

EXPLINER -Inspection Robot for High-Voltage Transmission Lines-

HiBot Corp.

The proper maintenance of High-voltage transmission lines is of vital importance, since any problem may result in the interruption of electricity, with many negative impacts to health, sanitation, transportation and safety. Preventive maintenance is the best way to avoid problems with infrastructure, by detecting them in an early stage and responding accordingly with action plans for repairs or improvements. However, inspection of high voltage transmission lines is a very risk operation, as workers must move on the lines several tens of meters above the ground, in very demanding and stressful conditions. In order to make this work safer, sometimes the transmission of electricity is interrupted for the inspection operation. However, this may not be possible at all times, since it would overcharge other parallel lines. In times of high demand, such as in summer and winter, the utilities may have to pay hefty fines for the reduction in capability to provide electricity.

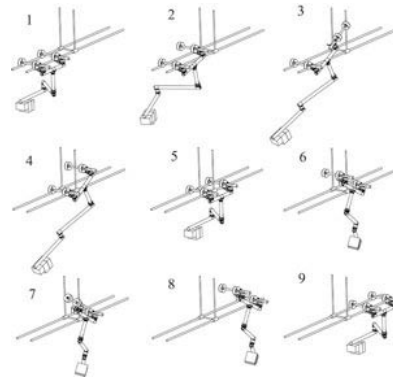
The use of helicopters has been proposed as a way to improve safety and speed of inspection operations. Even though video shot from helicopters provides general information regarding the conditions of the lines, and (perhaps most importantly) the vegetation around the towers and lines, this method cannot provide details of the lines regarding scratches, minor faults or corrosion, which are early signs of problems that must be repaired before the lines are seriously damaged.



【fig.1 Expliner overview】

Expliner was designed to move on live lines. In Japan, it has been certified with up to 500kV, but the principle of shielding allows it to operate in even higher voltages. Expliner performs very detailed inspection of up to four conductors simultaneously by placing sensor units around them, and acquiring images of the entire surface of the cables with CCD cameras and mirrors, that allow a coverage of 360 degrees.

By crossing the suspension clamps of towers, Expliner is not limited to operate only between towers, but may go on for several spans, depending on the configuration of the transmission lines. In addition, it is able to perform the tower-crossing motion shown in Figure 2 in lines with inclination of up to 30 degrees. These obstacle-crossing motions are automated, requiring the operator to simply control the speed of the motion while watching it remotely with videos taken from several on-board cameras. Cable spacers can also be crossed autonomously. When Expliner identifies a cable spacer, it moves close to it, stops automatically, and removes the sensors and locks in order to cross it.



【fig 2. crossing the suspension clamps】

Portability and ease of assembly are two key features of the system. Since the towers of transmission lines are usually located in mountains or other remote areas, it may not be possible to transport a fully-assembled robot. Expliner was designed in a few major parts that are easy to carry, even in mountain paths that are too narrow for vehicles, and can be easily assembled on the spot, without any tool.

In 2010, the commercial version of Expliner left the HiBot assembly line with several improvements in manufacture, ease of transportation and assembly, endurance and reliability. In 2013, it will be used in the actual inspection of cable in Kansai Electric Power Company (KEPCO)'s operation. In addition, HiBot is currently building a business scheme of Expliner Robot for worldwide.