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Guidance

In-Service Inspection Procedures

Fork Lift Truck/Order Picker-Leaf Chain Elongation Rejection Criteria

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SITUATION

Guidance on the determination of rejection criteria for leaf chains utilised for lifting purposes.

GUIDANCE

1. General

Health and safety legislation, guidance and associated thorough examinations of lifting equipment are primarily focused at reducing the risk of accidents, incidents and protecting person(s). As such operations, which lift person(s) or, regularly lift loads over or around person(s), will escalate the importance in determining the margin of safety and rejection criteria.

Regulations require that where, in the opinion of the Competent Person carrying out the Thorough Examination, there is a defect involving an existing or imminent risk of serious personal injury (or a cessation of work in the Republic of Ireland), they shall send a copy of the report to the relevant Enforcing Authority.

2. Introduction

Leaf chains are subject to cyclic loadings and stresses throughout their lifespan. The lifespan and continued safe use of leaf chains may be compromised due to various conditions. These are likely to increase wear rate and decrease normal service life.

Examples of these conditions may include:

- Incorrect fitting of leaf chains such as poorly adjusted or incorrectly tensioned.
- Incorrectly used with the lifting equipment such as overloading.
- Hostile or aggressive working environment.
- Poor maintenance and/or suitable chain protection.

3. Chains – Thorough Examination

Due to the potential issues which may result in the failure of the leaf chains, a detailed thorough examination is required which should involve the following:

- The leaf chains should be sufficiently cleaned to facilitate the thorough examination to be completed. Steam cleaning should be avoided, as this will remove internal lubrication.
- With the chains in a slack condition, ensure the anchor pins are present, defect free and are secured in by means such as, but not always, locking pins/split pins.

- Visually examine the chains for (not exhaustive):
- Corrosion including pitting.
- Seized links.
- Wear to chain link depth.
- Missing / damaged link plates.
- Elongation to pin holes.
- Loose, damaged, turned or protruding pins.
- Plate width wear (see below for further information).

The chain (s) should be assessed over the whole length. As part of the thorough examination, the most worn section of the load chains should be identified. The wear can then be measured in and around this section, in order to quantify and accurately ascertain the percentage wear. With the chains taut (normally, the weight of the load / fork carriage will be sufficient), the elongation of the leaf chains can be measured. On an industrial truck typically, but not exclusively, the predominantly worn section of such chains is generally the area which is in contact with the sheaves, when the forks or attachment are sufficiently clear of the ground for the transportation of load. The worn section measurement can subsequently be compared with that of a section of chain which has had little or no wear (often located near the chain termination), in order to ascertain the degree of elongation.

4. Rejecting: Criteria

NOTE: The following provides guidance to the Competent Person, regarding the rejection criteria for general lifting. However, manufacturers may stipulate more or less stringent alternative rejection criteria for specific applications. In such instances, the manufacturer's guidance should be followed.

The criteria for rejection should be made on the following basis:

Elongation should be measured over at least 10 pitches. When considering the use of gauges, the Competent Person must assure themselves that, when including more than 10 pitches, the accuracy of the final reading is not adversely affected, by the inclusion of an excessive number of additional pitches of unworn chain section (which may dilute the efficacy of the finding).

- **Up to 2% elongation** – For newly supplied or renewed chains, excessive rate of deterioration may be an indicator of manufacturing defect(s), harsh working conditions and/or aggressive usage. Where this may be evident on chains with less than 2% elongation, the Competent Person, using discretion, may still require chain renewal, especially if there is severe local damage and/or a combination of issues. Elongation is to be ALWAYS considered a contributing factor for rejection, in conjunction with other issues which affect the continued safe use of the chain.

- **>2% but <3% elongation** – Where the Competent Person measures chains which are between 2% but less than 3% elongation, a decision needs to be made by the Competent Person, whether the chains are safe for continued use until the next thorough examination.

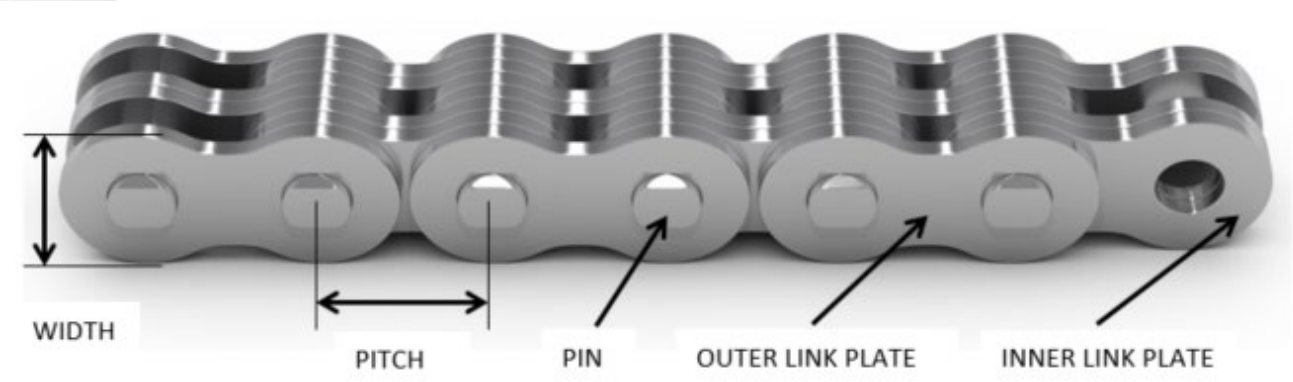
  Account should be taken of at least the following factors:

1. General condition of the chain.
2. Nature of the loads, e.g. person(s), delicate equipment, radioactive, scrap handling.
3. Operating hours of the lifting equipment (length of time the equipment is in use)
4. The periodicity of the thorough examination.
5. Significance of any local damage or wear.
6. Wear rate since the last thorough examination.
7. Quality and frequency of maintenance.
8. Whether the equipment is frequently working at, or near, maximum capacity.
9. Condition of the travelling surfaces over which the equipment operates.
10. Working environment, e.g. wet, humid, dry, dusty, hot, cold, abrasive and corrosive.

Where the Competent Person decides that the chain(s) may not remain safe for continued further use until the next thorough examination, a defect should be raised requiring renewal of the leaf chains before further use or provide a time limit of up to a maximum of THREE MONTHS FROM THE DATE OF THOROUGH EXAMINATION.

- **Equal to or >3% elongation –** Leaf chains with an elongation of 3% or greater, should be RENEWED BEFORE FURTHER USE. The equipment should not be used until the chains have been renewed.

5. Leaf Chain – Principal Components



The thorough examination should ascertain the chain plate width as above, is still suitable for further use. Leaf chains which have plate width dimension of less than 95% on the original dimension should be RENEWED PRIOR TO FURTHER USE. The original width can be ascertained at the section of chain near the chain termination which does not travel over pulleys.

6. Service Life

Leaf chains and anchor pins fitted to some equipment including industrial trucks/order pickers which are working within aggressive or hostile environments should be renewed after no more than 4000 operating hours or 2 years, whichever of these occurs first.

Examples of this type of environment include the following:

- Cold stores
- Brine processing
- Corrosive (such as chemical works)
- Marine
- Fertilizer plants
- Metal processing and manufacture
- Cement/aggregate processing

NOTE: Where chain renewal is called for then for industrial truck configurations incorporating multiple chain sets, all sets of chains for the given mast section should be changed.