Troubleshooter Guide




RENOLD

Superior Chain Technology

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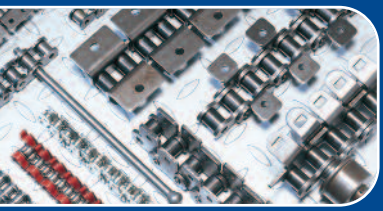
Product range

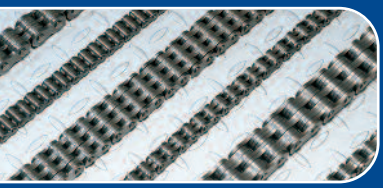


Roller Chain

- British, ANSI, API, DIN, ISO and Works Standard Chains
- Adapted Chains
- Extended Pitch Chains
- Hollow Pin Chains
- Made to Order, Special Chains
- Mini Pitch Chains
- Nickel Plated Chains
- Oilfield Chains
- Plastic Bush Chains
- Power and Free Chains
- Polymer Block Chains
- Side Bow Chains
- Stainless Steel Chains

Conveyor Chain

- British, ISO and Works Standard Chains
- Adapted Chains
- Agricultural Chains
- Bakery Chains
- Deep Link Chains
- Escalator Chains
- Made to Order, Specials
- Stainless Steel Chains
- Sugar Cane Chains
- Zinc Plated Chains



Lifting Chain

- LH(BL), AL, LL and Works Standard Chains

Contents:

Transmission Introduction

The Renold Troubleshooter highlights a series of common failure modes to give maintenance engineers an insight into the effects of application conditions and the benefits of installation and maintenance best practice.

The Troubleshooter supplements the information available in the Installation, Maintenance and Designer Guides that are available for Transmission Chain and Conveyor Chain.

To download any of these publications please go to www.renold.com

Figure 1 - Mode of Failure - Alignment

Application	Simple transmission chain drive.
Failure Mode:	Rubbing wear on the face of the side plates, the end of the side plates and the pin end.
Diagnosis:	The chain has been rubbing against some fixed point on the circuit. This may have caused damage to parts of the guide system or fixtures.
Solution:	Realign the chain drive before the damage to the chain becomes too serious and the chain has to be scrapped.

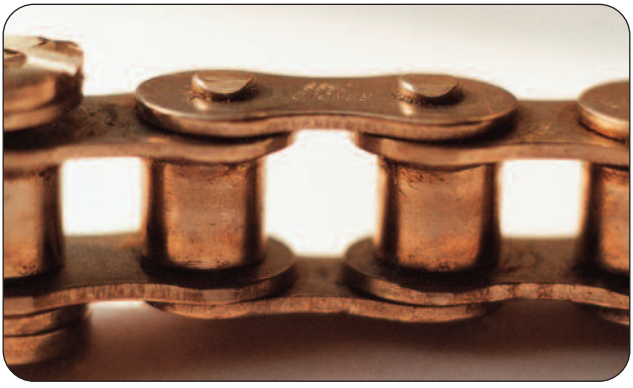


Figure 2 - Mode of Failure - Abrasion

Application:	Stainless steel transmission chain used to remove produce from the cooking oil in an automatic fryer.
Failure Mode:	The chain suffered rapid pin/bush wear and pitch extension.
Diagnosis:	When the oil at the delivery end of the fryer was examined, it was found to contain product residue that had been degraded to form very hard burnt particles, that were abrading the chain round parts.
Solution:	Fit replacement chain and introduce a filtration system to the cooking oil to remove the abrasive residue.

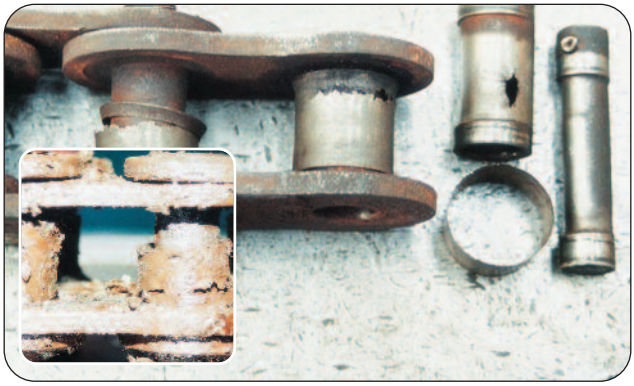


Figure 3 - Mode of Failure - Corrosion

Application:	1.75" ANSI simple detachable chain used on a table roll drive in a steel mill.
Failure Mode:	Heavy corrosion and erosion of all parts.
Diagnosis:	Bush and rollers have corroded / worn to a wafer thin condition with corresponding wear on the pins. Plates have a great deal of side wear and are heavily pitted. This chain has been used in an extremely hostile environment subject to high temperatures and water spray.
Solution:	Improve lubrication methods. Consider using a corrosion resistant chain.

Figure 4 - Mode of Failure - Corrosion

Application:	Chain drive used on a barrelling machine.
Failure Mode:	Corrosion.
Diagnosis:	This chain has been used in an environment with water contamination. The chain has not been regularly lubricated and external parts have gradually corroded until the rollers seized. The chain has then proceeded to wear heavily on the rollers.
Solution:	Protect from water if possible. Increase degree of maintenance lubrication.

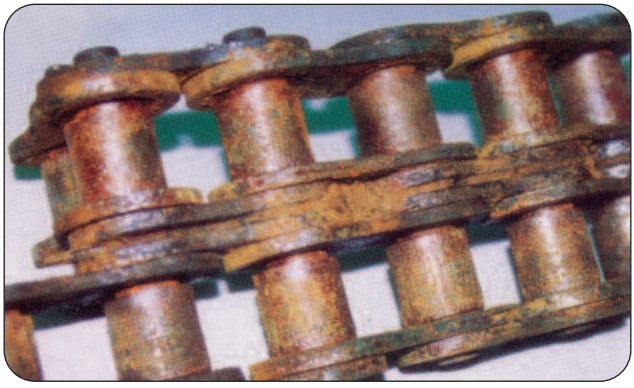


Figure 5 - Mode of Failure - Corrosion/Erosion

Application:	1.75" ANSi duplex chain used on a carrier drive in a sugar mill.
Failure Mode:	Heavy corrosion of all the components in the chain.
Diagnosis:	The chain had been operating without any lubricant being applied and was also subject to attack by acidic sugar juice. As a result the chain suffered heavy corrosion and wear.
Solution:	Replace the chain and ensure adequate lubrication is applied. Protect the chain from juice with an appropriate casing.

Figure 6 - Mode of Failure - Cracking

Application:	1" P BS transmission chain
Failure Mode:	Outer plate cracking
Diagnosis:	A pin has been tac-welded on both sides of an outer plate. The cooling rate after welding resulted in the plate cracking.
Solution:	No welding should be carried out after supply as this can cause plate cracking, distortion and stress relieving.

Figure 7 - Mode of Failure - Erosion

Application:	Bucket elevator chain
Failure Mode:	Dry cavitation erosion caused by particulate debris
Diagnosis:	Pin erosion when handling dry materials which act like a fluid when in contact with the chain, this type of wear is common on elevator chain handling cement.
Solution:	Once the wear pockets are established the rate of wear tends to accelerate. Sealed joint chains are recommended to increase the chain life.

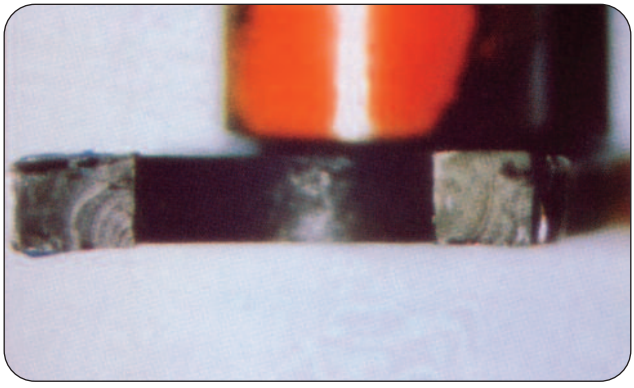


Figure 8 - Mode of Failure - Fatigue

Application:	Transmission chain was used in a highly impulsive load application.
Failure Mode:	Inner plate suffered a fatigue failure.
Diagnosis:	Due to the high impulsive loading, a crack started at the edge of the plate hole and crack propagation occurred, resulting in a 'classic' fatigue failure.
Solution:	Eliminate high impulsive loading or select larger pitch chain.

Figure 9 - Mode of Failure - Fracture

Application:	1.25" P BS zinc plated chain used in a water environment.
Failure Mode:	Bushes fractured on assembly
Diagnosis:	Customer supplied zinc plated bushes for assembly. When assembled the bushes broke into several fragments due to hydrogen embrittlement as they had not been de-embrittled after plating.
Solution:	Ensure correct de-embrittlement treatment is carried out immediately after plating.

Figure 10 - Mode of Failure - Fracture

Application:	1" P BS chain.
Failure Mode:	Plates fractured when chain working load was applied.
Diagnosis:	Chain had been zinc plated by customer without carrying out any de-embrittlement treatment which resulted in chain failure due to hydrogen embrittlement.
Solution:	Chain should be initially zinc plated before assembly by Renold.

Figure 11 - Mode of Failure - Fretting Corrosion

Application:	Transmission chain with pushers at intervals to control the conveying of boxes of breakfast cereal.
Failure Mode:	Severe wear of one pin of the pusher attachment and red deposit indicating fretting corrosion.
Diagnosis:	The pusher attachment was designed 50.8mm pitch to fit on a chain of 25.4mm pitch and operate on sprockets designed for 25.4mm pitch chains. This caused very high pressure on one pin of the attachment link which squeezed out most of the lubricant. This resulted in the marginal lubrication situation required to produce fretting corrosion.
Solution:	1. Use specially designed sprocket teeth with relieved tooth pocket at the attachment position. 2. Employ a high performance lubricant with solid residue to prevent squeeze-out.

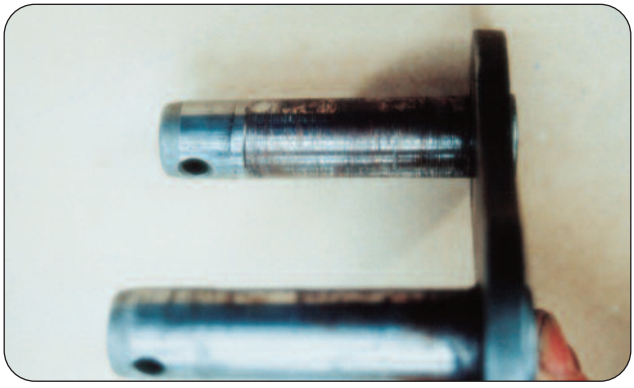


Figure 12 - Mode of Failure - Galling

Application:	2.5" P ANSI chain used on a lifting application.
Failure Mode:	The bearing areas have suffered galling where the surfaces have articulated and then fused together.
Diagnosis:	Very high bearing pressures had been experienced in this lifting application. The effect being that the lubricant had failed and galling had occurred on articulation.
Solution:	Use a high quality, high pressure lubricant and ensure that a film of lubricant is maintained between mating surfaces.

Figure 13 - Mode of Failure - Galling

Application:	Large Pitch Duplex Chain
Failure Mode:	Severe galling due to high bearing pressures and lack of lubrication between articulating surfaces resulting in surfaces fusing together.
Diagnosis:	Lubrication failure resulted in surfaces fusing together under high bearing pressure. This galling process is also referred to as 'micro welding'.
Solution:	Ensure adequate means of lubrication.

