1.2.12. APPLICATION OF EDDY CURRENTS TO THE ESTIMATION OF STRESS CORROSION DAMAGE

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Fatigue damage of ferrous materials in corrosive environment yields a wide-spread distribution of surface flaws [1] whose density increases with number of cycles. Figure 1 shows an example of such distribution on the surface of a round specimens made in a mild steel subjected to artificial rainwater during a rotating bending test. The low depth and the typically closed configuration of such flaws makes difficult their individuation and monitoring by means of traditional surface NDT techniques.

An experimental campaign was then initially carried out on round specimens made in a mild steel in order to yield different stress corrosion patterns very similar to those observed on running components. The schematic of the test facility, able to apply contemporarily rotating bending and a corrosive environment, is shown in fig. 2.

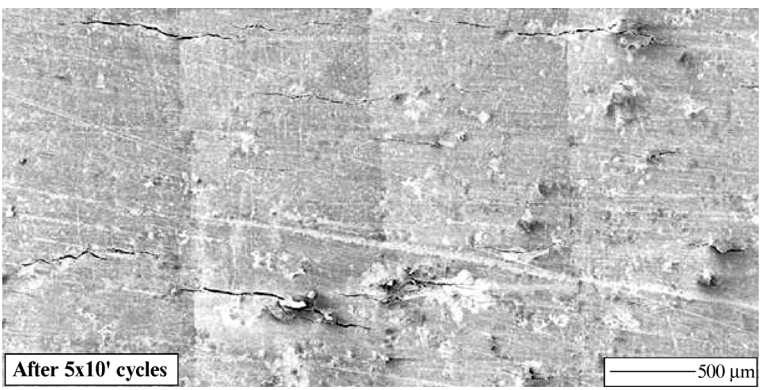

Fig. 1. Effects of fatigue loading in corrosive environment

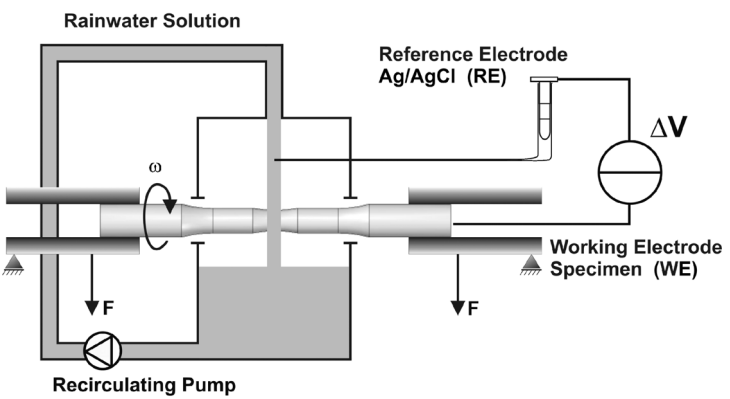

Fig. 2. Experimental facility to apply rotating bending and a corrosive environment

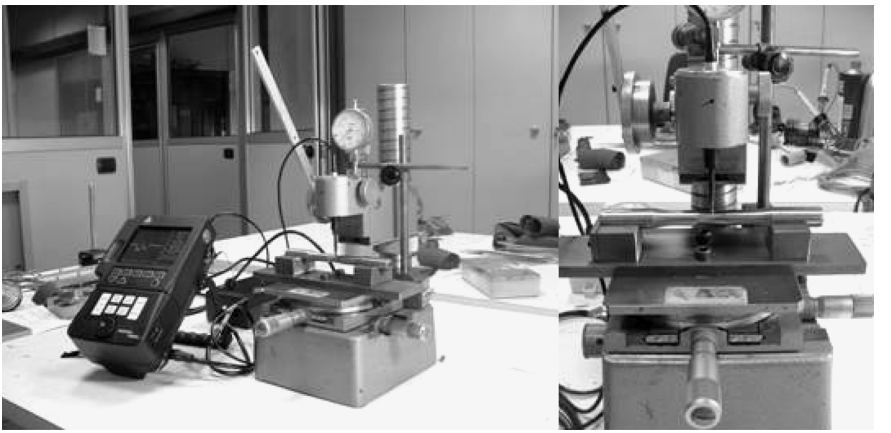

Fig. 3. Application of eddy currents to stress corroded specimens

Corroded specimens were then studied and analysed by means of eddy current probes (fig. 3). Particular attention was paid to the different parameters influencing eddy current performance such as lift-off and probe frequency.

Results showed a significant relationship between the stress pattern and the response from ET probes, so suggesting the possibility to define a real-time monitoring technique for components subjected to stress corrosion.

References:

1. **Beretta S., Carboni M., Lo Conte A., Palermo E.** (2008), An investigation of the effects of corrosion on the fatigue strength of A1N axle steel, Proc. Instn Mech. Engrs Vol. 222 Part F: J. Rail and Rapid Transit, 129 – 143.