number one source of injuries in the Oil and Gas services occur while attempting to make or break hammer union connections.

Brad Bull and Greg Neal (Halliburton Co.) in “Eliminating Hammer Injuries in the Oil Field”
Introduction

The efficiency and productivity of oil and gas, chemical production, water processing and other industries depends heavily on their ability to transport fluids through various pipes. While pipes are essential to resource transportation, they introduce safety hazards that need to be addressed. R&H Manufacturing, LLC provides a long-needed solution to “one of the biggest safety hazards that plague the industry – pipe connector assemblies” (Bull, 2007).

R&H’s business is the machining of intricate parts to solve issues in the oil & gas industry. Their knowledge of the industry helped them identify the inefficiencies of current tools such as hammer union designs.
Challenges Associated with Conventional Hammer Union

Pipes are essential to optimizing resource transportation (water, gas, oil, etc). They often have to be connected to each other to extend the reach of the pipe. These connections currently use connector assemblies (composed of a male end, female end, and wing nut) or what are called, unions. More formally, a connector assembly is a set of pieces that when used together serve to bond two pipes so that fluids and gases can flow through them freely.

In the oil & gas industry, these connections have to be capable of withstanding high pressures. If for any reason a connector fails, a physical explosion can occur – creating a very dangerous incident.

"Traditional unions require the use of a sledgehammer to tighten or loosen connections. This is a very crude and dangerous means of forming a sealed connection."
Conventional hammer unions present substantial safety hazards, due to:

- Using assembly pieces that are not designed for one another.

- Requiring the use of a sledgehammer to tighten the wing nut. Wing nuts have to be hammered 4 – 8 times for a good seal, and the overall physical strain necessary becomes a bodily concern (Bull, 2007). Bodily injuries occur from missing hammer strikes, the sledgehammer slipping out of worker's hands, or metal shards breaking off from the wing nut or the hammer itself.

- Most injuries on-site in the energy services occur while attempting to make or break one of these hammer union connections (Bull, 2007).

- Potential health concerns associated with the act of swinging a sledgehammer.

- Frequent beating on the hammer union can cause premature failure for the connection. Cracking a wing nut can lead to seal failure, which might result in a potential explosion.

Hammer unions can easily be over-tightened because of the lack of sensitivity of pounding an object with a sledgehammer – this adds another risk of connection failure.

Because they are hammered frequently – every time a drilling rig is rigged up or broken down, those pipes must be taken apart or reconnected – this increases the hazard because the lifetime and overall reliability of the union is reduced.
Also, there is a variety of hammer union designs and some models (Weco 1502, Weco 1002, Weco 602) are similar enough in appearance that parts can easily be confused with one another (Hammer, 2000). Assembling a connector with the wrong pieces can substantially reduce the amount of pressure that union can withstand; this issue has been observed in the past (Hammer, 2017).

There are standards, set by the American Society of Mechanical Engineers (ASME), to determine what use can be made of a connector. The variables described in the standards include things like: expected pressure load, the material that the assemblies are made of, and the dimensions of the component, to establish the acceptable uses for a connector assembly.
The innovative solution offered by R&H Machine – the SaferUnion – has reduced hammer union hazards dramatically. The SaferUnion™ is a new wing nut fastener that provides greater safety in dangerous working environments. It is a superior alternative to conventional hammer unions, because it requires the use of less energy. Instead of hitting a union with a sledgehammer to tighten the connection, the new design uses a bar with a long moment arm, that is capable of providing sufficient torque on the nut to either tighten or loosen the connection.

Tests conducted by R&H Manufacturing according to the QSP-SU1 procedure have demonstrated that the SaferUnion™ can, on average, be supplied with 18% more torque compared to the conventional hammer unions (1240 lbs – ft vs. 1052 lbs – ft).

The SaferUnion torque bar can easily be inserted and removed from one of the 8 openings that are available at every 45 degrees of the SaferUnion™ wing nut. The bar handle is equipped with a detachable connector piece on one end, where the clearance between the connector and the handle allows the application of additional torque without any damage to the bar.

The SaferUnion™ bar connector has a slot on the end which engages the pins inside the union.
When the bar tip is inserted into the union, the wing nut pin locks the handle in place, which prevents unintentional detachment. SaferUnion™ makes the process of tightening and loosening a connection easier, more convenient, more cost-saving, and safer.

**Overall, SaferUnion™ is superior for several reasons:**

- It doesn't generate a spark (due to not hitting a SaferUnion™ nut with a sledgehammer); sparks can serve as an ignition source in explosive environments.

- The union interior is identical to that of the hammer union's, which requires no new knowledge to use.

- It comes in the most common sizes such as 2”, 3”, and 4” diameters.

- The life cycle of the tool is extended when compared to the conventional hammer unions, because there is no damage resulting from hammer hits. It is ASTM A-732 steel Steel, and because it's not being deformed by hammer hits, its structural integrity remains sound.

- It is corrosion-resistant, so it is durable and reliable in virtually any environment, including sour environments.

- Its design was evaluated and validated by a professional engineering firm, Lynch Engineering. According to their study, the SaferUnion™ has a minimum safety factor of 3. This theoretical study was validated when the union was tested under hydrostatic pressure of 50 ksi by a third party (H. Lorimer Corporation). The rated pressure of that unit was 15 ksi, so it withstood a little above 3 times its designated load.
Only one person is needed to install and remove the SaferUnion™, which reduces piping service expenses by up to 50%.

The surface of the handle is knurled to provide an exceptional grip.

Strain on the operator's joints and back is greatly reduced, which results in better work conditions.

The bar tool is safe to use when loosening connection because its length keeps personnel out of the spray-zone of fluids or gases.

These factors lead to a safer alternative that's easier to use.

SaferUnion™ is a true “hammer-free” alternative to hammer unions.

Adopting SaferUnion™ will enable facilities to maintain a work environment with fewer accidents and better performance.

The SaferUnion™ concept originated when the inventors considered their experience, and observed people's interactions with hammer unions. They realized that there had to be an alternative to this incredibly dangerous method of sealing.

They took their combined 65 years of hands-on experience in the industry, and applied it towards constructing a more appropriate and safer alternative to hammer unions.
The accident reports and the countless RCRA’s related to hammer unions that the inventors personally filed was enough confirmation to know that a new union was badly needed. Reports detailing workers getting struck in face with hammers, having crushed fingers/hands, eye injuries, and damage to other body parts were all too common. Their answer to the issue was the SaferUnion™ – a better fastener that addresses the most pressing concerns of personnel safety, as well as the longevity and efficiency of pipe connections.
“Hammer Union Failure Explosion During Well Stimulation Fracturing or Fracking. Talk to a Lawyer about Injury or Death Lawsuit.”

“Hammer Union Mismatches Threaten Wellsite Personnel.”

“Bull, B., & Neal, G. Eliminating Hammer Injuries in the Oil Field.”
Society of Petroleum Engineers. doi:10.2118/106566-MS, 1 January, 2007

Product details of hammer union:
https://www.dixonvalve.com/product/HU206150

Traditional high-pressure unions use 4130 AS/4140 AS grade steel: