

IT'S A WRAP

A new system for corrosion protection of stay cables is being trialled on a footbridge over the River Rhine. Words and photographs by Helena Russell

Pedestrians and cyclists crossing the Kehl Footbridge near Strasbourg in the last few months have been distracted from the glorious views of the river by the curious sight of a small machine crawling slowly up the cable. Once it reaches its target position, the machine then begins the process of wrapping the cables, inching up so slowly that it barely seems to be advancing. The presence of a roped access operative, travelling up and down the tower by the use of an electric winch, makes the scene even more fascinating for observers.

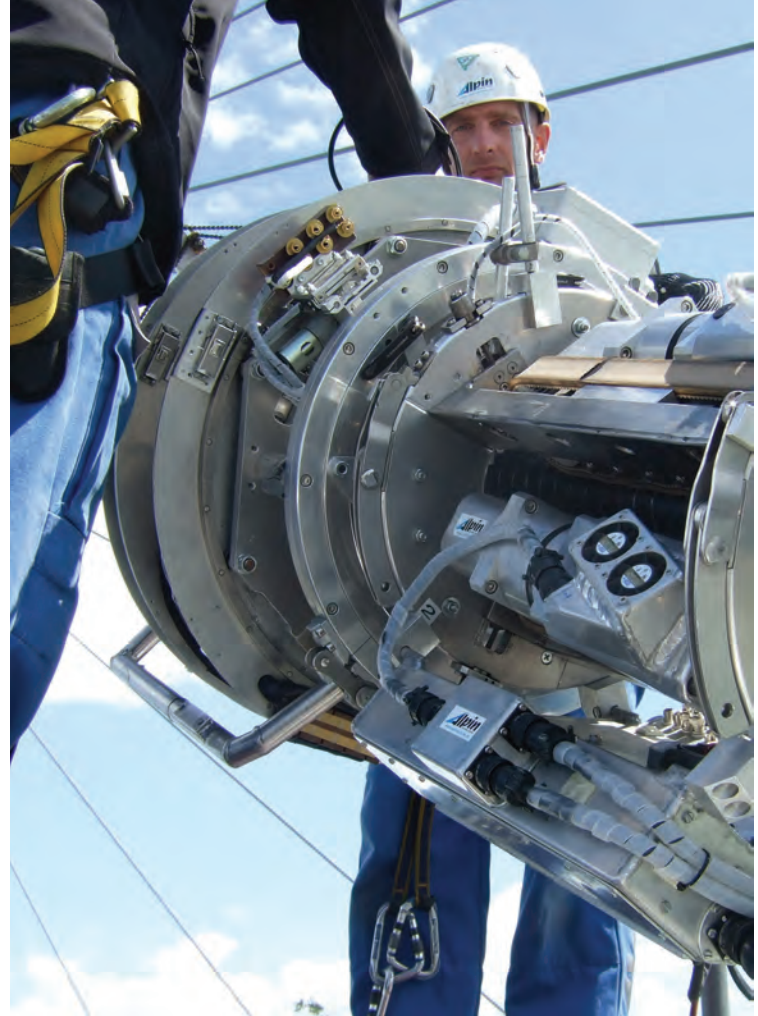
What observers do not realise is that from a technical point of view, the scene that they are observing is even more interesting than it appears. A team from German access specialist Alpin Technik is working with Suspa-DSI to trial a new system for applying corrosion protection to stay cables, using an adapted version of its cable inspection machine. If successful, the process could replace the painting of cables after installation, cutting the cost of corrosion protection by an estimated two thirds, by eliminating the need for expensive and difficult scaffolding or other access equipment.

As Alpin Technik civil engineer Eric Kuhn explains, most of the technology that is being used is already in use elsewhere. The Denso tape that is being wrapped onto the cables has already been in use for some 40 years to protect steel pipes in other industries, although its size has been modified for this application. Likewise, the machine that is doing the wrapping is built around Alpin's cable inspection equipment that has been in use for several years. The only thing that is new about the process is the introduction of a new module to the machine; Alpin has developed this unit to carry out the wrapping process, and it is fitted to the front of the standard transport module.

The trialling of this system is being carried out over a period of several months on the Marc Mimram-designed footbridge which connects Kehl in Germany with Strasbourg in France over the River Rhine. The structure, which has a main span of 183m, was opened in 2004 to provide a link between the two sides of the river as part of a garden festival that was taking place on the two banks. When the bridge was built, funding and time were limited, explains Kuhn, so corrosion protection for the cables was not installed at the time. But now, with some signs of corrosion being initiated where the cables have been damaged, the owner wants to retrofit the bridge to extend the life of the cables.

