Project Plan

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Version 1.0

Status

Reviewed	Karl Asklund	2023-09-15
Approved	Lars Eriksson	2022-09-27

Project Identity

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Homepage: https://tsrt10.gitlab-pages.liu.se/2023/aurobay

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Customer: Fredrik Wemmert, Aurobay
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Participants of the group

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CONTENTS

DOCUMENT HISTORY

Version	Date	Changes made	Sign	Reviewer
0.1	2023-09-12	First draft.	Martin Ling	Karl Asklund
1.0	2023-09-15	Final revision for BP2	Martin Ling	Karl Asklund
1.1	2023-09-27	Updated revision after BP2	Martin Ling	Jonna Jämte

1 CLIENT

This project client is Lars Eriksson and Vehicular Systems(ISY, FS). Costs and materials are managed by the client, which also contributes with 25 hours of assistance on top of the scheduled testing time.

2 BRIEF DESCRIPTION OF THE PROJECT

The charcoal canister is used to limit the emissions caused by the fuel evaporating in the fuel tank. This is done by adsorbing hydrocarbons in the activated charcoal inside the container.

The solution is aimed to improve upon the emptying of the canister by modifying the regulator controlling the purging event of the container. This is done by defining a different cleaning cycle which is based on a theoretical model of the system.

2.1 Purpose and goal

The purpose of this project is to investigate the purging of a charcoal canister. This would improve the process and thus help the customer Aurobay to release a better product for their customers. Aurobay can thus stay at the forefront of market-leading technology, improving the customer's economy. The specific long-term goal is to examine and improve the purging process of the charcoal canister, which can enhance the overall emissions of the system it is installed on.

The short-term objectives for this project, therefore, are as follows to achieve the aforementioned long-term goals:

1. Design a regulator to control the purging cycle of the charcoal canister while maintaining flow requirements.
2. Commission laboratory equipment.
3. Model the hydrocarbon flow through the charcoal canister.
4. Regulate the EVAP flow for an arbitrary purging cycle.
5. If possible, demonstrate the EVAP system in the university's engine test cell.

2.2 Deliverables

The following deliverables should be completed upon termination of the project

- Technical report
- Printed poster in A1-format
- Webpage
- Oral presentation of the project
- Film demonstrating the function
- Written code
- After study

2.3 Limitations

This work will not do any experimentation of filling the carbon canister, as the necessary equipment is lacking. Furthermore, the control of the intake manifold is outside of the scope, and the same applies to all components in the engine, not to the EVAP system.

3 PHASE PLAN

The project is divided into three phases; before, during, and after the project. The purpose and activities of each phase are further described below. The project is further divided into decision points, with deliverables, which are presented in table 1

Table 1: Deliverables

Delivery	Time	Type of delivery
Specification of requirements	BP2	PDF
Project plan	BP2	PDF
Time plan	BP2	PDF
Presentation of the system	BP2	Oral
Draft for design specification	BP2	PDF
Design specification	BP3	PDF
Test specification	BP3	PDF
Working prototype	BP5	Physical delivery
Protocol from tests	BP5	PDF
User manual	BP5	PDF
Presentation	BP5	Oral
Technical report	BP6	PDF
Report of final reflections	BP6	PDF
Poster	BP6	Poster/Oral
Presentation	BP6	Oral
Webpage	BP6	Webpage
Demo movie	BP6	Movie
Time report	Every Friday	PDF
Status report	Every Friday	PDF

3.1 Before project start

Before the start of the project, each member of the group was assigned a role most suitable for them, these are presented on the second page. Then a preliminary time plan, a project plan, an introductory presentation, and a requirement specification were drafted to plan the structure of the project. This phase is either terminated or completed at BP2, and upon completion, these will be delivered and mark the beginning of the next phase.

3.2 During the project

Each member of the group will be assigned different tasks to distribute the workload and streamline the project. These are the following:

Tasks
Construct a regulator for purging
Test the new system
Document the work
Visit Aurobay's facility
Keep in contact with the client and the customer

Table 2: List of tasks during the project

This phase is considered complete after BP5.

3.3 After project

After the project the following tasks are to be completed:

Tasks
Report on final reflections
Presentation (A finalizing seminar)
Website (Where all material will be available and for a clear view of what has been done)
Technical report
Project film (Quick visual overview of the project)

Table 3: List of tasks after the project

This phase, and in turn the project, is considered completed after BP6.

4 ORGANIZATIONAL PLAN FOR THE PROJECT

This section presents the organization of the project.

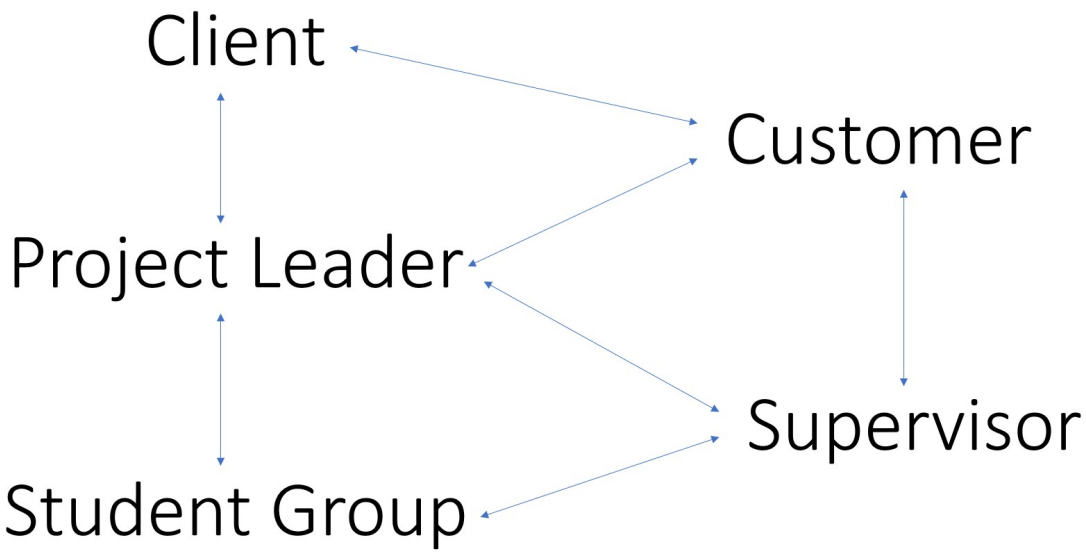

Figure 1: The general organization of this project

4.1 Organizational plan for each phase

The plan for the different phases is to work with the deliverables associated with the different time points. For example, for BP3 we work with the Design specification and Test Plan at the same time to make the deadlines. A document of what has been done during each week is done by the Project Leader to make sure all deadlines are met.

4.2 Organizational plan at the customer

The customer has a time frame throughout the course time. The customer is connected through some meetings and provides necessary experiment equipment. The customer will also provide a visit to their facility.

4.3 Terms for cooperation within the group

All members of the group should actively work towards a good group dynamic and a well-functioning group. All members should also participate actively in the project and strive towards some understanding and knowledge in each project phase. This is important to retain the collaboration in the group. If conflicts occur there should first be attempts to resolve them in the group. If this is not possible the supervisor should be contacted to resolve the problem.

4.4 Definition of work content and responsibilities

The work content is divided equally but the different people in the project group have the main responsibility for certain parts, responsibilities are presented in table 1.

5 DOCUMENT PLAN

All documents should be written in English, except the status reports and time reports which are written in Swedish, and accessible to all group members. In table 4 all documents that should be created within the project are presented.

All documents should be versioned. Major revisions are denoted by increasing the integer, while smaller revisions should be denoted by increasing the decimal. Furthermore, all documents should be dated to show when the file was last edited.

6 EDUCATIONAL PLAN

In this section education is discussed, both from the perspective of the project group and the customer.

6.1 Own education

To ensure high quality of work each group member should educate within the scope of the task ahead. Naturally, each group member will end up with a different amount of knowledge within certain areas of the project. However, this also enforces efficiency within the project as the total man-hours will decrease if only certain group members are required to obtain certain information.

6.2 Customers education

For the customer to be able to use the product to its full potential the project group will be required to educate the customer. This will mainly be done through the user manual and verbal presentations. If needed, additional support and education may be provided to the customer before BP6.