Figure 14 - Mode of Failure - Lubrication & Alignment

Application:	1" P BS duplex chain driving a flywheel on a 400 Tonne press.
Failure Mode:	Excessive wear. Chain jumping teeth causing tooth rounding.
Diagnosis:	Examination of the chain showed no lubrication had been applied in the 6 months service life. The loads involved require a minimum of oil sump lubrication. In addition to this the centre distance was higher than recommended and the sprockets were out of line.
Solution:	Improve the lubrication method. Consider hardening the driver teeth. Correct the drive alignment.

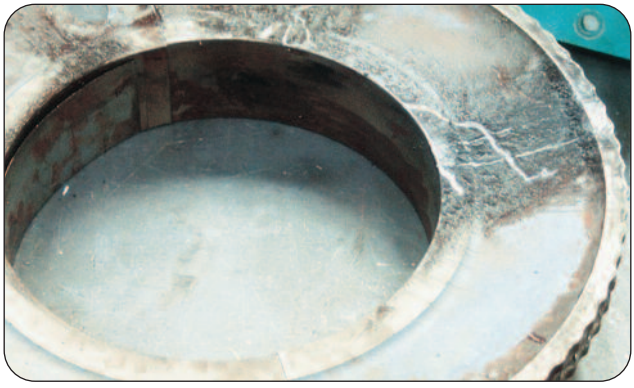


Figure 15 - Mode of Failure - Lubrication & Alignment

Application:	1" P BS duplex chain driving a flywheel on a 400 Tonne press.
Failure Mode:	Excessive wear. Chain jumping teeth causing tooth rounding.
Diagnosis:	Examination of the chain showed no lubrication had been applied in the 6 months service life. The loads involved require a minimum of oil sump lubrication. In addition to this the centre distance was higher than recommended and the sprockets were out of line.
Solution:	Improve the lubrication method. Consider hardening the driver teeth. Correct the drive alignment.

Figure 16 - Mode of Failure - Lubrication & Alignment

Application:	Special 2.5" P ANSI simple chain used for conveying in a mine.
Failure Mode:	Slip fit connecting link pin suffered a fatigue failure.
Diagnosis:	The joint was extremely dry and showed no signs of lubrication. The joint showed heavy galling with the presence of surface corrosion products. Subsequent investigation revealed that the chain had been running in water, but more significantly that the user had opened out the holes on the loose plate of the No 58 joint to make assembly easier. This caused the fatigue failure experienced.
Solution:	Provide a better lead in on the pin to enable the user to assemble more easily. Reconsider lubrication regime.

Figure 17 - Mode of Failure - Material cracking below teeth

Application:	0.5" P BS 20 tooth sprocket.
Failure Mode:	Material cracking below teeth.
Diagnosis:	Customer had flame hardened the teeth incorrectly. Due to the differential rate of cooling resulting from the sprocket section, cracking occurred.
Solution:	Sprockets to be supplied with teeth already flame hardened by Renold.

Figure 18 - Mode of Failure - Overload

Application:	1.5" P BS chain test sample.
Failure Mode:	Outer plates have been permanently stretched due to the high load.
Diagnosis:	Good example of overload.
Solution:	Correctly size the chain for the application.

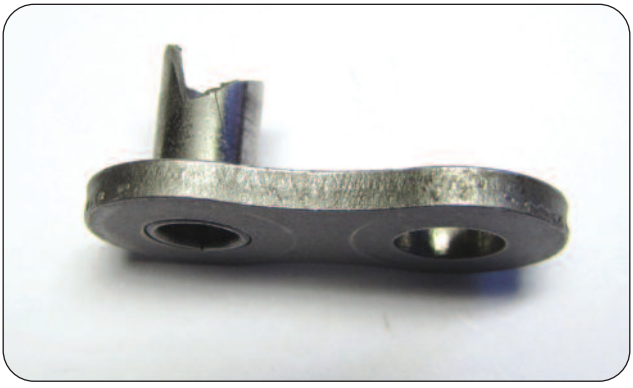


Figure 19 - Mode of Failure - Overload

Application:	Simplex transmission chain used in severe overload situation.
Failure Mode:	Severe damage to transmission chain pin and collapse of the chain bush.
Diagnosis:	Bush fatigue failures occur as the result of service overloads. The crack originates at a point on the inside surface of the bush and it progresses longitudinally or circumferentially until it cracks completely. Failures may also be caused by improper sprocket manufacture or selection.
Solution:	Bush fatigue can be overcome by eliminating overloads, increasing sprocket size and changing sprockets that are badly worn or oversized on the bottom diameter.

Figure 20 - Mode of Failure - Pitting Corrosion

Application:	Duplex transmission chain used in severe overload situation.
Failure Mode:	Severe damage to transmission chain pin and collapse of the chain bush.
Diagnosis:	Excessive overload on the chain led to the collapse of the bush and damage to the pin.
Solution:	Correctly size the chain for the application.

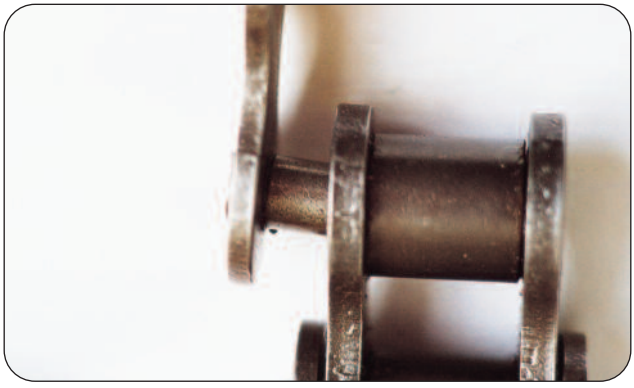


Figure 21 - Mode of Failure - Riveting Failure

Application:	Simple transmission chain drive to a machine.
Failure Mode:	One outer link has become detached and the pin bent.
Diagnosis:	The loose side plate of a No 107 connecting link has become detached due to inadequate riveting on site. The pin has moved out and jammed in position allowing the chain to continue working until the failure was noticed.
Solution:	Replace the No 107 link and ensure that the pins are adequately riveted.

