

# Design Catalogues: An Efficient Search Approach for Improved Flexibility in Engineering Systems Design

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**Abstract.** This paper proposes and demonstrates design catalogues as a computationally efficient method for identifying improved designs for complex technological systems. This new process significantly speeds up the analysis of systems that will operate and will be managed under various uncertainty scenarios. It enables analysts to explore the design space more fully, taking into account a greater number of design parameters and variables. It can lead to design solutions with greatly improved lifecycle performance. The design catalogue consists of a small subset of designs that collectively perform reasonably well over a range of possible scenarios. The catalogue approach contrasts with the usual approach that optimizes designs for each scenario, and thus can only afford to examine a limited number of situations. Each design in the catalogue consists of combinations of design variables, parameters, and flexibility decision rules. The set of designs in the catalogue is determined using adaptive One-Factor-At-a-Time (aOFAT) analysis. An example demonstrates the use and how it leads to improved lifecycle performance compared to a standard benchmark design.