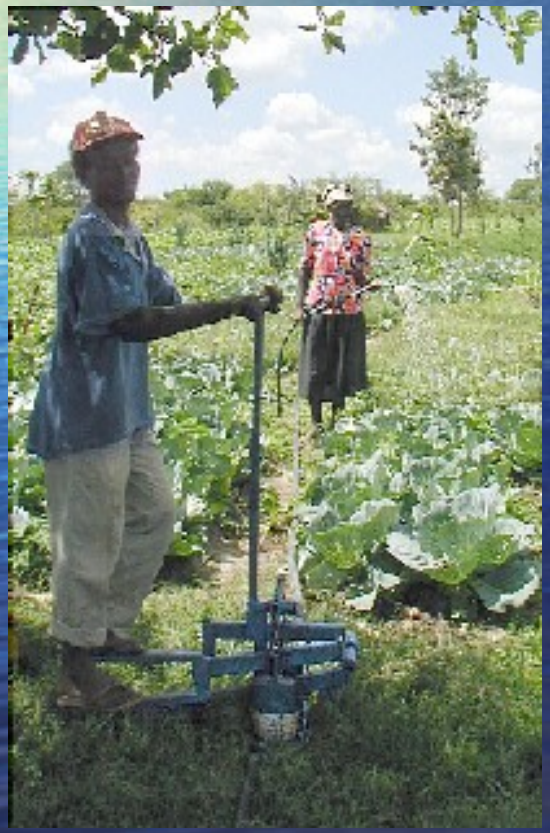
Sketch Model Review

Purple B



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Need Statements

A low-cost, practical irrigation system to facilitate the growth of agriculture.

An inexpensive power source for rural farmers.

Product Concepts

- Water pump
  - Draws water up from well
  - Pressurizes water for irrigation
- Bicycle Power Source
  - Power transmission from bicycle to gear train
  - Potential for modular attachments
  - Fly wheel stores energy

Competition

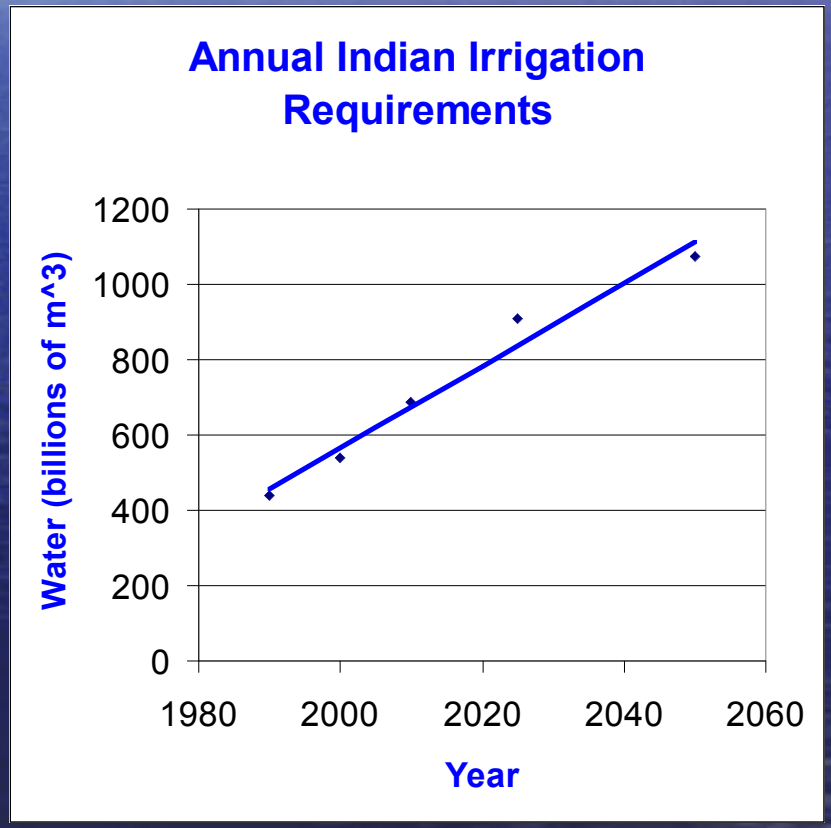
- Variety of pumps already exist
  - Hand pumps
  - Foot pumps
- ApproTEC – MoneyMaker foot pump
  - Markets to East African nations
  - 38,000 pumps sold
- No bicycle-powered pumps marketed to developing country farmers

