

ILLINOIS INSTITUTE OF TECHNOLOGY

**MIDTERM PROGRESS REPORT
IPRO 349**

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Exploring possibilities of solid bio-fuels

IPRO 349 Mid-Term Progress Report

1.0 Revised Objectives

The objectives for IPRO 349 have not changed throughout the course of the semester. The current objects are still to:

- Examine the logistics for the collection of corn waste stover within the state of Illinois.
- Conceptualize the technology that would be required in the form of a process flow sheet and equipment considerations.
- Deliver a final report that evaluates the overall energy and economic potentials of such an approach.

Specifically, progress has been made on the first and second objects. However, as the collection and compilation of data is a continuous process, the majority of remaining time will be further directed towards these goals. After all data has been collected and analyzed, the third objective will be addressed.

2.0 Results to Date

Currently, a large amount of data has been collected. The primary goal of the initial stage of research was to develop a complete and thorough understanding of the process from start to finish. Collection, storage, transportation, compaction and cogeneration were identified as the key steps for consideration. Additionally, turbines, emissions, EPA laws and renewable fuels made of other starting materials were also identified as important topics of research. All data was gathered either from government or scientific resource, or by contacting university and industry sources.

The initial research phase was focused on understanding all available options relating to these key steps and topics. Taking ‘stover collection’ as an example, it was found that there are several different methods and options available (i.e. single pass vs. multi-pass, round vs. square baling, etc...). All options were researched for logistical and cost considerations. This data was then critically analyzed to arrive at a decision as to which options would be best to pursue. In some cases, decisions could be easily made considering only preliminary data relating to the logistics or feasibility of the options. In other cases, an obvious answer was not apparent, and more detailed research was necessary before a conclusion could be drawn. A running flow diagram of the process was created and modified as the data was gathered and compiled. This initial chart presents all the available options from start to finish of the process. Eventually, as different options are further pursued or discarded, the final, overall process will emerge.

Currently, research is focused on equipment considerations both for the continuous process and as capital for a cogeneration plant. Several companies have been contacted in an effort to obtain information on buying equipment on a commercial scale. Once all this information comes in, the final process flow can be decided upon. At that point, a final report detailing all logistical, cost and energy considerations can be compiled. This information will be compared to current methodologies for energy from bio-fuels, including wood charcoals and ethanol. This

comparison will elucidate whether or not corn stover as a solid fuel is a viable alternative to current options.

Methods for collecting and sharing information as outlined in the project plan have gone according to schedule. Generally, team members are assigned tasks by the team leader and are then responsible for completing the tasks outside of class time. The following class period is subsequently utilized to share information and add to the process flow diagram. Both the research and administrative teams undertake a similar process for task distribution and completion. The results to date for each individual member are listed below.

Research Team:

The Research Team researches charcoal, farm equipment, turbines, Emissions, Transportation, Filtering, Collection,

Anna Dlugosz – Architectural Engineer

- *Research points on Emission standards of bio-fuel production.*
- *Located several air cleaning companies*

Anna Vassi – Chemical Engineering

- Research on filtering, cleaning bio-fuel production, and emissions.

Jonathon Mikesell – Computer Engineering (Team Leader)

- Researching stover collection and the energy output of wood charcoal
- Researching multiple research papers on stover collection and stover information
- Process Midterm Report

Joseph Heffernan – Bio-medical Engineering

- Calling transportation organizations and establish pricing for different types of bunching.

Josh James – Bio-Medical Engineering

- Collaborating with local farmers on problems may encounter during corn processing.

Xin Yi Yeap - Biology

- Call companies and verify pricing on turbines and efficiency ratings.

Ying Bing Yap – Electrical Engineering

- Call companies and verify pricing on turbines and efficiency ratings.
- Compare cogeneration system with other system
- Find relevant information about cogeneration system
- Do research on the process and equipment for cogeneration system
- Do research on the cost of cogeneration system

Administration Team:

Collaborate with Research Team and use research data to process a midterm report

Serena Chacko – Bio-Medical Engineering

- Responsible for all final deliverables
- Midterm Report
- Ethics Report
- Project Plan
- Team Building Outing

Ryan Ruidera - Mechanical / Aerospace Engineer

- Midterm Report

- Flowchart management
- Terrance Stanfield – Computer Engineering
- Midterm Report, Ethics
 - Research on background information
 - Supplemental research
 - Gantt Chart
 - Poster Graphics
 - Talking with an Italian Turbine manufacturer for their product line costs

