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Mechanical Project 478
Mechatronic Project 478
Mechatronic Project 488

Guidelines for Project Proposals

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Department of Mechanical and Mechatronic Engineering

1. Introduction

This document, which includes an example of a project proposal, serves as a guideline for the preparation of project proposals in Mechanical Project 478, Mechatronic Project 478 or Mechatronic Project 488. Please note that the content of a specific project proposal will depend on the project's topic, and therefore the example serves as a guideline only.

The point of departure for the project proposal is that the proposal should "sell" the project to lecturers and fellow students. Students should consider it to be a situation where they have to compete with their classmates to be awarded a part of a limited source of funds to realise the project. The project proposal has to, in other words, explain the goals of the project, that the project is significant and that the proposal presents a workable plan to realise the project in a meaningful way. Ertas & Jones describes it in as followings (p426):

The purpose of submitting a proposal is to put forth an idea or solution to a need for which the potential customer is known or thought to be interested. Since the purpose is to sell an idea or solution, the proposal must first ***establish that the need exists*** *and then provide information adequate to convince the potential customer that* ***the solution proposed is the right one*** *and that the* ***proposer is capable*** *of accomplishing the effort described within the planned schedule and budget.*

2. Instructions

Appendix A gives an example in the recommended format for project proposals. The usual report format, as described in the "Guide for writing Technical Reports" by AH Basson and TW von Backström, must also be followed for the project proposal. Some particular aspects are explained in the remained of this section.

The format of the executive summary, which is based on a proposal of SASTECH, has to be strictly adhered to. The executive summary may only comprise of one page. A Word template is given, in the section titled "Templates", at:

http://mecheng.sun.ac.za/index.php/en/general

The Introduction section must give the background of the project. As is customary, it should start with the "big picture" and gradually narrow the perspective to the current project, to show how the proposed project relates to the "big picture". Preceding and concurrent related projects should also be mentioned.

The Objectives section should concisely state the project's objectives, taking care not to include ways of reaching the objectives as the objectives. The objectives would typically be formulated as results that a client would be prepared to pay for. The formulation of the objectives should also take into account that, at the end of

the project, the examiners will assess to what extent the student has achieved the objectives.

The Motivation section should focus on why it is worth pursuing the specific objectives of the project, or what value would a client get from investing in the project.

The Planned Activities section should reflect the objectives and scope of the specific project. It should be clear from the description of each activity what value the activity would have or, in other words, how that activity contributes towards achieving the project's objectives. The activities should also be refined sufficiently to assist in compiling a time schedule (in the Gantt chart), which should show which activities can be conducted in parallel and which activities have to be done in a sequence.

A budget must also be compiled for the project as part of the proposal. Record must be kept of the actual costs incurred during the execution of the project, since the actual costs must be given in the final report, as well as a techno-economic evaluation. Guidelines for compiling the budget are:

- The budget can be based on a nominal tariff of R350 per hour for junior engineers (for the student's own work).
- "Running Costs" are costs of services or goods that will be “consumed” and not included elsewhere in the budget, eg travel expenses, copying, printing, lubricants, bought-out items, etc.
- "Facility Use" makes provision for the depreciation and maintenance of equipment that was purchased previously or the infrastructure used, eg laboratory instrumentation, computers, and wind tunnels. Depreciation is usually calculated on the basis of the replacement value of the equipment, the frequency of use, and the expected lifetime. In the project proposal an amount of R50 per hour per R100 000 replacement value can be used.
- "Capital Costs" are expenses undertaken for purchasing equipment specifically for the completion of the project, but where the equipment will still be available for other uses after your project has been completed, eg computers and instrumentation. At Stellenbosch University only items with purchase costs exceeding R2000 are considered to be "assets" and would be included in the capital cost budget.
- "MMW Labour" is the time that the technicians from the Mechanical and Mechatronic Workshop spend on the project and can be budgeted for at R250 per hour.
- "MMW Material" is for the direct running expenses (typically material costs) that MMW will incur for the work on the project.

All expenses incurred outside the university (typically running, capital and material) should include VAT.