7 REPORTING PLAN

Every Friday a status and time report are to be sent to the client and supervisor, Lars Eriksson and Oskar Lind Jonsson. This ensures that the project follows deadlines and the group members contribute evenly.

8 MEETING PLAN

Meetings during the project are to be conducted frequently and efficiently. To ensure efficient meetings, each meeting should have an agenda that the present members should follow (often as a message beforehand). Before the meeting is ended it should be known by all participants when the next meeting is.

9 RESOURCE PLAN

This section presents the people who will participate in the project as well as the available premises and materials.

9.1 People

People who will participate in this project, apart from the project group, are Fredrik Wemmert (Aurobay, customer), Lars Eriksson (LiU, client), Oskar Lind Jonsson (LiU, supervisor), and Daniel Axehill (LiU, examiner).

9.2 Material

Available hardware components and laboratory equipment:

- Test rig for charcoal canisters provided by Aurobay
- Charcoal canisters (EU-spec)
- Fume hood
- High-precision scale
- Mass flow regulator
- Engine test cell
- M5Stack KMeterISO
- Arduino Nano IoT
- Raspberry Pi 3B+
- Kistler 4264A-type pressure sensor
- Sensiron SFM3000-200 flow sensor
- Control box provided by Aurobay

9.3 Premises

The premises available for the project are the L-building, a project room in the B-building, a lab for experimentation in the B-building and a gas storage in the B-building.

9.4 Economy

Each member of the group shall provide 240 hours of work towards the project. This shall summarize to 1440 man hours for the entire group.

10 ACTIVITIES

All activities are listed below, see appendix for the full time plan.

Table 4: Activity plan for the project

No	Activity	Responsible	Description	Deadline	Est. time (hours)
Documentation					
1	Status and time reporting	Everyone	Status and time report every week and inform the orderer	-	8,5
2	Resource plan	Everyone	Establish a resource plan.	-	6
3	Project plan	Everyone	The plan for the project, to be approved by the supervisor	2023-09-18	40
4	Requirement specification	Dylan	Write a requirement specification to be approved by the supervisor.	2023-09-18	40
5	Design specification	Theodor	Provide a framework for design-related decisions	2023-10-09	40
6	Time plan	Martin	Establish and update the time plan.	2023-09-18	30
7	Presentation	Martin, Dylan, Lucas	The first small presentation in BP2 and the final presentation of the project in BP6.	2023-12-18	66
8	Risk analysis	Karl	Write a risk analysis for the conducted experiments.	-	24
9	Test specification	Everyone	Establish a test plan.	2023-10-09	24
10	Non-disclosure agreement	Everyone	Sign the non-disclosure agreement.	-	6
11	Description of project and background	Martin	Write and implement in the final report.	BP5	10
12	Method	Jonna	Write and implement in the final report.	BP5	20
13	Program the website	Lucas	Establish a web site for the project	2023-12-10	46
14	Conducting experiments	Jonna	Execute experiments in laboratory	-	30

15	Result	Dylan	Write and implement in the final report.	2023-12-18	25
16	User manual	Lucas	Establish a user manual for future users.	2023-12-14	20
17	Discussion	Karl	Write and implement in the final report.	BP5	25
18	Poster	Theodor	Create a poster for the project.	2023-12-12	32
19	Design website	Theodor	Design the web site for the project and upload all files necessary.	2023-12-12	37
20	Demo film	Jonna	Create a demo film showcasing the project.	2023-12-12	65
21	Technical report	Karl	Establish a technical report.	2023-12-18	20
22	Reflection document	Everyone	Write a reflection document in the end of the course.	2023-12-18	12
Education					
23	Lectures	Everyone	-	-	36
24	Educational visit	Everyone	Visit Aurobay	2023-10-11	60
25	Own education	Everyone	Study	-	32
Hardware					
26	Install initial configuration	Lucas	Program the initial configuration of the Arduino and Raspberry pi	2023-09-29	30
27	Establish sensor communication	Martin	Enable measurement data to be readable.	-	40
28	Verify the mass flow sensors functionality	Karl	Ensure that the measuring system is functioning.	-	10
29	Establish method for data storage	Dylan	Storage of the measurement data.	-	20
30	Install pressure and temperature sensors	Jonna	Install the sensors.	-	15
31	Verify the functionality of the pressure and temperature sensor	Lucas	Verify functionality to get accurate measurement data.	-	6
32	Guarantee performance requirements	Theodor	Make sure that the requirements are fulfilled.	-	1
Software					
33	Create UI	Everyone		-	40
34	Refine UI after first experimentation	Lucas,Theodor		-	15
35	GIT-management	Karl		-	12.5
Modeling					

