Clean Marine Systems| Burnaby, BC V5A 1S6

September 23, 2010

School of Engineering Science

Simon Fraser University
Burnaby, BC
V5A 1S6

Re: *ENSC 440 Project Proposal for Clean Marine Systems Shoreline Detection System*

To Whom It May Concern;

The following documentation outlines Clean Marine Systems ENSC 440 project proposal for a shoreline detection system. The project has been chosen to combat one of the world's most horrific man-made disasters, ocean oil spills. Specifically this project is aimed at detecting oil in remote areas, providing real time alerts of zones affected by the spill.

This proposal will outline Clean Marine Systems justifications for picking the project and bring to the forefront problems we plan to encounter. It will also discuss different strategies at which the project can be combated, and justification for why we have chosen our solutions.

The dedicated team of engineers at Clean Marine Systems will be dividing responsibilities in the project, dictated by their own area of expertise for the research and development cycle of this project. This document will outline their respected areas of responsibility, as well as introduce you to them.

Sincerely,

James Kennedy

James Kennedy

Chief Executive Officer
Clean Marine Systems

Enclosure: *Clean Marine Systems Shoreline Detection System Project Proposal*

CLEAN MARINE

Project Proposal

Shoreline Oil Detection System

Fall 2010

Executive Summary

Environmental disasters come in two forms, natural and man-made. Natural disasters can be experienced in the form of hurricanes, earthquakes, flash floods or volcanoes. They aren't any less destructive than man-made ones, but the fact is that no one company or society is directly responsible for it. Man-made disasters, on the other hand, come in a much larger variety, such as nuclear reactor blow-offs, collapsing bridges, falling buildings, or chemical spills. At Clean Marine Systems we are aimed at protecting the environment from one such man-made disaster, oil spills, more specifically off shore oil spills from giant ocean tankers or oil drilling platforms.

On Tuesday April 20th, 2010 an oil rig 52 miles southeast off the coast of Venice, Louisiana exploded in a giant fire ball producing the most environmentally devastating ocean oil catastrophe known as the Deep Water Horizon Oil Spill. At that same time Minerals Management Service reported that there were 90 other active oil rigs working in the waters of the Gulf of Mexico, cumulatively producing 1.7million barrels of oil per day, and nearly 187 billion m^3 of gas per day. What this translates to is a huge environmental impact if anything goes wrong on just one of those rigs, which happened.

It was reported by CNN that on the 30th of April the first traces of the oil had reached the Louisiana Gulf coast, which now meant that the disastrous effects on the environment would increase several magnitudes higher for the reasons accredited to coastlines being typically where one finds coral reefs with their shallow waters to support tropical schools of fish, which brings the larger fish and animals such as seals. As well, the shoreline supports birds and crabs, clams, and oysters. Even further into the delta one finds the marsh lands that support even more wildlife like alligators and snakes.

When the actual environmental catastrophe occurs, all parties involved are pointing fingers and backing away slowly. This is why we aim our products at companies that want to show they are taking the necessary measures to ensure that if indeed an accident does occur, they will have the proper infrastructure in place to combat the disaster properly, somewhat like having a first aid kit on hand.

This document outlines Clean Marine's Shoreline Oil Detection System which detects the content of the oil in the ocean at strategically chosen drop points along the coast line, alerting the proper authorities where their attention is immediately needed, helping in the attempt for an efficient cleanup. In this way, multiple detection systems can be dropped along the coast in the hazard zones to fully take advantage of technology to help combat the oil spill.

Clean Marine Systems is a very motivated team of Simon Fraser University Engineering Science students who have come together to combat problems we feel are major setbacks in the development of human civilization.

The timeline developed for this project is estimated at 50 weeks, where a prototype will be designed and built by December of 2010. The project budget has been set at CAD$440, where we will seek funding from all available resources detailed in the budget.

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Introduction

No matter how much environmentalists like the notorious David Suzuki, or the former Vice President Al Gore, and even the heart-throb Leonardo DiCaprio campaign for a more sustainable world, the fact remains the same: we will always need oil. Even if we do stop driving cars, the world will still have buildings to erect, tools to build, metal to mine, computers to manufacture, and clothing to make, all of which require unquestionably machines to make or perform the duties of the task, which in turn require oil. So in essence oil exploration is not going to slow down unless a major event completely alters human civilization.

