Remote retrofitting

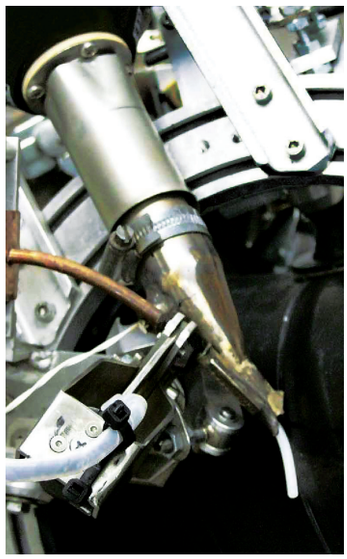
Accessing bridge components such as inclined cables, pylons or cross-beams more than 100m high is a challenge; regardless of the actual task, accessing the exposed structure often requires special equipment. Items such as temporary carriages or platforms must be used to reach a cable, but German specialist Alpin Technik has developed a special carriage that operates remotely, moving up and down the cables and carrying the equipment required.

The system can carry out three different tasks: visual inspection by a camera system which records the conditions of the full circumference of any cable; magneto-inductive inspection to examine the condition of the cable's inner core; retrofit welding of spirals onto the cable sheath.

The first two of these facilities were made available last year *(Bd&e issue 43)* but the spiral welding is a new feature. It is mainly required on older bridges which are not protected against the rain/wind-induced vibrations which arise under certain weather conditions. The spirals are common on new sheaths; they are designed to prevent the rain from forming rivulets on the surface of the sheath and hence prevent vibrations in the cables.

In order to retrofit the spirals, a welding gun is assembled on the upper end of the carriage. The system moves automatically up to the top of the cable while the preheating process is carried out. Once at the top, the welding gun is lowered onto the surface by remote control and the welding rod - also fed automatically - is applied to the roughened surface. The spiral movement is achieved by radial and axial movements of the gun, the ratio of which determine the welding angle.

The total weight of the system is only about 70kg, which reassures bridge owners who may be worried about the damage that heavy equipment can cause. Too much weight on a certain point may



rupture the covering of the strands or may damage the inner bead of the radial weld that the single PE parts are connected to.

The device measures about 1.5m in length, and its diameter is equivalent to the cable diameter plus 60cm. But the weight increases depending on the length of the cable and hence the length of power cable. Regardless of the weight, the system can work at any angle up to 90°. The movement device ensures the necessary adhesion and allows the system to move over obstacles up to 5mm high.

The welding process is comparable with any normal plastics welding method, except that it is remotely-controlled instead of being manually operated. Ground personnel supervise the workflow using the embedded camera system.

This automated process is the only way it can be done within an acceptable time and at an appropriate cost. Welding by hand is not a feasible alternative; even if a person could access the whole length of a cable by means of roped access, they would not be able to hand-weld a helical spiral to an acceptable quality. Dampers, which are usually regarded as an alternative way of reducing vibrations, offer a way of tackling the effect, but not the cause. Vibrations still occur and may still cause damage. Furthermore, dampers need maintainenance whereas the spirals are permanently fixed.