IPRO 321
Blood, Sweat, and Beers

Introduction

Zymurgy, the practice of fermentation in brewing, is a multi-billion dollar industry and profession that dates further back than even the beginning of America. It is a stable market that exists on a small scale, such as a microbrewery or on a larger level, such as a global corporation. The key to a successful business in this industry is a delicious product whose recipes can be designed through a scientific examination of the ingredients used and chemical processes that occur in fermentation.

Mission Statement

Our mission is to effectively work as a team of engineers and scientists to produce a high-quality beer that can enjoy and market our product on campus.

Business Plan

Blood, Sweat, and Beers Group provided preliminary analysis for continuing the project at IIT, but creating an economically viable brewery was outside of the scope of the current IPRO project.

The go-no-go has been laid for preliminary cost analysis. Cost of materials, labor, licenses, and applicable taxes are listed in Figure 1 to the right.

Brew Quality

Brews were made using the finest purified water to ensure consistent taste and brew. It was brewed in the halls of Illinois Institute of Technology to ensure the control love and attention it needed. Multiple batches were made, and test samples of the recipe were taken during fermentation to ensure the beer taste. Samples will be given to those others who love drinking beer and enjoy all to get feedback.

Safety

The main concerns when brewing beer is personal safety. Explosions from heated substances and pressure build-up are generally more associated with, but not limited to, industrial scale brewing. The possibility of explosion lies in the following conditions:

- Temperature excess
- Storage of dry grains
- Mixing or transport operations
- Anything that involves dry cereal or grains

Sanitation is necessary in brewing beer anywhere. There is a difference between cleaning and sanitizing: cleaning is the removal of dirt and grease, while sanitizing removes the unseen bacteria and other microorganisms. All brewing equipment was cleaned and sanitized prior to usage in this project.

Kinetics and Heat Transport

Kinetics

Glucose breaks down in a 10-step process called glycolysis when it enters the yeast. Two pyruvates, which are three-carbon sugars, and adenosine triphosphate (ATP) are the products of glycolysis. The yeast converts the pyruvates into carbon dioxide and ethanol, which is the source of alcohol in the desired beer.

Heat Transport

As the wort was chilled, the temperatures of the wort and outlet water stream were measured. Heat transfer analysis was performed and the results are in Figures 5 & 6 below.

With a more sophisticated analysis, the heat transfer coefficient could be estimated and used to scale the process or optimize utility usage or production time.

The Tipsy Professor: A Bavarian Weizen

Boil time: 60 min
Amount: 10 gal
5.00 lb Wheat Malt: Ger (2.5 SRM) - Orin
4.00 lb Extra Light Dry Extract (XLD) Extract
0.50 oz Tettnang [1.5% A] (60 min) - Hops
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1.00 oz Irish Moss (old 15.0 mm) - Additive
1.00 oz Honey (45 min boil) - Additive
0.50 oz Orange Peel (old 12.2 mm) - Additive
0.75 oz Orange Peel, Bitter (old 5.2 mm) - Additive
6.00 gal Water Water
0.05 lb Wyeast Wyeast (Wyeast Labs #3068) Yeast

Acknowledgments

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