Day 2: Manufacturability, scalability, and economics of conceptual designs

Breakout session questions

May 23, 2014

Manufacturing techniques and other design considerations

- New techniques may allow integration of technologies.
  - Eg heat pipes integrated in fin structures
- Using polymer saves cost over metal materials and the extrusion process can be more cost effective than production of metal tubes
- Low hanging fruit to integrate dimples on fins which is an easy manufacturing challenge where you can get modest gains.
- 3D fins – (eg open air metal foams) – underexplored area
- Perhaps it is not one technique that get all of the performance gain or cost reduction – more likely to be cumulative effect of several ideas.
- Really need a design tool to allow for exploration/optimization of complex 3D designs. Design tool must also consider lifetime, fouling, and other considerations beyond just HT

Additive Manufacturing

- Current manufacturing – wrapping coils over tubing – is additive manufacturing. Look at opportunities to improve performance of fins, perhaps dimpling or high surface area (“fractal”) surfaces
- In short term, laser sintering is a prototyping tool. Cubic inch per hour won’t accommodate production scale
- Community working on additive surface features while part travels down line. This is 5 years out
- Fundamental limits on deposition rates – multiple weld heads can address this and companies working on this now, probably 10 years out
- Hybrid approaches (traditional + AM) could work, where a majority of the design is extruded and features are added

Convective tower

- Right now, lots of field erection, but you could make a modular design in the shop
- Nuclear plants in Japan have achieved lots of cost savings by going modular with their designs – using large concrete components
- Hyperbolic convective towers tend to have high performance when you don't need it and low performance when you do – so movement is towards mechanical drive (fans)
- Some convective towers now made of fiberglass vs. concrete

Market

- Getting to GW scale will take time to penetrate market
- Early adopter markets that could afford to pay more for performance we're seeking
  - Diesel
  - Geothermal
- Defining size is important. 10 – 100kW scale could be used almost everywhere
- HVAC, chemical process industries, refineries.

Other thoughts

- Worth looking at much smaller, distributed, air cooled plants
  - Siting possibilities open up, so higher allowable costs
  - Can integrate large number of small fans that are cheap and disposable, perhaps even integrate with fins
- Wet cooling with vapor recovery
- Important in metrics to not just consider a spot design point. Instead, suggested to ask for systems that do not increase annualized heat rate
- Emerging manufacturing capabilities should look at air *and* steam side. Improvements on steam side can improve air side
- Absorption cooling – should also consider solar heat rather than just stack heat.
- Installed cost of HX may only represent 15% of total cost. Are there ways to attack costs by non HT systems?