

# Analysis of Thermodynamic Optimization for Nickel Catalyzed Reactor in Low Energy Nuclear Reactions (LENRs)

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A company, Defkalion Green Technologies S. A. was established in Greece to manufacture and market products based on the energy catalyzer (E-Cat), which was invented by Andrea Rossi [1]. S. Focardi and F. Piantelli made use of hydrogen gas in combination with nickel rods [2]. By scientific papers as well as online scientific exchanges, the science elements of Rossi's invention had been fully documented and extensively discussed online. The simplified configuration is shown in Fig. 1, which describes the configuration of a reactor.

The power generation purpose following heat productions is to connect with the electricity generator to the reactor in Fig. 1. The mass flow rate can regulate the power productions. The equations are written as,

$$\Delta\dot{Q} = \rho v A c_p \Delta T \quad (1)$$

$$\frac{\Delta\dot{Q}}{\Delta T c_p} = \dot{m} \quad (2)$$

where,  $\dot{Q}$  = heat rate,  $\dot{m} = \rho v A$  = mass flow rate,  $\rho$  = mass density,  $v$  = velocity,  $A$  = area,  $c_p$  = heat capacity at constant pressure,  $T$  = temperature are shown.

Using the software system, the features include dynamic functions, subscripting (arrays), Monte-Carlo sensitivity analysis, optimization, data handling, application interfaces, and more [3]. In this work, the calculation is shown for mass flow rate of 1,000 minutes. Fig. 2 shows the trend of mass flow rates. Results show necessary mass flow rate for constant power productions.

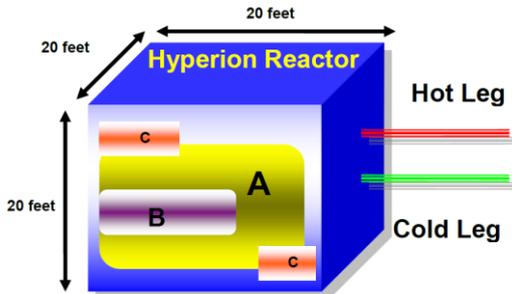


Fig. 1. Configuration for reactor (A: body of E-cat, B: Hydrogen canister, C: Monitor and control equipment).

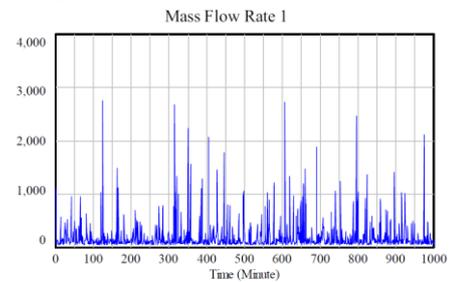


Fig. 2. Mass flow rate (Y-axis: kg/sec) for glycol coolant (Max. = 1,000 min.).

Furthermore, it is needed to construct the standard of the LENR energy commercialization. The constant heat production using control of the mass flow rate is proposed in this paper.

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