SPED Newsletter

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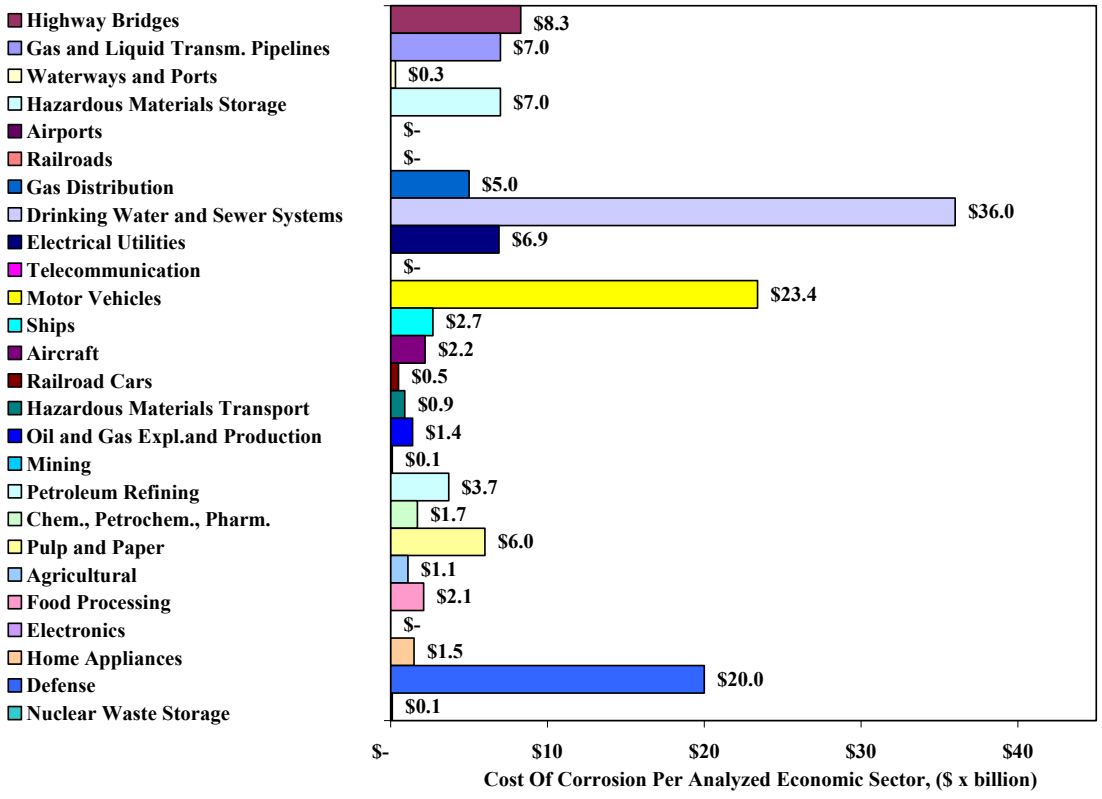
Corrosion Costs US Economy $300 Billion per Year

A recent study says that corrosion costs about $300 billion a year in the United States with costs in the Oil and Gas Industry alone approaching $20 Billion per year. The study was conducted by CC Technologies, in cooperation with NACE International (The Corrosion Society), and was funded by the Federal Highway Administration (FHWA). It shows the areas of industry with large corrosion costs, and calculates the moneys spent on corrosion control methods. According to Cost of Corrosion project manager Gerry Koch, the study of industry sectors summarizes and explains corrosion costs to all engineers and managers in the field of corrosion, and to the general public and policy makers.

The annual cost of corrosion consists of both direct costs and indirect costs. The direct costs related to corrosion are made up of two main components:

1. The costs of design, manufacturing, and construction, and
2. The cost of management.

The costs of designing, manufacturing and construction include material selection, such as stainless steel to replace carbon steel, additional material, such as increased wall thickness for corrosion allowance, material used to mitigate or prevent corrosion, such as coatings, sealants, corrosion inhibitors, and cathodic protection, and application, including the cost of labor and equipment. The cost of management includes corrosion-related inspection, corrosion-related maintenance, repairs due to corrosion, replacement of corroded parts, inventory of backup components, rehabilitation, and loss of productive time.



