

DUROCHAIN™

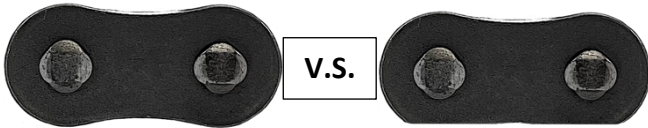
Roller Chain Wear & Inspection Sheet

Example of New Roller Chain:



The above photo shows a brand-new intact roller chain prior to installation for a reference point.

Side Plate Wear:



The above photos show a new side plate (on the left) and a worn side plate (on the right). When a roller chain runs across a surface that isn't present in every application, the sidebars are subject to wear due to surface-on-surface contact, which is often steel-on-steel. Therefore, it is typically recommended to replace the chain when side plates have become roughly 5% worn. At DUROCHAIN, we recommend utilizing a polymer roller chain guide (wear guide) in these circumstances. Typically made from UHMW, a roller chain guide sacrifices itself as a wear component and will reduce the amount of friction and energy required to operate. When using a roller chain guide, it is essential to inspect the wear pattern and rub pattern to ensure the chain guide is evenly wearing as it is intended to and that there is not an abnormality that could be caused by misalignment or over-tension.

Tight Joints:



The joints of a roller chain are the points where the outer surface of the inside link plate comes into contact with the inner surface of the outside link plate. When these "joints" become difficult to move, it can cause a significantly increased wear action that affects your sprocket, guides, chain performance, and even bearings within the system from increased vibration. This is generally caused by foreign substances getting packed into the joints of the chain, corrosion, misalignment, or bent pins/ plates. DUROCHAIN offers several problem-solving chain types when it comes to corrosion (nickel, stainless, coated, zinc plating) or when the chain is running in an application subject to large amounts of dust, dirt, or debris (O-Ring or X-Ring chains). If pins or plates are bending, we recommend ensuring the chain is not operating past its recommended working load rating and checking system alignment.

Fractured Side Plate (Tension Failure):



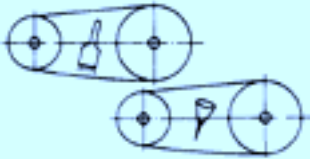
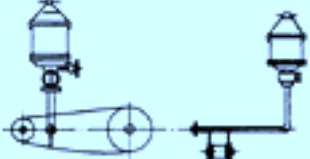

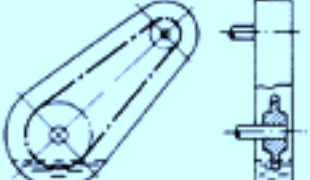
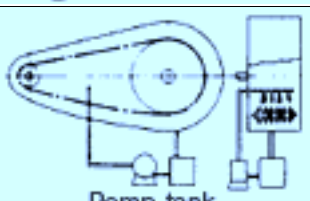
A fractured side plate is a catastrophic chain failure, typically due to overload or tension failure. If this event occurs, it is recommended to replace the entire chain since, more than likely other points in the chain have become compromised. Other factors that can cause this is improper engagement with the sprocket, excessive chain elongation, misalignment, excessive chain slack, cracked bushings, or debris buildup between the chain and sprocket that prevent proper seating.

Pin Wear (Pin Galling):



Pin wear should be even on the entire circumference in an ideal scenario. However, when wear occurs on one side or galling occurs, it typically means there is a lack of lubrication. Ensure that you are lubricating the roller chain with the correct lubrication type based on the application's needs and correctly (see the table below). For applications where frequent lubricating is difficult or impossible, utilize one of our DUROCHAIN self-lubricating or sealed chains. If lubricating is done correctly, then ensure you are not exceeding the safe maximum speed rating for the chain and make sure the chain is not exceeding its load rating or that over-tensioning is not occurring.

Roller Chain Lubricating Methods:

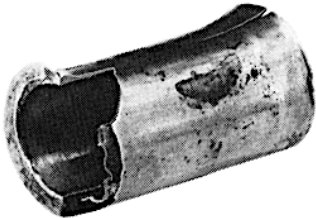
Lubricating Type	Recommended Lubricating Method	Figure
Manual Lubrication	Apply oil manually with filler or brush as needed.	
Grip Lubrication	A consistent drop of oil onto the roller chain as many times as needed per hour.	
Disc Lubrication	Disc rotor transporting oil from a pan that splashes onto the sprocket and chain.	
Oil Bath Lubrication	Chain and sprocket casing that acts as an oil pan where the chain is dipped in oil at the bottom of the system.	
Spray Lubrication	Oil pump circulating and spraying oil onto the chain within an enclosed casing.	 Pump tank

Fractured Side Plate (Fatigue Failure):



In most circumstances, a fatigue failure results from repeated cyclic loading that surpasses the chain limit or capacity rating. Overloading on a roller chain is often the result of worn sprocket teeth, pocked buildup, motor overload torque, dynamic loading from sudden stops, or impact loading equipment. Fatigue crags will generally occur at the point of the highest stress, which is the aperture of the pin or bushing plate. Repeating cyclic stresses will typically cause the crack to extend perpendicular to the pitch line of the chain until the plate eventually breaks. Unlike a tension failure, there will not be evidence of the material stretching. When this type of failure happens, it is crucial to inspect the sprocket teeth and investigate the cause of the overload; if the overload is unavoidable, we recommend increasing the chain size. In circumstances where the chain size cannot be increased due to space requirements, contact a DUROCHAIN applications specialist for possible solutions.

