

Multi-Disciplinary Design Optimization of Fluid-Power Components

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Research is being conducted at the Milwaukee School of Engineering in conjunction with the Center for Compact and Efficient Fluid Power to improve compactness, efficiency and effectiveness of fluid-power components by removing dead weight, integrating components, and combining component functionalities.

Weight reduction will minimize material cost, improve system response/efficiency and allow for increased payload. These improvements can be achieved through the application of structural-optimization techniques, such as the commercially-available Altair or Genesis software suites.

Component integration minimizes the number of assembly/system components and minimizes the potential for leaks. Such integration is attainable through solid free-form manufacturing.

Multi-functional structures are those that are designed to simultaneously handle different load types, such as pressure, heat and acoustics. Variable-density lattice structures are being employed to allow for this.

These methods are related to multi-disciplinary design optimization. Some commercial finite-element and multi-physics software are being used; but, MSOE is also developing new software algorithms that can expedite and even automate the design process. Currently these methods are being applied to a commercial axial-piston-pump housing and an un-tethered, powered ankle-foot orthosis.