Fact Sheet

Atlas® (Synthetic Wire) Rope
Install Inspect Discard

Safety...

What we produce and supply needs special care...,
...Care about consequences in case of failure.
It's not just quality, it's safety that matters.

06.08.2011

Installation and Handling
A properly developed and functioning mooring arrangement is very important.

- General:
  Make sure that
  - o there are no obstacles on the mooring deck from winch to fairlead
  - o all guide elements rotate freely
  - o there are no obstacles outboard from fairlead to bollard

  Abrasion is a common cause of reduced lifetime of Atlas® ropes.

- Winch pull:
  According to the international standard for mooring winches, the minimum breaking force the Mooring Rope should be not less than 3x, but not more than 4,5x the nominal drum load, but not exceed the holding load by more than 25%. As for ATLAS Rope we recommend a minimum breaking force of between 4x and 4,5x drum load.
- Bending diameter:
  The ratio of diameter of the rope to diameter of the rollers should not be less than 5. For example:
  when using an 84 mm Atlas® rope, the rollers should have a minimum diameter of 420 mm.
- Split drum winch:
  The split drum winch with stowing part and tension part is perfect for mooring as the pull will not depend on the number of layers. It is just very important that the crew moves the rope from the Storage Drum to the Tension Drum at the right moment. If this happens too late, the rope will be damaged in the slit. With the Atlas® rope having less elongation than other ropes, the crew might need to develop their knowledge about this procedure.
- Installation and start-up:
  When installing the new Atlas® rope on the drum, unwind the rope from the coil – do not pull off from outside or inside of the coil! To ease the installation of the new Atlas® rope without twisting or kinking, a blue line is printed longitudinally along the ropes surface. In order to allow the setting of the rope, the brand new Atlas® rope should be loaded several times with 50 % of the winch pull. This is a requirement to achieve the optimal load-elongation characteristics which ensures a long lifetime.
- Splicing:
  When splicing a new eye upon replacing a damaged rope end, make sure you apply a wire rope splice: Divide the fibre core into two parts, cut off one part and splice the remaining part of the fibre core (wrapped with tape) with one of the six strands.
- Chafe protection:
  Integral part of production are fibre yarns in the outside layers of all strands, positioned between the polyamide wires, with the purpose to immediately transform into a furry surface around the strands after first use. This might appear as early damage, but, in fact, acts as a protective coat. These yarns have no load bearing function, their only job is to protect the rope surface from damage.

Inspection
Ropes should be inspected before and during service to establish their safe usage condition.
Generally, the service life of a mooring rope depends on its own design (material and construction), but much more on environmental, and applicational influences. Number and condition of operations applied to the rope, are measures worth to be recorded in a kind of log-book.
Such history will help to locate risks for, and reasons of increased wear, and damage. It will enable users to determine methods, number and intervalls of in-depth-inspections, with the purpose to realize as much as possible about the shape of a mooring rope in use.
The following pages are meant to offer detailed information about consequences arising from obervations made during inspections.

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Atlas® (Synthetic Wire) Rope Inspection and Discard

Discard criteria
The Atlas® mooring ropes are very compact, have good abrasion resistance and are designed for use as winch mounted lines. The rope is made from special monofilaments and high tensile PA yarns. The monofilaments in the strands providing form, stability and excellent behaviour on the drum.

The following factors may warrant removing a rope prematurely from service:
- wear and abrasion
- friction burns
- creep
- crushing/pinching
- local damage
- cut yarns or strands and monofilaments
- others

If local damage is observed then a length of 50 times the diameter before and after that position should be closely inspected and all reductions in strength should be added together.

Wear and abrasion
Wear and abrasion are the most common causes of rope failure. Rough surfaces, sharp edges, burrs, rust and dirt can cause serious damage to a rope. Winches, pulleys, chocks, bits, etc. should be clean and in good condition.

Wear and abrasion can occur over greater lengths or locally. Particular attention should be paid to the splice area and the eye.

Frayed and broken yarns should be removed and the damaged area should be estimated.

Grease, oil and other deposits do not damage the Atlas® mooring ropes. However grease and oil can pick up dirt and grit, the dirt can damage the rope and it makes the rope unpleasant and difficult to handle.