Round Part Wear (Bushings & Rollers):



The bushings and rollers within a roller chain are both subject to shock loads, just like the rest of the chain. If possible, check the round parts of the chain to see if there are any fatigue cracks or warping prevalent. Typically these cracks will be circumferential and near the bushing link plate or longitudinally along the length of the bushing; it is not unheard of for both forms of cracks to be prevalent on the same bushing or roller. Common causes for round part failure include operating the chain past its recommended working load, cyclic loads, sprocket wear, and shock loads. To help prevent these types of failures even in adverse applications, our DUROCHAIN is standardly equipped with heat-treated solid bushings and rollers that have also been shot-peened for maximum wear. However, even the best quality chains will still fail if the chain is not maintained and used in the correct manner.

Below are two illustrations that also show common round-part failures outside of cracking.

Warped Round Part Example



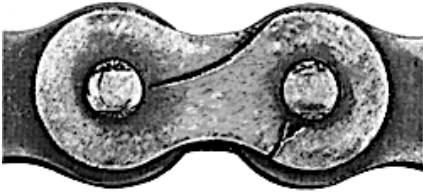
A warped round part can occur if debris between the round parts prevents proper roll, if there is too much load or tension on the chain, or if the sprocket teeth have worn in a narrow fashion.

Split Round-Part Deformation



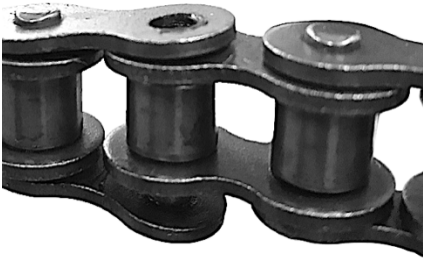
In cases of split bushings or rollers, it is imperative to pay close attention to the splits themselves. Over time or under application anomalies such as overloading or periodic shock loads, the round part can become deformed. If the bushings deform, this is incredibly destructive on the roller's inner surface and the pin's outer surface. In contrast, if a roller becomes deformed, it gives way to excessive wear on the roots of sprocket teeth and the outer surface of the bushing.

Stress Cracks and Hydrogen Embrittlement:



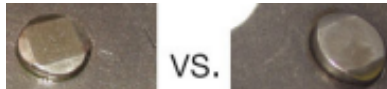
Stress cracks and chain embrittlement have nearly identical stress cracks. The cracks typically initiate at the point of highest stress and pose an arc-like formation path that extends parallel to the rolling grain of the material. Often, more than one crack will be prevalent on the side plate. The cause of this in normal environments is typically due to an overload on the chain or misalignment. When it comes to acidic, corrosive, or caustic applications, the cracking occurs from corrosion happening within the steel; both carbon steel and specific grades of stainless steel are subject to stress cracks from corrosion. Many chemical agents react with metals in a way that liberates hydrogen, which in turn attacks and weakens the metal structure. Check with a DUROCHAIN application specialist when operating a chain in corrosive environments or if these cracks become prevalent on your current chain.

Failing Rivets:



Rivets on a roller chain are essentially what holds everything together. The majority of chains on the market utilize a dual-staking rivet design. When rivets fail, the side plates will protrude outwards away from the pin. This is typically caused by overloading, misalignment, or side load. Often there will be early warning signs of a rivet failing, such as the side plate working its way flush to the pin or flecks of metal on the outside of the pin where it meets the side plate. At DUROCHAIN, we implemented a quad-stake riveting process that doubles the holding power of the chain to withstand higher loads and occasional side loads without chain failure.

Quad Staked Rivets Versus Dual Staked



Side Plate Failure (Popping Off):



In a circumstance where your chains' side plates are working themselves off or popping off the chain, it is typically a result of the rivets failing. When no evidence of rivet failure is prevalent, inspect sprockets for material buildup that can wedge between the inner surface of the inside plates and the sprocket. Additional factors of this can include if the chain is seeing sudden shock loads, is experiencing loads past its recommended tensile strength, or has severe misalignment. If this occurs where a connecting link (master link) is present, consider using a different style retaining method

Pin Breakage:



When a roller chain pin breaks, it is considered a catastrophic failure. Much of the time, the entire chain needs to be replaced since the integrity of the other components will more than likely be compromised. This type of failure typically happens from overload or sudden shock loads from stopping and starting. To combat that consider using a chain with through-hardened pins or chrome-plated pins.

Rust / Roller Chain Corrosion:



Rust can be a chain's biggest enemy; it causes chain binding and will eventually lead to chain failure. Rust typically occurs in applications exposed to corrosive materials and liquids such as salt, cleaning solutions, water, and many others. At DUROCHAIN, we have a range of anti-corrosive roller chains dependent on the exact needs of the application and environment. The list below shows all the standard corrosion-resistant roller chain options ranging from the least amount of anti-corrosive capability to the highest anti-corrosive ability. Please note, stainless steel and **CLOUT** series stainless steel roller chains are equal in corrosion resistance. The CLOUT series DUROCHAIN is a high-strength stainless chain that has tensile strengths equal to carbon steel chains.

- Zinc -



- Nickel Plated -



- Coated -



- Clout Stainless -



- Stainless Steel -

