

Absorption Power Cycle

A new power cycle has been developed which excels at converting low temperature heat to power. Currently massive amounts of heat in the range of 220°F to 500°F are wastefully dumped to the environment. Examples include: exhaust from engines, furnaces, and boilers; process heat; geothermal heat; and solar heat. Both steam cycles and organic Rankine cycles have been employed for producing power from low temperature heat, but they are too inefficient and costly.

Ammonia absorption refrigeration cycles have long been recognized as the most efficient and cost-effective means of converting low temperature heat to refrigeration. Now Energy Concepts has adapted that technology to produce power, either in lieu of or in addition to the refrigeration.

The key attributes of this cycle are: (1) higher efficiency due to temperature glide matching; (2) lower cost due to desirable pressure range (low volume components) and a working fluid with superior transport properties; (3) takes full advantage of low ambient temperatures; (4) adapts well to either air or water cooling. The cycle efficiency is at least 20% higher than competing cycles, and the cost varies from \$1000 to \$2000 per kW dependent upon capacity and on temperature. Near-term development is focused on the 1 to 40 MW range of output.

The novel cycle makes use of proven heat and mass transfer processes, and uses commercially available turbines/expanders to produce shaft power. In contrast to other recently publicized power cycles which use the ammonia-water working pair, the absorption power cycle does not have a risky total evaporation step. Thus standard corrosion inhibitors can be used, which allows all carbon steel construction. When applied to gas turbine exhaust, this cycle provides a 30% increase in the gas turbine efficiency.

The absorption power cycle is protected by seven US patents.

References

US Patent 6,269,644 – Ammonia Power Cycle With Two Pumped Absorbers

US Patent 6,715,290 – Fluid Mixture Separation by Low temperature Glide Heat

“Heat Activated Dual-Function Absorption Cycle,” *Transactions of ASHRAE Winter Meeting, January 2004.*

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