Supporting Information

The formulas used for hot water production system equipment are as follows:

a) For the compressor: [1, 2]

$$\dot{E}x_D = \dot{E}x_F - \dot{E}x_P = \sum(\dot{m}.e)_{in} + W - \sum(\dot{m}.e)_{out} \quad (7)$$

$$\varepsilon = \frac{\sum(\dot{m}.e)_{in} - \sum(\dot{m}.e)_{out}}{W} \quad (8)$$

b) For condensers, evaporators, and heat exchangers: [3]

$$\dot{E}x_D = \dot{E}x_F - \dot{E}x_P = \left[\sum(\dot{m}.e)\right]_{in,(Hot)} + \left[\sum(\dot{m}.e)\right]_{1,(Cold)} - \left[\sum(\dot{m}.e)\right]_{out,(Hot)} - \left[\sum(\dot{m}.e)\right]_{2,(Cold)} \quad (9)$$

$$\varepsilon = \frac{[\sum(\dot{m}.e)]_{in,(Hot)} - [\sum(\dot{m}.e)]_{out,(Hot)}}{[\sum(\dot{m}.e)]_{2,(Cold)} - [\sum(\dot{m}.e)]_{1,(Cold)}} \quad (10)$$

c) For solar collectors: [2-6]

$$\dot{E}x_D = \dot{E}x_F - \dot{E}x_P = \sum(\dot{m}.e)_{in} + Q\left(1 - \frac{T}{T_0}\right) - \sum(\dot{m}.e)_{out} \quad (11)$$

$$\varepsilon = \frac{Q(1 - \frac{T}{T_0})}{\sum(\dot{m}.e)_{in} - \sum(\dot{m}.e)_{out}} \quad (12)$$

d) for pump: [2-6]

$$\dot{E}x_D = \dot{E}x_F - \dot{E}x_P = \sum(\dot{m}.e)_{in} + W - \sum(\dot{m}.e)_{out} \quad (13)$$

$$\varepsilon = \frac{\sum(\dot{m}.e)_{in} - \sum(\dot{m}.e)_{out}}{W} \quad (14)$$

e) For pressure relief valve: [2-5]

$$\dot{E}x_D = \dot{E}x_F - \dot{E}x_P = \sum(\dot{m}.e)_{in} - \sum(\dot{m}.e)_{out} \quad (15)$$

$$\varepsilon = \frac{e_{out}^{\Delta T} - e_{in}^{\Delta T}}{e_{out}^{\Delta P} - e_{in}^{\Delta P}} \quad (16)$$

A detailed sensitivity analysis of the parameters used in the study is presented in Figs 12 to 18.

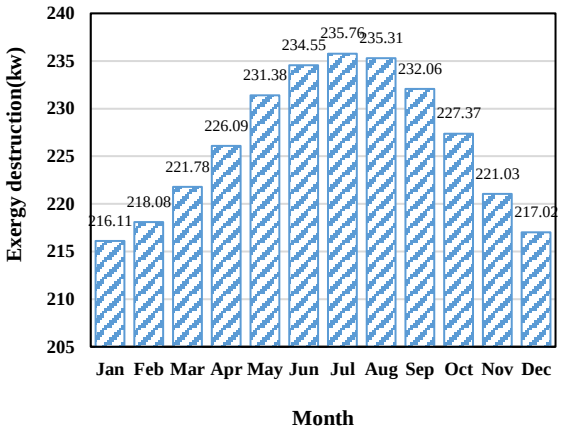

Fig. 12: Exergy destruction (kW) Compressor 1

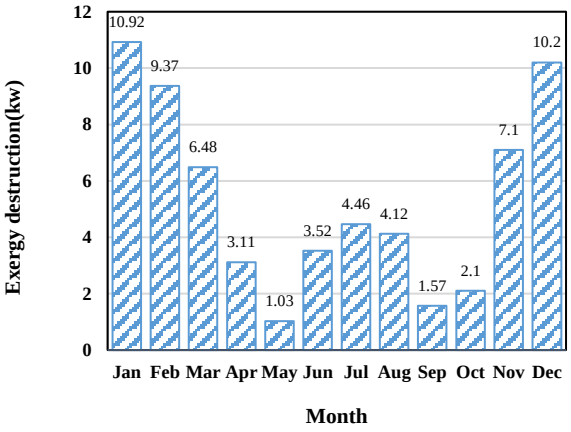

Fig. 13: Exergy destruction (kW) Heat Exchanger 2.

