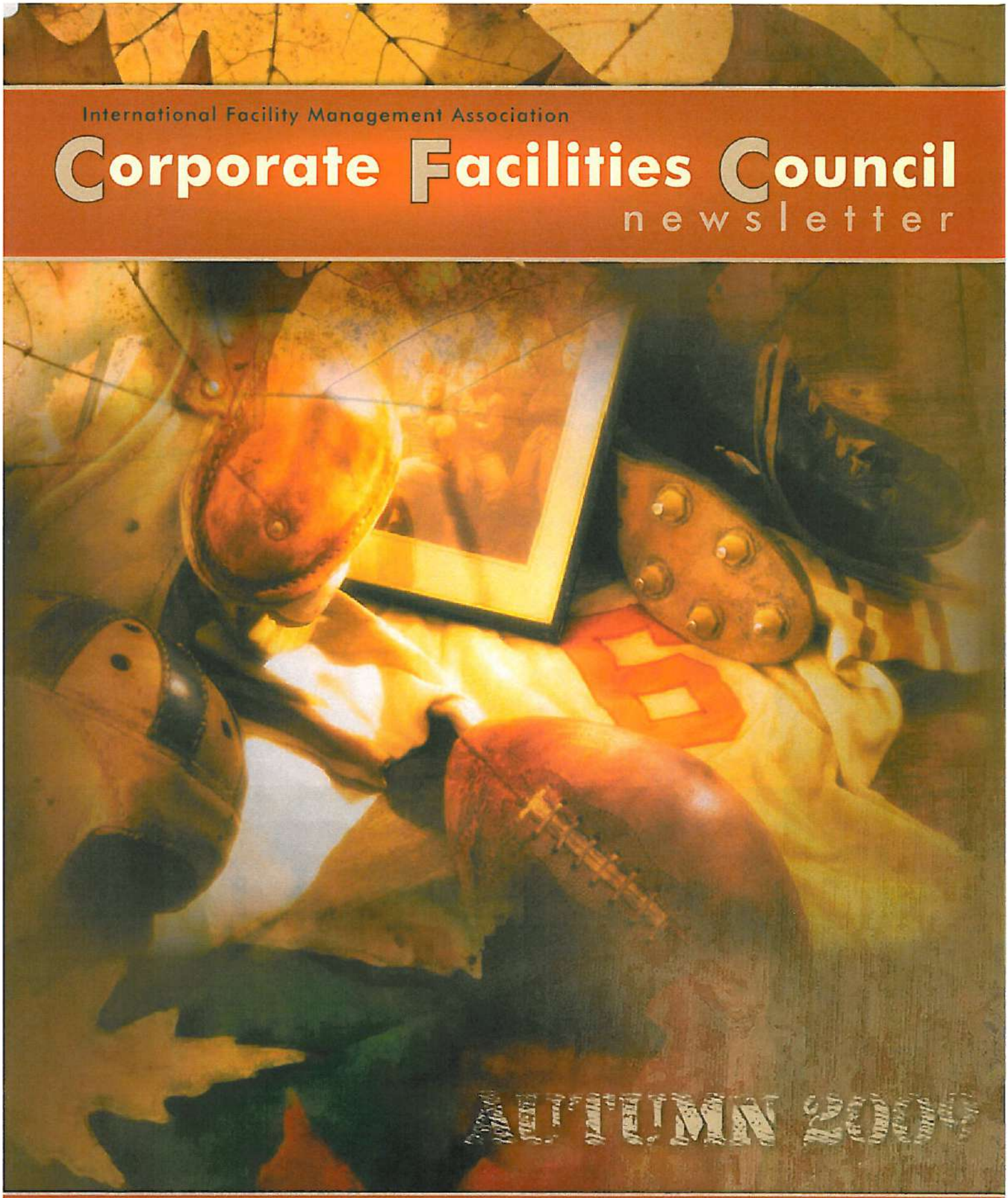
International Facility Management Association

Corporate Facilities Council

newsletter



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Headquarters ◆ *Campuses* ◆ *Office Environments*

A 2001 study conducted by

CC Technologies Laboratories, Inc. estimated that corrosion in the United States has an impact of approximately 276 billion dollars a year. This equates to about 3.1% of the nation's GDP! When you consider this study was conducted eight years ago, you may begin to wonder what corrosion costs the US today.

On a personal level, the questions beckon: "Do I know what corrosion is costing my company? What is the decreased reliability of machinery, equipment, and structures due to corrosion costing us? What is the potential cost of lost revenue due to disruption of services? What are we spending on labor and equipment for corrosion repair and management?" I believe when we stop and give some thought to things such as what the leaking cooling tower is costing us, the potential liability associated with spalling concrete in the parking garage, the likely repercussions of hydrostatic water issues in the elevator pit saturating the machinery, etc., we quickly come to the realization corrosion is costing us much more than we ever imagined. So what do we do about it?