Appendix A: Example Project Proposal

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THE TECHNICAL FEASIBILITY OF A MULTIPURPOSE ELECTRICAL VEHICLE PROPULSION SYSTEM

Mr HAR de Werker

10 February 2013

Departement Meganiese en Megatroniese Ingenieurswese
Department of Mechanical and Mechatronic Engineering

THE TECHNICAL FEASIBILITY OF A MULTIPURPOSE ELECTRICAL VEHICLE PROPULSION SYSTEM

MECHATRONIC PROJECT 478
PROJECT PROPOSAL

Mr HAR de Werker
Student no 12345678

Supervisor: Dr K Nowitall

10 February 2013

Executive Summary

Title of Project
The technical feasibility of a multipurpose electrical vehicle propulsion system
Objectives
Identification of the propulsion system configuration that will have the best technical feasibility and determining the technical feasibility of producing the selected propulsion system.
Which aspects of the project are new/unique?
Formulating the design requirements for a multi-purpose propulsion system. Determining the best configuration for a multi-purpose propulsion system.
What are the expected findings?
Whether producing an electrical propulsion system that is suitable for multiple applications, will be feasible or not.
What value do the results have?
To determine whether the expenses involved in a study of the economical viability should be incurred.
What contributions have/will other students made/make?
A previous student investigated the state of currently available battery technology.
Which aspects of the project will carry on after completion?
The economical viability of the chosen configuration will be explored.
What are the expected advantages of continuation?
To be ready to enter the electrical vehicle market at the right moment.
What arrangements have been made to expedite continuation?
The chosen configuration has to be defined in sufficient detail that the production demands and marketing potential can be determined.

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1. Introduction

There is growing interest in electrical vehicles due to increased concern about climate change. Many companies already market electrical vehicles. Future increases in the price of crude oil will lead to marked increases in the price of petrol and diesel. Although electricity cost has increased significantly in recent years, electricity still remains an economically attractive energy source for vehicles. Further, there have been significant advances in battery technology over the last decade, while internal combustion engines still have shorter life spans and higher maintenance costs than electrical motors. These factors can result in electrical vehicles being able to compete on a lifetime cost basis with petrol and diesel vehicles.

The project proposed here is a technical feasibility study of a propulsion system that will be suitable for a range of electrical motor vehicle applications. Economic considerations will play an obvious part in the study, but the primary focus of this study is the technical aspects. This project, which Mr HAR de Worker is doing as part of Mechanical Project 448, stems from a proposal by Dr MY Lecturer and builds upon a project by Formerstudent [1993]. The work forms part of a bigger project aimed at the application of renewable energy and is funded by GreenEnergy Ltd.

This document explains the project's objectives, motivation and planning. The steps that are planned in this study, as well as the expected costs and time scales for the study, are also outlined.

2. Objectives

As mentioned above, this project is aimed at determining the technical feasibility of a multi-purpose electrical vehicle propulsion system. The objectives of the project are therefore:

2.1. Identifying the propulSsion system configuration that will have the best technical feasibility.

2.2. Proof of the technical feasibility of producing the chosen propulsion system.

3. Motivation

Since production volumes in South Africa’s vehicle market are fairly small, the economic viability of an electrical vehicle will be increased significantly by using the same electrical propulsion system (battery, electrical distribution, propulsion and control) for a number of different vehicles. One would expect that the body and interior of an electrical vehicle would not differ much from that of a conventional vehicle. It is therefore not deemed necessary to include that in this study.

The Department of Mechanical and Mechatronic Engineering, in conjunction with the Department of Electrical and Electronic Engineering, has a wide ranging expertise that will be used in this study. These fields of expertise include: the mechanical requirements that a propulsion system should comply with, the development and application of the electrical subsystems, and the development and utilisation of sophisticated electronic control systems.

4. Planned Activities

The following activities are anticipated for the execution of the project. The costs and time scales associated with each activity are given in Table 1 and Figure 1 respectively.

4.1. Literature Study

Study the literature on electrical vehicle propulsion to determine the current level of technology and to identify existing propulsion systems.

4.2. Identify Compatible Applications

Investigate possible/probable applications of electrical propulsion systems. Determine the categories of applications (from the perspective of the demands placed on the propulsion system). Determine which applications will be suitable for a multi-purpose propulsion system.

4.3. Compile Design Requirements

Determine the requirements for the propulsion system to be suitable for the chosen combination of applications. Compile a list of the evaluation criteria to be used to compare the different concepts. The whole life cycle of the propulsion system will be considered, including development and testing, manufacturing, operation, support and disposal.

4.4. Investigate Concepts for the Propulsion System

Formulate a set of concepts for the propulsion system based on these ideas, as well as the information gained from the literature study. Investigate each concept using simple analyses to determine the extent to which it meets the criteria set in Activity 4.3. Compile a shortlist of the most promising concepts on these grounds.

4.5. Simulate the Most Promising Concepts

Investigate the shortlisted concepts in detail. Develop a vehicle dynamic simulation of each concept to determine quantitatively the extent to which it meets the design requirements.

4.6. Preferred Concept Selection

Use the information gained from the previous activity to make a fully motivated choice of the most suitable concept(s). Throughout, the whole life

cycle of the propulsion system will be considered, including development and testing, manufacturing, operation, support and disposal.

