IPRO 321
Introduction to Zymurgy

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Problem Statement

- Zymurgy, or beer brewing, is a multi-billion dollar industry, making it a significant part of the American economy.

- Design a process for small-scale production (10-15 gallons).

- Understand regulations and marketing of beer.
Beer...in IPRO?

- One of the oldest chemical processes known to man
- Allows for a variety of design solutions
- Sanitation is crucial, quality control
- Marketing is key
- Viability
Objectives

- Design brew process
- Assure quality
- Economic analysis of brewing
- Market beer to IIT staff/students
- Samples for IIT staff
Development and Performance

- Team Logistics and Communication
- Tasks, timeline and goals
- In-class updates
- Adapted to change
  - Fermentor explosion
  - Equipment purchasing delays
  - Bad batch of beer
Team Organization - Funky Brewsters

Brew

Business ↔ Engineering
Team Organization - Know-IIT-Ales

Brewing

Marketing

Quality Control
Team Organization - Blood, Sweat, and Beers

Recipe

Acquisitions
Project Work – Funky Brewsters

- Brewing
  - 3 blond ale batches and 1 IPA batch
  - Sugar content analyzed

- Engineering
  - HYSYS model
  - Heat Exchange
  - Cost Analysis

- Marketing
  - Surveys
  - Logo
  - Business Plan
Project Work – Know-IIT-Ales

- 3 Batches of Altbier
- Applied concepts learned in class.
- Fit kinetic model to experimental data
- Determine cooling efficiency of heat exchanger

Cumulative Net Profit

<table>
<thead>
<tr>
<th>Profit (Thousands of Dollars)</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
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Project Work – Blood, Sweat, and Beers

- Brewing
  - 3 batches of Bavarian Weissen
- Engineering
  - Monitored/modelled reaction kinetics
- Marketing
  - Determined feasibility of on-campus microbrewery
Cost Analysis

Top Selling Beers - The BOG, March 2011

Units Sold

<table>
<thead>
<tr>
<th>Beer Type</th>
<th>Units Sold</th>
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<tbody>
<tr>
<td>Budweiser - Pitcher ($5.50)</td>
<td>207</td>
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<tr>
<td>Stella Artois - Pitcher ($9.00)</td>
<td>56</td>
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<tr>
<td>312 - Pitcher ($7.50)</td>
<td>50</td>
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<tr>
<td>Budweiser - Draft ($2.50)</td>
<td>59</td>
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<tr>
<td>Heineken - Bottle ($4.00)</td>
<td>44</td>
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<tr>
<td>312 - Draft ($4.00)</td>
<td>40</td>
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Total Cost

$1214.20

Relevant Costs

- Reusable Equipment Cost (Capital Investment): $737.50
- Operation Cost Not Including Labor (Ingredients, Non-reusable material): $229.20 / 15 gal
- Estimated Labor Cost ($8.25/hr – 2 people – 15 hrs/ea.): $247.50
Conclusions

- Better quality product made by students
- Beers are competitive
  - BOG
  - Increased production
- Ethical considerations incorporated
- Hands on experience for students
Recommendations

- Smaller teams
- Earlier budget approval
- Advertisements
- Collaboration with IPRO 340
- Implement business plan
Acknowledgements

- Professor Ramani
- Chris Arges
- Professor Teymour
- Professor Abbasian
- Joe Luciani
- IPRO Office
Questions?

Please come taste the fruits of our labor from 3-4 pm!