When such a disaster as an oil leak occurs, it has long lasting environmental reverberations for decades. The Exxon Valdez oil spill at Prince William Sound in Alaska on March 24, 1989 spilled an estimated 750000 barrels of crude oil into the sound. The oil eventually covered 2100 kms of coastline at the end of the disaster, encompassing 28000 km^2 of ocean. One of the biggest complications with the cleanup efforts was that the region was only accessible by helicopter, plane, or boat, which meant that if the transportation could indeed run due to co-operating weather, the cleanup crew had guess where along the 2100 kms of coastline to focus efforts.

The most recent disaster that overtook the Exxon Valdez oil spill severity was the Deep Water Horizon oil spill on April 20, 2010, killing 11 crewmen and ignited a fireball in the sky that could be seen 56 km away on the shores of Louisiana. 36 hours later the burning firestorm i.e. Deep Water Horizon oil rig finally sank to the bottom of the ocean, but still the oil flowed out of the hole because the well could not be capped off. It wasn't until nearly a full three months after the initial blow off, on July 15, when the final cap was put on to stop the rig from gushing oil into the ocean. Only speculation can be made about the amount of oil that has leaked into the Gulf of Mexico, and only time will tell how many thousands of kms of the shoreline surrounding the gulf will be effected, but we do know for sure, right now, it's already extremely devastating.

Detecting oil in the water currently exists in the form of optical sensors, digital imagery, and observations made by fly-bys, but Clean Marine Systems goal is to design an electrode system that physically detects the content of the oil in the water and alerts the end user when there is oil present. In this way, many of Clean Marine's Shoreline Oil Detection Systems can be strategically placed along the coastline so that a large distance can be accurately monitored instantaneously for oil, regardless of current weather conditions. This will be extremely valuable in focusing efforts in the post-oil-spill cleanup to ensure that the most effective resolution can be found in such a disaster.

This document provides a proposal for Clean Marine's Shoreline Oil Detection System, which will go into detail about existing technologies, Clean Marine's own solution, budget constraints, project timeline, a company organization structure, as well as a company profile.

Potential Solutions

Several methods are used for remote monitoring and detecting of oil spills in seawater, however, most of these techniques used are costly, inaccurate and inefficient. This is due to the complexity in design of the detection devices. Efficiency and accuracy of detection techniques used are suspect due to the relationship they have with current weather conditions. Optical sensors and satellite images are examples of resolutions that are virtually ineffective in bad weather. The use of human vision is another alternative for monitoring the oceans and making sure our oceans are clean. This method is considered too primitive on account of the current automated technology.

Optical Detection

Optical detection is based on the use of Fluorescent sensors for remote monitoring of seawater. An example of these sensors is the Slick Sleuth sensor that is produced by InterOcean Systems, a sensor making company based in San Diego, CA. Although this type of sensors might have a higher degree of accuracy, unlike other sensors of the same type that requires a weather condition free of clouds; it is sold at a very high price, compared to the price of our proposed solution. Another factor that affects the efficiency of the optical sensors is the wind. If the wind speed is higher than 10 m/s, the oil slicks break up into small pieces, which make it difficult for the sensor to detect accurately the presence of oil on the surface of the water.

Satellite Images

Satellite image technique analyzes images of seawater taken in real time from the edge of our atmosphere. Although this mechanism is one of the most efficient solutions to monitor our oceans, it is not reliable under certain circumstances. As an example, it is harder to detect oil spills through these images on darker shores or rocky areas. Even seaweed or debris can be mistaken for being an oil spot by analyzing a satellite image. In addition, these images do not tell how thick an oil spill is, if we are interested in knowing the degree of contamination.

Human Vision

This is a very basic yet common method for surveying and monitoring seawater. In this method usually a helicopter or an aircraft flies periodically over the coastline and checks if there is any oil spills. This method, even if it does give precise information about the presence and location of oil spills, it can't be implemented at night, under severe weather conditions, foggy days, or a few hundred miles off the shores. In addition, it is not cost efficient if we consider the amount of fuel needed to operate the air-borne approach.

Proposed Solution

Clean Marine's proposed solution is a real time remote sensor for oil spills. The basis of our detection device is based on the concept of conductivity; it is known that salty water is more conductive than oil due to its thermal properties. So using this principle, we will design a system that generates an alarm whenever seawater conductivity is sensed to be less than a pre-determined limit value calibrated to the location at the time of installation.