Specialists have long known of the tremendous costs of corrosion in monetary terms and in terms of safety. Corrosion engineers, such as Gerry Koch, hope that results from this study will bring a new awareness of these costs to people in other fields, especially to decision and policy makers in Industry and Government. "If we can make those people at that level aware of the impact that corrosion has on finances of the company, they may be more willing to do something about it. Awareness of corrosion costs is also important for Congress and local Governments, so they can allocate money for corrosion mitigation and research", Koch said.

Anyone who owns a home or a car is affected by corrosion, and that is a large part of our population. Water heaters and furnaces are particularly affected. "Corrosion is a costly problem and it will be particularly costly when you don't do something about it", Koch said. Corrosion makes it so we cannot hold onto our assets forever.

Not only does corrosion affect our household assets, it wreaks havoc in the water and sewage, automotive, and oil industries sectors, as well as in the airline and defense industries. Results gathered from extensive web searches, surveys, and discussions with various engineers who work in each field illustrate high corrosion costs across these various sectors.

Oil and Gas Industry

Corrosion continues to be a problem in all facets of the oil and gas industry. The study showed direct corrosion costs in oil and gas exploration and production of $1.4 billion/year, in petroleum refining $3.7 billion/year, in gas and liquid transmission pipelines $7.0 billion/year, in gas distribution $5.0 billion/year, in hazardous materials transport $0.9 billion/year, and in hazardous materials storage $7.0 billion/year. All these sectors were investigated individually, and showed specific corrosion issues for each industry. The corrosion cost issues range from added costs for new construction, to maintenance costs on aging/corroding equipment, the costs of inspections and structural integrity evaluations, to the costs associated with corrosion-related failures and outages.

In addition to the issues raised by processes used, the oil and gas industries are undergoing intense amounts of scrutiny in the United States from regulatory agencies and environmental groups. As a result, releases of pollutants to air, soil or water caused by corrosion leaks are becoming high consequence events. Various regulations in the last few decades have forced owners/operators to implement a number of costly measures to reduce their impact on the environment, both with the types of products they produce and the manner in which they operate.

Water and Sewage Systems

Even Koch was surprised by the results of the very high cost of corrosion in the water and sewage industry."People live with it but do not realize that the upkeep and replacement of the drinking water and sewage systems is costing society a large amount of money. It was somewhat of a surprise that corrosion of the drinking water and sewage infrastructure would be the most costly of all the sectors studies."

Astoundingly enough, very little is being done to prevent corrosion in the water and sewage industry. The problem of deterioration of the system is apparently so overwhelming that the one choice appears to be of just waiting for water and sewage lines to break. It is difficult to prevent corrosion cost in this industry, because, according to Koch, "Often the maintenance engineers don't even know the location of water and sewage lines and there is no way to measure the conditions of the lines."

Motor Vehicles

The automotive industry is another story that illustrates what proper design and material selection can control and even prevent corrosion, thereby lowering the costs to the consumer. In a previous cost of corrosion study by Battelle Memorial Institute in the mid 1970's, a main focus was on the automotive industry. It was shown that automotive corrosion was one of the main contributors of the national cost of corrosion. "After this study, auto makers started to use galvanized steel and incorporate more corrosion conscious design and manufacturing techniques. The result is that car bodies last much longer today, you don't see many rusty cars," said Koch.

Aircraft
Not every industry has done as much as the automotive to control costs of corrosion. For example, the airlines are subject to corrosion problems, primarily as a result of the aging of the fleets. "Airlines continue to fly planes past their design age, and corrosion is becoming a life-limiting factor on some of these airplanes. That needs to be looked at very carefully. In addition to affecting the cost of maintenance and operation, corrosion could start to have an effect on safety," Koch said.

Conclusions
Despite some successes such as those seen in the automotive industry, Koch feels that too many industries have a lopsided focus, viewing corrosion as a maintenance issue rather than a preventative one. "Emphasis should actually be placed on corrosion prevention and not corrosion repair. In general, I don't think that's being done enough," according to Koch. Moreover, Koch stresses that costs of corrosion are so high that they cannot and should not fall into a purely maintenance categorization.

