

Heat Exchanger for NG Heat Pump

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Research Challenge/Need/ Problem Addressed

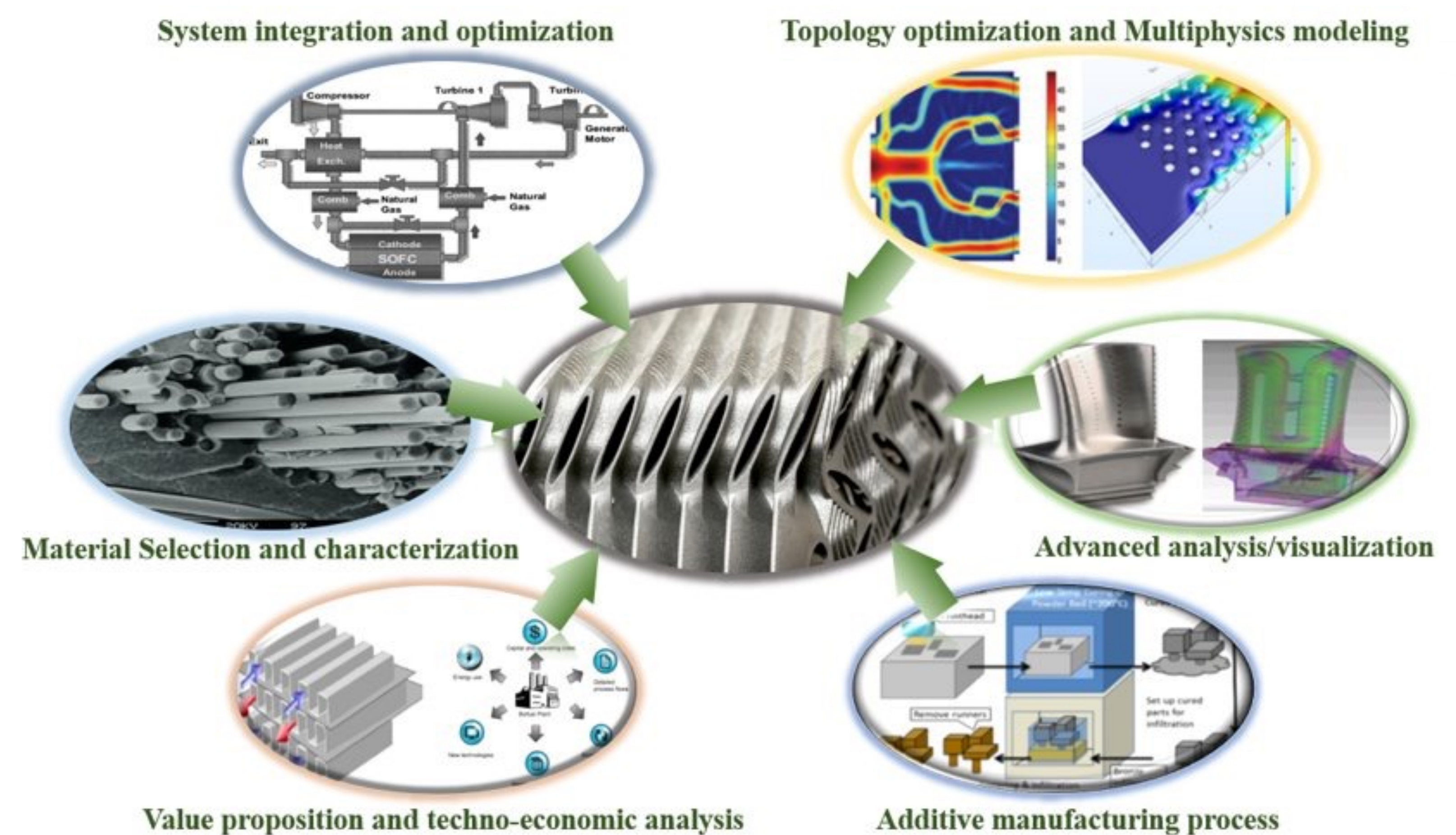
- Heat exchangers (HXs) are essential components of any energy conversion process.
- Overall, HXs account for more than 50% energy consumption, and the overall size of the system heavily depends on the HXs' performance characteristics (small-scale vs. large-scale systems).
- Conventional solutions have limited performance and durability.
- Unavailability of materials and manufacturing processes has imposed major limitations on the technology development.
- Many applications have relied on imperfect solutions with limited operational life.

