WIRE ROPE TROUBLESHOOTING GUIDE

The following is a simplified guide to common wire rope problems. In the event of no other standard being applicable, Bridon recommends that ropes are inspected/examined in accordance with ASME B30.5.

Mechanical damage caused by the rope contacting the structure of the crane on which it is operating or an external structure - usually of a localized nature.

- Generally results from operational conditions.
- Check sheave guards and support/guide sheaves to ensure that the rope has not "jumped out" of the intended reeving system.
- Review operating conditions.

Problem Cause/Action

Opening of strands in Rotation Resistant ropes - in extreme circumstances the rope may develop a "birdcage distortion" or protrusion of inner strands.

Note - Rotation Resistant ropes are designed with a specific strand gap which may be apparent on delivery in an off tension condition. These gaps will close under load and will have no effect on the operational performance of the rope.

- Check sheave and drum groove radii using sheave gauge to ensure that they are no smaller than nominal rope radius +2.5% - Bridon recommends that the sheave and drum groove radii are checked prior to any rope installation.
- Repair or replace drum/sheaves if necessary.
- Check fleet angles in the reeving system - a fleet angle in excess of 1.5 degrees may cause distortion (see page 95).
- Check installation method - turn induced during installation can cause excessive rope rotation resulting in distortion (See pages 86 to 90).
- Check if the rope has been cut "on site " prior to installation or cut to remove a damaged portion from the end of the rope. If so, was the correct cutting procedure used? Incorrect cutting of Rotation Resistant, low rotation and parallel closed ropes can cause distortion in operation (See page 88 to 89).
- Rope may have experienced a shock load.
- Broken wires or crushed or flattened rope on lower layers at crossover points in multi - layer coiling situations.
- Wire breaks usually resulting from crushing or abrasion.
- Check tension on underlying layers. Bridon recommends an installation tension of between 2% and 10% of the minimum breaking force of the wire rope. Care should be taken to ensure that tension is retained in service.
- Insufficient tension will result in these lower layers being more prone to crushing damage.
- Review wire rope construction. Dyform wire ropes are more resistant to crushing on underlying layers than conventional rope constructions.
- Do not use more rope than necessary.
- Check drum diameter. Insufficient bending ratio increases tread pressure.
- Wires looping from strands.
- Insufficient service dressing.
- Consider alternative rope construction.
- If wires are looping out of the rope underneath a crossover point, there may be insufficient tension on the lower wraps on the drum.
- Check for areas of rope crushing or distortion.
- Possible fleet angle problems causing rope rotation.
- "Pigtail" or severe spiralling in rope.
- Check that the sheave and drum diameter is large enough - Bridon recommends a minimum ratio of the drum/sheave to nominal rope diameter of 18:1.
- Indicates that the rope has run over a small radius or sharp edge.
- Check to see if the rope has "jumped off" a sheave and has run over a shaft.

Two single axial lines of broken wires running along the length of the rope approximately 120 degrees apart indicating that the rope is being "nipped" in a tight sheave.

- Check sheave and drum groove radii using sheave gauge to ensure that they are no smaller than nominal rope radius + 2.5% - Bridon would recommend that the sheave/drum groove radii are checked prior to any rope installation.
- Repair or replace drum/sheaves if necessary.

One line of broken wires running along the length of the rope indicating insufficient support for the rope, generally caused by oversize sheave or drum grooving.

- Check to see if the groove diameter is no greater than 15% greater than the nominal rope diameter.

- Repair or replace drum/sheaves if necessary.
- Check for contact damage.

Short rope life resulting from evenly/randomly distributed bend fatigue wire breaks caused by bending through the reeving system. Fatique induced wire breaks are characterized by flat ends on the broken wires.

- Bending fatigue is accelerated as the load increases and as the bending radius decreases (see page 74). Consider whether either factor can be improved.
- Check wire rope construction - Dyform ropes are capable of doubling the bending fatigue life of a conventional steel wire rope.

Short rope life resulting from localized bend fatigue wire breaks. Fatique induced wire breaks are characterized by flat ends on the broken wires.

- Bending fatigue is accelerated as the load increases and as the bending radius decreases (see page 74). Consider whether either factor can be improved.
- Check wire rope construction - Dyform ropes are capable of doubling the bending fatigue life of a conventional steel wire rope.
- Localized fatigue breaks indicate continuous repetitive bends over a short length. Consider whether it is economic to periodically shorten the rope in order to move the rope through the system and progressively expose fresh rope to the severe bending zone. In order to facilitate this procedure it may be necessary to begin operating with a slightly longer length of rope. Broken rope - ropes are likely to break when subjected to substantial overload or misuse particularly when a rope has already been subjected to mechanical damage. Corrosion of the rope both internally and/or externally can also result in a significant loss in metallic area. The rope strength is reduced to a level where it is unable to sustain the normal working load.
- Review operating conditions. Rotation of the load in a single fall system.
- Review rope selection.
- Consider use of Rotation Resistant rope. Rotation of the load in a multi - fall system resulting in “cabling” of the rope falls. Possibly due to induced turn during installation or operation.
- Review rope selection (see page 76 to 78 cabling calc.)
- Consider use of Rotation Resistant rope.
- Review installation procedure (see page 87 to 90) or operating procedures.

Problem Cause Action

Wave or corkscrew deformations normally associated with multistrand ropes.

- Check sheave and drum groove radii using sheave gauge to ensure that they are no smaller than nominal rope radius +2.5% - Bridon recommends that the sheave/drum groove radii are checked prior to any rope installation.
- Repair or replace drum/sheaves if necessary.
- Check fleet angles in the reeving system - a fleet angle in excess of 1.5 degrees may cause distortion (see page 76)
- Check that rope end has been secured in accordance with manufacturers instructions (see page 88 & 89).
- Check operating conditions for induced turn.

Core protrusion or broken core in single layer six or eight strand rope.

- Caused by repetitive shock loading - review operating conditions.

Rope accumulating or “stacking” at drum flange - due to insufficient fleet angle.

- Review drum design with original equipment manufacturer - consider adding rope kicker, fleeting sheave etc. Sunken wraps of rope on the drum normally associated with insufficient support from lower layers of rope or grooving.
- Check correct rope diameter.
- If grooved drum check groove pitch.
- Check tension on underlying layers - Bridon recommend an installation tension of between 2% and 10% of the minimum breaking force of the wire rope - Care should be taken to ensure that tension is retained in service. Insufficient tension will result in these lower layers being more prone to crushing damage.
- Make sure that the correct rope length is being used. Too much rope (which may not be necessary) may aggravate the problem. Short rope life induced by excessive wear and abrasion.
- Check fleet angle to drum.
- Check general alignment of sheaves in the reeving system.
- Check that all sheaves are free to rotate.
- Review rope selection. The smooth surface of Dyform wire ropes gives better contact with drum and sheaves and offers improved resistance to “interference” between adjacent laps of rope. External corrosion.
- Consider selection of galvanized rope.

- Review level and type of service dressing. Internal corrosion.
- Consider selection of galvanized rope.
- Review frequency amount and type of service dressing.
- Consider selection of plastic impregnated (PI) wire rope.