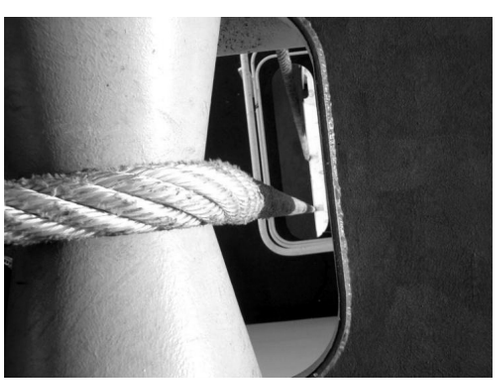

Figure 1: Rope in use without abrasion

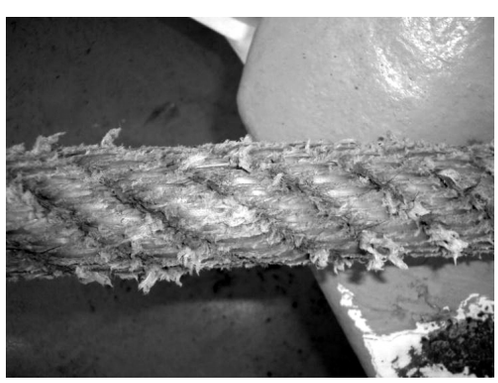

Figure 2: Atlas® Rope with normal abrasion

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Atlas® (Synthetic Wire) Rope Inspection and Discard

Figure 3: Atlas® Rope with severe abrasion

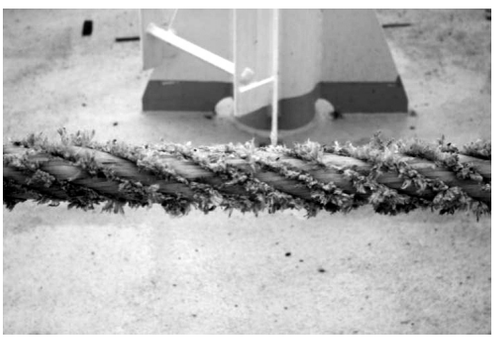

Figure 4: Atlas® Rope with normal abrasion

Figure 5: Atlas® Rope with normal abrasion and grease

Atlas® Mooring ropes consist of hard nylon monofilaments and nylon multifilament filler yarns. The outer multifilament filler yarns fur up and form a pile providing excellent resistance to surface abrasion. If the outer multifilament filler yarns are completely worn out the rope must be inspected by a competent person (manufacturers or suppliers).

Friction burns

Friction burns can occur over greater lengths or locally. Direct contact with hot objects should always be avoided (e.g. exhaust pipes). Also when using the rope on a winch, capstan, sheaves, etc. care should be taken to avoid surging the rope while it is under load. When the rope slips a lot of heat can be generated through friction.

When using Atlas® mooring ropes on a split winch drum, make sure that there're minimum four complete windings on the tension part of the winch.

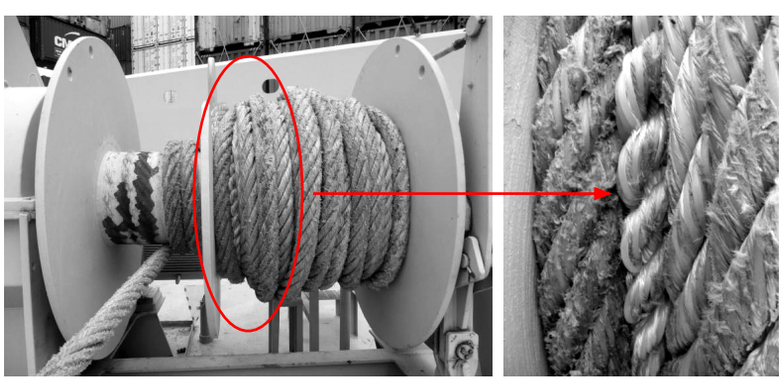

Figure 6: Atlas® rope deformation due to unsufficient windings on the tension part of the winch

When friction burns are detected, then the rope should be opened and it should be estimated how much of the rope is fused. The damaged area should be considered to be about twice the fused area.

Figure 7: Rope with servere friction burns

Crushing/pinching and kinking
When a rope has been crushed or pinched it should be removed from service. Typically with this type of problem the resulting damage in the rope is a combination of broken/cut yarns and pulled yarns or strands, which makes for very unreliable estimates of the resulting reduction in strength. A knot has a similar effect!

Layed ropes, like Atlas®, are sensitive to kinking when spooled incorrectly. The mooring ropes will then try to unlay and open up. This can be prevented by unspooling the rope, remove the twist and correctly respool the mooring rope.

If kinking or birdcages occur in these types of ropes, the rope should be removed from service.

