A Comparison of Frankenbrew and Traditionally Manufactured Brewing Equipment

Dan King
Backstory

- **Fall 2015**
  - *Sustainable Brewing Major*
    - Learning a lot about brewing
    - Starting a brewery is expensive

- **Spring 2016**
  - *Paw Paw Brewing Co.*
    - Learning a lot more about brewing
      - *More than one way to do things*
    - “You should take a roadtrip”
    - Input cost of “a really nice car?”
Frankenbrew?

- 1995 video by Tom Hennessy of Colorado Boy Brewing
- Improvised equipment
  - Pros and Cons
- Lower initial investment?
- Sustainable?
- Not found in textbooks
- Becoming commonplace in small scale craft brewing
  - So why not more information?

https://www.facebook.com/frankensteinpub/photos/a.10150103148638849.314063.128486703848/10155061755623849/?type=1&theater
Brewing Process Overview
Brewing Process Overview

- Didn’t see as much Frankenbrew implementation in these steps
Mash Tun

Boil Kettle

https://science.howstuffworks.com/innovation/edible-innovations/beer2.htm
Grant

http://discussions.probrewer.com/attachment.php?attachmentid=31294&d=1457551518
Carbonation

Research Objectives

- Is there any statistical difference between Frankenbrew and traditional systems in:
  - Brewhouse Extract Efficiency?
  - Time required to brew a single batch of beer?
  - Cost of installation?

- What other factors influence the style of system a brewer installs?
Research

- Interviewed Michigan craft brewers about 12 systems
  - 5 Frankenbrew
  - 7 Commercially manufactured
  - Questionnaire

- Quantitative data on:
  - Brewhouse extract efficiency
  - Monetary investment
  - Time investment

- Brewers’ thoughts on:
  - Satisfaction
  - Pros and cons
  - Why they chose their system
Brewhouse Extract Efficiency

Frankenbrew Mean: 77%

Commercial Mean: 85%

<table>
<thead>
<tr>
<th>T Test</th>
<th>Efficiency</th>
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<tbody>
<tr>
<td>t-value</td>
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<td>95% Confidence Critical T = 2.228</td>
</tr>
<tr>
<td>90% Confidence Critical T = 1.812</td>
<td>Reject</td>
</tr>
<tr>
<td>80% Confidence Critical T = 1.372</td>
<td>Reject</td>
</tr>
<tr>
<td>50% Confidence Critical T = 0.700</td>
<td>Reject</td>
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</table>
Brewhouse Extract Efficiency

Scale also seems to have a positive effect
Time Invested per Batch

<table>
<thead>
<tr>
<th>T Test</th>
<th>Labor Hours/Batch</th>
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<tbody>
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<td>Frankenbrew =</td>
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<td>Commercial?</td>
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<tr>
<td>95% Confidence</td>
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<tr>
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</tbody>
</table>
Time Investment
Larger Systems Make More Wort Faster

Length of brew day remains the same, volume increases
Cost of Installation

<table>
<thead>
<tr>
<th>T Test</th>
<th>System Cost/bbl</th>
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<tbody>
<tr>
<td>t-value = 1.260180875</td>
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Frankenbrew = Commercial?

- **95% Confidence**
  - Critical T = 2.228
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- **80% Confidence**
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- **50% Confidence**
  - Critical T = 0.700
  - Reject

Educational System Outlier
Cost of Installation (Removed Outlier)

**T Test**

System Cost/bbl

t-value = 1.259429511

Frankenbrew = Commercial?

95% Confidence

Critical T = 2.228

Accept

90% Confidence

Critical T = 1.812

Accept

80% Confidence

Critical T = 1.372

Accept

50% Confidence

Critical T = 0.700

Reject
Cost of Installation

- Top Left Educational System Outlier
  - Custom-built, scaled-down macro
Cost of Installation (Removed Outlier)

- Top right using state-of-the-art brewing tech
- Bottom right using stripped down system
Implications

- Efficiency tends slightly higher on commercially manufactured systems
- Brewing time and cost of installation statistically the same
- Brewers have freedom of choice in regard to systems
Why Might Cost Be Similar?

- Nano-brewing
- Used equipment
- Small-scale specializing equipment manufacturers
- Generic equipment
Qualitative Information

- Brewers learn from brewers
- Unique systems make for interesting display
  - “We built this ourselves!”
- Forces brewers to learn hands-on brewing and troubleshooting
  - “This system allows brewers to learn from the ground up. If you’re learning how to drive, you’re not given the keys to a Lambo...this system make it so we have to pay attention to things that a button controls on other systems.” – Dan Chapin, Territorial Brewing
- Sometimes Frankenbrew is all you can afford
Qualitative Information

- “Used car” model
- Advantages: Cheap; Disadvantages: Cheap
- Safety concerns
- Success of system depends on operator
- May limit capacity
- May limit style
Frankenbrew Conclusions

- Cost of installation and processing time very similar to commercial
- Brewhouse extract efficiency significantly lower on average than traditional
- Results may be skewed by brewhouse capacity
- Frankenbrew equipment can be a viable option for starting a brewery
- Personal preference more important to most brewers
Special Thanks

- Wiltse’s Brew Pub
- One Well
- Griffin Claw
- Paw Paw Brewing Co.
- Final Gravity Brewing Company
- Territorial Brewing Co.
- Thornapple Brewing Co.
- Stiggs Brewery and Kitchen
- Arcadia Ales
- Kalamazoo Valley Community College
- Tom Hennessy
- Dr. Steven Bertman
- Dr. John Geiser
Questions?
References