3.0 Revised Task/Event Schedule

	Task Name	Duration	Start	Finish
1	- Research	24 days	Wed 1/23/08	Mon 2/25/08
2	Transportation	24 days	Wed 1/23/08	Mon 2/25/08
3	Compaction	24 days	Wed 1/23/08	Mon 2/25/08
4	Legality	24 days	Wed 1/23/08	Mon 2/25/08
5	Pollution	24 days	Wed 1/23/08	Mon 2/25/08
6	Collection	24 days	Wed 1/23/08	Mon 2/25/08
7	Charcoal	24 days	Wed 1/23/08	Mon 2/25/08
8	Turbines	24 days	Wed 1/23/08	Mon 2/25/08
9	- Process	41 days	Mon 2/11/08	Mon 4/7/08
10	Develop a Flow Diagram	41 days	Mon 2/11/08	Mon 4/7/08
11	Determine a Process	5 days	Tue 2/26/08	Mon 3/3/08
12	- Refine Research for specific process	24 days	Tue 3/4/08	Fri 4/4/08
13	Transportation	24 days	Tue 3/4/08	Fri 4/4/08
14	Compaction	24 days	Tue 3/4/08	Fri 4/4/08
15	Legality	24 days	Tue 3/4/08	Fri 4/4/08
16	Pollution	24 days	Tue 3/4/08	Fri 4/4/08
17	Collection	24 days	Tue 3/4/08	Fri 4/4/08
18	Charcoal	24 days	Tue 3/4/08	Fri 4/4/08
19	Turbines	24 days	Tue 3/4/08	Fri 4/4/08
20	Equipment	24 days	Tue 3/4/08	Fri 4/4/08
21	- Administration	60 days	Mon 2/11/08	Fri 5/2/08
22	Project Plan	10 days	Mon 2/11/08	Fri 2/22/08
23	Code of Ethics	10 days	Mon 2/25/08	Fri 3/7/08
24	Midterm Presentation	6 days	Mon 3/3/08	Mon 3/10/08
25	Midterm Report	8 days	Wed 3/5/08	Fri 3/14/08
26	Final Report	35 days	Mon 3/17/08	Fri 5/2/08
27	Final Presentation	15 days	Tue 4/8/08	Mon 4/28/08
28	Poster	45 days	Mon 2/25/08	Fri 4/25/08
29	IPRO Day Preparations	15 days	Mon 4/14/08	Fri 5/2/08
30	iKnow Upload	0 days	Fri 5/2/08	Fri 5/2/08
31	IPRO Day	0 days	Fri 5/2/08	Fri 5/2/08

