UNIVERSITAT POLITÈCNICA DE CATALUNYA
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Aeroespacial i Audiovisual de Terrassa

CFD Studies of the Convective Heat Transfer Coefficients and Pressure Drops in Geometries Applied to Water Cooling Channels of the Crotch Absorbers of ALBA Synchrotron Light Source

FINAL PROJECT OF STUDIES

Document:

Budget

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Chapter 1

Budget

This document aims to break down the costs of the final project. Thus, all items that contribute to the budget will be listed and their respective cost will be estimated.

1.1 Personnel

The first factor within the project costs is the personnel involved in the project.

- **Director**. The director of this thesis is Gustavo Raush, an associated professor an researcher specialized in fluid dynamics at the Polytechnic University of Catalonia, which corresponds to a gross wage of 40 €/h.
- **Coordinator**. The coordinator of this thesis is Marcos Quispe, a Ph. D. Thermal Engineer at ALBA Synchrotron Light Source. Since the institution is public, the salaries are published and accessible. From this information, an approximate 35 €/h wage has been considerate.
- **Junior Engineer**. The hourly salary for the junior engineer is taken as 15 €/h, as UPC recommends.

1.2 Equipment and Software

The equipment employed for the development of this thesis are a laptop (MacBook Pro) and a desktop computer (HP). The yearly cost of the two have been computed by dividing their selling cost by their service time, which has been esteemed in 7 years for both. For both computers, an use of 4 months has been considered.

	Selling price	**Service time**	**Monthly cost**
	€	years	€/month
Laptop	1610	7	19.2
Desktop table	1120	7	13.3

TABLE 1.1: Equipment cost break down.

The software used for the development of this thesis are the following:

- **ANSYS Workbench.** This has been the main tool of this project, and up to 5 licenses of this software have been used simultaneously. The price of this software payed by ALBA is specific for research institutions. Since this information could not be found in the internet, the price has been obtained from contacts from ALBA.
- **Siemens NX.** This software has been used only for the third stage, since ANSYS offers a CAD generator. For this reason, only 1 month of use has been computed. On the other hand, the price of the software is also taken as for research institutions. [1]
- **Matlab.** Matlab has been used in the post-processing of the results obtained through Ansys. The license used has been the Student License offered for being an UPC student, which costs only 69€for the entire length of the career. [2]

1.3 Activities

The transportation of these 4 months from Terrassa to Cerdanyola del Valles has been computed as 18 FGC tikets of T-casual for 2 zones. The IPAC22 registration fee is required for the publication of the article that present the final results of this thesis, and has been payed by ALBA.

1.4 Energetic consumption and services

The estimated power consumption is approximately 0.35 kWh/hour for both devices. For the laptop, which has been continuously employed during this thesis, 400 hours have been computed. For the computer from ALBA where the simulations were running, 200 hours of simulation have been considered. According to electricity prices, a kilowatt-hour costs 0.29 euros [3]. With all this approximate data, the energetic consumption has been calculated.

1.5 Budget summary table

Finally, all the aspects mentioned in this report are represented in the following table.

Item	Quantity		Frequency		Unit Cost		Total Cost	
Personnel								
TFG Director	1	person	20	hours	40	€/hour	800	€
Project Coordinator	1	person	70	hours	35	€/hour	2450	€
Intern Engineer	1	person	400	hours	12	€/hour	4800	€
Subtotal							8050	€
Equipment and Software								
Desktop computer	1	computer	4	months	160	€/year	53	€
Laptop	1	laptop	4	months	230	€/year	77	€
ANSYS Workbench	5	licenses	4	months	1000	€/license-year	2085	€
Siemens NX	1	license	1	months	900	€/license-year	300	€
Matlab Student	1	license	4	months	69	€/license-degree	6	€
Subtotal							2521	€
Activities								
Transportation	18	train tickets			22	€/unit	396	€
IPAC22 Registration Fee	1	fee			344	€/fee	344	€
Subtotal							740	€
Energetic consumption								
Computer electric power	0,35	kWh/hour	200	hours	0,29	€/kWh	20,3	€
Laptop electruc power	0,35	kWh/hour	400	hours	0,29	€/kWh	41	€
Subtotal							61,3	€
Total							**11370**	**€**

Table 1.2: Budget summary table of the project.

Bibliography

[1] Siemens. Products. https://www.plm.automation.siemens.com/global/en/products/nx/. Last accessed 18 June 2022.

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[3] Selectra. Precio kwh hoy. ttps://selectra.es/energia/info/que-es/precio-kwh. Last accessed 18 June 2022.