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## **Project Man. 412 Assignment 2**

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# **Chapter 1**

## **Executive Summary**

We will design a high pressure vessel for industrial purposes

# Chapter 2

## Project Scope Statement

### 2.1. Introduction

### 2.2. Objectives

The objective of this project is to develop a high pressure vessel for industrial purposes (DETAIL) subject to time and monetary constraints specified by the customer while minimizing risk and maximizing stakeholder value. The product must be designed according to the the technical requirements specified by the multi-disciplinary team of engineers assigned to this project and approved by the customer.

The process for developing this product consists of evaluating the market to develop and execute a marketing plan based on these results. Using these results with the product specifications, the high-pressure vessel is designed, testing methods are derived and a risk analysis is conducted. The design's functionality is then tested by building a prototype that is subjected to the testing methods of the previous phase. These results are also used to determine if the prototype satisfies the design requirements.

If the prototype does not yield satisfactory results, the process is repeated until the requirements are met (given that the project's cost does not overrun). Once this step is reached, the manufacturing plan is developed and the product is advertised according to the marketing plan. Once sufficient materials are sourced, the manufacturing plan and the product is launched. This is also the point at which the project concludes.

Throughout this process, as outlined in Sec.2.7, the customer reviews the status of the product and gives their approval and/or feedback that must be taken into account.

### 2.3. Deliverables

In total, there are 12 milestones which have to be reached by certain deadlines. The work contained within each milestone is presented in this section and in the table below:

Milestone	Important deliverables:	Milestone completion date:
1	a) Complete market and business assessment.	
2	a) Product design and development plan. b) Marketing plan.	
3	a) Advertising campaign . b) Project risk analysis.	
4	a) Design approval. b) Initial engineering specifications.	
5	a) Design verification activities. b) Verification design review.	

6	a) Project functional model. b) Develop and issue RFQ. c) Evaluate design specifications. d) Identify vendors.
7	a) Develop plan for prototype testing. b) Issue prototype. c) Perform supplier process capability.
8	a) Approve sample parts. b) Test prototype. c) Present product.
9	a) Approve model design. b) Evaluate prototype test results. c) Validation design review.
10	a) Design transfer activities. b) Develop production plan. c) Qualify supplier.
11	a) Approve production parts. b) Evaluate RFQ responses. c) Select vendors. d) Production control plan.
12	a) Debug production system. b) Product launch.

**Table 2.1:** Milestone Dates and Associated work

## 2.4. Milestones

## 2.5. Work Breakdown Structure

## 2.6. Technical Requirements

This section describes the technical requirements determined by the multi-disciplinary team of engineers assigned to this project, subject to approval by the customer

### 2.6.1. Chemical Requirements

### 2.6.2. Civil Requirements

### 2.6.3. Electrical and Electronic Requirements

The high-pressure vessel must be monitored using a suite of analogue and digital sensors. This will be the purview of the electrical and electronic engineer.

This sensor suite must be designed and built using cost-effective and accurate components that can withstand the pressure inside the pressure vessel to be developed. Redundant sensors must also be included to provide reasonably accurate measurements in the event of a component failure or if the pressure vessel moves outside of its normal operating parameters.

All designs must follow industry best practice and safety standards.

**2.6.4. Mechanical Requirements**

The pressure vessel must be designed to have sufficient strength to resist failure under normal operating conditions. Theoretical stress and strain calculations must be performed to select the initial vessel material, dimensions and boundary conditions for the design. A finite element analysis can then be performed to refine these selections. The mechanical engineer will be charged with performing these calculations and analyses.

**2.6.5. Mechatronic Requirements****2.7. Customer Review and Approval Procedures**



# Chapter 3

## Project Baseline

The baseline for this project has been calculated using Microsoft Project and can be seen in A.1 and B.1.

end date, before deadline

Analysing this network leads to several potential problem areas.

The first is that this project is sensitive to the hiring time of new resources. For example, if junior product designers are not hired by the time Phase 2 starts, the entire project will be delayed. To mitigate this potential problem, two engineers are hired that can cover a variety of specialities in the event that required resources are not obtained. The hiring strategy must also take this possibility into account, such as hiring resources a period earlier than they are required.

