Top of the CHAIN

Toby Imgrund, Renold, discusses common engineered chain assembly pitfalls.

Assembling engineered chains is not easy, even under the best circumstances. Chains are typically replaced during a shutdown, or as the result of downtime, meaning there is pressure to get the equipment running again so production can resume. Engineered chains are normally weighty and awkward, requiring heavy equipment to move them into the correct position.

Many engineered chains, such as those used by cement mills in bucket elevators, can last for years, meaning infrequent repair and replacements. Because of this, it is not unusual for inexperienced installers to make mistakes that more seasoned professionals know to avoid. This article will examine some of the more common and detrimental pitfalls in engineered chain installations, and how to overcome them.

Figure 1. Pins can wear at varying rates. The topmost one is a carbon steel pin that was mistakenly assembled in a stainless steel chain.

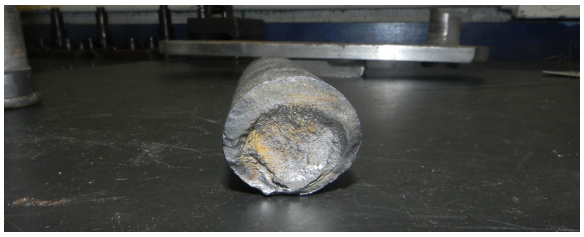

Figure 2. This pin was bent during assembly and sheared off when the chain was placed under load.

Figure 3. This pin was ground down to make the assembly process easier.

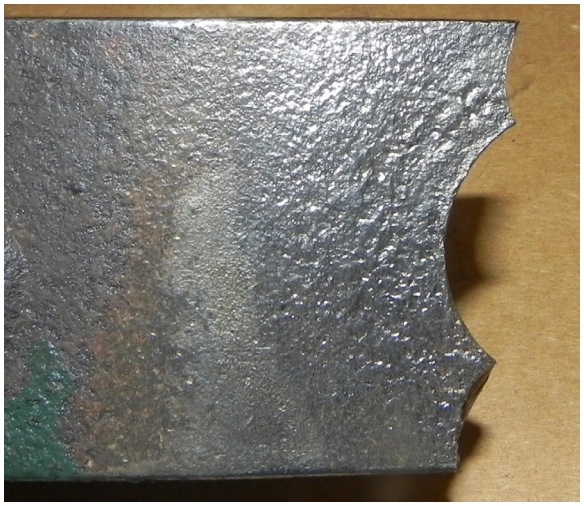

Figure 4. Close up image of a side plate that was overheated during assembly, which resulted in a plate crack.

Proper assembly

If care is not taken during the disassembly and assembly process, chain components can become mixed, and old and new parts can become intermingled and assembled together. This presents a problem, as the interference fits between chains from different manufacturers is not the same. Misfits and improper components can cause rapid wear and void the manufacturer's warranty. As Figure 1 illustrates, these pins can wear at varying rates. The topmost pin shown is a carbon steel pin mistakenly assembled in a stainless steel chain.

One of the most important things that can be done to extend the life of a chain is proper assembly. Proper chain assembly is far from an easy task, even in controlled settings. Most installations are done in much less desirable conditions. Some common challenges are chain placement, the surrounding environment, access to equipment, weight, and safety. These are all factors that can make it difficult to assemble and disassemble engineered chains.

Common mistakes

Using hammers to assemble large chains is unsafe, inefficient, and can damage links. Hand tools often result in deformed components, such as bent pins that are no longer concentric. Furthermore, sidebar hole breakout can occur around the hole, which will lead to rapid wear on the link. Holes can also end up out of alignment, meaning they are no longer perpendicular to the sidebar. Over time, this will cause additional wear on both the chain and the sprocket. Figure 2 shows a pin that was bent when the chain was assembled. Once the chain experienced normal shock loads, the pin sheared off and caused a catastrophic failure, ultimately resulting in unnecessary downtime and damage to the broader system itself.

Grinding pins is another common mistake. Shaving even a few millimetres off a pin can mean the difference between a long-lasting chain and accelerated wear. At Renold, each Jeffrey engineered chain component is manufactured precisely to tolerances that are held to the thousandth millimetre. This provides an interference fit between the components. This interference fit is tight, and inherently makes assembling a chain more difficult. However, maintaining the press fit between the components is a key factor for increased chain wear life. Not only does a tight fit help keep abrasives like dust and debris out of the chain joint, but it also reduces friction. Less movement means less friction, which in turn means less wear and longer chain life (Figure 3). In this instance, the pin has been ground down to make the assembly process easier. When the installation crew ground down

these pins, they removed the hard exterior surface that protects the pin and joint components from abrasion. The chain wear life was drastically reduced as a result.

Using a torch to heat the pin is another common mistake. Overheating the components will irreversibly damage the heat treatment process. Altering the hardness levels of chain components will drastically reduce the wear life of a chain. At Renold's Morristown, Tennessee, manufacturing site, the company precisely heat treats each component to make sure the outside maintains an exterior hard surface, which allows the pin to resist abrasion from the dust and debris that is commonly found at cement mills. The company takes care to retain a ductile core to withstand shock-loading. This delicate balance is often upset when pins are heated with a torch for easier assembly, which also invalidates any existing warranty on the chain. Figure 4 shows a side plate that was heated in the assembly process, which resulted in a plate crack.

Figure 5. Chain components that were bent during the assembly process and caused the pin to shear.

Figure 6. Renold Jeffrey's engineered chain break and assembly tool.

As mentioned, hammering on steel chain components can be dangerous for those present and damaging for the chain being installed. Repetitive motion injuries, crushing and impact injuries, and puncture or scrap wounds from shrapnel all represent the physical results of manual assembly that can be avoided. Hammering away on chains can also cause deformation and bending of the components. Figure 5 illustrates an example in which chain components were bent in field assembly, which resulted in the pin shearing from the additional stress.

A solution

Due to all of the extenuating factors that go into chain assembly and disassembly, Renold now offers a Jeffrey engineered chain breaker and assembly tool (Figure 6). This tool addresses the issues discussed in this article. It removes the need for cumbersome hand tools, channel locks, hammers, and other undersized and unfit tools. Its aluminium body makes it a portable tool, weighing 26 lb. The simple design is intended for use with one operator, and a second person for stable positioning. In a continued effort for simplicity, the cylinder is fitted with a standard adaptor to couple with most hand pumps or related hydraulic sources.

In conjunction with safety, the tool allows for better product performance and maximises chain life as it provides a press fit pin. It also makes breaking chains apart much easier, meaning a faster turnaround time on replacement and installation overall. Each tool body can be used on a range of chain sizes using the adaptor kit, which consists of a sized insert and ram pin components, as well as manually adjusting the saddle. This tool was designed by experienced field engineers with a desire to make the process of chain installation and assembly easier, safer, and more efficient.

Conclusion

Chain assembly is vitally important to the performance and wear life of a chain. One of the most important precautions that can be taken is to follow the manufacturer's installation and assembly instructions. It is important to always consult the manufacturer for advice and proper installation techniques. Taking extra steps to properly assemble an engineered chain can be crucial in how equipment performs, both today and in the future. ■

About the author

Toby Imgrund is Director of Product Management and Marketing at Renold.