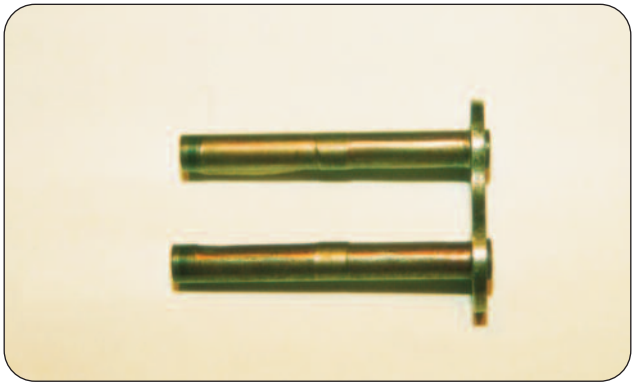


Figure 22 - Mode of Failure - Wear

Application:	1.5" P BS duplex chain.
Failure Mode:	Pin bearing areas worn. Note position of intermediate plates is clearly visible.
Diagnosis:	Over a long period of time the pins have gradually worn until the chain elongation has reached 2%
Solution:	Monitor chain extension regularly.

Conveyor Introduction

Renold Chain has, for many years, been a leader and innovator involved in the design and manufacture of standard conveyor chain and the development of engineered products for such applications as escalators, travelators, sterilisers, cement conveyors, theme park rides and numerous other specialised systems for the mechanical handling industry.

We have a detailed understanding of the maintenance needs on such applications and can now offer the manufacturers and operators of conveyor systems the benefits of this knowledge.

Chain is one of the most widely used moving mediums in mechanical handling systems, being robust and very adaptable, but it is also one of the most neglected components within such equipment when general or routine maintenance is carried out.

In many cases this product is attended to when problems occur, normally when the chain is already damaged and the only real option is to fit a replacement to the system.

For more information on Conveyor Chain, please refer to the Installation, Maintenance and Designer Guide for Conveyor Chain which has been designed with the manufacturer and operator in mind.

It covers the functional aspects of using Renold conveyor chain and emphasises the correct use of preventative maintenance procedures, which will ensure better machine performance, less down time, lower overall maintenance costs and extended chain life.

Should you require any further information, please contact our technical sales staff.

Figure 23 - Mode of Failure - Alignment

Application:	134,000 N breaking load chain operating on a slat conveyor with slats bolted across the K attachments.
Failure Mode:	Side plates showed severe rubbing marks along one edge.
Diagnosis:	The side plate edges have been rubbing against some fixed point on the conveyor structure, probably the edge of the guide tracks. The effect of this would be to wear away the side plate and to increase the drive power and chain tension.
Solution:	Determine the point of contact and realign the chain to prevent rubbing. It may be necessary to check and adjust the track to ensure levels are correct across the two strands.

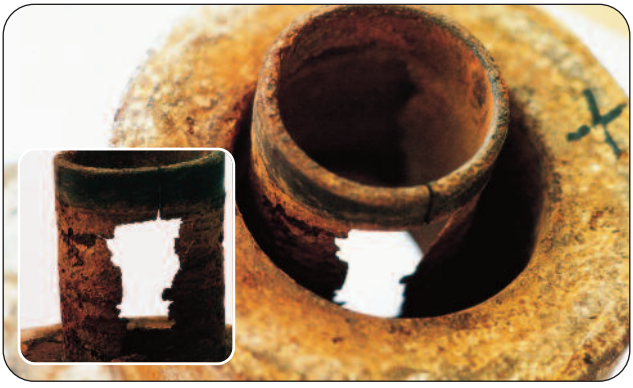


Figure 24 - Mode of Failure - Abrasion

Application:	Conveyor chain used in handling wet china clay.
Failure Mode:	Severe wear between the chain bush and roller in a china clay extraction plant.
Diagnosis:	Abrasive residues (Quartz) in the clay from the original granite material causing wear to the surfaces.
Solution:	Specify Renold Chain with extra hard surface materials to be included in the manufacture of chain round parts.

Figure 25 - Mode of Failure - Alignment

Application:	Can steriliser chain.
Failure Mode:	Wear to the pin ends has removed the rivet security and the outer plate has become detached.
Diagnosis:	Differential wear to the chains has caused the vertical strands to move to the side and contact the guides. The guides are of similar hardness to the pin ends and the pin ends have worn away releasing the outer side plate.
Solution:	Fit side guides that are softer than the pin ends. Also consider fitting a rubbing block at intervals along the chain to protect the pin end.

Figure 26 - Mode of Failure - Alignment

Application:	Cast iron sprockets fitted to chain scraper conveyors used for cleaning the primary screens at a sewage treatment plant.
Failure Mode:	Sprocket teeth suffered severe wear over a six month period and several teeth were so weakened that they fractured across the thinnest section.
Diagnosis:	The teeth were machined to a thinner section to accommodate flanged rollers on the chain and the chain was allowed to run out of line which resulted in only part contact on the sprockets. The resulting high pressure caused the rapid wear shown on the photograph.
Solution:	Replace the sprockets and realign the chain to ensure full contact between the chain roller and the sprocket teeth.