There are also several places where tasks from the same department must be done in parallel (e.g. commercialization in Phase 3), this means that there must be at least two members of this department to finish the tasks in time, especially if one of the tasks is on the critical path.

# Chapter 4

## Budget

This chapter documents the budget that has been planned for this project. Resources that have not been hired as of Phase 1 have been assigned using generic resources and their cost has been calculated using average rates for their respective specialisation.

The cost breakdown of the project can be found in the Tab. 4.1 below:

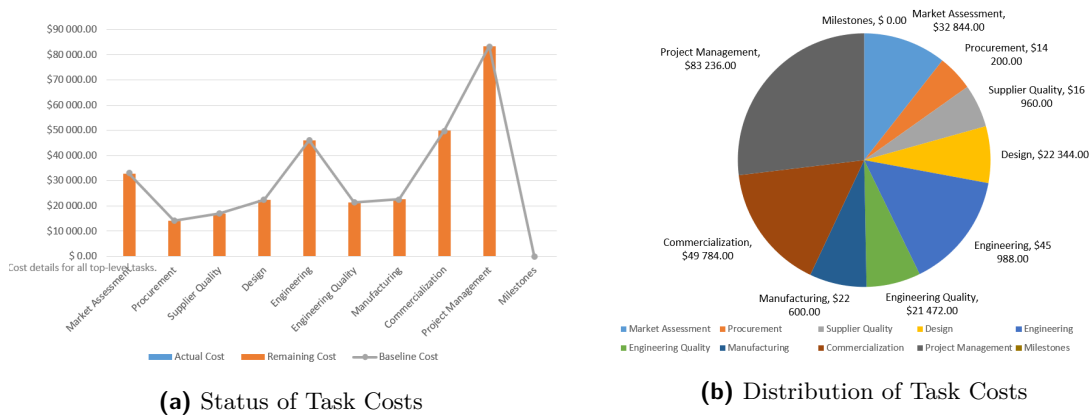
Cost Type	Cost
Direct Resource Costs	30 9428,00
Training Costs	0
Managerial Action Costs	1 600,00
Overhead (20%)	61 885,60
Total:	372 913.6

**Table 4.1:** Project Cost Breakdown

An overhead cost of 20% is added to account for unforeseen events and worker inefficiencies. This cost acts as a contingency fund to prevent cost overruns. Equipment and product material costs are not included in this budget.

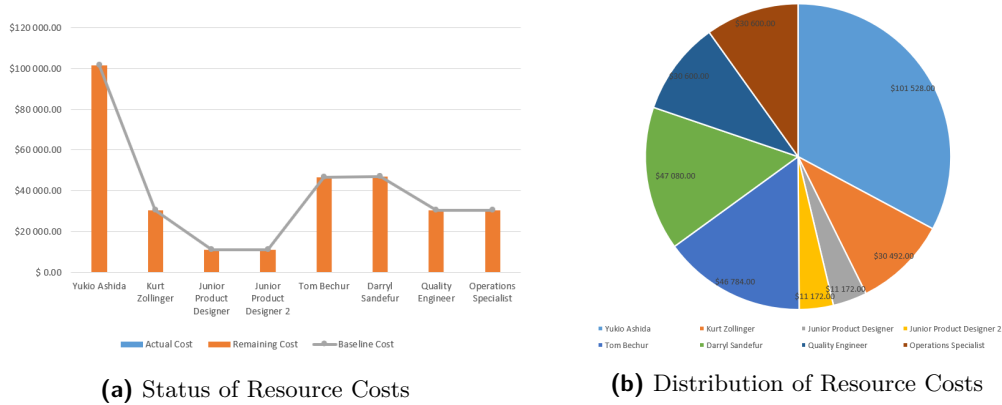
Comparing this total cost with the project budget of 380 000 \$ yields a margin of 7 086.4 \$. This margin can be considered as a discretionary fund to be used for adjusting the hiring or managerial action strategy.

