

Modeling Industrial Symbiosis Using Design Structure Matrices

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Abstract: Today, industry is under constant pressure to increase competitiveness and resource-efficiency. One possibility to cope with these challenges is industrial symbiosis. Industrial symbiosis is based on substituting a new resource by an undervalued resource such as waste. Thereby, industrial symbiosis reduces waste and saves resources. One of the practical challenges in developing industrial symbioses is the identification of symbiosis opportunities. In particular, the question how “new resource – substitute” combinations can be identified has not yet been addressed in the literature. This paper presents a modeling approach for industrial symbioses in industrial parks, based on design structure matrices (DSM), which intends to support the identification of substitution opportunities. The approach is applied to a sample industrial park. Combined with an optimization algorithm, the symbiosis model is used for identifying not only symbiosis opportunities but also the most attractive combination(s) of symbioses within the industrial park.

Keywords: Industrial ecology, industrial symbiosis, eco-industrial park, systems architecture, DSM