The oil spill detector is composed of two electrodes merged into a container made of a non-conducting material such as glass or plastic and a DC power supply to apply voltage across the two electrodes. The current sensed in the circuit will be amplified and used to turn on an LED, which will act as an indicator that the seawater is clean. If there is an oil slick in the area of interest, conductivity will be less than the normal seawater conductivity and as a result the LED turns off, which will trigger the circuit warning system. Once the alarm system is turned on, a signal will be sent wirelessly to the oil cleanup headquarters so that a quick response to clean up the spill can be taken.

Our proposed technique provides real time warnings at the very early stages of an ocean oil spill, and it guarantees reduction in oil clean up costs and damage done to the marine life and ecosystem in the affected area. It will monitor day and night around the year under clear, foggy, or severe weather conditions, and it will not mistake seaweeds and debris for oil. Moreover, our proposed device will be powered using solar energy, which will make it both eco-friendly and power efficient. This also means once the device is installed, the user need not worry about changing the batteries when they are low in power.

This solution is a simple design, yet it is both affordable and more efficient than any other techniques used in oil detection.

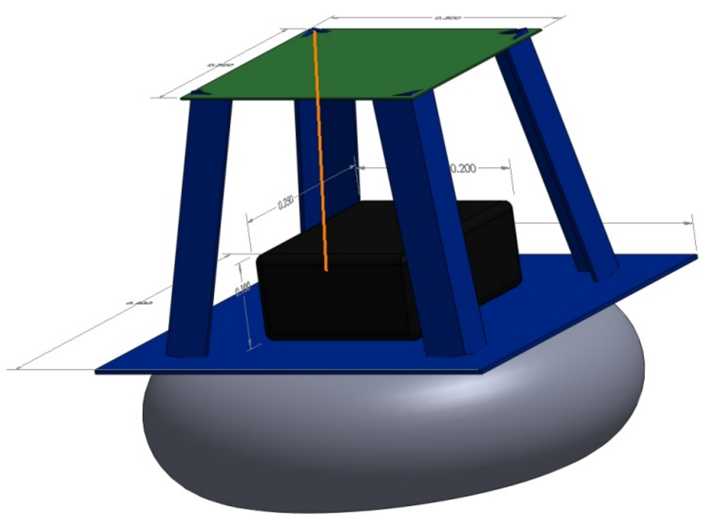

Figure 1 Frame of Shoreline Oil Detection unit

Estimated Budget

Item	Cost
Microcontroller Kit	50
Electronics components	10
Prototyping Boards	10
Electrodes	20
Cellular modem	150
Enclosure construction materials	50
Battery system	50
Incidentals	100
Total Cost CAD $	440

Figure 2 Estimated Budget

Sources of Funding

A portion of this project will be funded by the Engineering Student Society Endowment Fund (ESSEF). We will also seek sample parts from suppliers as a way of lowering component costs. We will also seek additional backing from the Wighton Fund.

Any additional costs will be incurred by Clean Marine Systems.

Project Timeline

The schedule of this project is being managed using the Basecamp project management software. We will be using an iterative development cycle with weekly goals and deliverables. An estimated Gantt chart is shown on the following page. Tasks marked with an asterisk (*) have not yet had dates provided by the instructor, and will be developed at future dates along the project development cycle.

