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A decomposition method for the evaluation of component interactions in energy conversion systems for application to advanced exergy-based analyses

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0010 **Abstract**

0011 A new approach for the calculation of the interactions among the components of a thermal
0012 system for application to the concept of advanced exergetic analysis is presented. The
0013 approach can be used to determine the thermodynamic interactions of system components,
0014 and to evaluate alternative designs. The new approach puts the calculation of endogenous
0015 and exogenous exergy destruction on a proper thermodynamic basis and introduces a
0016 straightforward and time-saving calculation procedure in contrast to various approaches
0017 used in the past. When employed to the analysis of the CGAM-problem, the new approach
0018 complies with qualitative reasoning, resolves shortcomings and shows comparable results
0019 with previous approaches. The top-down hierarchical approach assists in achieving the best
0020 system design possible by identifying the effects of design decisions and by stimulating the
0021 engineer's creativity in terms of design alternatives and optimization options. Furthermore,
0022 the generalization of the approach allows for any level of aggregation, thus, making the
0023 determination of improvement potentials easier. By providing profound thermodynamic
0024 understanding for processes, the advanced exergetic analysis is a promising tool for designing,
0025 analyzing and optimizing processes for higher efficiencies and lower costs.
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0030 *Keywords:* Exergy Analysis, Advanced Exergy Analysis, Process Analysis, Thermodynamic
0031 Interactions in Energy Conversion Systems
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