An overview of the cost status and distribution of the costs associated with the various tasks over the full project duration can be found in Fig. 4.1 below:



**Figure 4.1:** Status and Distribution of Task Costs

An overview of the cost status and distribution of the costs associated with the various resources over the full project duration can be found in Fig. 4.2 below:



**Figure 4.2:** Status and Distribution of Resource Costs

The cost breakdown of the managerial actions planned for the project is found in Tab. 4.2 below:

Managerial Action	Action Amount	Action Unit Cost	Cost
Pizza Party	12	50,00	600
Management Recognition Award	4	250,00	1000
Total:			1 600,00

**Table 4.2:** Managerial Actions Cost Breakdown

The managerial actions planned to be taken consist of a pizza party for all employees at every period as well as management recognition awards at regular intervals throughout the project.

It was decided that training resources was not worth the cost and lost hours for the relatively small gains in efficiency.

A detailed budget with task assignments, baseline budget and baseline duration can be found in A.1.

# Chapter 5

## Risk Analysis

Probability	Probability Percentage	Probability Score
Very High	80-100%	5
High	60-80%	4
Medium	40-60%	3
Low	20-40%	2
Very Low	0-20%	1

**Table 5.1:** Probability Scores Used for Risk Matrix

Impact	Impact score
Very High	5
High	4
Medium	3
Low	2
Very Low	1

**Table 5.2:** Impact Scores Used for Risk Matrix

Prob.	Very High	5	10	15	20	25
	High	4	8	12	16	20
	Medium	3	6	9	12	15
	Low	2	4	6	8	10
	Very Low	1	2	3	4	5
		Very Low	Low	Medium	High	Very High
		Impact				

**Table 5.3:** Risk Matrix Used for Risk Analysis

# Bibliography

# Appendix A

## Detailed Budget

The detailed budget can be found on the following pages. Note that the image can be zoomed in to read details of the various tasks.

ID	Task Name	Resource Names	Baseline Cost	Baseline Estimated Duration
1	<b>Market Assessment</b>		<b>\$32 844.00</b>	<b>25.5 days</b>
2	Evaluate market	Kurt Zollinger,Yukio Ashida	\$7 728.00	6 days
3	Develop Business opportunity	Kurt Zollinger,Yukio Ashida	\$9 016.00	7 days
4	Customer preference study	Kurt Zollinger,Yukio Ashida	\$13 524.00	10.5 days
5	Business evaluation (NPV, etc.)	Kurt Zollinger,Yukio Ashida	\$2 576.00	2 days
6	<b>Procurement</b>		<b>\$15 552.00</b>	<b>84.13 days</b>
7	Identify vendors	Kurt Zollinger	\$3 528.00	7 days
8	Develop and Issue RFQ	Kurt Zollinger	\$3 024.00	6 days
9	Issue sample (production equivalent)	Quality Engineer	\$3 000.00	5 days
10	Assess RFQ responses and select vendors	Quality Engineer	\$6 000.00	10 days
11	<b>Supplier Quality</b>		<b>\$15 952.00</b>	<b>45 days</b>
12	Perform supplier process capability	Operations Specialist	\$5 600.00	14 days
13	Approve sample parts	Tom Becher	\$4 352.00	8 days
14	Qualify Supplier	Quality Engineer	\$6 000.00	10 days
15	<b>Design</b>		<b>\$22 344.00</b>	<b>46.5 days</b>
16	Design and development plan	Junior Product Designer,Junior Product Designer 2	\$2 352.00	3 days
17	Design specs.	Junior Product Designer,Junior Product Designer 2	\$8 624.00	11 days
18	Identify testing requirements	Junior Product Designer,Junior Product Designer 2	\$3 920.00	5 days
19	Risk analysis	Junior Product Designer,Junior Product Designer 2	\$3 920.00	5 days
20	Design labeling	Junior Product Designer,Junior Product Designer 2	\$1 960.00	2.5 days
21	Approve design	Junior Product Designer,Junior Product Designer 2	\$1 568.00	2 days
22	<b>Engineering</b>		<b>\$45 988.00</b>	<b>94.63 days</b>
23	Initial engineering specs.	Tom Becher,Darryl Sandefur	\$2 460.00	2.5 days
24	Design verification activities	Tom Becher,Darryl Sandefur	\$3 444.00	3.5 days
25	Verification design review	Tom Becher,Darryl Sandefur	\$1 968.00	2 days
26	Release pre-production specifications	Tom Becher,Darryl Sandefur	\$4 920.00	5 days
27	Build functional model	Tom Becher,Darryl Sandefur	\$8 856.00	9 days
28	Design validation activities	Darryl Sandefur	\$2 200.00	5 days
29	Validation design review	Tom Becher,Darryl Sandefur	\$1 968.00	2 days
30	Approve model design	Tom Becher,Darryl Sandefur	\$1 968.00	2 days
31	Design transfer activities	Tom Becher,Darryl Sandefur	\$18 204.00	18.5 days
32	<b>Engineering Quality</b>		<b>\$21 464.00</b>	<b>74.13 days</b>
33	Evaluate design specifications	Quality Engineer	\$6 000.00	10 days
34	Develop testing protocol for prototype	Tom Becher,Darryl Sandefur	\$4 352.00	8 days
35	Test prototype	Quality Engineer	\$6 000.00	10 days