36	Parameterize	Jonna		-	20
37	Create model	Theodor	Establish a simulink model for the system	-	50
38	Verify model	Karl	Evaluation of the mathematical model.	-	55
39	Run new measurements	Jonna	Run new measurement to validate the model	-	40
40	Tune model	Everyone	Tune the model after validation	-	40
Buffer					
41	Buffer		-	153	

11 TIME PLAN

The time plan is preliminary and may change throughout the project, but acts as a guide for where the group should prioritize their time. All changes will be noted to allow the reader to distinguish between the original plan and the modified plan. In appendix a complete time plan can be found.

The time plan will also contain a time report, with a separate table for each group member. Each group member's time reporting will be summarized, reporting the group's total hours for each activity and week. Based on the summarized time reporting the time plan will revised as needed.

12 CHANGE PLAN

If delays were to occur, or requirements prove to be unfeasible, the customer and supervisor shall be informed as soon as possible. During the project, status updates will be vital to ensure proper progress. If proper progress is not made, the project leader will discuss with the customer and the supervisor about an action plan.

13 QUALITY PLAN

This section will discuss how a high-quality project is ensured.

13.1 Reviewing

Throughout the project documents will be written by group members listed as authors on the cover page. This will naturally lead to a continuous reviewing process. However, to ensure proper quality, one group member is responsible for ensuring quality standards are met. To do so, this group member will review all documents thoroughly before they are delivered.

13.2 Test plan

Through a well-planned test plan, all tests that are conducted will have a meaningful purpose. The test plan will also ensure that tests are conducted efficiently and safely, minimizing labor costs while ensuring a high-quality standard.

14 RISK ANALYSIS

A risk analysis will be conducted on the test rig and the execution of the experiments before they are conducted. The risk analysis should be made thoroughly and with great care for the personal health and safety of the people involved in the experiment. A test protocol shall be written and reviewed by authorized personnel from LiU. The same safety precautions will be taken for the experiments executed in the engine lab, where a separate risk analysis will be conducted to ensure the safety of the members and personnel taking part in the experiments. These protocols will be read and signed by all members of the group to ensure every individual's safety throughout the different conducted experiments.

15 PRIORITIES

In the event of delays or other issues, the top priority should be ensuring that the deadlines are met.

16 PROJECT COMPLETION

The project is completed when everything presented in table 1 is delivered and the project conference has been approved by the examiner. All hardware is returned to the owner, and all files connected to the project should be handed over to the supervisor. Finally, an individual reflection document should be made and delivered to the examiner.

A TIME PLAN

Basplan

Projekt:

Projektgrupp:	EVAP	**Datum:**	2023-09-18	**Granskad:**	
Beställare:	Lars Eriksson	**Version:**	1.1		
Kurs:	TSRT10	**Utfärdare:**	Martin Ling (PL)		

