

Session 25, 5/15/07

Final Student Presentations (Powerpoint Shows) – following completion of project proposals, continued from last class

### **(3) Biogas Nicaragua by Chris Tostado and Xavier Gonzalez**

- The Need: Energy for the poor rural farmers in Nicaragua
  - The majority of the population is poor rural farmers
  - 50% of the population is below the poverty line
  - Nicaragua is the 3<sup>rd</sup> poorest nation in the Western hemisphere
  - Most Nicaraguans currently use firewood for fuel
    - This creates indoor air pollution
    - It requires hours and hours spent collecting the firewood
- A Viable Solution: Biomass Alternative Energy
  - What is biomass?
    - Any form of organic material that has stored chemical energy
  - What is biomass alternative energy technology?
    - The use of biomass for renewable, sustainable energy generation
  - Biogas digesters take advantage of naturally occurring processes as biomass is broken down by bacteria
- Disadvantages of Single Phase Biogas Digesters
  - Batch process
  - Limited in its applications
  - Various chemical reactions with bacteria take place in same environment without specialization (impeding maximum productivity)
  - High start-up times and retention times
- Multiphase Biogas Digester
  - Aspects of our design:
    - Tri-phase, pH controlled continuous bioprocess applied to a developing country's energy challenges
    - Gravitational material flow design in biogas digester facilitates autonomous process dynamics
    - New approach advocating an integrated rural house plan synergistic with biogas technology
  - Advantages:
    - Continuous process at steady state
    - More applications
    - Lower start-up and retention times

- More methane per volume of manure
  - Greater benefit to cost ratio
  - Interchangeable parts make it more modular
- Integrating energy system with local housing infrastructure
  - We want people to think about the design of their housing so that it can be more synergistic with biogas technology
- Our prototype biogas digester
- Potential project phases (We have a 5-10 year plan. This summer we will be primarily focused on phase 1 and setting up for phase 2.)
  - Phase 1: building and testing full scale prototype
  - Phase 2: Symposium and exhibition with model kitchen
  - Phase 3: Dissemination to surrounding regions
  - Phase 4: Company for manufacturing of modular biogas kit and replacement parts
- Summer 2007 Goals
  - Completion of Phase 1 and setting up of Phase 2
    - Make contact and schedule with team members from UNA
    - Choose site (on reserve), plan, design, acquire local building materials, and build a full-scale biogas digester prototype. Troubleshoot design and building problems, and test digester.
    - Design and build small model Nicaraguan kitchen to test the connectivity of the digester and the convenience and compatibility of local rural farmers.
    - Document (with video) everything we do and keep a detailed lab manual for future research and installations
    - Make a strategic short term 2 year plan with our community partners for continuation of project.
- Target community and partners
  - We'll be staying on the coast
  - Rancho Guadalupe
  - The grad student we're working with will be in Managua this summer
- Pictures of the area

**(4) DataHealth Pakistan: Disease Mapping in Lahore Pakistan by Ali Alhassani and Ibrahim Kanan**

- Motivation
  - Desire to apply statistics knowledge to serve those in need
  - Simple Techniques can be used to prevent many needless morbidities and mortalities
  - Desire to bring healthcare services to the underserved
- Why Lahore, Pakistan?
  - Over 250,000 deaths due to diarrhea

- Over 300,000 deaths due to diseases such as TB, measles, whooping cough, and pneumonia
  - Health expenditure per capita was \$15 in 1999 and \$13 in 2003
  - National Health Management Information Systems (NHMIS)
- Project Overview: Innovative Data Tracking
  - Uses data from public hospitals and cross references it with socioeconomic information
  - Constructs maps that identify highly vulnerable communities
  - Targets vulnerable communities for improved healthcare
- Phase I: Data Interface
- Phase II: Data Analysis
- Phase III: Reporting findings to guide community-based efforts
- Budget
- Community Partners and Future Outlook
  - Advisory board:
    - John Guttag
    - Jonathan Rosen, MD
    - Susan Murcott
  - Lahore Hospital Partners:
    - Shalimar Hospital
    - Gulab Devi Hospital
  - \$5000 in capital raised so far
  - Two team members traveling to Lahore this summer
  - Data collection to begin...

#### **(5) Vac-Cast Prosthetics by Tess Veuthey**

- Team members
- Project summary
- Problem
  - There are more than 10 million amputees worldwide, and most of them are living below the poverty line
- Community Partner: Jaipur Foot
- Current Technology: Plaster of Paris
  - Wasteful, takes 3-5 hours per socket
- Current technology: Vacuum sand casting
  - Far more efficient, but not portable
- Our solution: portable human powered vacuum sand casting
  - This could create a 5-fold increase in patient throughput
- We won an IDEAS grant to put our project into use.
- We're thinking of expanding our program at MIT and creating a seminar class in rehabilitation here

#### **(6) New Dots by Angela Kirby (project presentation not recorded in these notes)**

#### **(7) EVCO-Heating Schools in Lesotho by Tamira Gunzberg (project presentation not recorded)**