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Inspection Guidelines for Plasma® Synthetic Ropes

Puget Sound Rope Company

Plasma ropes have been used extensively in numerous diverse applications for many years. Over this time period, particular operating conditions and hazards have been identified which are more harmful to Plasma than to steel. The presence of these conditions can best be determined by periodic inspection of the lines. This guideline presents recommendations for conducting periodic inspection by the end user

Conditions to be avoided in Plasma Lines

There are three areas where close attention needs to be paid to Plasma lines. Below are descriptions of these conditions and likely signs of their presence.

1. Repeated lateral abrasion against sharp edges. While HMPE is one of the most cut-resistant polymers available, metal can prove to be stronger than Plasma in a long-duration abrasion event. Signs of excess abrasion include strand pullouts, heavy fuzzing and cut strands in a single area, and localized bunching. It should be noted that normal light fuzzing of the Plasma rope surface is to be expected in normal use. This light fuzzing does not reduce the rated strength of the line, and actually creates a protective layer on the rope that helps to prevent further damage.

2. Plasma begins to lose strength above about 160 ºF, and has a zero-strength temperature around 250 ºC. Signs of high temperature damage include, melting, fused strands, and significantly reduced diameter. The fused strands should not be confused with high-tension compression of the rope which might appear similar. With standard urethane coatings, the rope can appear melted after high tension has been applied while the rope is bent around a surface. This is normally not melting and can be worked out with little effort. The rope strength is not affected.

3. Plasma lines can lose strength if overstrained. This can be the result of exceeding the recommended design factor for an extended time period, or by instantaneous peak loads during dynamic loading events. A typical design factor is 5:1, but this should be determined in conjunction with the application engineer. Signs of overstraining can be subtle but include localized thinning and elongation, and loss in flexibility (for example the rope becomes rigid).

Inspection Guidelines for Plasma Rope

Below are some suggestions for inspecting Plasma for the above damage conditions. Each end user should develop their own method of routinely inspecting these lines for damage prior to heavy use. The method and frequency of inspection will depend on the end users experience and usage level.

1. Lay rope out under hand tension so the entire length can easily viewed.

2. Visually inspect the entire length of rope for signs of abrasion, heavy fuzzing, stiff regions, fused or melted regions or thinned areas. Make note of any damaged areas.

3. Relate any damage to service over hardware for possible situation remedies.

4. Monitor for overloading. To accomplish this, put a small (less than 10% of break load) but repeatable load on the line. In subsequent inspections a similar load should be applied again, so determine a method that will give approximately the same load each time. Put a bright mark on the line at a point just beyond the tail of the splice (one suggestion is to use a bright colored ribbon through one or two strands of he rope). Put another bright colored mark (or ribbon) approximately 20 feet down rope from first mark.). These marks will be a reference for future measurements and should be located securely. While under reference tension, using a flexible tape measure, measure the length between reference marks. Write down this reference length and compare it to previous or subsequent measurements.

5. Keep a detailed record of the line reference length as well as any damage areas and their approximate locations relative to one or both reference marks. Future inspections should be used to monitor minor damage areas for signs of growth.

Inspection Frequency

The end user should determine the frequency of rope inspections. For heavy use, the rope should be carefully inspected prior to each day's use. The user should also perform a quick visual inspection (without length measurement) prior to any use of the rope.

Rope Replacement:

Ropes that show severe damage should be replaced, repaired (damaged areas cut out and re-spliced), or down-rated to other applications. Examples of severe damage in Plasma rope include (but are not limited to):

a. More than 2 strands severed within a 2-foot segment

b. Fused segment that is no longer flexible (strands not separable)

c. Segment whose diameter is 20% less than other part of the rope

d. Melting on one side that fuses one or more strands together

e. Rope that has lengthened (between reference marks) by more than 10%

Note: It has been found that cleaners/degreasers containing d'Limonene (citrus based cleaners) can rapidly deteriorate HMPE based ropes. Avoid contact with this chemical.

Each end user will determine through experience which signs of damage are more indicative of impending failure. (For example, the critical damage mode of a rope that fails in service might be identified if the location of the break can be traced to damage noted in a prior inspection.)

Plasma represent a significant technological breakthrough in high strength lifting lines; however, as with any synthetic fiber rope product, Plasma lines have a much better chance of meeting expectations when coupled with careful maintenance and periodic inspection.