AKTIVITETER		TID	VEM	TIDPLAN (när), veckonummer																					
Nr	Beskrivning	timmar	Initialer	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	#	#	#	#	
1	**Möten**																									
2	Internmöten	84	alla			6	6	6	6	6	6		6	6	6	6	6	6	6	6						84
3	Beslutspunktsmöten	48	alla				6		12	6								6		18						48
4	Möten med handledare/examinator	6	alla	6																						6
5	**Dokumentation**																									0
6	Statusrapportering/Tidsrapportering	8,5	ML	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5						8,5
7	Resursplan	6	alla	6																						6
8	Projektplan	40	alla		20	20																				40
9	Kravspecifikation och Designspecifikation	80	alla		28	30	10	6	6																	80
10	Tidsplan	30	alla			20	10																			30
11	Presentationer	66	alla			6			6								12	12	24	6						66
12	Riskanalys	24	alla				6	12	6																	24
13	Testspecifikation	24	alla				6	6	12																	24
14	Tystnadsplikts avtal	6	alla					6																		6
15	Beskrivning av projekt/Bakgrund	10	alla									10														10
16	Metod	20	alla									10	10													20
17	Programmera webbsida	46	alla										10	10	10		10	6								46
18	Utförande av experiment	30	alla										15	15												30
19	Resultat	25	alla												15	10										25
20	Användarmanual	20	alla													10	10									20
21	Diskussion	25	alla													15	10									25
22	Poster	32	alla													10	10	6	6							32
23	Designa webbsida	37	alla													15	10	6	6							37
24	Demo-film	65	alla													15	20	15	15							65
25	Slutförande av teknisk rapport	20	alla															10	10							20
26	Reflektionsdokument	12	alla															12								12
27	**Utbildning**																									0
28	Föreläsningar	36	alla	12	12															12						36
29	Studiebesök	60	alla							60																60
30	Egen utbildning	32			23	9																				32
31	**Hårdvara**																									0
32	Installera inital konfiguration	30	alla				20	10																		30
33	Upprätta sensorkommunikation	40						30	10																	40
34	Verfiera massflödessensor funktionalitet	10							10																	10
35	Upprätta metod för datalagring	20							20																	20
36	Installera tryck- och temperatursensorer	15	alla							15																15
37	Verfiera tryck- och temperatursensorers funktionalitet	6	alla							6																6
38	Garantera krav på prestanda	1								1																1
40	**Mjukvara**																									0
41	Skapa UI	40							20	20																40
42	Vidareutveckling av UI	15									5	5	5													15
43	GIT-hantering	12,5							10		0,5		0,5		0,5		0,5		0,5							12,5
45	**Modellering**																									0
46	Parametrisera	20	alla						10	10																20
47	Skapa en modell	50	alla							20	30															50
48	Verifiera modell	55											15	20	20											55
49	Köra nya mätningar	40										10	10	10	10											40
50	Finjustera modell	40												20	20											40
52	**Buffert**																									0
53	Buffert	153	alla				10	10	10	10	10	10	10	10	10	10	10	10	11	11	11					153
54																										0
55	**Deadlines och Leveranser**																									0
56	BP2		alla				Mån																			0
57	BP3		alla							mån																0
58	BP5		alla															Mån								0
59	Leverans och efterstudie		alla																Mån							0
60	Leverans Poster		alla																Tis							0
61	Publicering/Leverans hemsida		alla																Tor							0
62	Projektkonferens och Slutleverans BP6		alla																	Mån						0
63																										0
64	**Milstolpar**																									0
65	M0-BP2 Inlämningar		alla			Tor																				0
66	M1-BP3 Inlämningar		alla				Tor																			0
67	M2-Sensorkomunikation upprättad		alla					Tor																		0
68	M3-Riskanalys färdigställd		alla						Tor																	0
69	M4-Studiebesök avklarat		alla							Tor																0
70	M5-Börja med tester		alla								Tor															0
71	M6-Teknisk rapport påbörjad		alla									Tor														0
72	M7-Implementering av model påbörjad		alla										Tor													0
73	M8-Testning påbörjad och körd		alla											Tor												0
74	M9-Alla tester klara		alla												Tor											0
75	M10-BP5 Inlämningar påbörjade inklusive M13-mål		alla													Tor										0
76	M11-BP5 skrivning och sammanställning		alla														Tor									0
77	M12-BP5 Inlämningar		alla															Tor								0
78	M13-Leverans, Poster och Hemsida klara		alla																Tor							0
79	M14-Julafton ledig		alla																	Sön						0
80	M15-Nyår ledigt		alla																		Sön					0
81																										0
82	Slutdatum		alla																	Mån						0
83	Reserv-dagar v52 (ev. kompletteringar)		alla																	T Fre						0
84																										0
85																										0
86																										0
87																										0
88																										0
89																										0
90																										0
91																										0
92																										0
93																										0
94																										0
	Summa antal timmar:	1440		12	63	65	62	80	120	142	45,5	45	75,5	85	85,5	85	92,5	77	72,5	29	11	0	0	0	0	1440