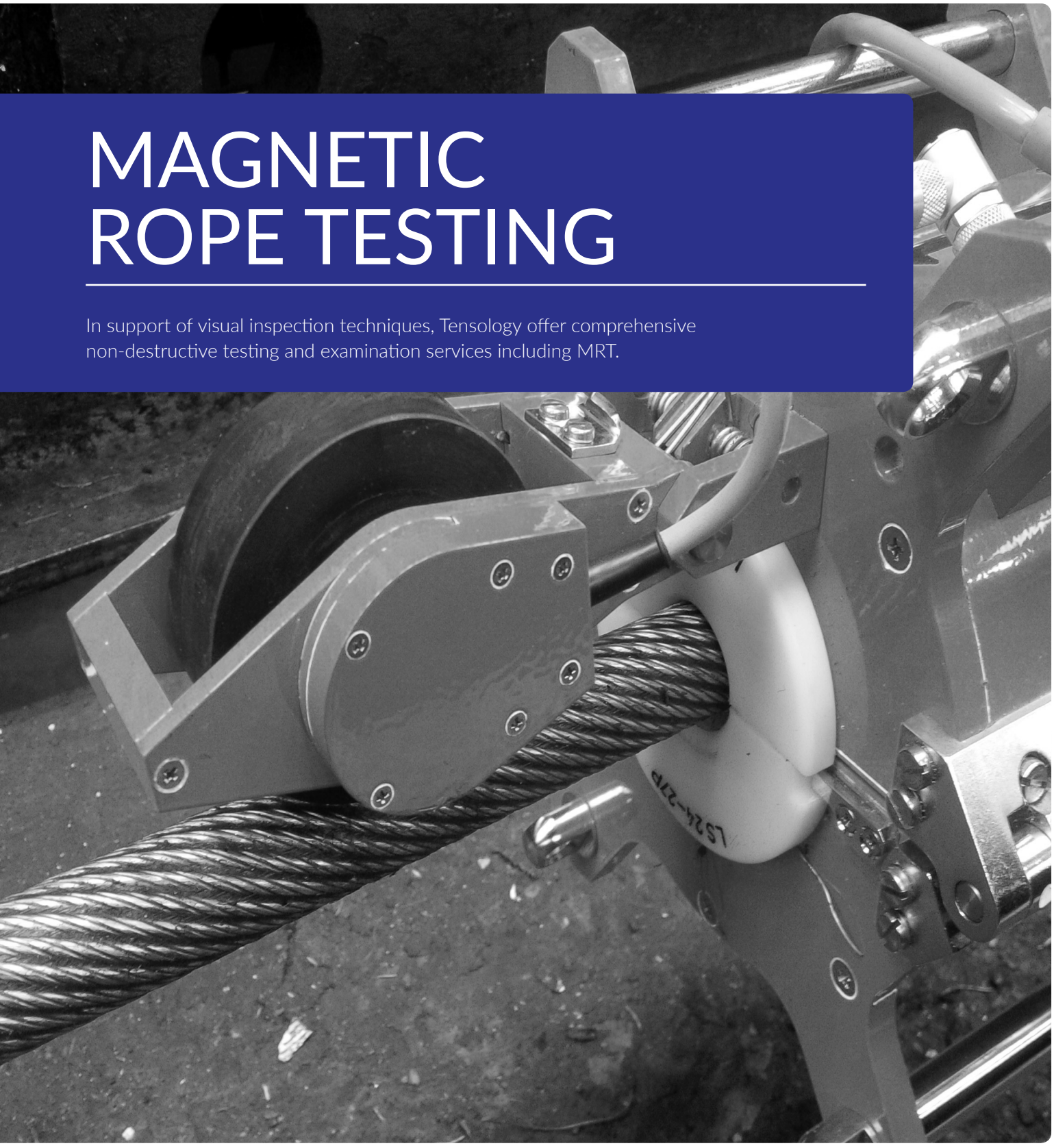
TENSOLOGY



MAGNETIC ROPE TESTING

In support of visual inspection techniques, Tensology offer comprehensive non-destructive testing and examination services including MRT.

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WHAT IS MAGNETIC ROPE TESTING (MRT)?

Magnetic Rope Testing (MRT) is a method of checking for defects and deterioration in steel wire ropes. MRT works by fully magnetising a section of rope and then detecting and measuring changes to the magnetic field caused by broken wires, corrosion, wear or mechanical damage.

The strength of a wire rope will reduce throughout its lifetime until the remaining strength is not sufficient to withstand the load being applied. At this point, the rope will fail causing the load to be released with often catastrophic consequences.

Periodic inspection is therefore required to ensure that the rope is retired from service whilst it is still safe. The inspection and assessment of the condition of the inside of a rope can only be effectively carried out by MRT.

MRT equipment is lightweight and portable and can be attached to the rope whilst still in service. The rope is run through the magnetic head and the inbuilt sensors provide information relating to the current condition of the rope. Loss in Metallic Area (LMA) can be measured and Localised Faults (LF) can be detected including their location along the length of the rope.

Special software interprets signals from the sensors and stores the data allowing for further analysis including zooming of areas of interest, filtering and comparison with previous tests.

WHEN CAN ROPES BE TESTED?

Although MRT is usually used to assess the condition of existing used ropes, it can also be carried out on newly manufactured ropes prior to them going into service. The results can then be stored and used as a reference for future examinations.

> In order to **look inside a rope**, equipment has been developed which allows us to **establish the condition** of the rope **without physically opening up the strands.**

WHY IS MRT IMPORTANT?

Many ropes deteriorate from the inside which is a worry to the rope examiner as the traditional inspection technique of visual examination is not adequate. Multi-strand, rotation resistant ropes are particularly susceptible to internal degradation because of the way the ropes are constructed.