Fig 1 IPRO 349 Bio-Fuels Task Schedule

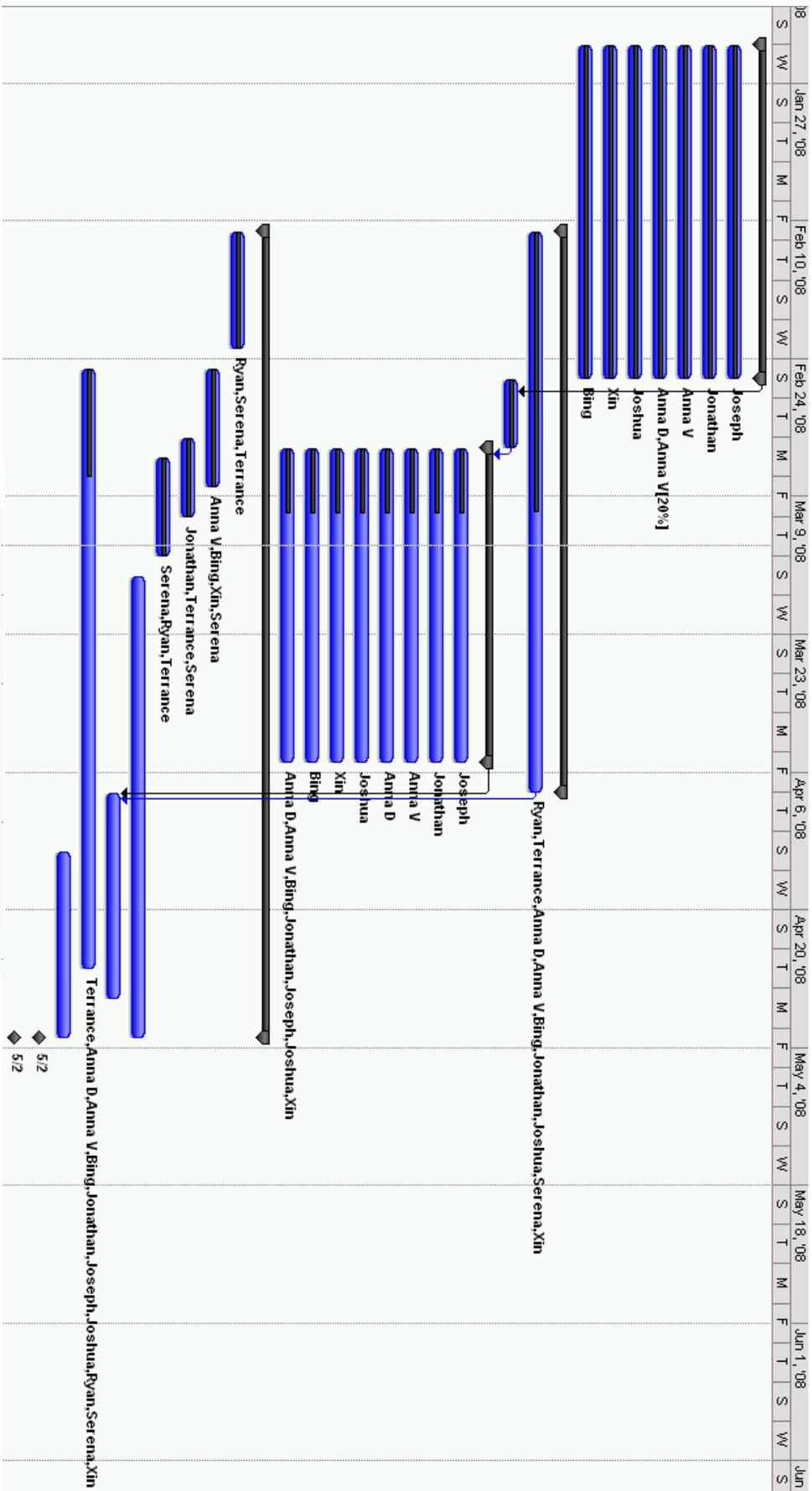


Fig 2. IPRO 349 Bio-Fuels Visualization of Schedule

4.0 Changes in Task Assignments and Designation of Roles and Team Organization

In general, the methodology for task designation and completion has gone according to plan. Therefore, the processes discussed on the original project plan will be continued for the remainder of the semester. The team will continue to function as separate research and administrative subteams. In general, each team member is assigned individual tasks by his or her team leader throughout the semester. Classroom hours are a time for the teams to interact and update one another on progress and goals. Class time is also spent discussing findings and decisions that may affect the project. As most of the preliminary research has been done, the aim of the project is now to narrow all available options to the most viable and efficient ones for the process. Once this is done, the proposed process will be analyzed in detail for all logistical and economic considerations.

Originally, the overall research was subdivided into smaller categories, which have proven to be a good basis. These categories were decided upon as being the main considerations for cost and logistics for the process. The team member assigned to each category is still expected to cover it thoroughly and in-depth. The subcategories include, collection, bunching, storage, transportation, compaction, cogeneration, energy and emissions. At that point, team members are resuming their original research with a focus on the specific areas deemed most important to the project by the team. It is still assumed that team members will dedicate as much time to their research as is necessary to retrieve the relevant information. This number continues to be between 5-8 hrs./week, depending on the topic and methods of the week. The administrative team will continue to operate in a similar manner with a focus on deliverables and compliance to the IPRO program. Below is a breakdown of the current team and member roles.

- Administrative Team: Produce the standard documents required by IPRO office while organizing the Research Team's focus toward a final report.
 - Team Leader: Serena Chacko – Directing the team during deliberations to focus the ideas on the deliverables and final report.
 - Terrance Stanfield – Using Microsoft Project to determine critical point in project and estimation of completion of tasks and report writing.
 - Ryan Ruidera – Dictating the minutes of the group meetings and organizing critical information on the iGroups website.
- Research Team: Gather essential data to determine whether corn waste could be processed in the state of Illinois for use as solid fuel.
 - Team Leader: Jonathan Mikesell – Assigning topics for members to research while researching as well.
 - Anna Dlugosz – Research filtering / cleaning during production
 - Anna Vassi - Research on emission laws.
 - Joseph Hefferman – Research on transportation.

- Joshua James – Research on collection.
 - Ying Bing Yap – Research on turbines.
 - Xin Yi Yeap – Research on charcoal.
- Flow Chart Sub-Team: Make a flow chart for the whole team to understand the process of the life of corn waste during the production process
 - Team Leader: Ryan Riudera – Organizing the flow chart using Microsoft software for the Business Team’s reports/website.
 - All members of IPRO organize the data to create the flow chart.

The leader of the flow chart sub-team has been changed to Ryan Ruidera, due to his familiarity with software to organize and present the material.

5.0 Barriers and Obstacles

In general, the team has been working and cooperating as expected. The only real difficulties encountered have been related to the retrieval of information. Specifically, information on the commercial use of equipment has been difficult to gather. It seems this is because companies do not want to release cost information unless it is to serious buyers. The fact that we must ethically present ourselves as college students seeking information only for research purposes, presents a dilemma as to what sort of information is available to us. The approach most students have been taking is to explain our purposes in a written email, then following up with a phone call. On a similar note, all contact with other universities conducting research of interest to our team has also been met with a certain sense of resistance. Specifically, researches do not want to release their data. Again, the approach has been to clearly state our purposes and the fact that no specific data will be released, only used in as past of our considerations.