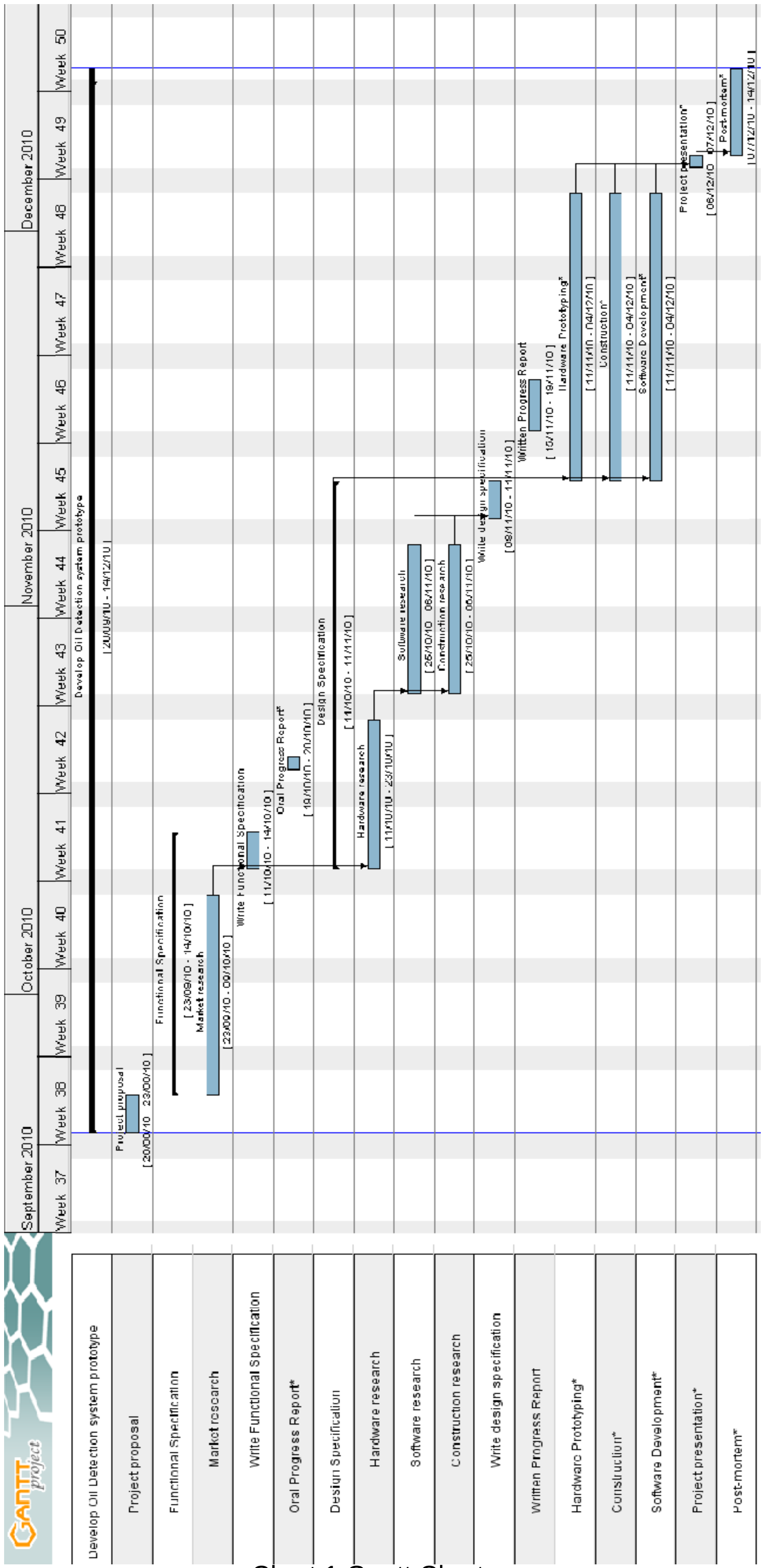

Chart 1 Gantt Chart

Organization Structure

Clean Marine Systems consists of four members: Ahmed Saleh, Ned Tobin, James Kennedy, and Farid Mabrouk. These four engineering students complement each other in manner where they each have a specialty: two of which are electronics, one a systems, and a computer engineer. In order to organize our company and succeed in completing the project in a timely and efficient manner we have devised the plan as outlined below, where each member will be responsible for a specific branch of the company.

James Kennedy, Chief Executive Officer (CEO), is in charge of project management, assigning tasks and ensuring they are finished in a timely manner. Also, he will be responsible for the software related tasks in the project, which consists of 2 components: communication and data analysis.

Ahmed Saleh, Chief Operating Officer (COO), is in charge of the market research. Finding the right customers and ensuring that the design and functionality specifications fall within the needs of the customers and targeted environment.

Farid Mabrouk, Chief Technical Officer (CTO), will be overlooking the electronic circuitry and design of the product. This branch is mostly “hands on” hardware design.

Ned Tobin, Chief Financial Officer (CFO), will undertake the budget and funding duties at Clean Marine. He will also look after construction of the product.

To eliminate conflict, each member will have the final decision regarding any issues occurring in their branch.

Although each engineer has a specified branch, it is vital that there is some cross section work within these branches. Ned and Farid will co-operatively work on the hardware aspect of the product, while Ahmed and James will be share duties involved in the software side of the design. Pairing up is a good way to eliminate errors and speed the process of reaching effective solutions. These outlined methods will be a major factor in the forming of our company, creating the most reliable product possible.