Alternate layers of right hand and left hand lay strands causes numerous point contacts along the entire length of rope. These point contacts see high stresses when the rope is loaded causing localised deformation and wear. Repeated bending under load adds to the problem as fatigue cracks form at the contact points, eventually causing the wires to break. This internal degradation is the primary cause of unexpected wire rope failure and as a result, all safety critical industries recognise the need for MRT in assessing the condition of ropes. The consequences of a rope failure include death or injury to personnel, damage to equipment and reputation, legal claims and loss of revenue. The cost of carrying MRT is more than offset by the cost of failure and the cost of premature discard.

WHAT DOES THE STANDARD SAY?

Various standards and codes provide rules and guidance for the inspection and examination of wire ropes such as *ISO 4309 – Cranes – Wire Ropes - Care and Maintenance, Inspection and Discard.*

ISO 4309 states that MRT should be used where defects might exist which might not be identified by visual inspection alone. It also states that if MRT is going to be used as part of ongoing periodic inspections, the rope should be subjected to an initial MRT examination (base trace) prior to it going into service, or as early as possible in it's lifetime, to serve as a reference point for future comparison.

DAILY VISUAL INSPECTIONS

Daily visual inspections shall take place on the intended working section of the rope

PERIODIC INSPECTIONS

Periodic inspections shall be carried out by a competent person through an appropriate assessment method

DETERIORATION THAT CAN BE TESTED BY MRT:

- Loss of metallic area caused by broken wires
- Loss of metallic area caused by mechanism other than broken wires(corrosion, wear etc)
- Corrosion (external, internal and fretting)

INSPECTION RECORDS

Periodic Inpsection records shall be provided by a competent person.

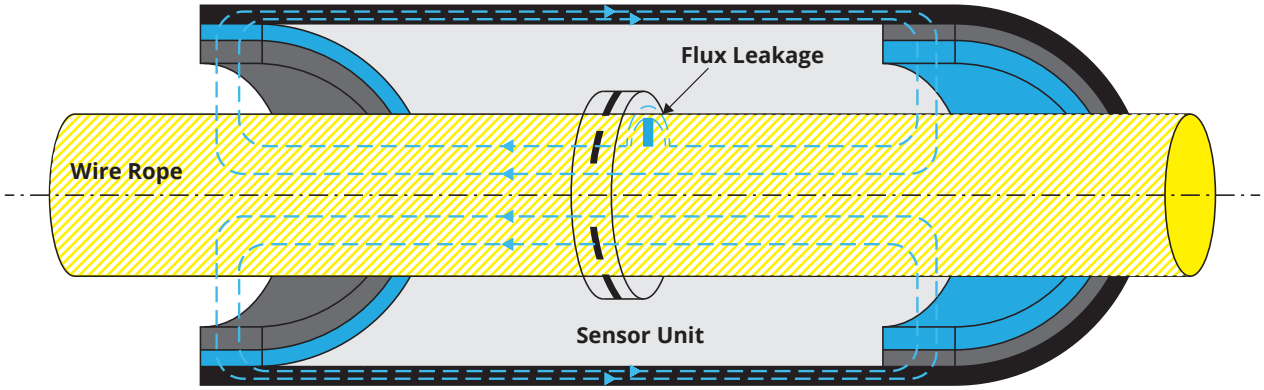
NOTE: Magnetic Rope Testing (MRT) is an essential part of any rope examination but should not be considered in isolation.

HOW DOES MRT WORK?

The instrument operation is based on the magnetic flux leakage (MFL) method that detects anomalies in normal flux patterns created by discontinuities in ferrous material, saturated by a magnetic field. This inspection method is commonly known as magnetic rope testing (MRT).

The wire rope portion is fully magnetised in the longitudinal direction with strong rare earth magnets, which are a part of magnetic head. If there are no irregularities in the rope, the magnetic field above the rope surface (flux leakage) remains uniform. If there are broken wires or changes in the steel cross sectional area, the magnetic field is distorted and flux leakage increases locally.

Sensors, located in the magnetic head, measure the magnetic flux and detect any flux leakage. Signals from the sensors are transmitted to an external data unit for storage and further processing.



Our examination and testing programmes have **increased the safety and reduced the cost** for a variety of high profile ropes.

TRADITIONAL METHODS VS. MRT

Traditionally, crane ropes are visually inspected – a method that only allows detection of external deterioration and does not allow the inspector to see what is going on inside the rope.

There are a number of issues associated with traditional visual inspection methods, hence the incorporation of MRT into international rope inspection and discard standards.

BENEFITS MRT vs. Visual Inspection	**MRT** Magnetic Rope Testing	**VISUAL INSPECTION ONLY** What can happen when you only rely on visual inspections?
COST	✓	Replacement of wire ropes is a costly exercise. Following replacement, subsequent examination often reveals no significant defects or deterioration meaning that a large number of wire ropes are needlessly changed each year.
SAFETY	✓	Wire ropes are consumable items and will eventually fail. The majority of rope failures are caused by internal degradation which cannot be detected by visual inspection.
EFFICIENCY	✓	Traditional visual inspection methods can be time-consuming, labour intensive and physically demanding, particularly for long lengths of rope.
RELIABILITY	✓	Manual inspection is very subjective and many hidden dangers remain undetected.

NOTE: Serious wire breakage accidents inevitably cause serious damage.
Every year, wire rope failures occur across all industry sectors.
These incidents often result in the loss of life, serious injury and damage to assets.

'Wire Rope Specialists'

Our company is based upon the knowledge, skills and experience gained whilst working exclusively within the wire rope industry.

By concentrating on what we know best and equipping ourselves with the latest technology, our clients are assured that their wire ropes could not be in safer hands.

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