Current Research

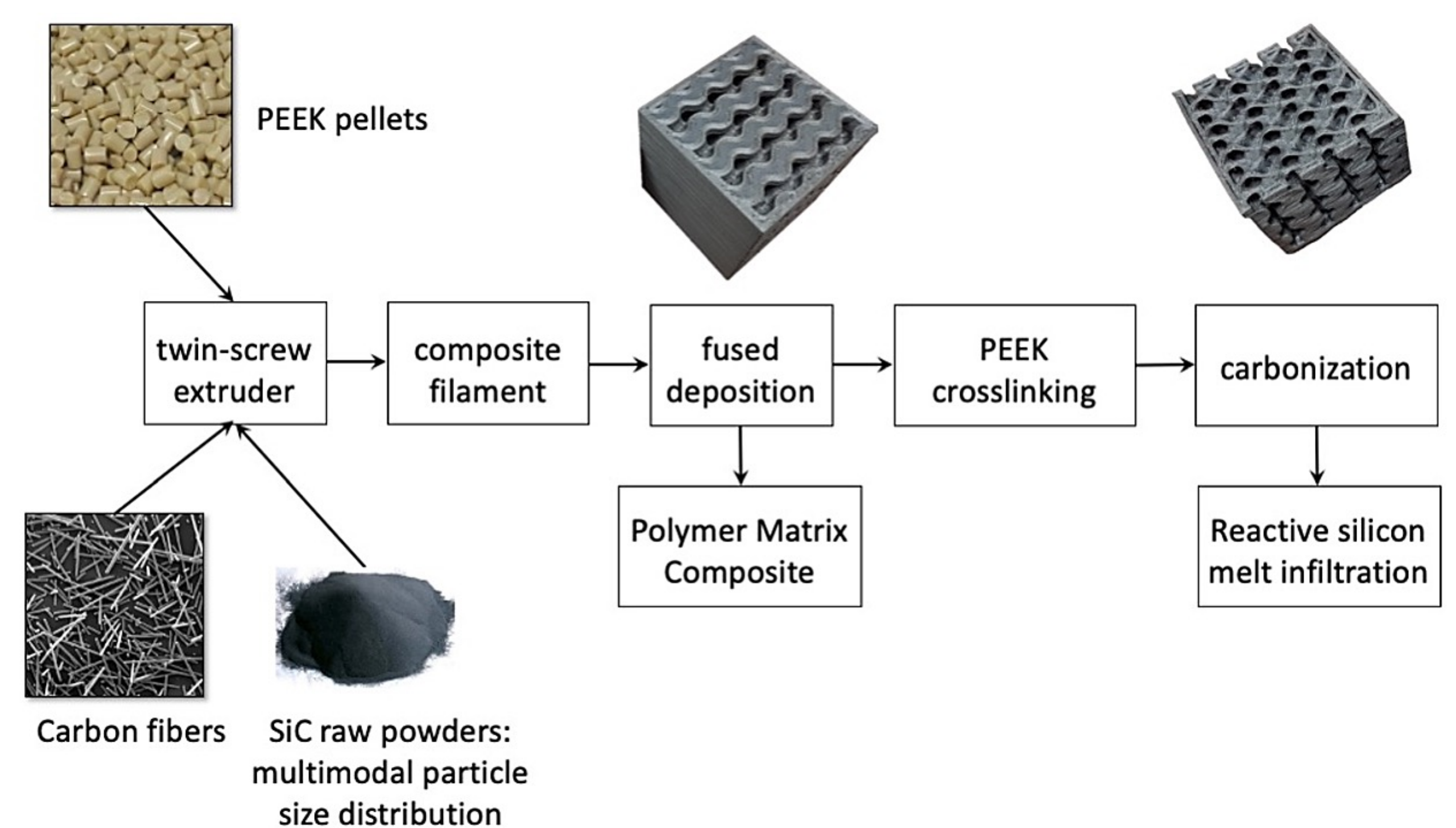
- Performed computer-aided design modeling to obtain optimal design candidates
- Additively manufactured HXs
 - Manufacturing of fiber-reinforced SiC matrix composites
- Basic materials assessment: fractural strength
- Development of an in-house experimental facility
- Conducted data analysis on preliminary test rig experimental data

