**Title:** A Numerical Analysis of a Composition-Adjustable Kalina Cycle Power Plant for Power Generation from Low-Temperature Geothermal Sources

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From the abstract:

The Kalina cycle (KC) is believed to be one of the most promising technologies for power generation from low temperature heat sources such as geothermal energy. Sofar, most KC power plants are designed with working fluid mixture[s] having fixed composition, and thus normally operate at a fixed condensing temperature. However, the ambient temperature (i.e., heat sink) varies over a large range as the season changes over a year, particularly in continental [sic] climates. Recently, a new concept, composition-adjustable Kalina cycle, was proposed to develop power plants that can match their condensing temperature with changing ambient conditions, aiming at improving the cycle’s overall thermal efficiency.

This paper contains what is advertised as one of the first numerical analyses of the varying composition KC.

The Kalina cycle was proposed in 1984. It is a power cycle that uses a binary mixture as a working fluid to generate power from a heat source with a relatively low temperature. This cycle is a further development of the Rankine cycle (RC).

KC can achieve very high efficiencies (up to 32.8% in one case) by closely matching the temperatures of heat transfer fluids in the evaporator and condenser.

Hettiarachchi et al. studied the performance of the KCS-11 KC system for utilizing low-temperature geothermal heat sources and foundan optimum ammonia concentration exists for a given turbine inlet pressure. Aiming at low-temperature heat sources, Kalina et al. proposed a power cycle which was later named KCS-34, based on which a low-temperature geothermal power plant was built in Husavik Iceland in 2000. Later Arslan studied the performance of a KCS-34 Kalina cycle system using artificial neural network and life cycle cost analysis, and found that the most profitable condition was obtained when the ammonia mass fraction was in the range between 80% and 90%.

In practice, the expansion ratio of the turbine for KCS-34 cycle is relatively high and a mult-stage turbine is required. A great deal of control is required to efficiently run a KC. This includes real-time working fluid composition sensing using density sensors and other techniques to actively monitor and adjust the ammonia mass-fraction.