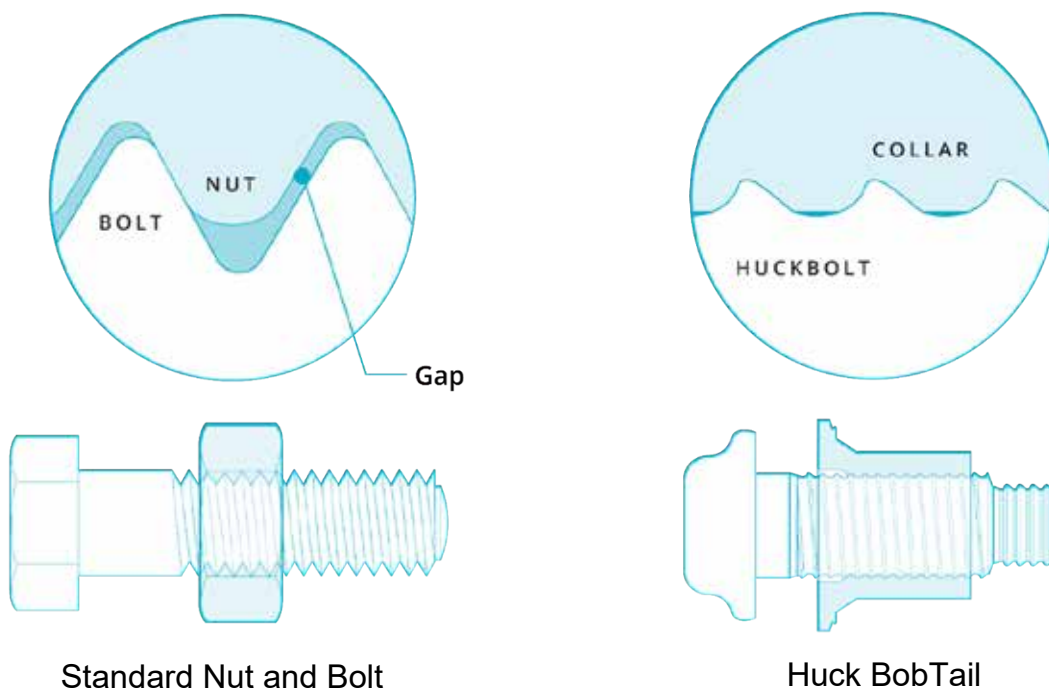
- Huck® fasteners utilize specialised tools to ensure consistent tensioning. LockBolts are tensioned directly using accurate power tools that set the preload through the swaging process.

This design eliminates assembler skill variability and the effects of friction coefficient variations, reducing human error and ensuring uniform performance across all fasteners in a project.

Reliability: Maintenance-Free Performance

Traditional fasteners often require regular maintenance to remain secure, particularly in high-vibration environments. Over time, environmental exposure, wear, and material fatigue can compromise their performance.

Huck® fasteners, by contrast, are designed to be virtually maintenance-free. Their permanent mechanical lock ensures long-term stability without periodic adjustments, translating into significant cost savings over the life of the joint by minimising maintenance and downtime.



Comparison of threaded fasteners and LockBolt with lock grooves

Advantages Over Traditional Fasteners

The following table highlights the advantages of Huck® fasteners compared to traditional fasteners:

Feature	Huck® Fasteners	Traditional Fasteners
Vibration Resistance	Mechanical lock; resistant to loosening.	Friction-based; prone to loosening under vibration unless a wedge lock washers or pre-applied, high strength thread adhesives are used.
Installation	Quick, consistent, and requires no re-tightening. The swaging process is completed in a single step, taking only a few seconds per fastener.	Installation often involves multiple steps, including torque application, inspection, and periodic re-tightening. These processes are prone to human error and inconsistencies, which can compromise the joint's performance.
Maintenance	Maintenance-free.	Regular inspection and tightening required.
Durability	High resistance to shear, tensile forces, and corrosion.	Variable; depends on material and design.
Cost-Effectiveness	Reduced long-term costs due to reliability and durability.	Higher maintenance and replacement costs.
Assembler Training Requirements	Minimal.	Assembler skill plays an important role in controlling torque settings, so ongoing training is generally required.
Ability to be Retightened	Not required.	Yes, unless if high-strength thread lockers and adhesives used.

Applications Highlighting the Superiority of Huck® Fasteners

LockBolts are ideal for use in applications where access to both sides of the joint is available and Huck® structural blind fasteners are used where only one side of the project is accessible. They provide an excellent alternative to screwed or welded connections, particularly in situations requiring high safety standards throughout the service life of the joint. Their exceptional static load-bearing capacity under shear and tensile forces, combined with outstanding fatigue strength, makes them a reliable choice for demanding applications. This durability makes them suitable for demanding applications such as:

Railway Systems: Huck® fasteners are extensively used in track connections, joints, and carriage assemblies. Their vibration-resistant properties ensure safety and significantly reduce the need for frequent maintenance.

Aerospace: Lightweight and durable, Huck® fasteners are essential in aircraft assembly, where weight savings and structural integrity are critical.

Heavy Machinery: In industries such as commercial vehicles, construction, mining, and agriculture, Huck® fasteners provide reliable connections for components subjected to intense loads and vibrations.