Customer Data - India

- Population – 1.09B people
  - ~110M agricultural workers
  - ~100M bicycles
- Economic Impact
  - GDP per capita = $3100
  - agriculture accounts for 22% of GDP
  - 58% of population depends on agriculture for livelihood
- Weather
  - Reduces risks from droughts and monsoon flooding
- Political
  - Indian PM recently stressed need to improve irrigation (September 27, 2005 - news.yahoo.com)

Market Growth

- Growing demand for irrigation in India
- As of 2000, only 43% of food-grain growing land was fully irrigated
- India is only one case study – many others countries could benefit.



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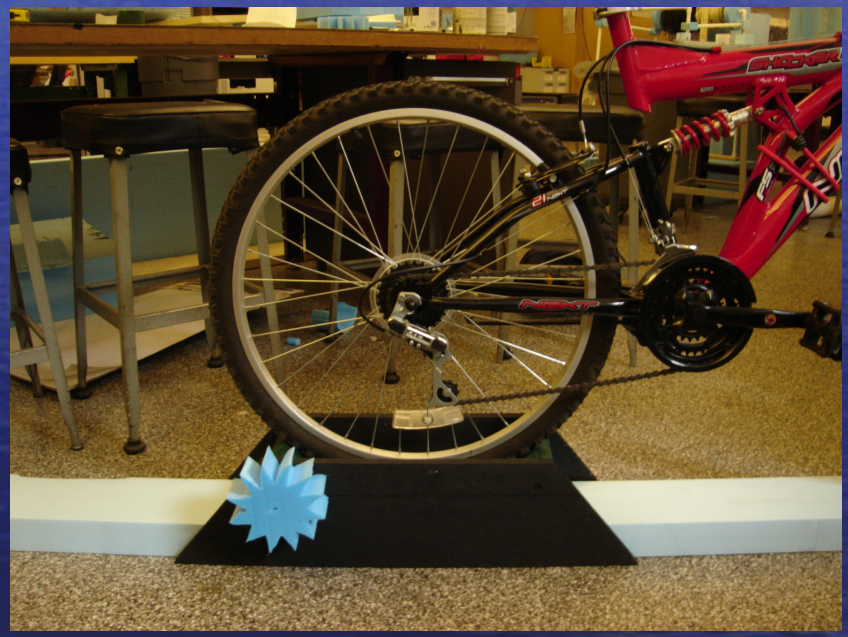
Critical Module #2: Bicycle Power Transmission

