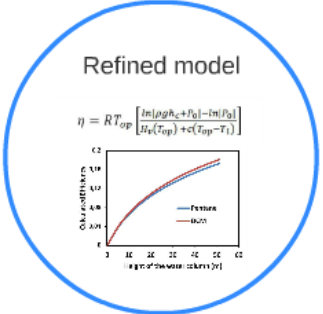
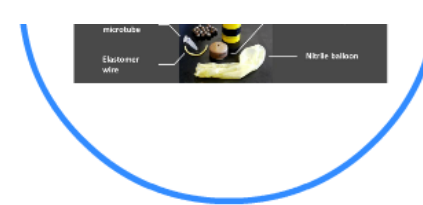
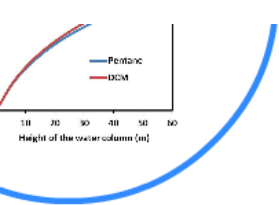


MODEL, SIMULATION AND EXPERIMENTS FOR A BUOYANCY ORGANIC RANKINE CYCLE

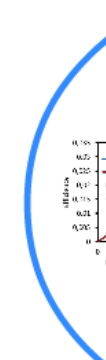
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Guilherme C M da Silva
Julio C Teixeira



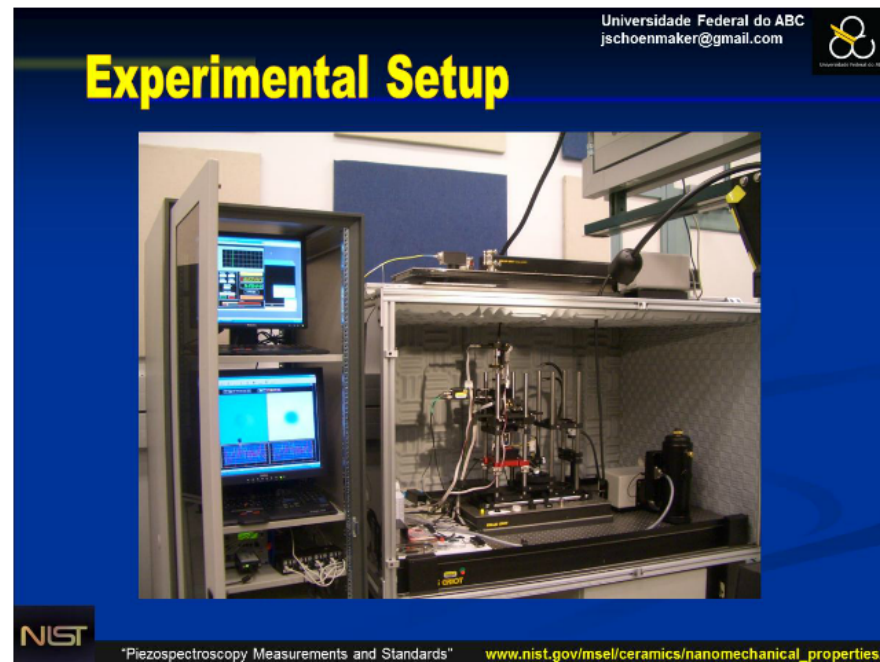


MODEL, SIMULATION AND EXPERIMENTS FOR A BUOYANCY ORGANIC RANKINE CYCLE

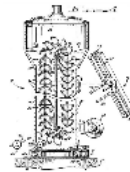
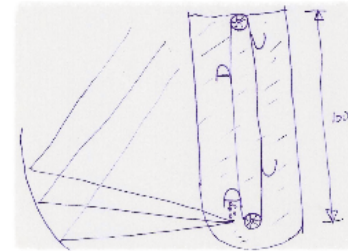
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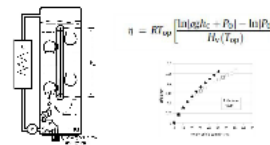
A Materials Scientist by formation