"If you look at the total annual cost of corrosion (in this report), it's almost $300 billion. That's a very large number. You ought to realize that it's not just maintenance. This cost can be reduced significantly and a lot of money can be saved (using preventative measures)," said Koch.

Hopefully, an important step in controlling the ravages of corrosion has been taken by creating awareness though this study. These new facts and data presented in this study can be used to give decision-makers the tools to act and to initiate programs that lead to prevention of corrosion. Corrosion will still be costly, as corrosion engineers like Koch realize, however, large amounts of money can be saved with proper planning and application of existing corrosion control technology.

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Fitness for Service Recommended Practice to Impact SPED Members

The new API RP 579, Fitness for Service, may be a new area of demand for SPED members. Fitness for service assessment is multi-disciplinary engineering analysis of equipment to determine if it is safe and fit for continued service until the end of some desired period of operation (for example, until the next shutdown, until some specific future date, or until the end of its useful life). The API Recommended Practice was recently discussed at the January, 2003 meeting of the SPED Board of Directors following a presentation by Bobby Wright and Clint Britt of Stress Engineering.

Mr. Wright indicated a growing demand for professionals capable of applying API 579. “The

SPED Spring ’03 Courses
(As Of: January 27, 2003)

(Subject to Change, Contact SPED for Updates)

Title	Schedule	Location	Cost
Plant Layout	**Feb. 3 – May 28**	**ABB Lummus Global**	**$995(SPED member) $1195(Non member)**
Intergraph PDS I	**Jan. 27-Mar 5 Mon.&Wed, 6-9 p.m.**	**UH-Downtown, One Main St.**	**$700(SPED member) $800(Non member)**
Intergraph PDS II	**Mar 10-April 23 Mon.&Wed., 6-9 p.m. Mar 18-April 24 Tues.&Thurs, 6-9 p.m.**	**UH-Downtown, One Main St.**	**$700(SPED member) $800(Non member)**
Intergraph PDS III	**May Tue.&Thurs., 6-9 p.m.**	**UH-Downtown, One Main St.**	**$995(SPED member) $1195(Non member)**
ASME B31.3 Code	**April Four Days 9 a.m. to 5 p.m.**	**Dow Chemical, 400 West Sam Houston Pkwy.**	**$995(SPED member) $1195(Non member)**

plants would hire them and we would as well," he said. "Right now, we have to train experienced maintenance personnel in the new procedures and calculations." Stress Engineering was one of many firms which worked on API RP 579.

Fitness for service assessment may be required, because the equipment may:

Contain Flaws Such as Locally Thin Areas (LTAs) or Cracks
Not Meet Current Design Standards
Operate Under More Severe Conditions than Originally Expected

Fitness for service assessment employs analytical methods, mainly stress analysis, to evaluate flaws such as locally thin areas and cracks as well as damage such as dents, bulges, and distortions. The main products of fitness for service assessment are (1) decisions to run, alter, repair, monitor, or replace equipment and (2) guidance on equipment inspection intervals.

Traditionally, the American Society of Mechanical Engineers and other groups have set precise standards on certifying piping and equipment mechanical integrity but API developed 579 as a more practical approach. Mr. Wright said that ASME is currently reviewing the new RP to further strengthen its technical basis and align its own work with the new approach.

The SPED Board is researching several emerging standards and recommended practices that are expected to impact SPED members working in both the engineering/construction and operations/maintenance phases of the plant life-cycle. These include standards for risk-based inspection, positive material identification, fitness for service and other plant site issues.

For more information, consult: Clint Britt, 13800 Westfair East Dr., Houston, TX 77041, 281-955-2900, Fax 281-955-2638, http://www.stress.com/.

About SPED

The Society of Piping Engineers and Designers (SPED) is only professional organization devoted exclusively to the betterment of Plant Design Professionals. It advances the profession through publications, training and other professional development activities.

This publication is mailed free of charge to all SPED members. Annual individual membership dues are $35 for professionals, and $20 for full time students. Corporate memberships for companies with fewer than 75 employees are $300 per year (includes 3 individual memberships). Corporate memberships for companies with 75 or more employees are $500 per year (includes eight individual memberships).

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