ID	Task Name	Resource Names	Baseline Cost	Baseline Estimated Duration
36	Evaluate results of tests and identify weaknesses	Quality Engineer	\$3 600.00	6 days
37	Product release meetings	Kurt Zollinger	\$1 512.00	3 days
38	<b>Manufacturing</b>		<b>\$22 600.00</b>	<b>78 days</b>
39	Process engineering plan	Operations Specialist	\$6 000.00	15 days
40	Develop production plan	Operations Specialist	\$2 400.00	6 days
41	Develop production control plan	Operations Specialist	\$3 400.00	8.5 days
42	Approve production parts	Operations Specialist	\$2 000.00	5 days
43	Contracting for deliveries	Operations Specialist	\$3 200.00	8 days
44	Submit production purchase order	Operations Specialist	\$800.00	2 days
45	Production pilot test	Operations Specialist	\$2 000.00	5 days
46	Debugging production system	Operations Specialist	\$1 600.00	4 days
47	Production release	Operations Specialist	\$1 200.00	3 days
48	<b>Commercialization</b>		<b>\$48 944.00</b>	<b>182.63 days</b>
49	Develop preliminary marketing plan	Kurt Zollinger, Yukio Ashida	\$3 220.00	2.5 days
50	Develop marketing program	Kurt Zollinger, Yukio Ashida	\$9 660.00	7.5 days
51	Train sales team	Kurt Zollinger	\$11 088.00	22 days
52	Advertising campaign	Yukio Ashida	\$21 952.00	28 days
53	Show functional model at trade show	Kurt Zollinger	\$1 512.00	3 days
54	Product launch	Kurt Zollinger	\$1 512.00	3 days
55	<b>Project Management</b>		<b>\$91 148.00</b>	<b>201.13 days</b>
56	Project Management Period 1	Tom Becher, Darryl Sandefur	\$12 300.00	12.5 days
57	Project Management Period 2	Tom Becher, Darryl Sandefur	\$6 888.00	7 days
58	Project Management Period 3	Tom Becher, Darryl Sandefur	\$6 888.00	7 days
59	Project Management Period 4	Yukio Ashida	\$10 192.00	13 days
60	Project Management Period 5	Yukio Ashida	\$11 760.00	15 days
61	Project Management Period 6	Yukio Ashida	\$7 056.00	9 days
62	Project Management Period 7	Yukio Ashida	\$8 624.00	11 days
63	Project Management Period 8	Yukio Ashida	\$2 352.00	3 days
64	Project Management Period 9	Yukio Ashida	\$3 136.00	4 days
65	Project Management Period 10	Yukio Ashida	\$3 920.00	5 days
66	Project Management Period 11	Yukio Ashida	\$10 192.00	13 days
67	Project Management Period 12	Yukio Ashida	\$7 840.00	10 days
68	<b>Milestones</b>		<b>\$0.00</b>	<b>182.63 days</b>



# Appendix B

## Network Diagram

The network diagram can be found on the following three pages. Note that the diagram is read left to right, the pages are contiguous and the images can be zoomed in to read details of the various tasks.

