University of Notre Dame
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Date: 19 September 2006
To: AME 40463 Project Management
From: InnovatioNDistillation – Group A4
Subject: Group Concept Selection Memo

Background: InnovatioNDistillation is developing an emergency water recovery system. The product aims to create a water distillation device, which converts human mechanical energy into heat for boiling brackish water and subsequently condensing the steam into potable drinking water. The device is being produced in conjunction with the 2007 ASME Student Design Competition, but is also being developed for outreach programs for third world countries, the armed forces, and for disaster victims.

Concept Summary: The device being designed will convert human mechanical energy into heat by means of an electrical generator in conjunction with a heating element. This heating element will boil the water which will then flow through a condenser employing a vapor – compression cycle. This system will recycle the latent heat energy of the steam back into the boiler. The compressor needed for this cycle will also be powered energy from the electrical generator.

Key Technical Issues:
Frame Configuration Trade Study – This trade study will develop the configuration of the frame of the device in order to maximize human input efficiency while minimizing its size and weight. The study will address assembly/disassembly and component containment as well. One of the most important deliverables of this study is a design which ensures the structural stability of the frame while in operation.

Electrical Generator Trade Study – This trade study will determine the most efficient, reliable, and cost-effective conversion of mechanical energy to electrical energy through an electrical generator. The study will outline power efficiency versus power output for available generators. It will also determine the most effective gearing system to operate the chosen generator given known performance parameters (e.g. operational torque, rotations per minute). This gearing system will also be designed with minimal frictional losses during operation.

Heating Element Trade Study – This trade study will address both composition and geometry of the heating element to maximize energy transfer and minimize power loss during its operation in water. The study will determine a configuration that is durable, highly resistant to thermal fatigue, and is highly efficient in its transfer of thermal energy. It will choose a material that can withstand energy fluctuations and operate well above maximum human power output. The element must be fully functional for a minimum of 60 minutes at a power output compatible with possible ranges.

"Heat Harvesting" Trade Study – This trade study will focus on the benefits and feasibility of adding a device to recycle latent heat energy from steam back into the boiler. It will focus on a vapor-compression cycle and the specifications of its thermodynamic cycle to make this system operate effectively. It will determine energy transfer rates and temperature ranges over which

this system is feasible. This study will determine the condensing system that will allow for the largest coefficient of performance.

Schedule of Key Deliverables:
9/14 – Work on trade studies begins
9/28 – Progress drafts and basic component sizes reported
10/3-10/17 – Ordering of device components
10/10 – CAD model started
10/12 – Trade studies complete
11/7 – Prototype complete
11/21 – Prototype demonstration

Key Deliverables Gantt Chart

	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16
	9/12	9/19	9/26	10/3	10/10	10/17	10/24	10/31	11/7	11/14	11/21	11/28	12/5
						break							
Begin Trade Study	X												
Progress Draft			X										
Part Size Estimate			X										
Parts Ordered													
Packaging													
CAD model work													
Embedded Intel. Research													
Trade Studies Complete					X								
Parts Arrived							X						
Prototype Complete									X				
Debugging/Demo Practice													
Design Review Preparation													
Prototype Demonstration											X		
Concept Design Review												X X	
Final Design Documentation Due													X