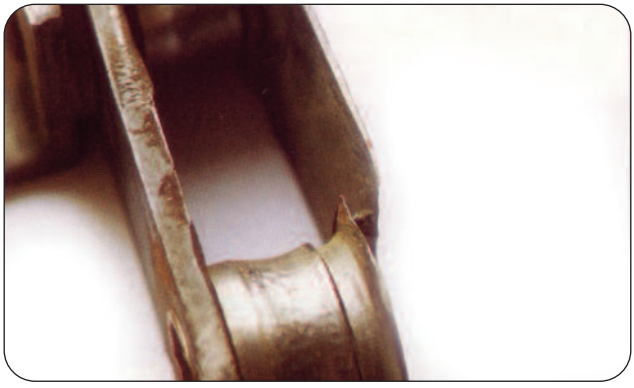


Figure 27 - Mode of Failure - Alignment

Application:	Cement conveyor chain
Failure Mode:	Wear on the chain side plate has occurred and the side plate has failed under load.
Diagnosis:	The chain has been allowed to run out of line and the sprocket teeth have worn away one side plate to the point where the side plate became so thin it failed under load.
Solution:	The chain has been damaged beyond repair and must be replaced. Chain tracks must be checked and sprocket alignment corrected before operating with the new chain.

Figure 28 - Mode of Failure - Corrosion at High Temp

Application:	Chain drive to rollers in a continuous casting machine.
Failure Mode:	Lubrication to the chain has been ineffective and has allowed chain components to corrode.
Diagnosis:	Lubrication has been ineffective and has not penetrated into the chain round parts
Solution:	Replace the chain with new chain, initially lubricated with a correctly selected lubricant for the temperature and environment.

Figure 29 - Mode of Failure - Corrosion/Erosion

Application:	Heavy duty chain used on a slat conveyor carrying cut sugar cane into a sugar factory.
Failure Mode:	Severe corrosion and wear of pin and bush surfaces.
Diagnosis:	Chain pin and bush were supplied drilled for grease gun lubrication. No lubrication has been applied and the surfaces have been subjected to unprotected corrosion / erosion by acidic sugar juice and sand contamination.
Solution:	Replace the chain and ensure that the grease gun lubrication feature is regularly used.

Figure 30 - Mode of Failure - Corrosion/Erosion

Application:	Threading chain for passing finished steel strip through the final washing and finishing process.
Failure Mode:	Severe erosion of material from areas of the chain leading to weakening and tensile failure.
Diagnosis:	Sequence of environments between caustic, water and air at high pressure caused erosion / corrosion of the side plates which reduced the section side plates leading to tensile failure.
Solution:	Protection of the chain by either zinc plating or shielding to prevent the erosion.

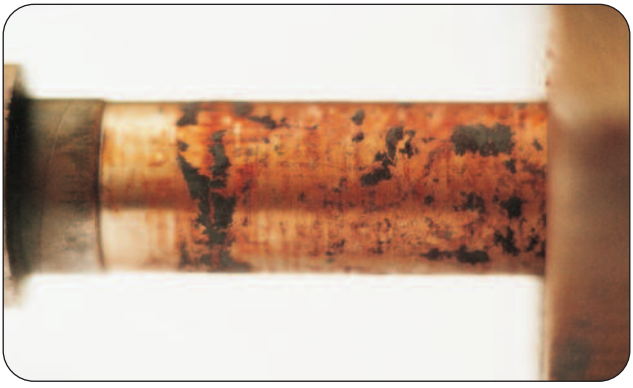


Figure 31 - Mode of Failure - Fretting

Application:	Tilt tray sorter chain used in baggage handling in the baggage hall of a major airport.
Failure Mode:	Chain pins and bi-planar block show scoring and heavy red deposit indicating fretting corrosion.
Diagnosis:	Fretting corrosion caused by marginal lubrication, where the lubricant present is insufficient to prevent the asperities on each component rubbing together.
Solution:	Every pin should be removed and all traces of abrasive red oxide removed. The chain should then be operated in an improved lubrication regime.

Figure 32 - Mode of Failure - Impact & alignment

Application:	Gravity bucket conveyor handling hot cement in a cement works.
Failure Mode:	Heavy surface cracking on the surface of the bushes and abrasion of the inner faces of the side plates.
Diagnosis:	This problem appears to be caused by heavy impact on the bushes. The abrasion on the side plates suggests that the chain is riding up onto the top of the sprocket teeth and then dropping into engagement.
Solution:	Initially the alignment between the chain and the sprockets should be checked. If this is correct then the remaining alignments should be checked, i.e. sprocket centres, levels, chain centres, etc.

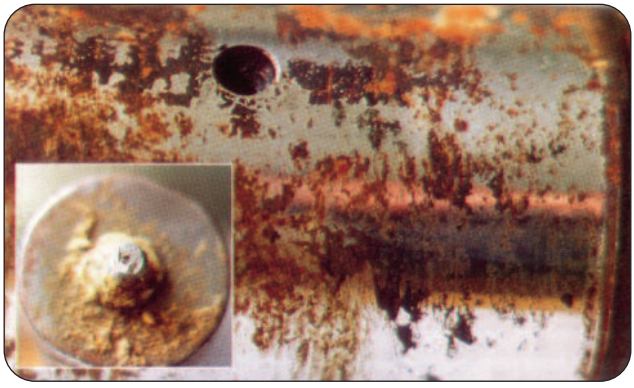


Figure 33 - Mode of Failure - Lack of Lubrication

Application:	Heavy duty conveyor in a cement works.
Failure Mode:	Lubricant has not penetrated into the pin/bush surface through the grease gun lubrication facilities in the pin, causing damage to surfaces.
Diagnosis:	The grease nipple has been allowed to become clotted with cement dust which has prevented grease entering the pin, leading to fretted pin surface.
Solution:	More regular lubrication prevents cement setting in grease nipple. Clean out pin and grease nipples on a regular basis.

