Project ID [08739] Development of a High-Efficiency Hybrid Dry Cooler System

Headline. Compact dry cooler meets performance and cost requirements with 59% reduction in footprint

1. Impact

Dry cooling provides an eco-friendly and cost-competitive cooling solution for remote CSP installations. The developed dry cooler provides 7˚C approach with a 59% reduction in footprint at a similar system LCOE to the state of the art.

2. Project Goal

Improve on the state-of-the-art dry cooler design by identifying the key contributing parameters to LCOE. The developed cooler should improve upon heat transfer performance, installation footprint, and/or capital cost. The developed system will then be demonstrated at MW-scale.

3. Method(s)

(1) Dry cooler sensitivity studies to define LCOE contribution, (2) prototype heat exchanger trials to validate fabrication methods and formed fin performance, and (3) MW-scale fabrication and performance testing.

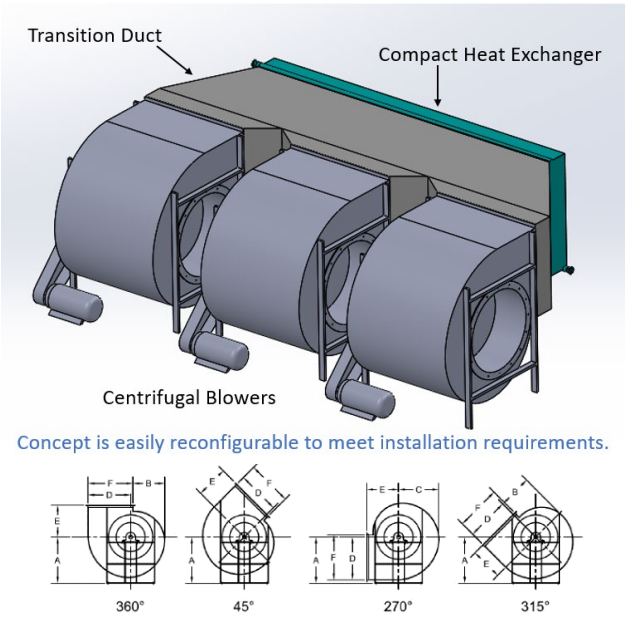

Figure 1. *5MWth commercial-scale configurable module*

4. Outcome(s)

Dry cooler LCOE is most sensitive to heat transfer effectiveness and air-side pressure drop (driving the power consumption). Capital cost shows much less impact. In a compact heat exchanger, the key tradeoff is between air-side power consumption and capital cost.

The compact heat exchanger can be fabricated wholly of Aluminum to minimize cost while maintaining performance targets and pressure/ temperature rating.

5. Conclusion/Risks

Cooler capital cost shows much less impact than expected. Air-side pressure drop shows much higher impact than expected. Minimized LCOE is achieved at a moderate approach temperature and moderate air-side pressure loss.

Prototype fabrication trials retired risks associated with aluminum brazed and welded joints. Chemical etching in aluminum is not as common; defining the etching/machining process for commercial-scale production is a remaining challenge.

6. Team

SwRI, Vacuum Process Engineering

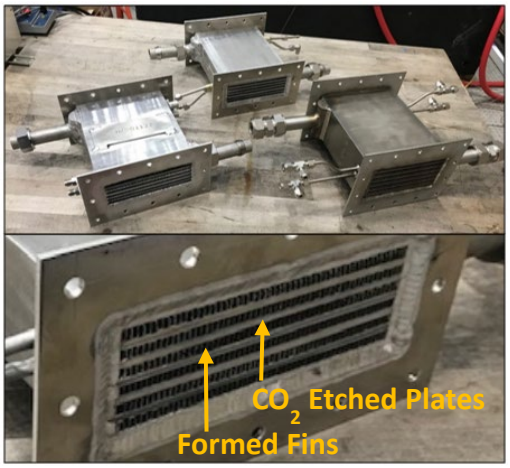

Figure 2. *Prototype heat exchangers for validating aluminum fabrication as well as quantifying fin-side performance*