IPRO 321 – Spring 2008
Enhancing the Reliability and Performance of Paper Shredders
Project Plan

Objectives:

1. Determine the best cutting head for speed, sound, and durability depending on the amount of paper being shred. This will be accomplished by running tests to determine sound, by using a decibel reader, by running large amounts of paper through the shredder and seeing how much it can handle and how fast
2. To look into alternate design ideas, as to implement new design features that could be beneficial to the sponsor, as well as to try to make amore efficient shredder. This would be accomplished by testing new ideas and seeing if they are plausible.
3. Determine which motor works best for the speed, sound, and durability for the paper shredder. This will be accomplished by running several different motors through tests to determine rpm, electric output, and how long it will last by constantly running it.
4. After the first three objectives are accomplished, what is learned from these tests will be implemented into the design of a prototype paper shredder. The teams will put in design advice and talk to the machine shop into helping design a prototype machine.

Background:

Spring semester 2007, the Manhattan Group came to IIT seeking advice regarding the improvement of their paper shredder. The paper shredders are manufactured in China and sold across the world, including the United States, under the Royal brand name. Each year, over a million paper shredders are sold. Consumers want paper shredders that are quiet and long lasting and are available at the lowest possible price. The Manhattan Group has asked us once again, the students of IPRO 321 and Professor Maurer, for the fourth straight semester to seek potential methods and problems in their shredder. These include improving the sound reduction, the gear optimization, and other features. The MMAE lab and machine lab will be used extensively for gear, sound, and material testing and design. Software resources, sound measuring equipment, and EE equipment will be used as well.

Potential legal and/or ethical issues will involve patents and idea ownership. Since this a sponsored IPRO, all discoveries will be property of Mr. Seth Lewis and the Manhattan Group. This potentially could be an issue where this IPRO will be unable to provide necessary information to the IPRO office regarding work and progress due to ethics.

Methodology:
As a group, we decided the best way to handle the objectives given was to split up into two teams, based on fields of study, to address the objectives.

Electrical Team

1. The team will attempt to determine which motor works best for sound reduction by running tests with various amounts of paper and measuring the sound output
2. They will also use tests to see how power the motor needs to handle various amounts by running a large amount paper through the shredder and measuring the output.
3. The team will finally determine what is the best motor to use for the paper shredder

Mechanic Team

1. The team will determine which type of paper shredder head is best to be used by running tests on sound, amounts of paper the shredder can handle, torque output, and several other variables.
2. The mechanic team will use the research from last semester as well as test the gears with acquired paper shredders to determine the best gear ratio based on performance in the areas of sound, reliability, and other factors to determine the best gears for the shredder.
3. The team will also test the torque needed to shred various amounts of paper to help the electric team determine the amount of power needed from the motor to make the paper shredder work at its maximum ability
4. The team will also look into alternative methods of design for the paper shredder. They will do this by being creative, looking into existing products, and by testing out what will work and what will not work.
5. The two teams will work out a design for the prototype, as to fit in the components as well as for look

Expected Results:

The two teams will coordinate their work in order to obtain the desired results.

1. Determine the best possible parts in unison to make a more efficient and reliable paper shredder that is up to needs and desires of the sponsor
2. Take the results from the best parts as determined by the teams and take these parts and work in unison with the machine lab and build a working prototype.

Milestones or Goals:

The two teams have several goals or milestones they would like to accomplish during this IPRO. Learning to work well with people from other disciplines is amongst them, as well as to build a working prototype of a paper shredder. Another goal is to be able to improve on the results of last semester, and to be able take this information and turn it into the best possible design for a paper shredder.

Project Budget:

Paper Shredders and other materials	$450
IPRO Day Materials	$300
Miscellaneous Equipment	$200
Total	$950

Schedule of Tasks:

The schedule for tasks is rough outline, which is expected to change as the teams learn more about what they are dealing with, and how to handle the changes.

	Name	Duration	Start	Finish
1.	Initiation	2 days	1/23/08	1/28/08
2.	Define Project	2 days	1/23/08	1/28/08
3.	Brainstorm and pick teams	1 day	1/30/08	1/30/08
4.	Acquire Materials	1 day	2/07/08	2/07/08
5.	Start Running Tests	1 month	2/11/08	3/13/08
	• Test to measure torque	2 days	2/11/08	2/13/08
	• Test sensors on shredder	2 days	2/18/08	2/20/08
	• Test rpm on motors	9 days	2/11/08	2/20/08
	• Test rpm on shredder	2 days	2/25/08	2/27/08
	• Test on gear ratio	2 days	3/03/08	3/05/08
	• Test electrical output	10 days	2/25/08	3/05/08
	• Test components together	8 days	3/05/08	3/13/05
6.	Work on prototypes	21 days	3/05/08	3/26/08
7.	Test Prototype	14 days	4/03/08	4/17/08
8.	Documentation	7 days	4/24/08	4/31/08
9.	Presentation	1 day	5/02/08	5/02/08

Teams:

Electric Team
Vesna Pesik
Matthew Anderson
Sebin Lee
Jason Howard

Mechanical Team
Stephen Flicek
Zachary Capps
Aseem Pandey
Michael Hatch
Patrick Bauer