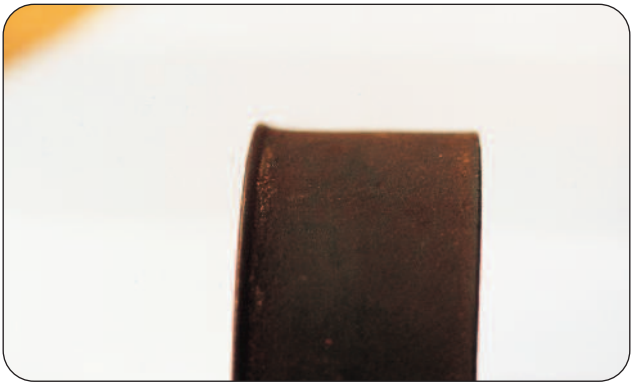


Figure 34 - Mode of Failure - Misalignment

Application:	Conveyor chain roller profile after use on a twin strand slat conveyor.
Failure Mode:	Eccentric wear across the face of the roller has caused a lip on one side.
Diagnosis:	The chain has run to one side to the degree where the roller edge has been over the edge of the chain track. The effect of this type of situation is to increase the roller face wear rate by only using part of the face width to carry the loads.
Solution:	Re-align the chain to run correctly on the chain tracks. In the failure shown the chain could be reused with the lip ground off, providing the roller is a sintered through hardened type. Otherwise the chain should be replaced.

Figure 35 - Mode of Failure - Misalignment

Application:	Heavy duty gravity bucket conveyor chain operating in a cement works.
Failure Mode:	The extended bearing pin has failed across the hole which was drilled to allow lubricant into the outboard roller.
Diagnosis:	The chain has moved sideways until one of the rollers has fouled the conveyor structure causing the extended pin to fail. The cross section is interesting in that the fine grained hardened case and the coarse grained ductile core can clearly be seen.
Solution:	The circuit of the conveyor should be checked to find the contact point. The conveyor should be checked to find and correct the reason for the movement to the side.

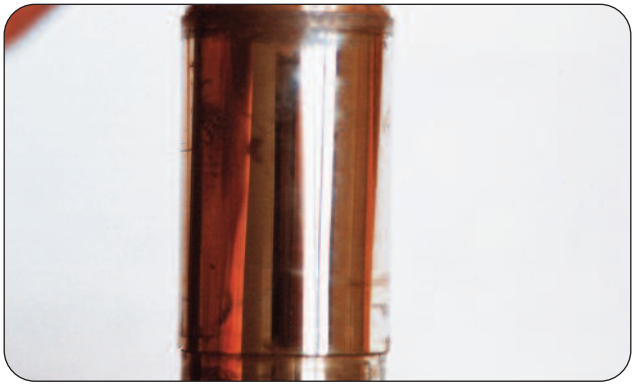


Figure 36 - Mode of Failure - None

Application:	107,000 N breaking load hollow pin.
Failure Mode:	None.
Diagnosis:	A correctly lubricated component.
Solution:	-

Figure 37 - Mode of Failure - Overheating

Application:	Stainless steel chain renewed in an oven operating at a high temperature.
Failure Mode:	The replacement chain wore severely after a short time resulting in the removal for examination.
Diagnosis:	At the same time as replacing the chain, heat trap doors had been fitted which saved heat loss but increased the oven temperature to a level above the acceptable working value for the chain.
Solution:	Return to the previous method of working or accept a much reduced chain life. Heat resisting steels are a possibility.

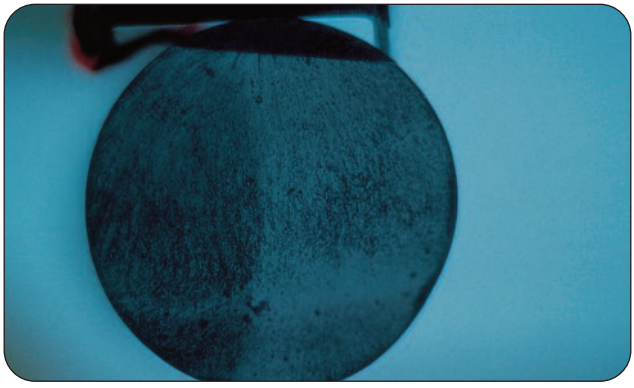


Figure 38 - Mode of Failure - Overload

Application:	Extended pin fitted to chain to carry an outboard roller.
Failure Mode:	Sudden shock overload has caused the pin to fail.
Diagnosis:	The extended pin has failed due to overload or shock loading. The failure has initiated at the corner of the flat on the pin. The "river markings" flowing away from the crack initial point can be clearly seen.
Solution:	Determine the reason for the shock / overload and either remove the cause or redesign the pin to carry the load.

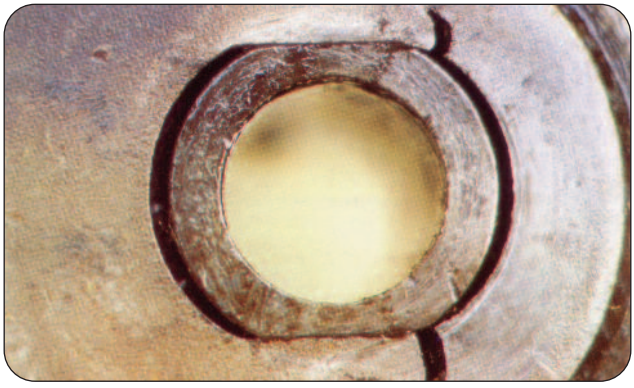


Figure 39 - Mode of Failure - Overload

Application:	Used on a scraper conveyor in a cement works.
Failure Mode:	Inner plates have failed around the bush hole with cracks initiating from the corner caused by the flatted pin.
Diagnosis:	The chain has been severely overloaded in tension causing plastic elongation of the bush hole.
Solution:	Replace the chain and determine the cause of the overload. IF it is not possible to remove the source of the overload then the chain should be reselected and a larger chain installed.