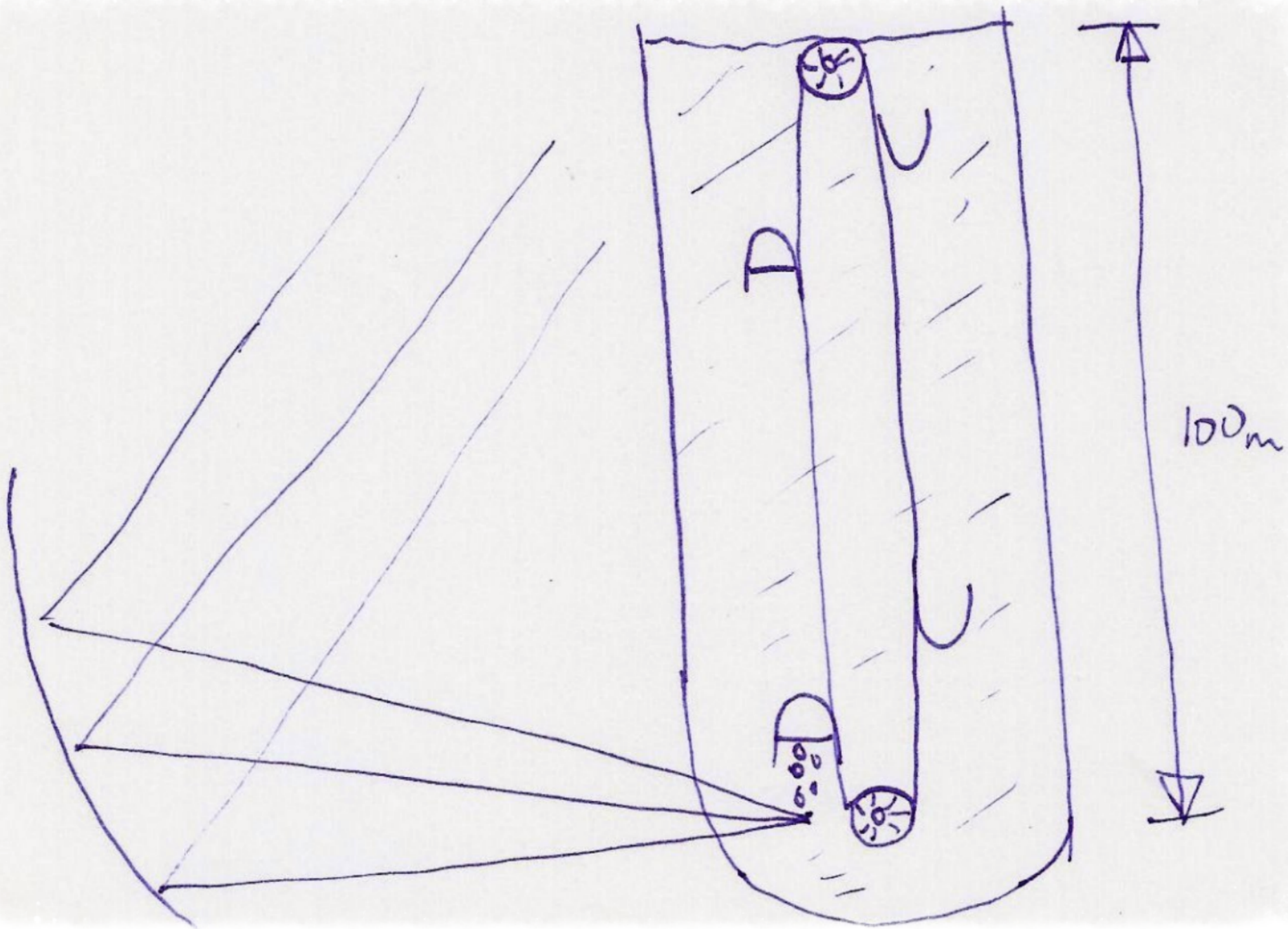
The idea

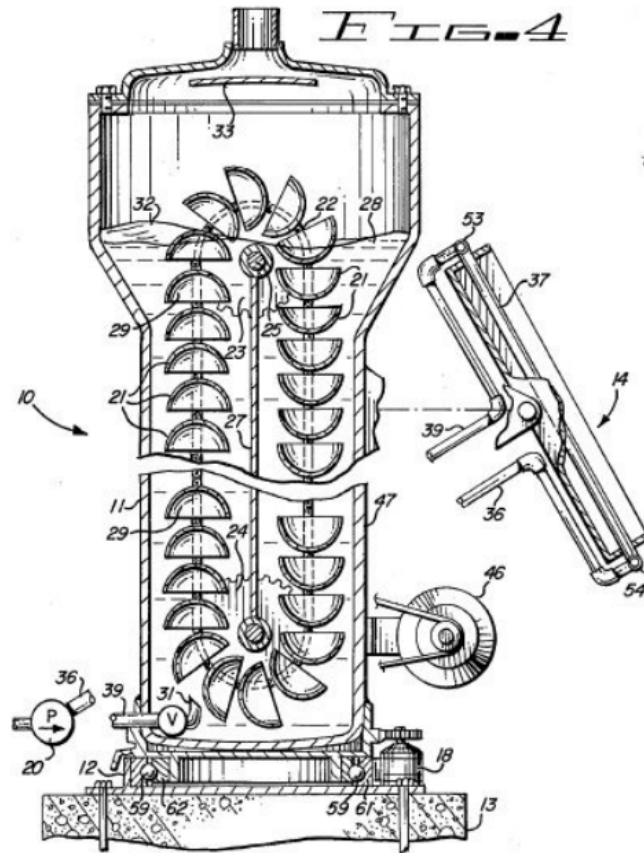


Patente John B Shaw
4 028 893 (1977)









Patente John B Shaw
4 028 893 (1977)



Buoyancy organic Rankine cycle

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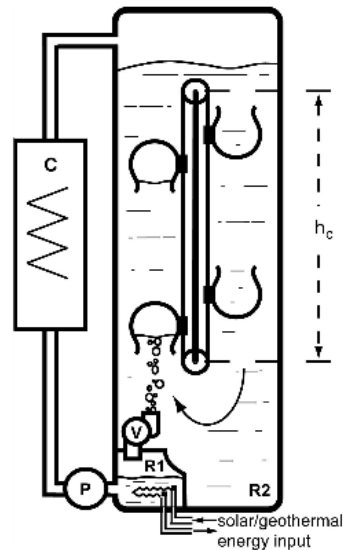
Keywords:

Renewable energy
Organic Rankine cycle
Buoyancy force
Combined cycle

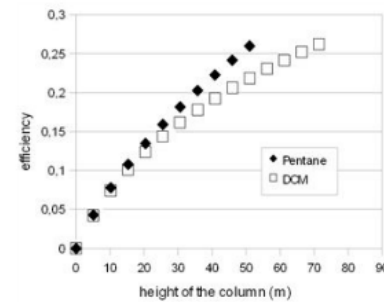
ABSTRACT

In the scope of renewable energy, we draw attention to a little known technique to harness solar and geothermal energy. The design here proposed and analyzed is a conceptual hybrid of several patents. By means of a modified organic Rankine