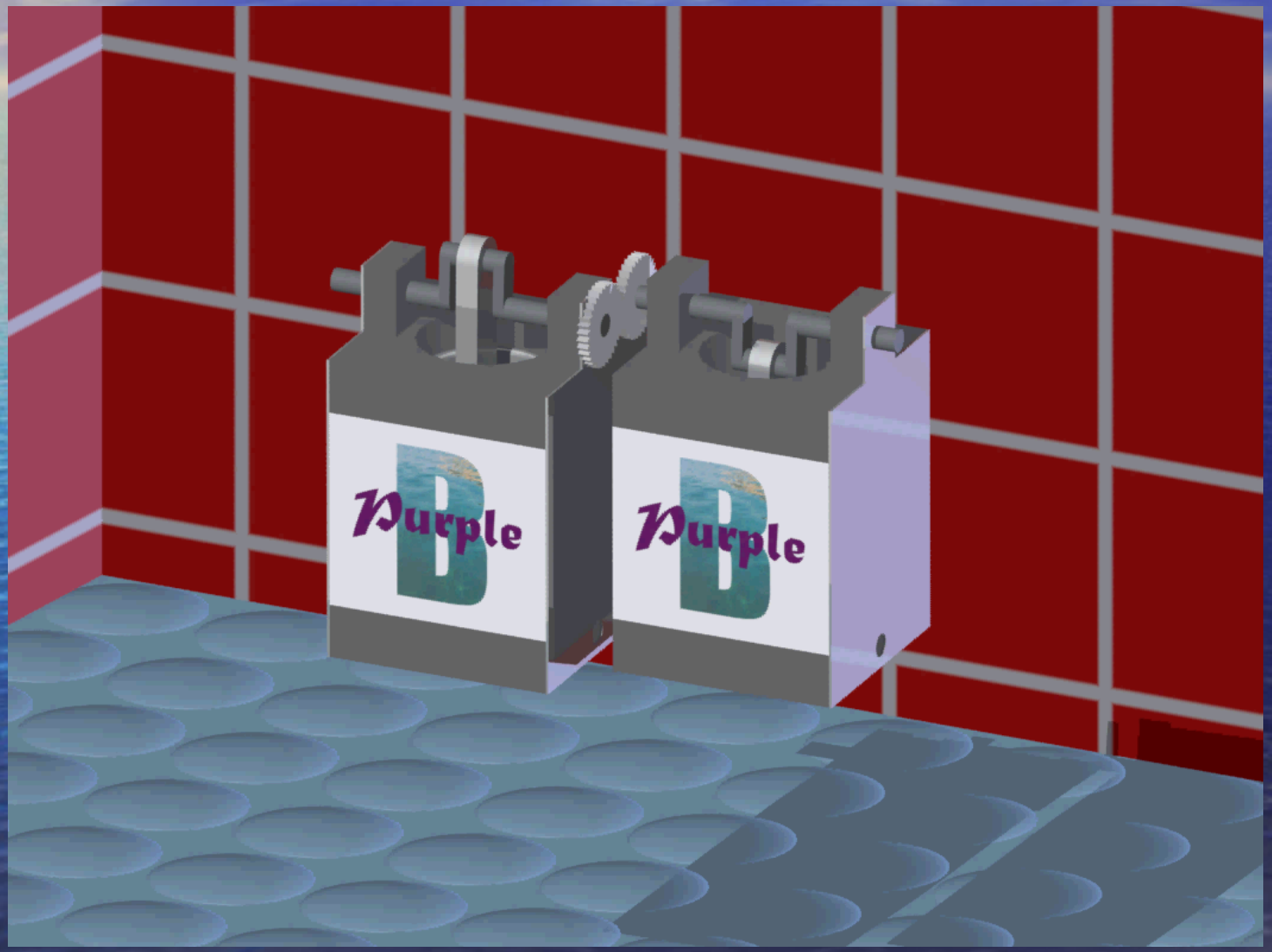
- FEATURES
  - Fits most any bicycle
  - Gear train transmits energy to modular attachments
  - Weighted flywheel increases system momentum and stores energy
- WHAT WE LEARNED
  - Stability is an issue
  - Power transmission system?
  - Adjustability



Future Work

- Pump
  - Explore other pump styles
- Wheel/Power Train Interface
  - Connection between rear wheel and gears train
  - Flywheel
- Bicycle Stand
  - stability

Questions?



Factoids

- 150W → 12gallons/min @ 60ft head
  - Assume 75% Efficiency 9 gallons/min
  - Need 200 Strokes w/ Piston Diameter 2.5”
  - Pedal Ratio 4:1 → 50RPM
- 316N to pull 10m
  - Piston Lever/Crank Lever Ratio = 10:1
  - Piston/Pedal Gear Ratio = 4:1
  - Need 123N at Pedal
- Force=123N, Distance = .5m
  - W=50J/s
  - 2 Pedals

→ 100W Needed