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Economic comparative study of Kalina cycle, sub- and trans-critical Organic Rankine Cycle (ORC) for low-temperature geothermal

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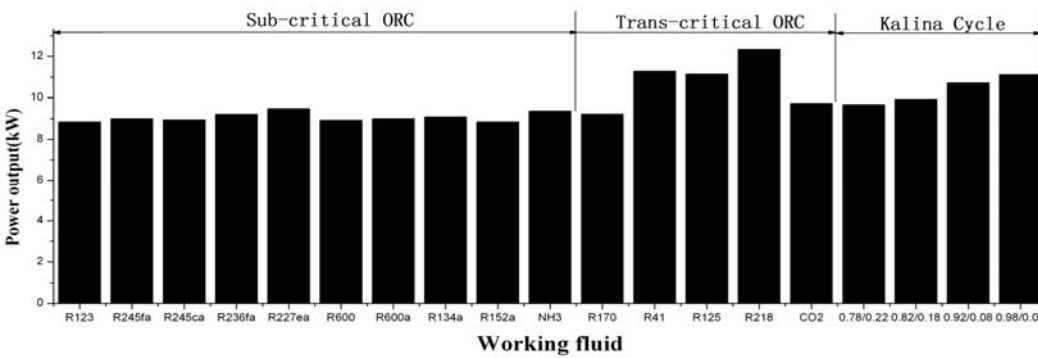
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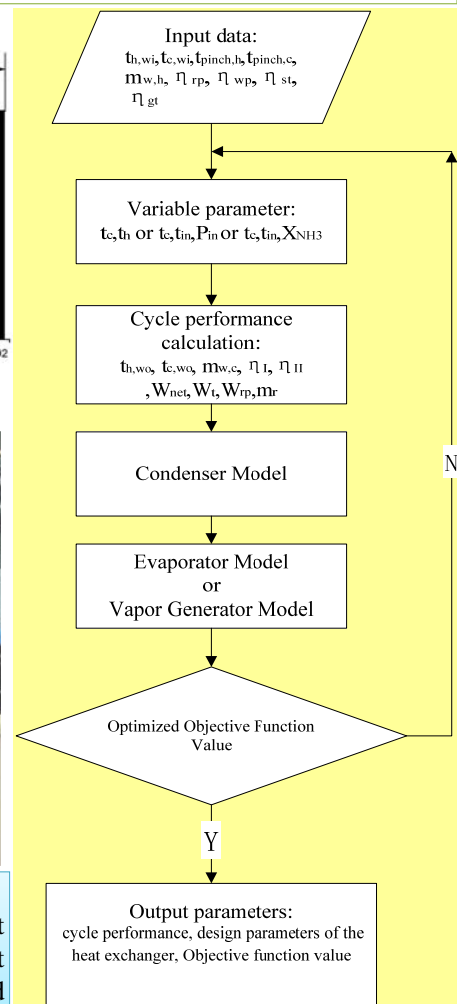
ABSTRACT

Kalina cycle, sub- and trans-critical ORC are three promising cycles to use low-temperature geothermal sources. The objective of this study is to find favorable cycle and fluids as well as the corresponding optimum operation conditions for 80-100° C geothermal power system. The fluids with maximum power output will be favored in this study.

The simulation is performed by assuming that the inlet temperature of the heat source and sink is 90°C and 20°C, respectively. And the pinch temperature difference is 5°C and flow rate of the heat source is 1kg/s. Saturated vapor was assumed at the turbine inlet in subcritical ORC system.



The power output of different working fluids under the optimized operation parameters



Fluid Name	T_{evap}	P_{cond}	$P_{net}/m_{w,h}$	$(P_{net}/m_{w,h})_{re}$	P_{net}	P_{rec}
	°C	Mpa	kJ/kg	kJ/kg	kW	kW
M2	66.1	0.47	1.60	2.279	0.414	0.589
	64.2	0.46	1.65	2.132	0.325	0.421
	61.2	0.46	1.59	1.752	0.212	0.234
M1	70.5	0.40	1.54	2.302	0.562	0.841
	67.9	0.39	1.68	2.564	0.510	0.776
	65.8	0.40	1.83	2.527	0.431	0.597
R245fa	63.5	0.39	1.78	1.977	0.289	0.321
	70.9	0.31	1.92	1.920	0.533	0.533

Experimental Conditions:
The inlet temperature of the heat source is 90°C and the inlet and outlet temperature of heat sink are 35°C and 45°C, respectively.