cycle, energy is obtained utilizing buoyancy force of a working fluid. Based on thermodynamic properties we propose and compare the performance of Pentane and Dichloromethane as working fluids. Theoretical efficiencies up to 0.26 are estimated for a 51 m (Pentane) and 71.5 m (Dichloromethane) high column of water in a regime below 100 °C operation temperature. These findings are especially relevant in the scope of distributed energy systems, combined cycle plants, and low-temperature Rankine cycles.

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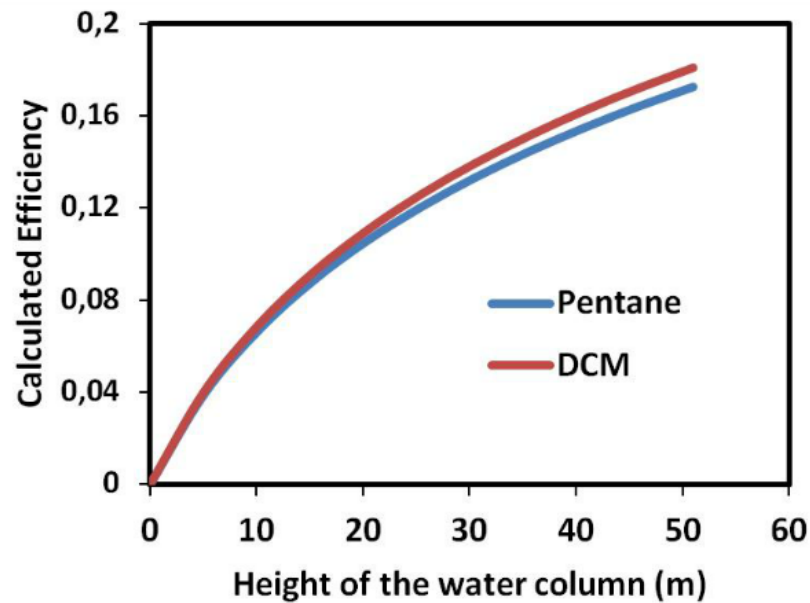


$$\eta = RT_{op} \left[\frac{\ln|\rho gh_c + P_0| - \ln|P_0|}{H_v(T_{op})} \right]$$