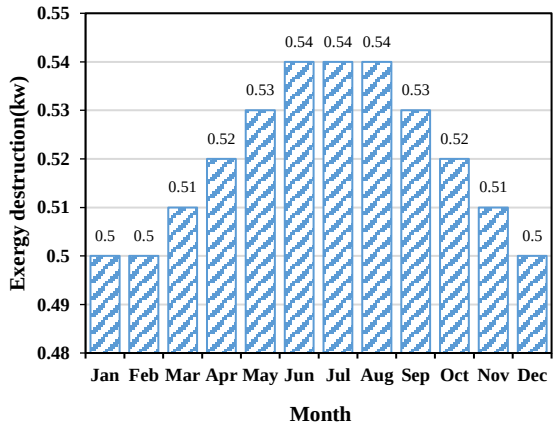

Fig. 14: Exergy destruction (kW) Pump 1

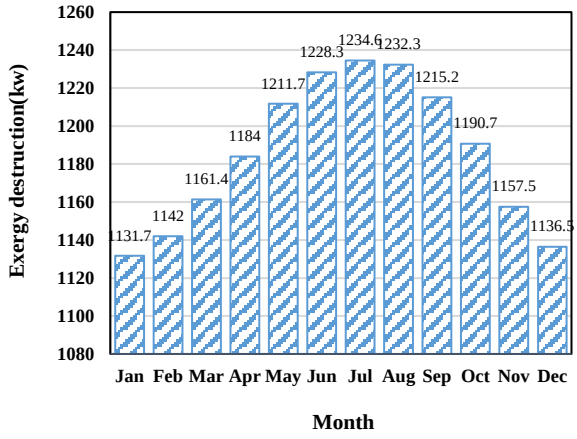

Fig. 15: Exergy destruction (kW) Heat Exchanger 1.

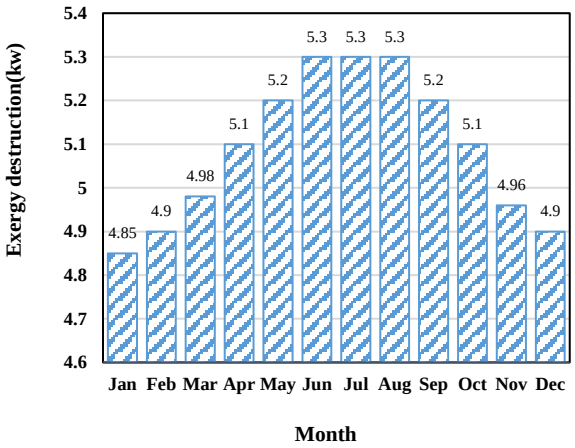

Fig. 17: Exergy destruction (kW) Expansion Valve.

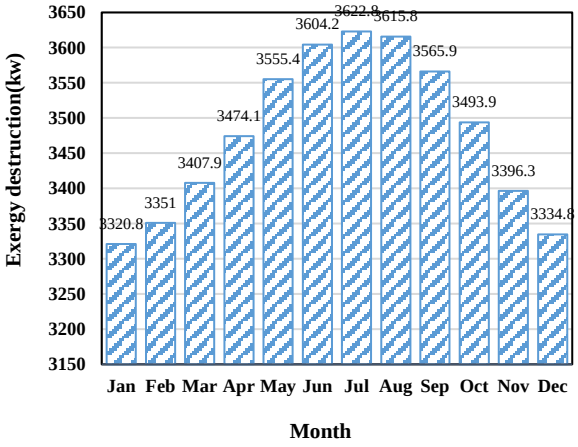

Fig. 16: Exergy destruction (kW) Storage Tank.

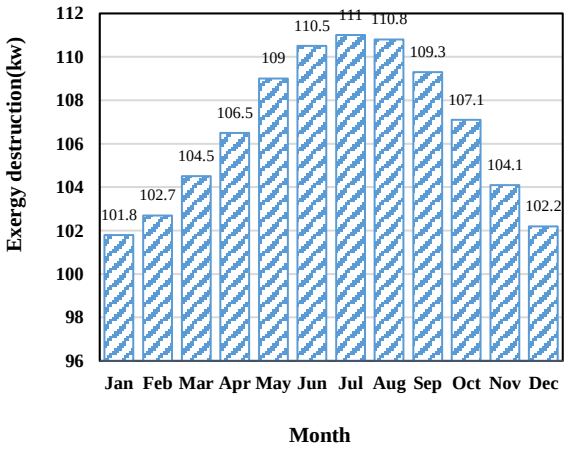

Fig. 18: Exergy destruction (kW) Expander.

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