

Study for the numerical resolution of conservation equations of mass, momentum and energy to be applied to solar thermal collectors

Bachelor's thesis
Budget

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1 Budget

This study has been carried out by a single engineer along a 4 months semester (it has been completed in exactly 19 weeks), working an average of 7 days per week, 4 hours per day. Assuming the average wage of an undergraduate engineer is 15€/hour, the overall human cost can be estimated in Table 1.0.1.

Weeks/Semester	days/week	hours/day	Total hours [h]	Price [€/h]	Cost [€]
19	7	4	532	15	7980

Table 1.0.1: Human cost estimation

The hardware used to perform the project was a laptop with a cost of 780€. Considering a 25% annual amortization and a period of 19 weeks of 52weeks/year, the hardware cost will be computed as $780 \cdot 0.25 \cdot 19/52$, which is equal to 71.25€. Although extra calculations have been done using a desktop computer with a cost of 650€. Considering a 25% annual amortization and a period of 5 weeks of 52weeks/year, the hardware cost will be computed as $650 \cdot 0.25 \cdot 5/52$, which is equal to 15.625€.

$$\text{Hardware cost} = 71.25\text{€} + 15.625\text{€} = 86.875\text{€} \quad (1.0.1)$$

Several software have been used, including Microsoft Office package (80€), Matlab with student license (69€), LyX Latex (free software), Mendeley (free account) and Dev-C++ compiler (free software).

$$\text{Software cost} = 80\text{€} + 69\text{€} = 149\text{€} \quad (1.0.2)$$

Apart from the hardware and software, an electricity cost of 0.15€/kWh has to be included. Taking into account an electrical power of 120W for the personal computer and an electrical power of 500W for the desktop computer, the study has consumed 483.84 kWh. The total electrical cost is shown in Equation 1.0.3.

$$\text{Electrical cost} = 0.15\text{€/kWh} \cdot 483.84\text{kWh} = 72.576\text{€} \quad (1.0.3)$$

A 20% overhead cost has been included.

The total cost is shown in Table 1.0.2.

Type cost	Units	Criteria	Cost (€)
Human resources cost	532 h	15€/h	7980
Hardware cost	19 weeks	780€ in 4 years	71.25
	5 weeks	650€ in 4years	15.63
Software cost	-	-	149
Electrical cost	483.84kWh	0.15€/kWh	72.58
Cost			8288.45
Overhead	-	20%	1657.69
Total Cost			9946.14

Table 1.0.2: Total cost estimation