

Fastening systems for reliability and longevity

Solar electricity generation saw a record share of total power output for 20 EU countries in 2022, and is projected to rapidly expand with new projects in the coming years. With expansion comes the challenge of delivering new capacity quickly and sustainably to meet energy demand. To address that challenge, solar project components need to be engineered for reliability, longevity, and improved productivity so that capacity is delivered on time.

Applications in the solar industry require components to withstand field conditions including corrosion and provide longevity, reducing maintenance costs. However, not all components of a solar field provide the same level of utility. Some, like fasteners, need to offer even more value. Fasteners are vital to the structural integrity of solar installations and need to meet all reliability criteria, while managing static and dynamic loads transmitted by each joint in a solar system.

Fasteners face their own unique challenges in maintaining structural integrity and longevity. Conventional nuts and bolts can loosen in high vibration conditions, requiring re-tightening to avoid joint failure. Productivity challenges are another concern, where potentially scarce skilled labor is

needed to quickly install conventional bolts with a torque wrench.

First developed nearly 80 years ago by Louis C. Huck, lockbolts present a solution to challenges faced by conventional bolts and have evolved to feature the capabilities necessary to provide reliability in solar application. Lockbolts have made joints more reliable in a wide range of industries and applications while allowing faster, quicker installation and with less operator training or potential for error.

Lockbolts and structural blind fasteners for solar

Lockbolts differ from conventional fasteners for a multitude of reasons. Conventional nuts and bolts are installed

with torque tools or wrenches, while lockbolts consist of a high-strength bolt and a less-hard collar, allowing for installation through swaging with a powered installation tool. In the swaging process, the softer collar is squeezed onto the threaded lockbolt, reducing collar diameter and increasing its length, leading to more direct surface area tension between the collar and lockbolt than found in a conventional nut and bolt.

The lack of surface area contact in conventional fastening systems can allow transverse vibrations to loosen joints with greater ease than lockbolts, as shown in Figure 1, which are considered a permanent joining solution.

Swaged lockbolts eliminate the need for torque-tightening and reduces preload scatter, which is the amount of variation in preload achieved during the assembly process. Managing this variation is vital to solar projects because insufficient preloading can lead bolts to become loose. Swaged lock bolts will not self-loosen like conventional bolts. This prevents the need for lockbolts to be re-tightened, and also mitigates the risk of fallout that conventional bolts can face from self-loosening in the extreme conditions solar applications can be exposed to.

Beyond torque, the usage of conventional bolts also requires solar installers to consider the coefficient of friction when the conversion to clamp takes place, which can vary depending on lubricants and materials used and can potentially affect the durability of a joint. Lockbolts do not need to take this into account, allowing for more flexibility in

