PHORGOTTEN PHENOMENA

Using Impressed Current Cathodic Protection in Urban Areas

JOHN H. FITZGERALD III, FNACE,
MP *Technical Editor, Grosse Pointe Park, Michigan*

There are times when it is necessary to use impressed current cathodic protection (ICCP) in urban areas, in spite of concerns about extensive interference. This article describes three ICCP systems that can be used safely in urban environments. They are distributed anode (parallel) groundbeds, deep anode groundbeds, and low-output surface groundbeds.

An announcement that a rectifier is going to be installed in an urban area is likely to elicit disparaging remarks. The problem stems from the mindset that rectifiers are a cross-country pipeline phenomenon consisting of units located many miles apart and connected to groundbeds producing fairly high current outputs.

The direct application of the transmission system in a city could indeed be disastrous. Introducing a large amount of current into the earth from a few widely scattered groundbeds could cause a great deal of interference. But if properly engineered, impressed current cathodic protection (ICCP) can be used quite effectively and safely in urban or other congested areas. Three groundbed configurations can be considered: distributed anodes, deep anodes, and small low-output surface beds.

Distributed Anodes

In a distributed anode (parallel) system, the anodes are connected to a header cable and spaced perhaps 50 ft (15 m) apart along a pipeline. Each anode protects only a small amount of piping and the system is not very different from galvanic anodes. In one such installation, a bare 20-in. (500-mm) interstation gas main within a large city was protected effectively, with no interference on adjacent buried gas and water piping and telephone cables.

Use of distributed anodes is also a common way to upgrade underground storage tanks. By placing the anodes around the tanks and along the dispenser piping, current is closely coupled to the protected structures and effects on other structures are minimal.

A word of caution, however—be careful with the driving voltage. One such installation was placed in a service station in very high-resistivity soil and energized at 85 V and 3 A. The resultant high volt-

age gradient caused serious interference on a nearby gas line. Additional anodes were added to bring the voltage down to ~35 V; the problem was solved, but only at an appreciable added expense to the owner.

Deep Anodes

Deep anode groundbeds, which can be installed on small plots of ground or in an alley or parkway, provide effective protection for coated, isolated pipe in a subdivision or other distribution area. This configuration, which might be used to replace spent galvanic anodes, has been used successfully in several cities without creating interference problems. A variation of this is the semi-deep groundbed, perhaps 35 to 50 ft (10 to 15 m) and generally containing three or four anodes. These installations have been made quite successfully for gas piping in city streets and alleyways, as well as to upgrade underground tanks and piping in service stations.

Low-Output Surface Beds

Frequently it becomes necessary to protect relatively short sections of mains of ~3,000 ft (900 m) under streets or other paving to bring low areas up to protection or to replace dissipated galvanic anodes. This often can be done with a low-output rectifier and a small surface groundbed of one or two anodes. Groundbed resistance will be high, but at the typical output of <1 A, a driving voltage of 20 to 30 V is perfectly acceptable. Short river crossings of ~300 ft (90 m) also lend themselves to this type of installation.

Impressed current is most commonly used in urban areas for retrofit installations, although it can also be employed on new construction. Properly designed and installed, it can be used effectively without causing interference on the myriad other structures in the area.

JOHN H. FITZGERALD III, FNACE, is a consultant for Corrpro Companies, Inc., 1350 Berkshire Rd., Grosse Pointe Park, MI 48230. He previously was with Columbus Gas of Ohio and has been involved in corrosion work since 1959. He is experienced in underground and submerged structures, cathodic protection, stray current control, and water and steam systems in buildings. He received the Mars Fontana Award, T.J. Hull Award, NACE Outstanding Service Award, and the Colonel Cox Award. A NACE Fellow, Fitzgerald is a registered professional engineer, a NACE Corrosion Specialist, and a NACE past president (1990/1991). He is the technical editor of *MP*. MP