A basecamp profile has been created, accessible only to the four engineers in the company. Basecamp will hold information on the following items: Meeting times, references, discussions, issues, milestones, to-do lists, and a live chat room. Our meeting times will be held regularly once a week to eliminate confusion and catch any problems early. During these important meetings, every member will present their completed to-do lists and discuss any issues that have occurred. At the end of these meetings, new to-do lists will be assigned for the following week.

The product that is proposed lies within the scope of our capabilities, a balance of hardware and software design. This product will be used to help save the environment, which alone is a motivational factor for the company. Team work, communication, and organizational skills need to all be sharpened in order to succeed in our mission. We believe the company will be working at its maximum effort for every member knows their roles and knows what kind of contribution is needed to make this company valuable.

Company Profile

James Kennedy – CEO

James Kennedy is a fourth-year Computer Engineering student. Before attending Simon Fraser University, James received a Diploma in Game Design from Vancouver Film School. His previous employment has given him experience in software development as both a programmer and a project manager. James is involved in the Shoreline Oil Detection System project as the project manager and lead programmer.

Ahmed Saleh – COO

Ahmed Saleh is a 5th year Electronics Engineer student at Simon Fraser University. He has 8 months of co-op experience, working for a telecom/communications company. During his time working he's done software programming involving various chips and boards, creating testing algorithms, and hands on hardware testing. Ahmed is extremely interested in all areas of Engineering Science, which will effectively build the company stronger, his dedication building the company higher.

Farid Mabrouk – CTO

Farid Mabrouk is a 4th year Electronics Engineering student at Simon Fraser University. He holds an Associate Degree of Arts and Sciences from Whatcom Community College in Bellingham, Washington. Before he joined the Engineering program at SFU, he spent more than two years working as an Electronics Technician. He has hands on experience with analog circuits, troubleshooting, and customer service support from his previous work experience. In addition, Farid has strong interests in digital signals processing, digital communication, and analog circuits design.

Farid's previous work experience and academic knowledge make him a key leader in the company, where he will be controlling the circuit prototyping and design areas.

Ned Tobin – CFO

Ned Tobin is a Systems Engineering student at Simon Fraser University who comes to the team holding a Diploma in Electronics Engineering Technology from Southern Alberta Institute of Technology. He has previous oil industry experience where he spent two years servicing and maintaining oil-well directional drilling tools at Nabors. He has also spent time working at Xerox where he serviced and maintained their multifunction machines.

Ned comes to the team with a proven track record of being a hard worker, effective communicator, and commitment to goals. He will be applying his knowledge to construction and circuitry for the project.

Conclusion

Both anti-industrialists and pro-consumers can agree there is no stopping the oil consuming machine society has already started without major psychological shifts. Even if today, society as a whole managed signed a pact saying they would instantly stop using anything related to oil, it would take over a decade for the great oil machine to come to a halt, if it could even be stopped at all.

Clean Marine Systems does not look to stop development and exploration in the name of progress, but seeks to take the proper precautions that will minimize the impact that such great man-made disasters like oil spills, dam leaks, and power outages have on the environment.

With the development of Clean Marine's Shoreline Detection System, our goal is to monitor the oil content in the water and give advanced-warning signals to the proper authorities of the progression of an oil spills dispersion. Our design incorporates two electrodes submerged in the water to monitor the oil content of the ocean, which will trigger a warning flag and alert wirelessly to the proper authorities. Placing the detection system strategically along the coastline will allow the network of detectors to effectively map dispersion of the oil and give advanced warnings to effected shorelines.

At the end of this project, the engineering team at Clean Marine Systems will have gained valuable knowledge in man-made disasters and how to deal with them. We will learn about transmission protocols for sending the alert signals, and also the detection system for oil content of a sample of ocean water. We will also learn about corrosion of the materials we will use in the construction of the aperture and how to avoid it. Hopefully this will also instill in our minds the environmental impact that such explorations and developments can possibly have on the earth, so in each of our future endeavors we will always plan for the worst, to prevent the worst from happening.

James Kennedy

James Kennedy
CEO

Ahmed Saleh

Ahmed Saleh
COO

Ned Tobin

Ned Tobin
CFO

Farid Mabrouk

Farid Mabrouk
CTO

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