Atmospheric Vapor Extraction Device

Problem Definition and Project Plan

Adnan Alhashim, Nathan Allred, Essa Alowis
Travis Butterly, Andy McPhail, Nate Ogbasellasie

September 21, 2015

Overview

- Introduction
- Problem Definition
  - The Need
  - Project Goal
  - Objectives
  - Constraints
- Quality Function Deployment
- Project Planning
- State of the Art Research
- Conclusions

Introduction

- Chris Allender, an NAU Biological Sciences graduate student, wants us to build a device to study atmospheric vapor extraction
- Only around 2.5% of the earth's water is freshwater, 1% of this is easily accessible (Clean Water Crisis)
- There is a relatively untapped resource of water in the atmosphere

Need Statement

There is not enough research to determine if extracting water from air is a viable option in arid environments.

Project Goal

Create an atmospheric vapor extraction device for researching optimal operating conditions.

Objectives

rqmt. #	Function	Engineering Requirement	Unit of Measure
1	Collection	collect water	kg
2	Portable	small enough to move	m^3
3	Low Cost	low cost to build	$

Constraints

rqmt. #	Function	Engineering Requirement	Unit of Measure	Value
1	Sensing	equip enough sensors	#	
2	Data Logging	enough data storage	MB	
3	Production	cost of production	$	<1,000
4	Power Usage	limit power to avg home	W	
5	Power Source	must not use 220v power source	Y/N	

Quality Function Deployment

		Engineering Requirements				
		Weight	Volume	Part Count	Power Usage	Sensor Count
Customer Needs	Portable	X	X		X	
	Inexpensive	X		X		X
	Able to Log Data					X
	Runs Continuously				X	
	Efficient				X	

House of Quality

		Engineering Requirements				
		Weight	Volume	Part Count	Power Usage	Sensor Count
Engineering Requirements	Weight	--	X	X		X
	Volume	--	--	X		X
	Part Count	--	--	--		X
	Power Usage	--	--	--	--	
	Sensor Count	--	--	--	--	--

Project Planning

	completed	in progress	coming	Weeks															
A	Tasks			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	**Problem Definition and Project Plan**																		
1.1	Need Statement																		
1.2	Project Goals																		
1.2.1	Objectives																		
1.2.2	Constraints																		
1.2.3	Quality Function Deployment																		
1.2.3.1	Engineering Requirements																		
1.2.3.2	Customer Requirements																		
1.3	State Of The Art																		
2	**Concept Generation and Selection**																		
2.1	Engineering and economic analysis/ concepts																		
2.1.1	Filter through the possible designs																		
2.2	Research power requirements																		
2.3	Design concepts assembly																		
2.4	Material selection																		
2.5	Assembly planning																		
2.6	Location selection																		
3	**Proof of Concept Demonstrations**																		
3.1	Prototype assembly																		
3.1.1	Test 1 design analysis data																		
4	**Project Proposal**																		
4.1	Economic analysis																		
4.2	Proposal																		
	Tasks Due Date																		
	Problem Definition and Project Plan Presentations						21-Sep												
	Concept Generation and Selection Presentations										19-Oct								
	Proof of Concept Demonstrations														16-Nov				
	Project Proposal Presentations																		7-Dec
	Final Report																		7-Dec

State of the Art Research

- The team looked into various ways of collecting vapor
- Patents have been made for devices that perform similar functions (Rosenthal 1999)
- The main uses for these devices have been for emergency situations and where pipelines are impractical (Aqua Sciences)

Conclusions

- The client is Chris Allender, an NAU Biological Sciences graduate student
- There is not enough research to determine if extracting water from air is a viable option in arid environments
- An atmospheric vapor extraction device for could be used to research optimal operating conditions
- The device should collect water from the atmosphere, be small enough to transport, and be low cost to build
- The device must log data from sensors, stay under $1,000 to produce, and limit power use while avoiding 220v requirements

References

Atmospheric Water Extractor and Method. Richard A. Rosenthal, assignee. Patent US 5857344 A. 12 Jan. 1999. Print.

Clean Water Crisis, Water Crisis Facts, Water Crisis Resources - National Geographic." National Geographic. Web. 21 Sept. 2015.

"Aqua Sciences Inc - Making Water Virtually Anywhere on the Planet. Make Potable Water from the Air, Atmospheric Water Generators." *Aqua Sciences Inc - Making Water Virtually Anywhere on the Planet. Make Potable Water from the Air, Atmospheric Water Generators.* Web. 18 Sept. 2015.