Under normal circumstances, this would require extensive scaffolding to access the cables in order to apply special paints directly to the steel elements. On this bridge in particular, with its two planes of cables supporting the two narrow decks which are separated by several metres and one of which has a steep gradient with steps at each river bank, it would be a very onerous and expensive procedure. Only perhaps the smallest cherry-pickers would fit on the deck, but would be unlikely to have the reach for the upper parts of the cables, and if scaffolding were to be installed on the structure it would have serious implications for the wind resistance and wind loading of the structure, in this rather exposed location.

The bridge decks are supported by 76 cables which vary in diameter from 65mm to 139mm and which make up a total length of 3.7km. Two decks span the river, one on each side of the two inclined towers, and they are connected by a walkway at the midspan position. One deck is for pedestrians only - it has stepped access at each bank and rises steeply - while the other has a much shallower gradient, is wider, and is



The machine being prepared for its journey up the cable

suitable for cyclists as well as pedestrians. This deck must be kept open throughout the installation process, while the pedestrian deck can be closed. But since the cycle deck is wider, there will be space for the team to work while keeping the remaining width open for traffic.

When *Bd&e* visited the site in mid-August, the team was at work on the first section of the project, installing the wrapping on the third cable. Progress had been disappointing so far, but this was due to poor weather conditions rather than any technical difficulties, says Kuhn. Like painting, the wrapping of the cables can only be carried out during dry weather and the site had experienced three weeks of rain since the contract began. But with good weather during the visit, the team was able to demonstrate the wrapping process.

The main unit that makes up Alpin Technik's cable wrapping equipment is the transport unit, which enables the system to move up and down the cables without damaging them. It runs on a set of miniature 'caterpillar tracks' on four sides of the cable; these allow the load of the system to be evenly distributed and prevent any damage. Depending on what kind of work is required, Alpin has developed a range of add-ons for the system, which are connected to the front of the transport unit and can carry out visual inspections by means of four industrial-quality cameras, thermographic imaging, PE welding or application of helical fillets to PE sheaths, and now cable wrapping.

A 10m length of the special Dyna Protect tape is loaded onto the reel of the wrapping system, then threaded through a series of rollers and guides to ensure that the backing tape will be removed (and stored on a separate reel) and the tape itself wound at the right angle, tension and overlap onto the cable. When it reaches the end of the tape, the unit is brought back down to deck level, the backing tape removed from its reel and a new 10m length of tape loaded onto the first reel. A camera in the unit transmits live pictures to the operator at deck level, who can ensure the machine is operating as it should. The top and bottom of each cable has to be wrapped by hand, since the machine cannot access these sections, and Alpin has also developed a special machine for hand-wrapping, to ensure the tape is applied to the right specifications.

Kuhn explains that the recommended procedure for such a job is that all the cables should first be subject to a visual inspection using the same machine, but with the camera unit attached. Once processed, the data is used to provide a photographic record of every



Left: Wrapping in progress; the operative above is working at the end of the cable.
Above: View of the structure with its twin decks and cable planes.

inch of each cable, and engineers can use it to spot any potential problems. The inspection is carried out at night - the inspection unit has lighting built into it - to ensure that the lighting is consistent and so the images can be compared like for like. The visual inspection unit is also on hand during the wrapping process in case the operators want to record any part of the process for future reference.

With good conditions, says Kuhn, the machine should be able to wrap about 70m of cable per day, with both layers of tape. As *Bd&e* went to press, the project on Kehl bridge was approximately 25% complete, with some 22 days of wet weather responsible for the delays so far ■

UNDER WRAPS

The Dyna Protect system is based on butyl rubber tape developed by Denso more than 40 years ago. Although they have been adapted specifically for this application, the protective technology remains the same. The tape is overlapped as it is wound onto the cable, and the butyl rubber compound adheres to itself through cold amalgamation. This process produces a closed tube which is mechanically highly resistant and stable, and which is practically impermeable to water vapour and oxygen. Dyna Protect B is a three-ply tape that consists of a

stabilised polyethylene carrier film which is coated on both sides with a duroplastic butyl rubber-based compound. Dyna Protect-C is a two-ply tape consisting of an outer coloured polyethylene carrier film which is coated with a butyl rubber-based compound on one side. During installation of the system, the Dyna Protect-B tape is applied first, onto the mechanically-cleaned cable surface, followed by Dyna Protect-C. Both are wrapped with an overlap of 50%, and the final thickness of the wrapping is at least 2.6mm. The system is flexible to allow for movement of the cable or hanger without any cracking.

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