Figure 8: Kink in a Atlas® rope

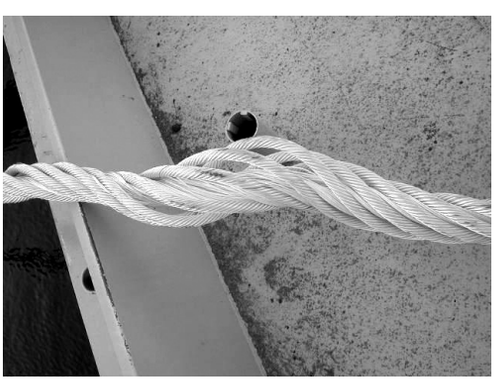

Figure 9: Birdcage in a Atlas® rope

Local damage
Depending on the extent of localised damage it may be possible to repair the rope rather than remove it from service. Options include local repair plus downgrading or removal of the damaged section and re-splicing.
A second, independent evaluation by a competent person (e.g. the rope manufacturer) is strongly recommended before re-splicing.

Pulled yarns or strands
Individual yarns or strands can be caught behind objects (nails, burrs, etc.) and be pulled out of the rope. This damage makes the rope very unsafe, because the pulled yarns can easily snag behind an object. Thus care should be taken to work the yarn or strand back into the rope.
If a cover yarn is pulled and the pull is too severe, the yarn can be cut and the ends worked back into the rope. A pulled core yarn or strand should not be cut. Rather, the pull should be buried back into the interior of the rope.

The number of pulled yarns or strands should be counted and noted in the inspection card. The cause should be traced and alleviated.

Figure 10: Loose inner core yarns and outer strand yarns

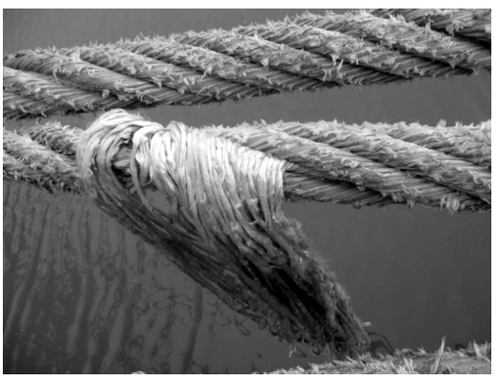

Figure 11: Several inner core yarns pulled out

Cut yarns or strands
Individual yarns or strands can be cut through chafing against sharp objects (e.g. the side of a steel plate).

The number of cut yarns or strands should be counted and the damaged area per strand estimated.
A minimum of cut yarns will not influence the rope behaviour and performances.

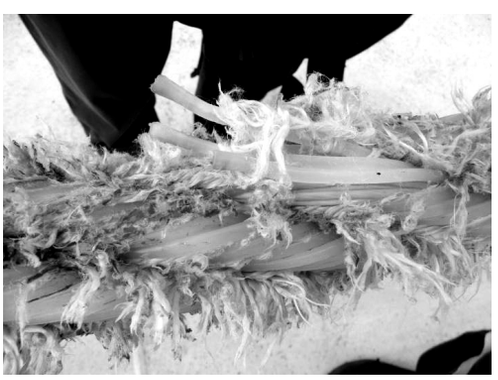

Figure 12: Cut off several monofilaments

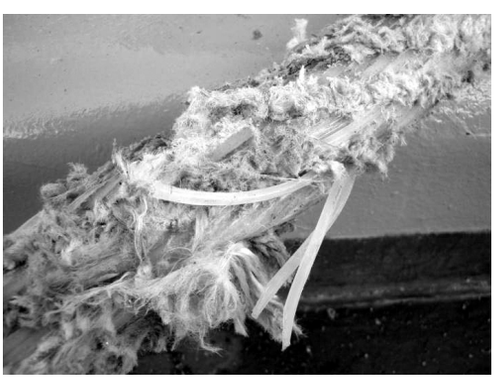

Figure 13: Cut off several monofilaments

Others
No attempt is made here to list a complete catalogue of discard criteria. Many different types of damage to a rope are possible. Thus common sense during inspection to assess the Residual Strength is paramount.

It should be noted however that several gradations of damages exist. Not all of them are reasons to discard the rope. Some phenomenon's are perfectly normal for synthetic ropes, others can be repaired.

If there's any doubt on the abrasion risk a second independent evalution should be performed by a competent person (e.g. the rope manufacturer).

Estimating residual strength
The Breaking Strength of a rope is reduced by damage to its yarns. Through inspection this reduction in strength is estimated per damaged spot. All damages over the inspected length of the rope should then be added together. On the basis of that total estimate the rope is downgraded or removed from service.

On specific request the manufacturer can complete a residual lifetime assessment for a discarded mooring hawser. The result can be used as input for further future lifetime assessments. Typically a length of 2 meter is sufficient This assessment is considered to be effective and fully comparable with a full hawser break test.