A systematic framework for enterprise-wide optimization: Synthesis and design of processing network under uncertainty

In this paper, a systematic framework for synthesis and design of processing networks under uncertainty is presented. Through the framework, an enterprise-wide optimization problem is formulated and solved under uncertain conditions, to identify the network (composed of raw materials, process technologies and product portfolio) which is feasible and have optimal performances over the entire uncertainty domain. Through the integration of different methods, tools, algorithms and databases, the framework guides the user in dealing with the mathematical complexity of the problems, allowing efficient formulation and solution of large and complex enterprise-wide optimization problems. Tools for the analysis of the uncertainty, of its consequences on the decision-making process and for the identification of strategies to mitigate its impact on network performances are integrated in the framework. A decomposition-based approach is employed to deal with the added complexity of the optimization under uncertainty. A network benchmarking problem is proposed as a benchmark for further development of methods, tools and solution approaches. To highlight the features of the framework, a large industrial case study dealing with soybean processing is formulated and solved.

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