4.7. Design Review

Present the findings of the preceding activities to the client and technical advisors to obtain their approval for the selected concept.

4.8. Demonstration Model Detail Design

Design a model propulsion system where the core elements of the simulation are represented. The model will be suitable to verify the main results of the simulation. Plan the test procedure that will be used.

4.9. Demonstration Model Manufacturing

Have the model manufactured by MMW, and supervise the manufacturing.

4.10. Demonstration Model Testing

Instrument and test the demonstration model. Process the test results and compare it with the results from the simulation.

4.11. Final Report

Document the whole investigation, including the preparatory study, the investigative procedures and the results obtained in each activity. Make a recommendation regarding the technical feasibility of a multi-purpose electrical vehicle propulsion system.

5. Conclusions

Electrical vehicles are increasingly gaining attention and the propulsion system is a determining factor in the performance and production cost of such a vehicle. The proposed project will identify the best propulsion system for these vehicles, and will investigate the technical feasibility of producing such a propulsion system. The results from the investigation will be verified by tests on a demonstration model. This will provide the basis for decision regarding further development and funding in electric propulsion systems.

The project team has at its disposal all the expertise required to successfully complete the project. The expected total costs are R232 700, of which R5 000 is for capital expenditure. The expected duration is 8 months.

6. References

Formerstudent, A, 1993, "Investigation into Electrical Vehicle Substructure", Mechanical Project 478 Final Report, Department Mechanical and Mechatronic Engineering, Stellenbosch University.

Table 1: Estimated Cost per Activity

Activity	Engineering Time		Running Costs	Facility Use	Capital Costs	MMW		MMW	TOTAL
						Labour		Material	
	hr	R	R	R	R	hr	R	R	R
Literature study	25	8750	500						9250
Identify Compatible Applications	25	8750							8750
Compile Design Requirements	25	8750							8750
Investigate Concepts for the Propulsion System	70	24500	100	100					24700
Simulate the Most Promising Concepts	100	35000	150	1000					36150
Preferred Concept Selection	10	3500							3500
Design Review	5	1750	500	500					2750
Demonstration Model Detail Design	100	35000	50	200		5	1250		36500
Demonstration Model Manufacturing	20	7000	10000			120	30000	10000	57000
Demonstration Model Testing	50	17500	500	1000	5000	15	3750		27750
Final Report	50	17500	100						17600
TOTAL	480	168000	11900	2800	5000	140	35000	10000	232700

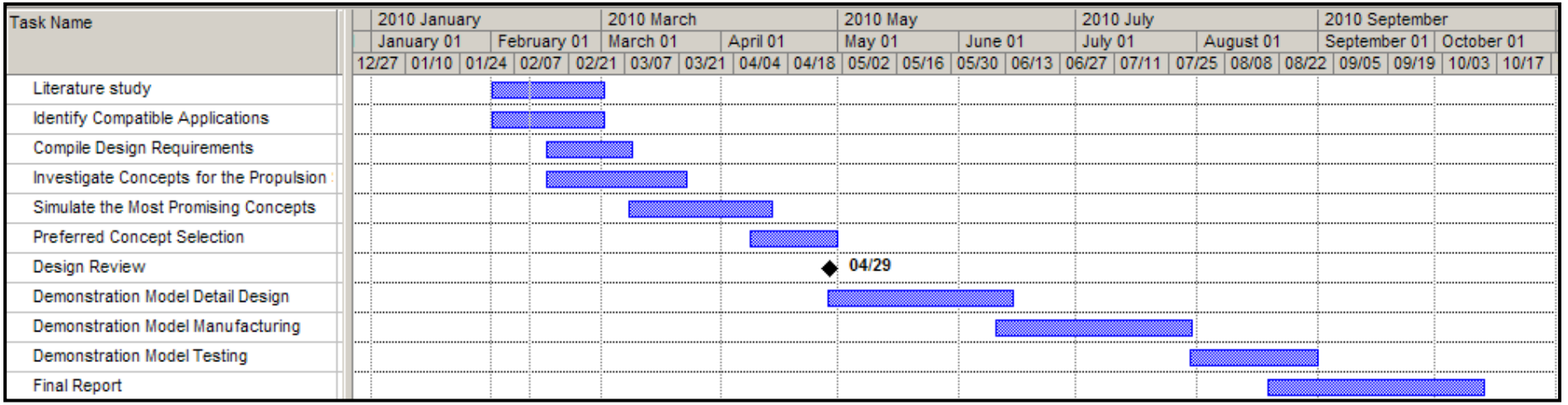

Figure 1: Gantt Chart for Electrical Vehicle Propulsion Investigation