Stuff We Haven't Covered

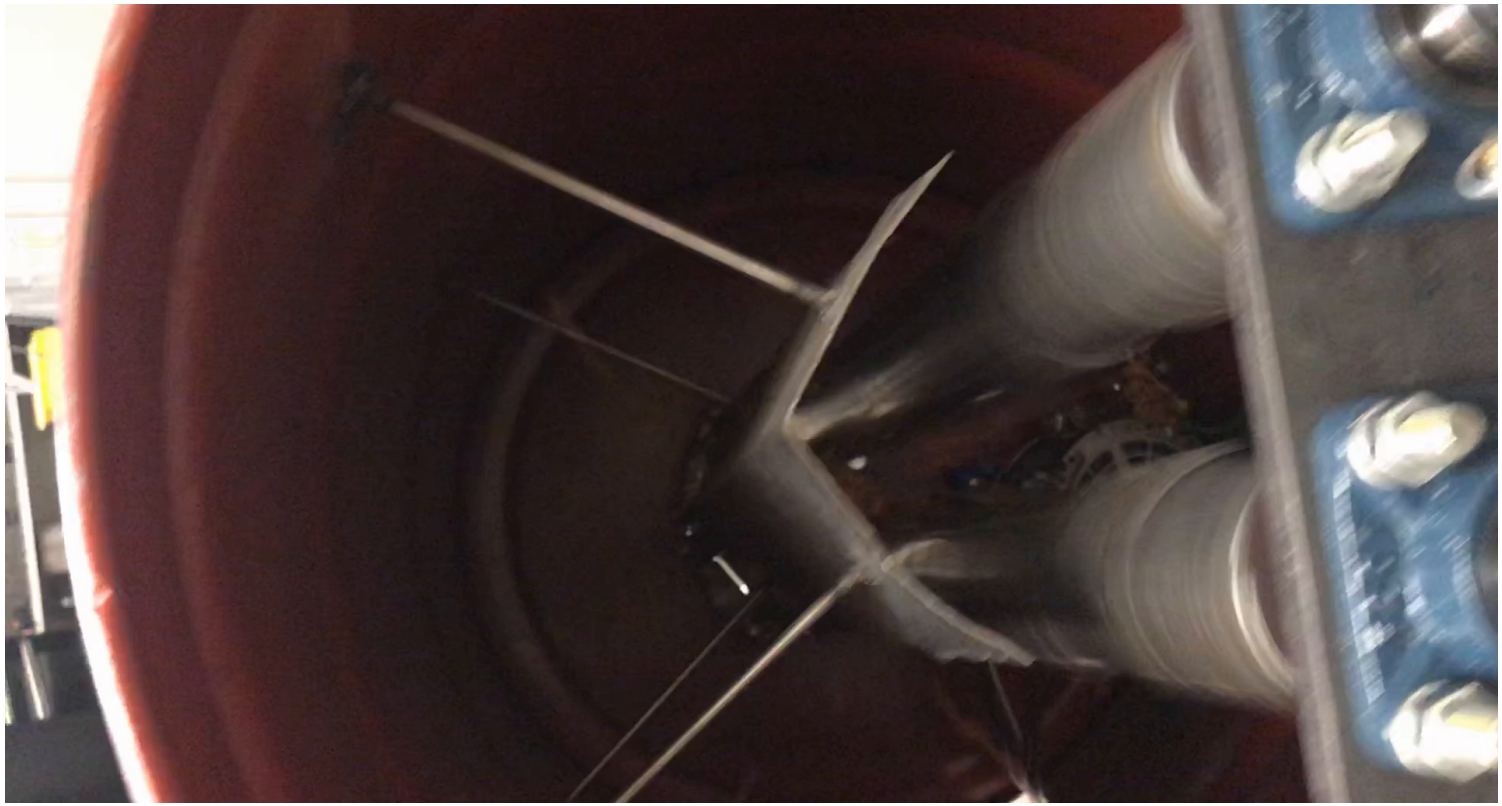
- Productions Systems
  - Toyota Production System vs. traditional Ford system
  - Buzzwords: lean, 5S, etc
- Higher levels
  - HMI
  - Supply chain management

Design for the other 90%

- 90% of today's designers work for the richest 10% of world's customers
- We need things like:
  - $2 eyeglasses
  - $3 drip irrigation systems
  - $5 household water filter
  - $10 solar lantern
  - $100 house with real market value

Allan Sierra and Gurkarn Gill

Sierra and Gill Corn Sheller



Liter of Light

- families in shanty towns can't afford electricity, live in the dark.
- Liter of Light project trains entrepreneurs to install bottle lights filled with water and bleach
- 28,000 homes in Manila now lighted
- over 20 countries now implementing.

Baylor University

- Converting Coconuts into Value-Added Products in Developing Countries
- “Coco-nuts” Team:
  - Graduate student - team leader
  - One each of sophomore, junior, senior engineering students
  - faculty sponsor

Baylor “Coco-nuts”

- Analyzed coconuts
  - young coconuts (9mo)
    - 65 calories
    - superior to Gatorade
  - mature coconuts (12mo)
    - husk - 35%
      - fiber, pith
    - shell - 12%
    - copra - 28%
      - oil - 9%
      - meal - 5%
      - water - 14%
    - milk - 5%

Baylor “Coco-nuts”

- coconut milk
  - 5% of total mass
  - 127 calories
  - 12 g fat
- copra
  - 28% of total mass
  - 14% water, 9% oil, 5% meal
  - mechanical expeller for oil

Baylor “Coco-nuts”

- Coconut oil converted to diesel fuel
  - modify coconut oil to run in std engines
    - needs 16% methanol, small amt of lye
    - $0.69/gal + coconut oil
    - low emissions
    - first project in Papua New Guinea
  - or modify engines to run on pure coconut oil
    - preheat coconut oil to >80C to lower viscosity
    - best properties of 50 vegetable oils for diesel fuel

Baylor “Coco-nuts”

- Husk
  - 35% of total mass
  - 11% fiber, 24% pith
  - heat and pressure cures pith into hard resin binder
  - make fiber reinforced panels directly by hot pressing husks

Baylor “Coco-nuts”

- shell
  - 12% of total mass
  - specific gravity of 1.2 (doesn’t float)
  - 2x hardness of furniture hardwood
  - strength similar to low strength aluminum
  - useable as fibers in engineering polymers
  - useable as cooking fuel or for charcoal

Baylor “Coco-nuts”

- Coconut economics summary:
  - 100 coconuts wholesale prices
    - 3 gal of diesel fuel $ 9
    - 2 sheets of particle board $20
    - 19kg of coconut shell $20
    - 8kg of meal for animal feed $ 2
    - cost of production -$6
    - cost of processing -$8
  - profit is $0.37/coconut
  - village could produce 500 coconuts/day (1250 trees) for $55K / year profit
  - capital costs of $90K

The PlayPump

http://www.youtube.com/watch?v=qjgcHOWcWGE

Manufacturing for the other 90%


MST
Heavy Duty
Super Power

Worldbike.org

Worldbike.org

Worldbike.org

Worldbike.org

Yuba Utility Bicycle


yubaride.com

So how to bridge the divide?

- Manufacturing is the basis of most economic activity
- Economic activity is essential to 100% of the world's population – spread it out!
- An exponentially increasing world population needs exponentially increasing productivity
- Automation is the only way to achieve the efficiencies needed to provide energy, food, goods, and services for the world population
- Use people when appropriate and robots when appropriate
- Watch for unintended consequencies
  - displaced local farmers or workers
  - environmental degradation
  - resource depletion
  - defacto subsidies for uneconomical processes