Planned/Future Research

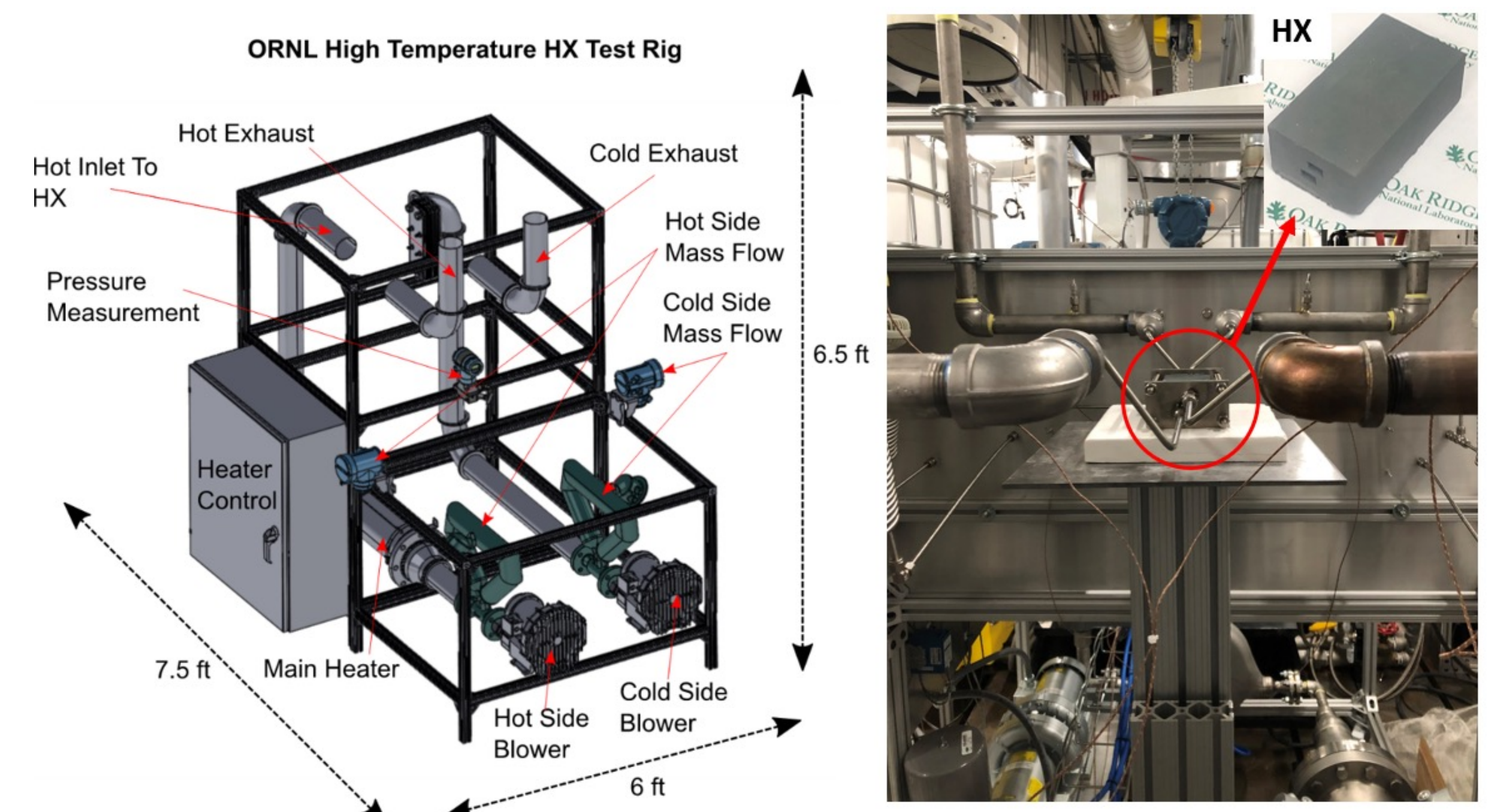
- Further reliability assessment of mechanical properties
- Design evaluation with various gyroid configurations
- Perform test rig experiments to assess thermal performance of HXs
- Durability assessment on gas-turbine testing
- Technoeconomic and life cycle cost analysis



Multifaceted solution approach



Manufacturing of fiber-reinforced SiC matrix composites



Test rig setup for thermal-performance assessment of SiC HXs