SUSTAINABLE DESIGN

ROBERT WILDER

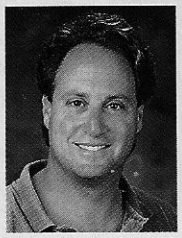
Develop Eco-Industrial Parks

More narrow-minded than holistic, the construction industry generally disregards the sum environmental havoc caused by development. Environmental engineers design complex treatments for wastes and remediation of toxics. But almost no one involved in planning industrial construction thinks about linking processes so that nothing "unwanted" gets spewed or thrown out in the first place.

Consider the ecologically careless operation of an oil refinery that must get rid of its excess gas, steam and cooling water; a pharmaceutical plant that dumps sludge; a powerplant that generates wastes; and a wallboard manufacturing plant that imports gypsum from ravaged mines. Now imagine these four operations linked as a mimicry of an ecosystem where waste of one organism serves as nourishment for another. Such a symbiosis exists at a well known "eco-industrial park," 100 kilometers west of Copenhagen.

REUSE There, Denmark's largest powerplant and largest refinery, as well as a wallboard manufacturer, pharmaceutical plant and the municipality of Kalundborg help reuse each other's wastes. The pharmaceutical plant trucks its biological sludge to local farms for use as fertilizer. Waste heat from the powerplant is reused by homes, greenhouses and fish farms. The powerplant sells its fly ash to cement producers and recovers and treats stack flue gas to produce gypsum for sale to the wallboard plant. The refinery supplies its cooling water effluent to the powerplant for use as raw boiler feed water. And the refinery supplies its treated effluent to the powerplant for cleaning purposes and fly ash stabilization. The refinery also sells sulphur effluent for the manufacturing of sulphuric acid.

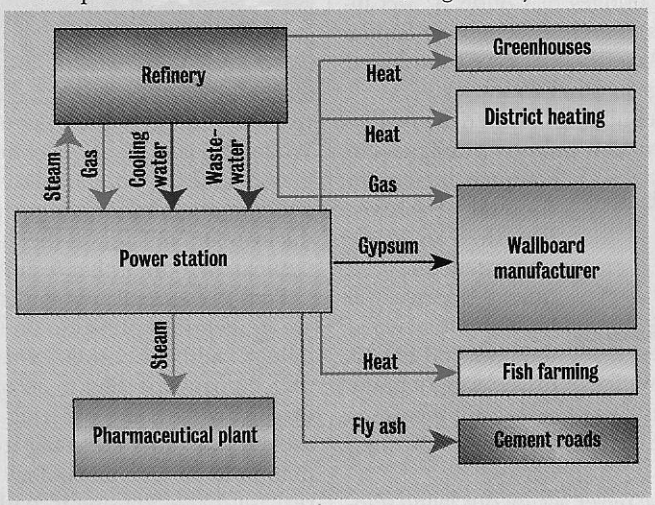
Neither expected nor mandated, the metamorphosis of Kalundborg into such a clean industrial city began in the 1970s because it made good economic sense for the participants. But Kalundborg remains an anomaly. Only a few eco-industrial parks have been built worldwide, according to Dalhousie University's School for Resource and Environmental Studies in Halifax, Nova Scotia, as discussed online at *www.mgmt.dal.ca/sres/research/inpark.htm.*



The prevalent linear mode of industrial production can be seen as akin to primitive life on earth, when there was very little recycling of material. Toxic wastes accumulated to a point where they presented problems for life. Fortunately, microorganisms evolved to become consumers of others' wastes. The aerobic metabolism needed to exploit what had been poisonous oxygen evolved from primitive anaerobic life and the web of living systems grew more integrated and resilient.

Robert A. Frosch, now a senior research fellow at Harvard University, helped introduce the public to ideas of industrial ecology and "design for the environment" in 1989. Since then, firms such as Indigo Development in Oakland, Calif., and the Research Triangle Institute in Research Triangle Park, N.C., have helped bring these ideas to agencies such as the U.S. Environmental Protection Agency. Now the concept of eco-industrial parks is being promoted by the U.S. Dept. of Energy's Center for Excellence for Sustainable Development at *www.sustainable.doe.gov/business/ecoparks.htm.*

But, regrettably, there are few instances of these concepts permeating the nation's engineering schools. Why? Perhaps because notions of industrial ecology cross traditional disciplinary boundaries and place planning and construction in a whole new light where networking "waste streams" (seen as misplaced resources, really) becomes a crucial new goal. But a few technical programs do cover industrial ecology in the curricula, such as at Cornell University, discussed at *www.cfe.cornell.edu/wei/eid.html.*



INDUSTRIAL SYMBIOSIS Denmark's example minimizes wastes.

MODELS Emerging attempts to create new eco-industrial parks in the U.S. include the Port of Cape Charles Sustainable Technologies Industrial Park in Virginia, the Brownsville Eco-Industrial Park in Texas and the Cabazon Resource Recovery Park in Indio, Calif. Case studies on eco-industrial parks appear at *www.smartgrowth.org/resources/ecoind_res.html.* But all of these examples face institutional barriers and a reluctance to pay somewhat higher costs upfront in exchange for longer-term economic benefits. And yet a few places are becoming models of the efficient ecosystems approach. Germany, for instance, is beginning to require that companies check production processes to detect waste byproducts for which there may be uses by others.

Looking ahead, design and construction of integrative systems would require that we neither assume that pollution must happen nor depend on the assimilative capacities of the sea, air and land. Doing so would represent a quantum leap from the present, where the ability of the sea and air to absorb innumerable land-based sources of harm has been too long assumed.

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