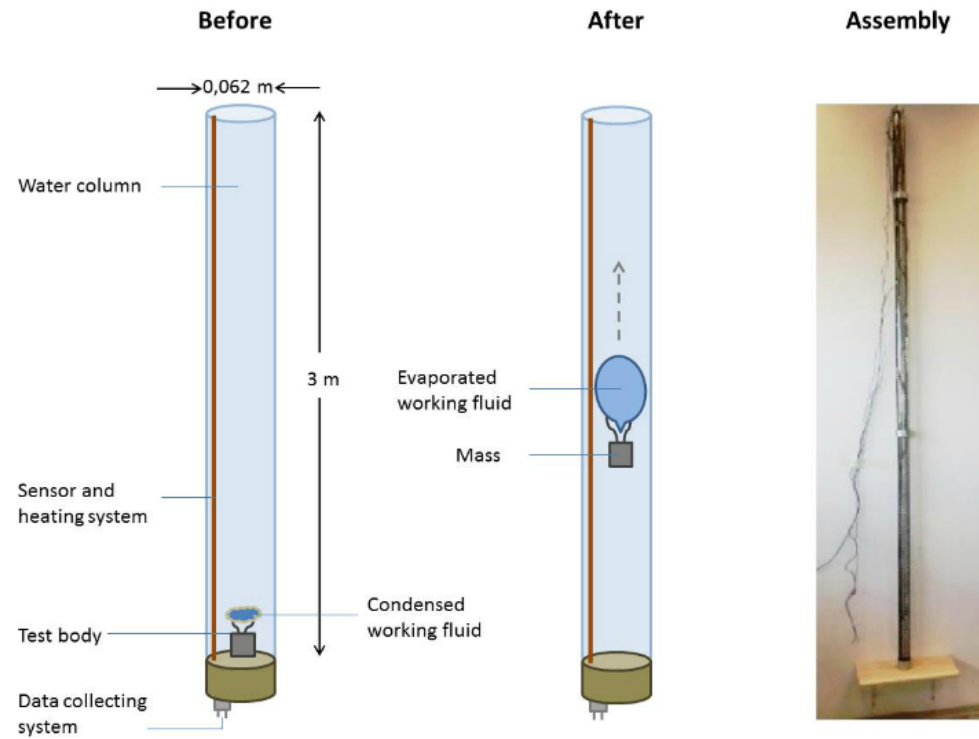


Refined model

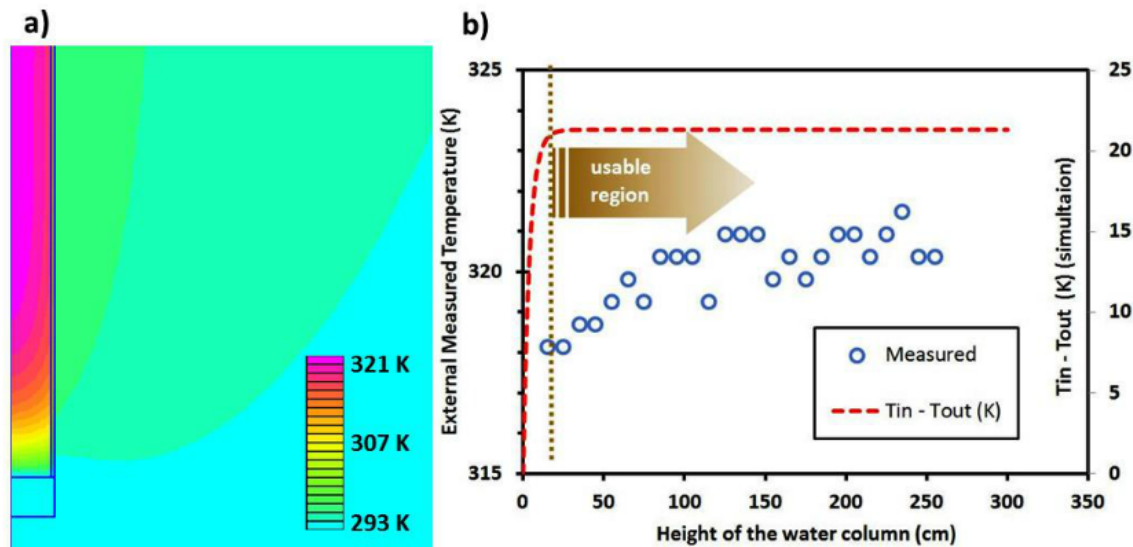
$$\eta = RT_{op} \left[\frac{\ln|\rho gh_c + P_0| - \ln|P_0|}{H_v(T_{op}) + c(T_{op} - T_l)} \right]$$