When we're aware of issue and have a basic level of knowledge regarding the challenge, we are better prepared to deal with it when it occurs. To this end, let's define corrosion and quickly identify the most basic forms we are prone to encounter in our industry on a daily basis.

Generally corrosion encompasses the process that involves the deterioration of metal. Ultimately corrosion is the chemical wearing a way of a metallic substrate. The most common forms we will probably see in our industry as follows:

General/Uniform Corrosion
(such as rusting steel)

The metal loss occurs at essentially the same rate (uniformly) over the metal surface (no pitting / deep pockets of corrosion are evident), hence the term uniform corrosion. Uniform corrosion is considered to be one of the most common forms of corrosion and is relatively easy to address through the thoughtful selection of materials, coatings and corrosion control methods. Although unsightly, uniform

corrosion is generally insignificant in that it is usually addressed prior to becoming an issue.

Atmospheric Corrosion

Degradation of a material as a result of coming in contact with substances present in the atmosphere. Atmospheric corrosion occurs on a steel surface when the steel becomes wet from rain, humidity, etc., and the moisture is combined with impurities/pollutants present in the air such as chlorides from sea air and/or industrial pollutants (carbon dioxide, sulfur, etc.). In moist environments where atmospheric impurities are high, corrosion can occur rapidly. The corrosion can have marked visual

differences dependent on the location and the environment or atmosphere. For example, in an atmosphere near the ocean (chlorides) or in an industrial area (carbon dioxide), the surface can be have a very rough corrosion face with evident pitting present, where in a different environment the corrosion might be smoother. Both are certainly worthy of concern; however, keep in mind the chemical reactions taking place due to the atmosphere can give rise to different corrosion mechanisms and therefore a different appearance.

Galvanic Corrosion/Bi-metallic Corrosion

A galvanic reaction occurs when two dissimilar metals are in contact with one another in an electrolyte. The end result is that the less noble metal (anode) will sacrifice itself to the more noble metal (cathode). The more disparate the metals are in the galvanic series of metals the more rapidly the corrosive action will occur. As an example, zinc anodes, which are very low on the galvanic series, are often used to intentionally create a galvanic reaction so they will sacrifice themselves in lieu of the steel they are protecting, such as a ship hull or pipeline. (Many times galvanic reactions are set-up unintentionally, which often leads to severe consequences.)

Concrete Corrosion/Corrosion in Reinforcing Steel

Needless to say, concrete itself doesn't corrode; however, a vast majority of the concrete used in buildings and structures contains reinforcing steel. In instances where the quality of

concrete is poor, and therefore highly permeable to moisture, calcium chloride has been used as an additive due to having to pour concrete in cold weather, or the thickness of the concrete over the reinforcing steel was not adequate to protect the steel from moisture. Once the reinforcing steel begins to corrode the rust expands and flakes, thereby cracking the concrete and delaminating it from the reinforcing steel. The cracking then allows further moisture to penetrate the concrete, exacerbating the problem.

This is a short list of the corrosion issues one might see in a building on a daily basis. Keep in mind complete books have been written on the subject of corrosion! There are entire fields of study on the subject and, of course, there are people who have chosen to make the identification and prevention of corrosion a career. Now that you are more attentive of the potential corrosion issues in your facility and the challenges they present, what might your next steps be if you are concerned? There are a number of options available ranging from traditional paint, to ultra-high performance polymer composite rebuilding and coatings systems, to corrosion inhibitors, alloys and catholic protection.

Over the course of the last decade a great deal of research has gone into the development of a new breed of highly advanced polymer composite coating and rebuilding system. Some of these systems are quite unique as a result of their physical properties, in that some possess extremely high bond strengths (often in excess of the rate at which ferrous corrosion/rust grows), are 100% solids, odorless, and can be used to rebuild (paste grade components) and protect (liquid grade) vital machinery, equipment, and structures from the effects of erosion, corrosion, wear, chemical attack, and hydrostatic water transmission.

The pictures included here are designed to give you an idea of the various types of corrosion. Rebuilt components and structures utilizing advanced polymer composite coating and rebuilding systems give you an idea what can be cost-effectively accomplished utilizing this technology. As you explore potential remedies for your specific corrosion challenges, keep in mind every solution has its own application. So look at all your options, be curious, and make good informed decisions based on long-term results. You can be a winner in your battle against corrosion!

CFC member Brien Neill is the Western Region Vice President for ENECON Corporation, based in Medford, NY. He is an active member of the Seattle IFMA Chapter.