Renewable Energy: Huck® fasteners are integral to turbine assemblies, where they withstand dynamic loads and environmental stresses. They are also used in solar racking systems, where maintaining fastener preload and clamp load throughout the life of a photovoltaic (PV) installation is critical to the reliability of PV racking joints in service.

Infrastructure: Huck® fasteners play a significant role in infrastructure projects, including bridge construction and highway and road infrastructure components.

Marine: In shipbuilding and ship repair, Huck® fasteners create strong, corrosion-resistant connections for various marine structures and vessels.

As can be appreciated from the list of industries utilising

Huck® fasteners; they are highly versatile, offering endless possibilities for installation across a diverse range of applications.

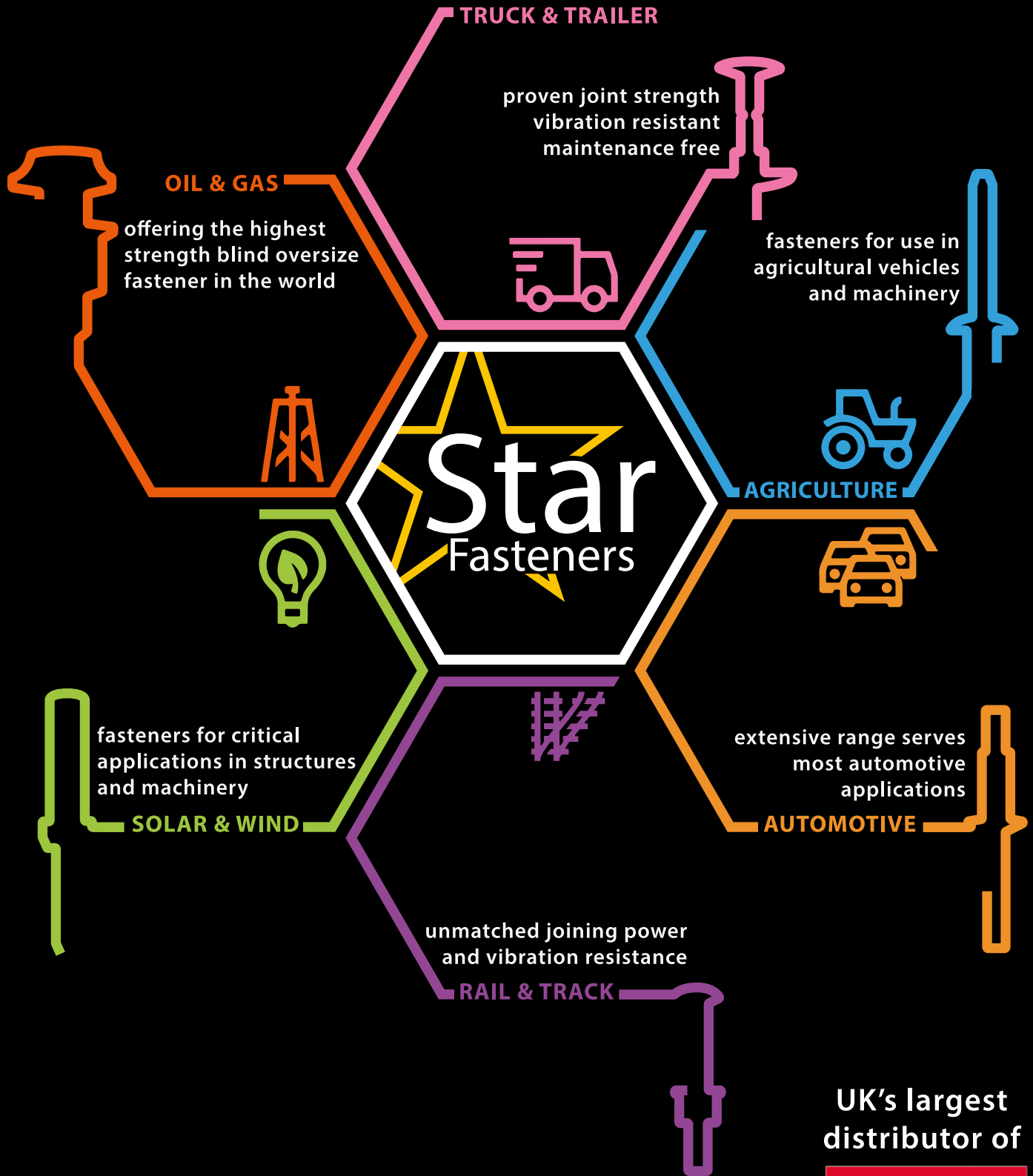
To Conclude, Huck® fasteners exemplify engineering excellence, offering unparalleled strength, durability, and vibration resistance. Their innovative design and efficient installation process make them superior to traditional fasteners in critical applications. By eliminating the risks associated with vibration-induced loosening, Huck® fasteners ensure the long-term reliability of connections, reduce maintenance costs, and enhance safety.

As industries continue to demand robust and maintenance-free fastening solutions, Huck® fasteners stand as a testament to the power of innovation and precision engineering, providing a secure foundation for the world's most demanding applications.

For further information contact Star Fasteners (UK) Ltd, the UK's largest Huck® fastener and tooling distributor.

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