Busbars vs. energy chains for crane electrification and applications with limited installation space

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igus®

The performance of a crane is directly dependent on its electrification system. With various power supply options available and a range of application requirements to take into consideration, making a choice of which type of system to implement can be difficult. It is essential to consider the benefits and disadvantages of prospective energy supply systems before deciding which is best.

Busbars

One power system that is frequently offered for overhead cranes is an open or insulated busbar. These horizontal metal conductors are found to be a standard in many industries. They can be used in indoor or outdoor cranes, as well as on tracks with more than one bridge operating on them.
Most busbars are comprised of seven main components. The system supplies power along the track or bridge of a crane through steel or copper conductor bars. A collector arm slides along the conductor bar, allowing current to pass from the electrified conductor bar to the moving collector and on to the moving hoist or other travelling element. The conductor bars are typically hung from insulated hangers. The hangers are attached to a mounting bracket that is either attached to the wall, crane or machine structure. An end cover provides protection at the end of the conductor bar, and anchor clamps and expansion joints are used to manage thermal expansion and contraction.
Though busbars can provide adequate power supply to some applications, they have some serious shortcomings. One problem for busbars is downtime for maintenance, as they require frequent inspection. The shoes installed on the collector arms need to be regularly inspected and replaced when they wear out. The system must be powered down to facilitate this replacement.

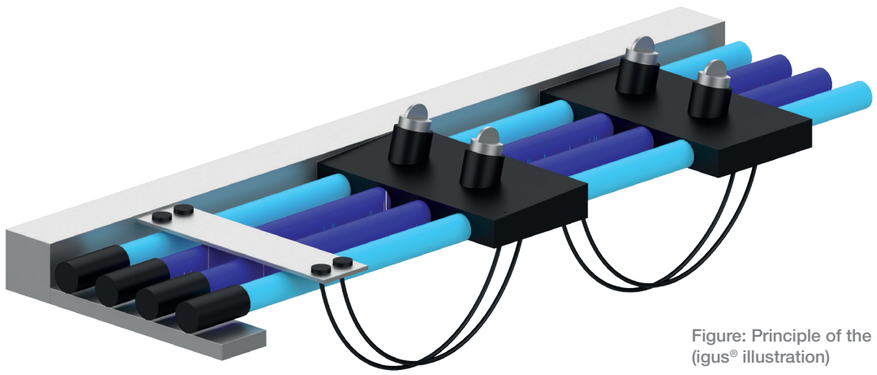

Figure: Principle of the busbar system (igus® illustration)

Busbars are also limited in the complexity and type of energy they can supply. On a busbar system, each conductor or pole requires its own conductor bar and collector. To add additional conductors, extra conductor bars must be installed on the hanger brackets. Due to the space required to do so, it is usually not feasible to install more than eight conductor bars on a single system. This limits busbars to be used only for power or occasionally control circuits. Hoses and other cable types must be guided by a separate system. This is important to consider if wired Ethernet, camera systems or other Industry 4.0 solutions are planned to be used in the future, as they may require wired connection of data or fibre optic cables to a central location. While busbars may have a relatively low initial cost, potential functionalities are limited, as a full rebuild of the cable management system may be required to integrate additional components. Wireless systems can solve this problem to a degree, but they are generally regarded as less reliable and secure than hardwired connections. The difficulties with busbars don't stop there, as they expose bare loaded conductors to the surrounding environment, causing serious safety concerns. This is especially problematic in hazardous or explosive environments. Busbars can experience problems when used to power transfer carts or other equipment where dust or debris are in the air. Problems can also arise if the conductor bars corrode, which is likely in applications installed near seawater or where chemical vapours are present.

Energy chains

Figure: Energy chain in a sludge vacuum-cleaning basin (igus®)

An electrification system that can solve the problems caused by busbars while providing superior performance for most applications, is an energy chain system. Often referred to as the lifeline of modern machinery, energy chains are high-strength plastic cable carriers that reliably protect cables during constant movement. The systems have been successfully used and tested since 1971.

