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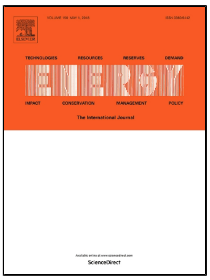

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Fuzzy P-graph for Optimal Synthesis of Cogeneration and Trigeneration Systems

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Cogeneration systems provide an efficient means of producing electricity and heat, while trigeneration systems extend the concept by producing an additional output in the form of cooling. Such systems are more efficient than stand-alone production of separate product streams due to the inherent opportunities for Process Integration. Additional advantages include operational flexibility, which can be achieved by varying the outputs of component process units, or switching them on and off selectively as the need arises. Various Process Systems Engineering tools such as Mathematical Programming and P-graph have been used for the synthesis of such plants, most of which work on deterministic assumptions. In this work, a fuzzy P-graph approach is developed for the optimal synthesis of cogeneration and trigeneration systems. This approach assumes that product demand and fuel availability are specified as fuzzy constraints, or fuzzy ranges, instead of exact values. Two case studies are used to illustrate how the fuzzy P-graph method identifies sets of optimal and near-optimal designs that meet the specified fuzzy constraints.

Keywords: Cogeneration; Trigeneration; Process Network Synthesis; Fuzzy optimization; P-graph