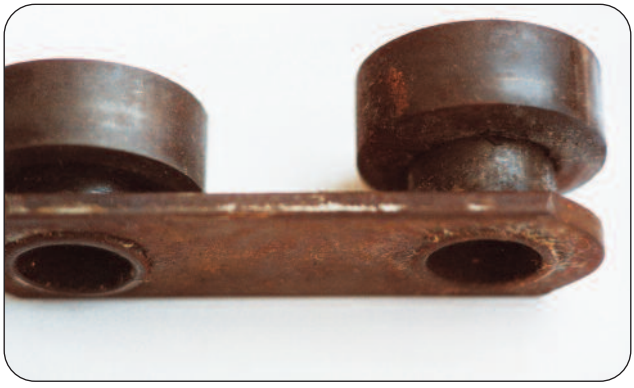


Figure 40 - Mode of Failure - Roller Seizure

Application:	Chain used in an oven conveying system.
Failure Mode:	Rollers seized on bushes producing flats on roller outside diameters.
Diagnosis:	The grease lubrication used on the chain was not suitable for the oven temperature and during operation the grease 'carbonised' causing seizure of the rollers.
Solution:	Apply a light flushing oil to the chain to clean out the residue of carbon. If this is not successful then the chain must be replaced and lubricated with an oil compatible with the oven operating temperature.

Figure 41 - Mode of Failure - Sprocket tooth wear

Application:	Sprockets fitted at the end of a conveyor.
Failure Mode:	Severe hooking wear of the sprocket teeth has been compounded with a second phase of hooked wear.
Diagnosis:	The original chain and sprockets have followed normal wear patterns with hooked wear of the sprocket teeth and pitch elongation of the chain. A new chain has then been fitted to the old wheels which have a worn tooth form incompatible with the pitch of the new chain. The result is severe secondary wear of the sprocket teeth and probably very rapid chain pitch extension.
Solution:	Always check the condition of the existing sprocket teeth before fitting a new chain to any system. In this case the sprockets must be renewed and the chain checked for damage.

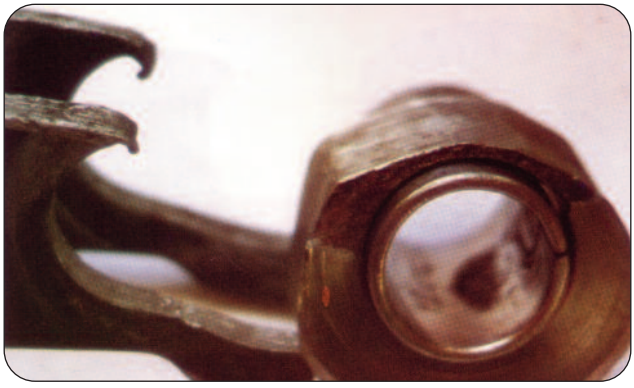


Figure 42 - Mode of Failure - System Assembly

Application:	Chain is used with suspended loads from carriers bolted through the hollow bearing pins.
Failure Mode:	The inner side plates and roller have severely worn to the degree that the bush has broken out of the end of the side plate.
Diagnosis:	The assembly of carriers through hollow bearing pins has caused the inner link to be closed onto the roller, preventing roller rotation. The roller outside diameter has worn on one side due to sliding and allowed the side plates to slide on the chain tracks and subsequently wear has caused side plate failure.
Solution:	Replace chain and ensure that carriers are correctly assembled without closing up chain side plates.

Figure 43 - Mode of Failure - Tensile overload

Application:	Bottle washer chain used for washing returned milk bottles in a caustic environment.
Failure Mode:	The chain cranked link has failed in tensile mode.
Diagnosis:	The outer link has been crudely modified which was thinner than the normal inner link.
Solution:	Obtain a properly designed cranked link from Renold.

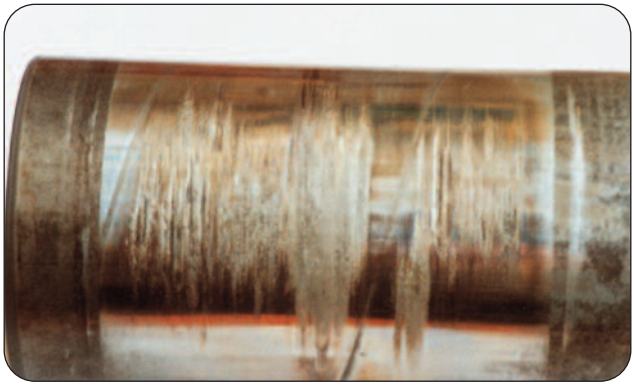


Figure 44 - Mode of Failure - Galling

Application:	Hollow pin (step pin) used in a high rise escalator.
Failure Mode:	The pin pressure faces have suffered from severe galling where the surfaces have articulated and fused together.
Diagnosis:	The very high pressures experienced by these high rise escalators have led to squeeze-out and failure of the lubricant allowing the surfaces to touch and gall when the chain articulated.
Solution:	Use high quality, high pressure lubricants and ensure that the lubricant regime is such that the film of lubricant is constantly maintained between the surfaces.

Lifting Introduction

Renold Chain has over 100 years experience in the operation and maintenance of lifting chain. Involvement with designers, manufacturers and users of all types of equipment has enabled Renold to develop the Renold Lifting Chain Installation and Maintenance Manual which should be referred to for more information.

This definitive manual is designed to pass on the preferred methods of correct handling, adjustment, installation and maintenance of lifting chain systems resulting in maximum chain life.

If further information is required, please contact our technical sales staff.

