

CASE STUDY

NURSING HOME – GERMANY



Problem

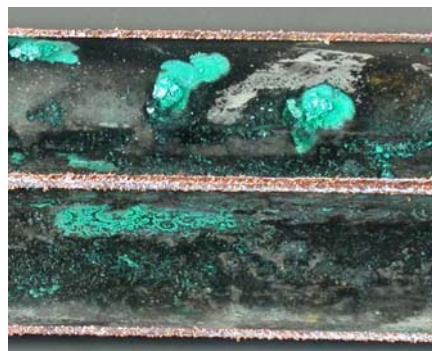
A large nursing and residential home, 'Stadtrésidenz' in Oberursel, was built in 1996. Four years later, leakages started to occur in the copper drinking water system. Around ten leaks occurred, although there were none in the hot water system. The leaks caused widespread disruption and distress to residents.

Because of his international reputation in the area of copper corrosion, Dr. P. Munn of CESL was called in to investigate the problem and find a solution.

Discovery and explanation

Samples of failed copper pipe and water samples were sent to CESL for analysis.

The situation was unusual and quite complex, as inspection of the pipe samples showed two quite different modes of attack. On the bore of several samples, large blue nodules were found surrounded by a black deposit.

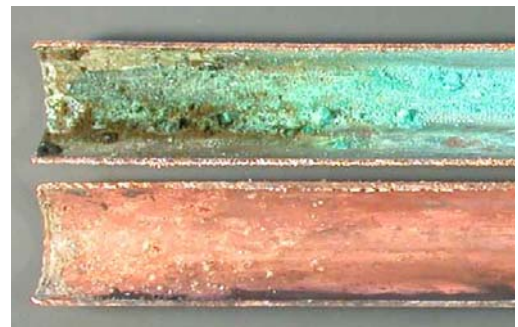


On dissolving the nodules in acid, the underlying copper surface contained a high density of tiny pits, some of which perforated the pipe. Chemical analysis revealed the presence of both sulphates and sulphides in the nodules and the rest of the surface was found to be coated with a polysaccharide film.

The cause of the attack was attributed to microbially assisted pitting corrosion (MIC). The action of sulphate-reducing bacteria in the anaerobic conditions under deposits leads to the formation of acid, which causes pitting of the copper.

On other samples there was a green-blue patina over most of the surface, but at the jointed ends the patina was discoloured and disrupted.

Underneath this discoloured scale, there was widespread pitting of the copper pipe. Below you can see the appearance of such a section both before and after cleaning to remove the surface films.



The composition of the supply water would not support type I pitting, therefore, the attack here was attributed to the excessive use of flux on soldering.

Solution

The solution was to replace the most badly affected parts of the system and to clean the rest of the internal surfaces of the pipe work using dilute acid. Checks needed to be made to ensure that water was not left stagnant in any parts of the system for long periods, and to filter the incoming water supply.

Reaction

One of the partners in the project, Daniel Davies of Research and Development Services, said: *"We were very impressed by the investigation carried out by CESL into the failures of the domestic water system at the nursing home in Oberursel, Germany. The report into what was a complex case was clearly written and we were able to act successfully on the recommendations."*