Lapp cables for flexible applications

Does a cable break if it is bent or twisted too much? Not if you choose the right cable for the required application. This article explains where the challenges lie and the technical ideas that Lapp is using to overcome these issues as the leading supplier of connection solutions.

Cables have long been high-tech products. There is now a wide range of options when it comes to the material, processing methods and pre-assembly. This variety is necessary as the demands placed on cables, particularly regarding flexibility, have risen sharply over the last few years. One of the most gruelling places to install a cable is in a power chain. Here servo cables such as the ÖLFLEX® SERVO FD 796 CP and the ETHERLINE® or HITRONIC® fibre optical data cables are placed very close to one another. They move to and fro during a machine's power cycle, sometimes faster than 5 m/s with accelerations over 50 m/s2. "In highly dynamic applications, several things must be borne in mind in order to accommodate the demand for increased service life while guaranteeing lower space requirements, reduced weight and a small minimum bending radius," explained Lucas Kehl, Product Manager at U.I. Lapp GmbH.

Three types of movement

There are three different types of movement in cables:

- Torsion: the cable is twisted about a longitudinal axis. Pure torsional movements are found in wind turbines where the cables run from the rotating nacelle down to the tower;
- Drag chain: the cable is bent, sometimes millions of times, in the drag chain;
- Winding and unwinding: this is where cables are unreeled from drums, for instance in stage applications or on live TV, then reeled back onto them and stored after the event.

The material, particularly that used in the sheath, determines whether a cable can withstand movements over long periods of time and most combine several properties, e.g. fire behaviour or resistance to oil, chemicals and cleaning agents. PVC continues to dominate the market for sheath materials, but there are other materials such as thermoplastic elastomers (TPE) or polyurethane, which is the first choice for highly dynamic applications, e.g. in the ÖLFLEX® Servo FD 796 CP servo cable. Polypropylene is particularly good at insulating the core in flexible applications as it features excellent electrical insulation properties while also being very strong with a low density.

Flexible braiding

The screening braid plays an important role in a cable's flexibility. It blocks out interference from other cables, e.g. from motors or live cables. It is important that most of the screening braid is covered; no gaps should appear, even when the cable is bent. The braiding angle is the decisive factor here: the steeper it is when measured agains the cable's axis, the more turns are made in the wires in the braided shield per metre of cable, the thicker the braiding. Unfortunately, this also makes the cable more expensive as more material is needed.

The ETHERLINE® FD Cat. 6A Ethernet cable, which is used for robot monitoring or inspecting finished products using camera systems, is an example of excellent shielding. Suitable for use in power chains, the ETHERLINE® TORSION Cat. 6A can even be used in applications where the cable is twisted. Until now, cables in accordance with Cat. 6A with data transmission rates of up to 10 Gbit/s were only possible in fixed or slightly flexible installations.

Glass fibres can also bend

Fibre optic cables are the only option if you want even higher data rates. Users can choose between three fibre types: plastic optical fibres (POF) for shorter distances of up to 70 metres, plastic cladded fibres (PCF) for distances of up to 100 metres and glass fibres for even larger distances and applications requiring the highest data rates. In principle, all fibre types are suitable for flexible applications as long as the recommended bending radii

Polyurethane is the first choice for cables in highly dynamic applications, e.g. the ÖLFLEX® Servo FD 796 CP cable

The ETHERLINE® FD Cat. 6 A Ethernet cable is suitable for robot monitoring or for use in camera systems.