While busbars are comprised of many different components, e-chains® are simply made up of parallel side links that are connected with crossbars along the top and bottom of the carrier. The design is modular and can be adapted to a wide range of applications. Specialised designs and materials are available for various types of motion and environmental factors, such as extremely high speeds or chemical resistance. Unlike steel systems, plastic cable carriers are designed to resist abrasion and corrosion. Plastic also reduces weight and offers vibration-dampening properties.
e-chain® cable carriers are virtually maintenance-free. The systems can run for years without problems and only require basic visual inspections to ensure the system is in good working order. The energy chains can carry all types of cables and hoses in a single system, including power, data, fibre optic, media and hydraulics. This saves space and is advantageous for the use of storage and retrieval units, which often have to move in narrow aisles.

Figure: Energy chain for an indoor crane in a galvanising plant (igus®)

Figure: Crane with energy chain (igus®)

The energy chains are typically populated with jacketed multi-conductor cables designed for continuous flexing applications. Cable terminations are typically made in environmentally-sealed junction boxes, eliminating any safety concerns or corrosion issues with exposed conductors. Cables are secured to the energy chain with strain relief clamps installed at each end. If a cable needs to be replaced or upgraded, the existing cable can be released from the ends and used to pull in a new or different cable, with little to no adjustments of the cable management system required. Spare space can be left in the e-chain® during the design phase, and draw-wires can even be installed to pull in cables needed for future changes or machine upgrades.

Figure: Energy chains used for long travels in a dirty environment (igus®)

Due to the modularity of the plastic energy chains, they can easily be equipped or retrofitted with sensor systems that monitor chains and cables. The advantage of such isense systems? Maintenance can be planned predictively, failures can be avoided and costs can be lowered.
Due to their clean and durable design, the e-chain® is the only possible option for applications in the food industry or the pharmaceutical industry, and for the storage of flammable liquids. The non-corroding plastic energy chains are also impervious to aggressive chemicals.
The carriers in e-chains® remain stable even when subjected to high loads. For additional protection, the chains are available with integrated rollers for extremely long travel distances.

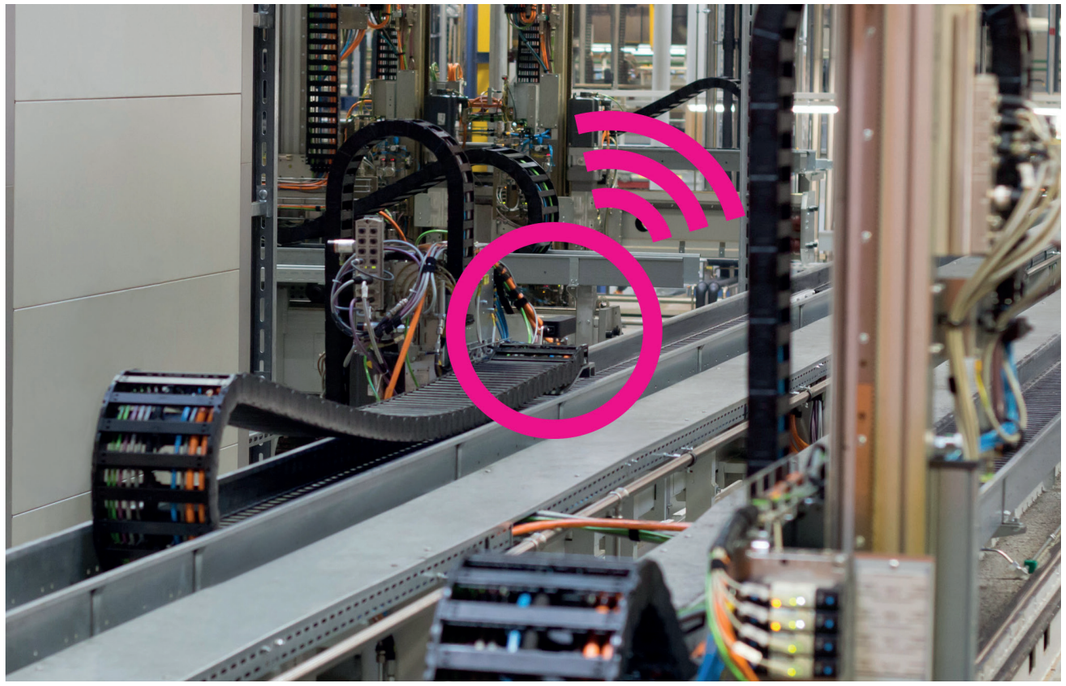

Figure: Smart monitoring in a car factory (igus®)