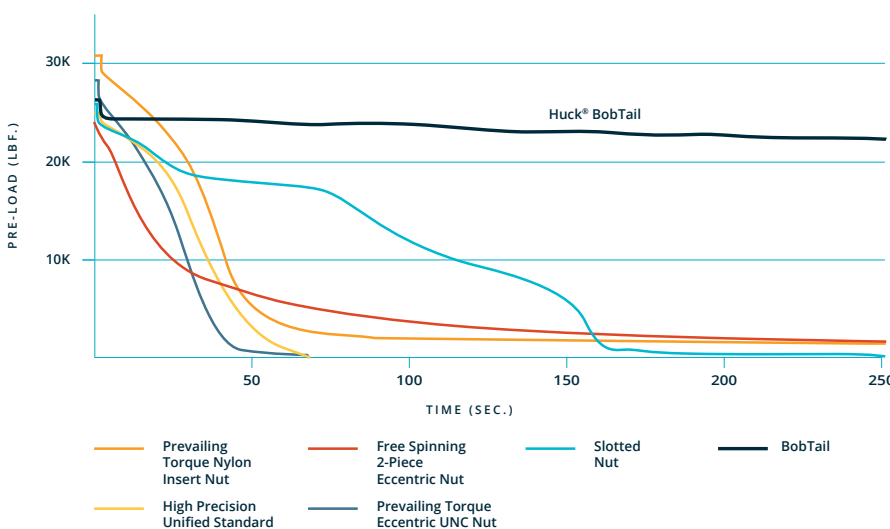


Figure 1

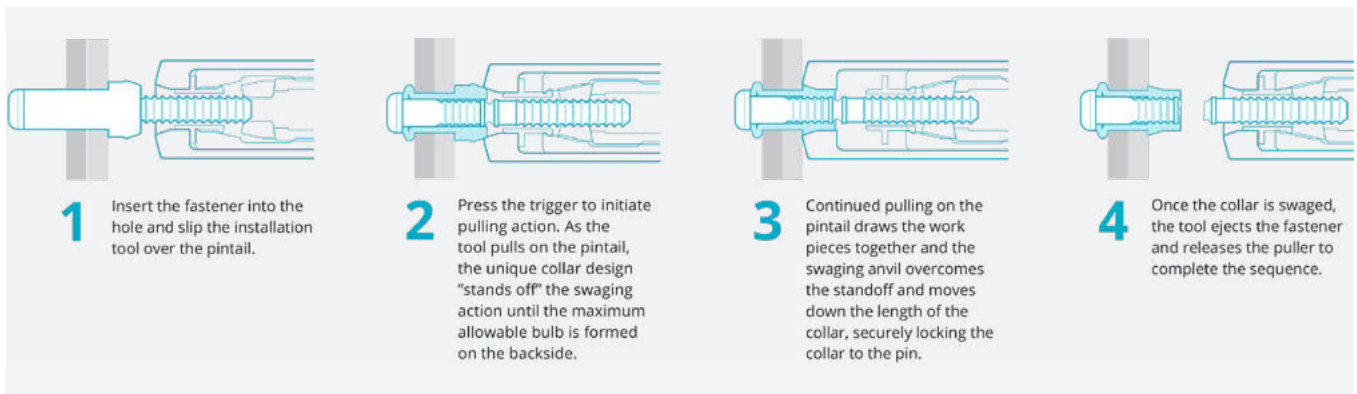


Figure 2: Structural Blind Fastener Swaged Installation Steps

their material, grade, diameter, and coating while still delivering consistent values.

Most structural blind fasteners do not employ swaging technology for installation as lockbolts do, since they are a one-piece fastening system, allowing for installation where there is no backside access or a low clearance. However, BOM®, Blind Oversized Mechanically Locked, fasteners have a unique push-and-pull installation design, giving the strength to replace welding applications without the need for extensive training or skilled operators. These fasteners do not require surface preparation, grinding, or filling after application.

An example of how the push-and-pull swaged installation of a BOM is completed is shown in Figure 2. Structural blind fasteners and two-piece lockbolts both benefit solar sites with faster installation times than conventional bolts, helping solar projects quickly build long-lasting and consistent joints at the pace needed to meet rapidly growing demand.

Lockbolts and structural blind fasteners are available in various plating and coating options to resist corrosion, a quality necessary for the longevity of any component in a solar application. One way fastening systems can resist corrosion is through advanced finishes like zinc or zinc nickel electroplate in small diameter



The Huck SF20 is a popular installation tool for all industries, including solar

fasteners and zinc flake coatings for larger diameter systems.

Coatings can also assist installers with identifying which fastening systems they are using quickly and without the need for in depth training, since parts can be color-coded. Overall, lockbolts and structural blind fasteners can provide reliability through consistent clamping, longevity through resistance to vibration and loosening, and can save time while meeting the needs of rapidly expanding solar applications.

Installation tooling for lockbolts and structural blind fasteners

Lockbolts and BOM fasteners are designed to leverage swaged installations that solve more problems faced in joints required for solar applications than conventional bolts. Powered installation systems use linear-pull swaging and are designed to properly install these swaged fastening systems. The installation process is critical to the success of the fastener.

The fastening systems are designed from the pin and collar all the way to the installation tool, nose assembly, and power source. Inspection of an installed lockbolt or BOM fastener can be achieved with calipers or by using a swage gauge designed for the appropriate fastener to verify proper swaging has been achieved.

There are many installation tooling systems to support several different approaches to any given application or requirement. Powered installation tooling systems are pneumatic, electric, gasoline, diesel, or battery powered based on the preferences of the installer and job site requirements.

Huck® manufactures a wide range of nose assemblies to assist with application requirements that may call for extended length noses to enable installation of hard-to-reach lockbolts or blind fasteners. The new BV17 battery powered installation tool provides sufficient tool stroke and capacity to install lock bolts up to M14 and

blind fasteners up to ½" in diameter. This enables an installer to roam the job site untethered to install high strength fasteners as needed to support build schedules. Wireless battery tools have provided increased productivity through their enhanced mobility and can allow installers to navigate muddy or adverse terrain that would not be easily accessible for power rigs.

The Huck global manufacturing footprint, foregrounded by factories in North America, Europe and Asia, gives solar installers the support they need to implement lockbolt and structural blind fastener technologies in their projects. Solar project leaders can source HuckBolts® with short lead times from regional manufacturing facilities and have them shipped directly to the assembly location, reducing lead time and cost. Each location has the technical expertise to support assembly through an array of services from training to trouble-shooting.

www.hfsindustrial.com/us/huck

About the company

Huck is a registered trademark of Howmet Fastening Systems.

Behind every Howmet Fastening Systems brand is a powerful commitment to providing the strongest, most reliable fastening solution available, regardless of industry.

Its uncompromising approach to engineering, manufacturing quality, and breadth and depth of products is unmatched; resulting in a range of structurally superior fasteners and ergonomically designed installation tooling.

In addition, Howmet Fastening Systems make the process easy.

Knowledgeable sales and engineering support staff are available to consult with customers, to help identify the products that best meet their needs and application requirements.