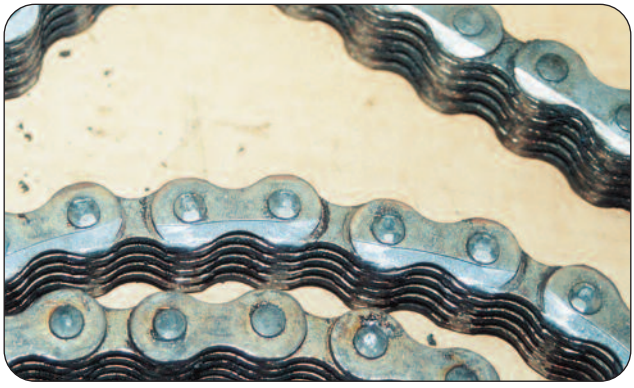


Figure 45 - Mode of Failure - Alignment

Application:	1" P 5 x 6 leaf chain used in a counterbalance mechanism for the drivers cab in an overhead crane.
Failure Mode:	Excessive judder noticed by the crane driver.
Diagnosis:	Inspection of the counterbalance arrangement showed that the pulley had worn excessively on one side. This was reflected on one side of the chain. The pulley was found to be out of line with the line of action of the chain attachment points.
Solution:	Renew chain and pulley and realign.

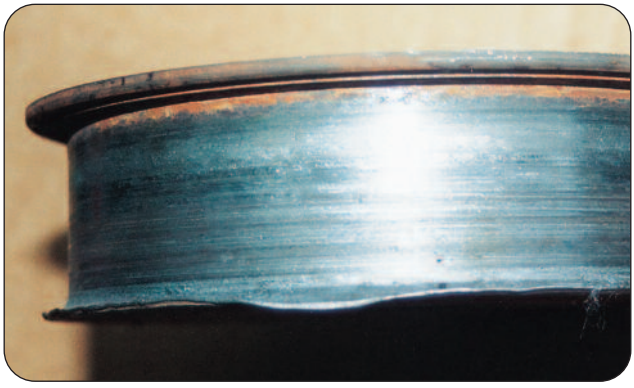


Figure 46 - Mode of Failure - Alignment

Application:	1" P 5 x 6 leaf chain used in a counterbalance mechanism for the drivers cab in an overhead crane.
Failure Mode:	Excessive judder noticed by the crane driver.
Diagnosis:	Inspection of the counterbalance arrangement showed that the pulley had worn excessively on one side. This was reflected on one side of the chain. The pulley was found to be out of line with the line of action of the chain attachment points.
Solution:	Renew chain and pulley and realign.

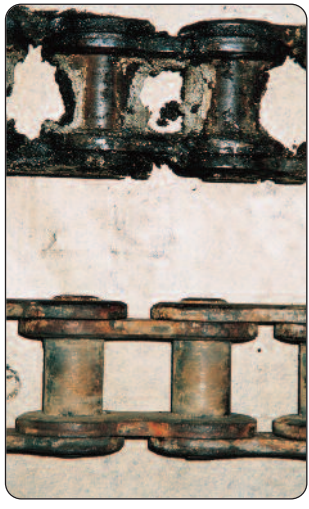
Figure 47 - Mode of Failure - Galling & fretting corrosion

Application:	Chain used for a lifting application.
Failure Mode:	Galling and fretting corrosion.
Diagnosis:	The chain being under constant loading at high bearing pressure has resulted in the lubricant being squeezed out between the pin and bush bore. This created a metal to metal contact resulting in a slight galling of the surfaces and the oxidization of the microscopic particles, giving the red oxide deposit. A typical example of fretting corrosion.
Solution:	More frequent lubrication schedule to be introduced.

A long & trouble free life

To obtain the maximum performance from a set of chains and sprockets, maintenance needs to be planned and carried out on a regular basis. This will not only ensure optimum chain life, but will reduce downtime and limit inconvenience when chain replacement is necessary.

The cases in this guide are typical examples of failure modes. They can all be avoided with a little forethought.



Despite working in a wet environment for over 60 years, the end of life inspection revealed this Renold chain to still be in good condition. This can mainly be attributed to the maintenance schedule undertaken by the customer.

To ensure your Renold chain achieves maximum life refer to the Installation, Maintenance and Designer Guides for Transmission Chain or Conveyor Chain.

Health & safety

SAFETY WARNING

Outer Link: for high speed drives or drives operating in arduous conditions, a properly riveted outer link (No. 107) should always be used for optimum security, in preference to any other form of chain joint. The use of other connectors and cranked links (No.12 and No.30) should always be restricted to light duty, non-critical applications, in drives where an odd number of pitches is absolutely unavoidable. Wherever possible, drives should have sufficient overall adjustment to ensure the use of an even number of pitches throughout the useful life of the chain. A cranked link joint should only be used as a last resort.

HEALTH AND SAFETY AT WORK

Customers are reminded that when purchasing Renold products, for use at work or otherwise, additional and up-to-date information, which is not possible to include in Renold publications, is available from your local Sales Company in relation to:

a) guidance on individual product suitability based on the various existing applications of the extensive range of Renold products.

b) guidance on safe and proper use, provided that full disclosure is made of the precise details of the intended or existing application.

All relevant information should be passed on to the persons engaged in, likely to be affected by and those responsible for the use of the product.

Nothing contained in this publication shall constitute a part of any contract, express or implied.

CHAIN PERFORMANCE

The performance levels and tolerances of our chain stated in this catalogue (including without limitation, serviceability, wearlife, resistance to fatigue, corrosion protection) have been shown in a programme of testing in accordance with Renold, Independent and/or International standard recommendations. No representation warranty or condition is given that our chain shall meet the stated performance levels or tolerances for any given application outside the controlled environment required by such tests.

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WARRANTY – In no circumstances are chain lengths to be extended or joined together using links other than those supplied by Renold. Failure to use bona fide Renold components could invalidate quality certification and any subsequent warranty claims.

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