Sea Cells and Ocean Currents

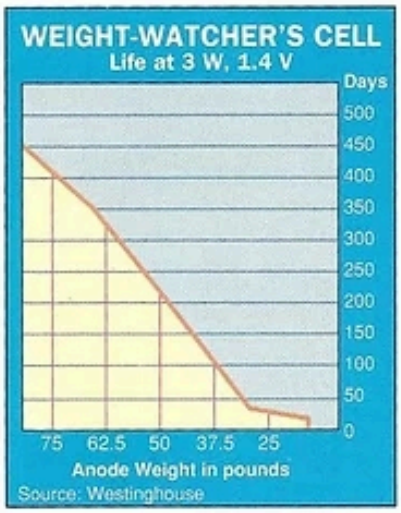
One of the chemical processing triumphs of the 1930s was the extraction of metallic magnesium from seawater. First commercialized by Dow Chemical Co., Midland, at a plant near Wilmington, NC, on the unforgettably named Cape Fear River, the process in the early 1940s was a vital part ofthe wartime effort at Dow's giant Texas Division complex in Freeport. Now, in a neat twist, Pittsburgh-based Westinghouse Corp.'s Advanced Battery Group is returning magnesium to the seas in a breakthrough electric cell that uses seawater, magnesium and a proprietary membrane system.

While the magnesium anode (generally alloyed with 5 percent aluminum) is the driving force behind the new cell, it is the membrane that makes it all work. The membrane serves several roles beyond separating the metal from its surrounding seawater, notes John Jackovitz at Westinghouse's Science & Technology Center. It allows the tiny amounts of oxygen dissolved in the seawater (about 6 ppm) to pass through to the magnesium, and catalyzes the oxidation of the metal to produce current. Result: about 1.4 volts of electricity and an inoffensive waste product, magnesium hydroxide, that harmlessly washes out of the cell into the sea.

A 70-pound cell-about 80 percent metal, 10 percent membrane, 10 percent supplementary parts-will last well over a year, giving off a steady 3 watts of power at roughly 1.4 volts. It works in waters ranging from slightly below O°C to tropical ocean temperatures and is unaffected by deep-ocean pressures.

The membrane is a rubbery, carbon-and-Teflon film hot-pressed onto a metal frame; its shape can be varied to envelope whatever shape the magnesium anode is molded. As the magnesium is used up, the membrane collapses around the shrinking anode.

Fabricated now mainly for military uses, the novel cells can power remote sea buoys and emergency signals, or underwater sensors and navigation aids, says Jackovitz. He will not name specific prices nor commercial availability now, but says, "It's less expensive than the cells often used in such applications, such as those employing copper chloride and silver." But it is a low-power cell, he stresses-you are not going to find it driving a submarine.



The cell's modified Teflon membrane is obviously a cousin of the membranes that have revolutionized chlorine/caustic cell design. These include the Nafion membranes, developed by E. I. du Pont de Nemours & Co., Wilmington, and the Polyramix membrane worked out by OxyTech System, Inc., Chardon, OH, which uses a PTFE impregnated with zirconium oxide particles. Their jobs are catalyzing a reaction that is started when a powerful current is imposed on a bath of brine while keeping apart the chlorine and sodium hydroxide that is formed as the brine is decomposed.

ISO 9000: Quality International Style

Whether or not the long-heralded economic consolidation of the European Community is fully completed in 1992, it looks now as if the European-generated international quality standard, ISO 9000, will be the mark by which products and plants will be judged in markets there-and perhaps in much of the world. For US chemical companies, the push is on to bring their plants and products in line with that tough new standard.

Adopted in 1987, ISO 9000 is actually a series of numbered codes setting a uniform, mllllmum standard of operational quality management. Certainly, top quality has been the goal of many companies in the US and abroad for much of the 1980s and 1990s. What ISO 9000 brings is an outsider's certification-not an internal assurance or a customer's stamp of approval.

Bringing in qualified inspectors, and supplying the vast amount of written documentation of a company's quality procedures is forcing many plants and corporations to evaluate and totally revamp their quality management systems. It is also costing them a considerable sum; depending on size and other factors, it ranges from $10,000 upwards. And while qualified US-based inspection teams are to be found, they are not yet commonplace.

In that ISO 9000 has European origins, it is not surprising that many American companies shooting for ISO accreditation have seen their European units lead the way. "We've had an all-out push for quality at our US plants from the mid-1980s," says John McChesney, marketing communications manager for Ethyl Corp. in Baton Rouge, LA, "but it was our Belgian plant that went for the ISO rating first, and got it in September of last year." Ethyl's Houston aluminum alkyls plant got its certification this Spring from a Brussels-based company, and its Sauget, IL, facility is in the process of certification now.

As ICI Americas, Inc., (Wilmington, DE) quality assurance coordinator, J.C. Rubiano, points out, going for the rating can uncover areas for improvement that a "homegrown" quality plan might not have found as soon. "We were driven by marketing to seek registration," he says. "However, once we started the program, we found it was making us work smarter by forcing us to actually write down on paper what our quality systems were."

ICI found the process of documenting its procedures went a long way toward clarifying some nebulous areas. Rubiano sums up: "Participating in the audits has allowed us to improve our productivity at really almost no cost."

The ISO standard was originally published in 1987 as an upgrading of the British Standards Institutes' (BSI) BS 5750 quality standard, which had been codified back in 1979 based on British Ministry of Defense standards. Europe got a jump on the rest of the world, but according to BSI quality specialist, Rod Cure, "Adoption of the standard should spread even more quickly in the US as a