JCH INDUSTRIAL ECOLOGY LTD

Industrial ecology

The concept underpinning industrial ecology is to think of energy and materials flows in industrial systems in a way that is analogous to ecosystems.

The basic principle is that in properly functioning ecosystems there are no wastes, with by-products from one metabolic process providing feedstocks for other coupled metabolic processes. This is a long way from how industrial processes work now!

The industrial ecology vision is one of industrial 'ecoparks' with a group of industrial processes operating in some form of industrial symbiosis with zero pollution, because the waste from one factory is the feedstock for another.

In this model, each industrial unit is viewed as an organism operating within a nutrient web. Industrial nutrients are assimilated by a factory which produces material goods, which may then be used by another manufacturing facility to produce a more complex product. This is in some ways mimicking a grazing food chain in an ecosystem. However, industrial processes also yield waste products and what is often missing from current industrial practice is a detrital food chain, where factories 'feed' on waste products. There is no closure of the materials flow loops with our present system.

There can however be difficulties associated with the operation of such facilities. One is that if there is a closely linked network of industrial operations and one link in the web disappears (because for example, there is no longer a market for its products) then the whole web may fail. It is well-known in systems theory that the most efficient system is also the most vulnerable. Similarly, if the factories are synergistically integrated then this may cause difficulties if one of the operations innovates and no longer has a requirement for one of the products (for example if a solvent-based process is replaced by a water-based one). Such a linking of industrial enterprises may even serve to reduce the rate of innovation or efficiency improvements because of the problems that it might cause for the whole web of linked enterprises in the eco-industrial park.

The idea of industrial ecosystems is a compelling one and there are good reasons for seeking analogies between nature and industrial systems. At first sight there is a close correspondence between the natural and human systems. Both are systems that produce organized structures far from thermodynamic equilibrium. However, the industrial metabolism that we humans have created is a strange beast indeed. It feeds upon fossil carbon that has been dead and buried for millions of years and it metabolises materials that have no place in the functioning of biochemical processes. When this industrial life form relieves itself, it expels matter as chemicals that are often not recognized, or are sometimes positively dangerous to the natural life forms that inhabit the planet. The engine that drives this industrial ecosystem is not photosynthesis but money. How closely is it really possible to mimic the behaviour of ecosystems?

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