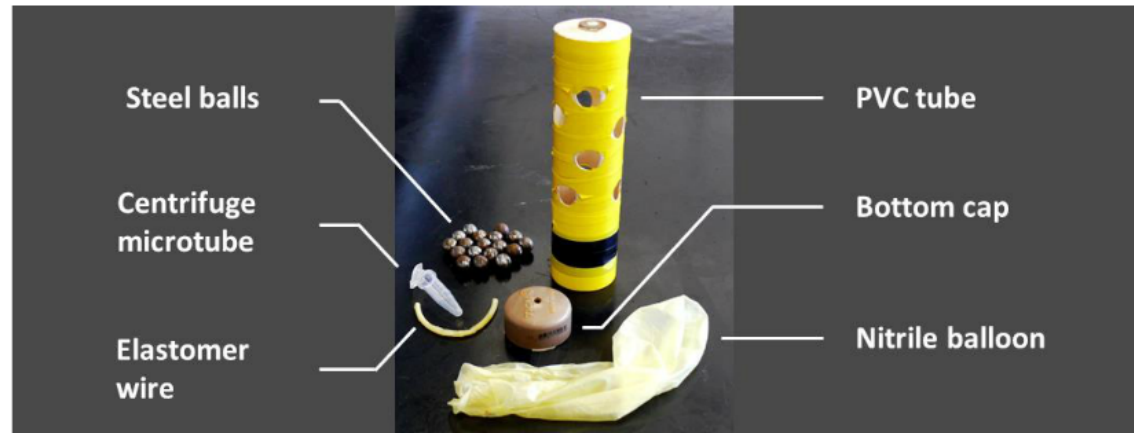
Testing the concept



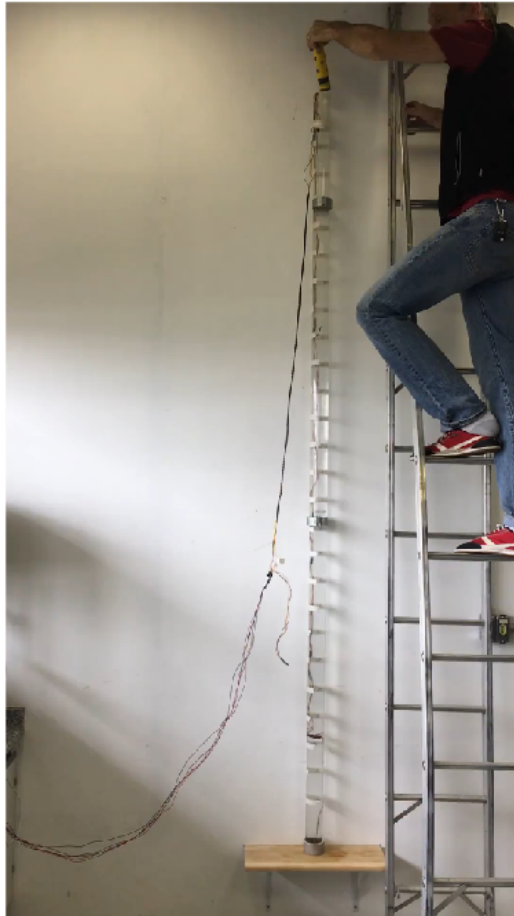
Simulating and knowing our system



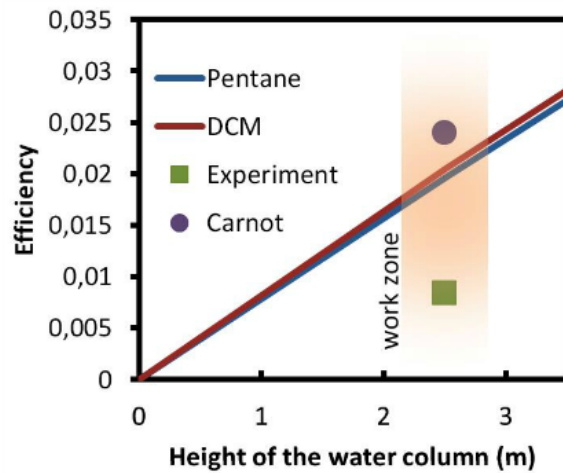
The test body



The tests



Conclusions



- A refined model is put forward
- Tests demonstrated 0,84% efficiency for Top = 43,8°C, corresponding to 35% of a Carnot cycle working in the same temperature difference.