Lightning Protection System Stops the Strike before it Causes Damage

When lightning strikes, it represents a direct threat to people, buildings, electrical and electronic equipment, and also cranes. Lightning can severely damage or destroy a crane's electronic systems, including load cells, control systems, and load moment systems. Ashland, Va.-based Atlantic Coast Cranes & Machinery Inc. (ACC) recognized that no single technology can protect a crane from the damaging effects of lightning and induced transients. ACC founder Wally Jones started another company, LPC LLC, to introduce an integrated approach to direct strike protection and grounding.

This approach, in combination with effective surge protection, ensures computers, load cells, and all other sensitive, expensive electronic components remain secure and safe, and downtime is eliminated. "The LPC system, which stands for Lightning Protection Cranes, was demand-driven by our customers whose cranes were struck by lightning at great direct cost, not to mention the indirect costs of downtime, job delays, and cessation of crane rental revenues," explained Jones, ACC president. He said damage to one customer's Liebherr crawler crane was in excess of $100,000.

The protection system is designed specifically for crawler cranes with longer boom lengths and luffler and superlift attachments, which require more expensive LMIs, angle sensors, load cells, and the like. "We think the cost/benefit analysis really makes sense with crawlers above 250 tons," said Jones.

Made in the USA

Last year, ACC introduced this lightning protection plan, the first of its kind available commercially. It is the result of a partnership among LPC, Jones, and Erica, a global lightning and surge protection components manufacturer in business since 1903. Jones founded ACC in 1991, sold the company to his partner in 2005, and repurchased it last year. This year, he founded LPC. Erica has several manufacturing plants in the United States, and the finished LPC products are shipped from Solon, Ohio.

"We use components from other manufacturers since our LPC kits are customized and are crane brand- and model-specific," explained Jones. "ACC finishes the completed product in our Ashland, Va., facilities." The system removes the strike at the base of the boom before it, and an electrical surge, can enter the main part of the crane where the LMI computers and sensors are located and well before the crane will naturally ground itself through the track system.

"Structural damage can also [happen] to the very expensive bearings, and other structural components of the crane, so we remove this electrical discharge before it gets there," said Jones.

The kit also comes standard with an Erica event counter, which indicates a strike has happened when the user might otherwise not know about it, such as over a weekend or during an overnight shutdown. Jones said some customers have experienced latent crane damage to their cranes, in their Rotek crane swing bearings, for example, that might not show up until months later.

Two components of the LPC system include copper-clad ground rods (below), which are used when a grounding station is not available, and an Erica lighting event counter, which lets the crane owner know when a strike has occurred.

Pieces of the system

The system comprises several components. Air rods capture the lightning strike to a known and preferred attachment point, and they direct the flow away from electronic components. Copper-clad ground rods, 4"x2", are used to ground the system if a grounding station is not available. The rods are driven into the earth, and two grounding cables are attached to the baseplates mounted at the base of the boom to complete the electrical ground. The corrosion-resistant ground rods have a 30-year service life in most soils. The manufacturing process ensures uniform plating thickness of the rods, which have an average tensile strength of 80,000 psi, a straightness tolerance of .010 inches per linear foot, and exceed ANSI/UL 467-1984, CSA and ANSI/NEMA GR-1 requirements.

A NEMA weather- and moisture-proof enclosure box houses transient barrier surge protection components. The box is mounted on the crawler's boom for intermediary angle sensor and load cell transmitting cables, while the system's universal transient barrier (UTB) is installed as close to the equipment being protected as possible. A UTB also must be installed every 30 meters in series to ensure maximum protection to the LMI system.

The UTB, which features a compact design that protects low-voltage circuits and transducers, has a separate, hot-swappable plug and base design, which allows for easy module replacement. The design is also CAN-BUS compatible. The system's 4.3"x3.3"x3.14" lightning event counter has a NEMA-6/IP67 enclosure rating, and operates between -40°C to 50°C (-40°F to +122°F). The counter has a triggering impulse of 2000A 8/20μs within 18mm (0.7") of the unit base.

Transient Discriminating (TD) technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure safe behavior at end-of-life. A visual indicator flag provides user-feedback in the event of such operation. As standard, the TDS1100 provides a set of voltage-free contacts for remote signaling that maintenance is due.

The system can be installed by a crane field mechanic with instructions provided, or LPC can supply a crane tech to install it.

Call Wally Jones at (804) 798-8840 or email at wally@lpc-llc.com for more information.