

# Assessing the Water Use During the Brewing Process and Recommending ways to Improve the Economic and Environmental Performance

Bindu Chandrashekar, School of Chemical Engineering and Advanced Materials, Newcastle University, Newcastle upon Tyne, NE1 7RU

## Introduction

This project assesses the water and energy use during the brewing process where close monitoring of Stu brew is done in order to provide recommendations and improve the economic and environmental performance of microbreweries.

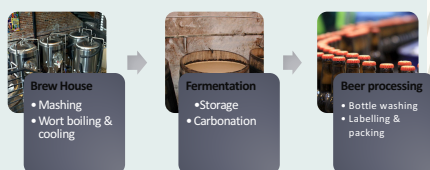


Figure 1 : General beer production process in a brewing industry.

Every step of a brewing process is energy intensive and produces waste. It is important to reduce the water and energy used in brewing process by quantifying the data obtained from Stu Brew and performing physicochemical tests for assessing the waste water quality.

## Methodology

Investigate the water and utility usage from breweries and compare them with Stu Brew

Study the various operations in Stu Brew and identify energy & water usage & waste disposal

Determine appropriate tests for wastewater analysis like BOD, COD & pH

Identify options for wastewater disposal and treatment

Analyze the results to determine the wastewater quality

Recommendations suitable to the research for progress

## Results & Discussion

| Year | Month     | Total energy usage | Single brew day + miscellaneous energy input | Double brew day energy input | Cleaning Energy input | Liters of beer brewed | Energy/L |
|------|-----------|--------------------|--|------------------------------|-----------------------|-----------------------|----------|
| 2015 | JUNE      | 207588             | 207588                                       | 0                            | 20967                 | 800                   | 259.485  |
| 2015 | JULY      | 4006               | 2462   | 0                            | 1544                  | 400                   | 10.015   |
| 2015 | AUGUST    | 153646             | 147625                                       | 0                            | 6021                  | 800                   | 192.0575 |
| 2015 | SEPTEMBER | 11988              | 8554   | 0                            | 3434                  | 1600                  | 7.4925   |
| 2015 | OCTOBER   | 9888               | 6714   | 0                            | 3174                  | 1600                  | 6.18     |
| 2015 | NOVEMBER  | 7984               | 7526   | 0                            | 458                   | 2000                  | 3.992    |
| 2015 | DECEMBER  | 72582              | 68091  | 0                            | 4491                  | 400                   | 181.455  |
| 2016 | JANUARY   | 136827             | 83160  | 0                            | 53667                 | 800                   | 171.0337 |
| 2016 | FEBRUARY  | 121044             | 112851                                       | 0                            | 81930                 | 800                   | 151.305  |
| 2016 | MARCH     | 230655             | 230655                                       | 0                            | 0                     | 800                   | 288.3187 |
| 2016 | APRIL     | 0                  | 0  | 0                            | 0                     | -                     | -        |
| 2016 | MAY       | 0                  | 0  | 0                            | 0                     | -                     | -        |
| 2016 | JUNE      | 4512               | 2734   | 1778                         | 0                     | 1600                  | 2.82     |

Table 1: Energy usage data obtained from the energy meter for various activities in Stu Brew, where most of the energy is used during the brewing and cleaning operations.

| Year | Month  | Water used in sinks for cleaning (L) | Water used in HLT for cleaning (L) | Liters of beer brewed | Total water used (L) | Specific water consumption |
|------|--------|--------------------------------------|------------------------------------|-----------------------|----------------------|----------------------------|
| 2015 | Jul-15 | 781                                  | 948                                | 400                   | 1729                 | 4.3                        |
| 2015 | Aug-15 | 3456                                 | 2619                               | 800                   | 6075                 | 7.6                        |
| 2015 | Sep-15 | 6001                                 | 5534                               | 1600                  | 11535                | 7.2                        |
| 2015 | Oct-15 | 4944                                 | 5204                               | 1600                  | 10148                | 6.3                        |
| 2015 | Nov-15 | 3992                                 | 5426                               | 2000                  | 9418                 | 4.7                        |
| 2015 | Dec-15 | 440                                  | 5                                  | 400                   | 445                  | 1.1                        |
| 2016 | Jan-16 | 1387                                 | 1484                               | 800                   | 2871                 | 3.6                        |
| 2016 | Feb-16 | 9427                                 | 1733                               | 800                   | 11160                | 13.9                       |
| 2016 | Mar-16 | 25146                                | 3795                               | 800                   | 28941                | 36.2                       |
| 2016 | Apr-16 | 2139                                 | 2369                               | -                     | 4508                 | -                          |
| 2016 | May-16 | 962                                  | 0                                  | -                     | 962                  | -                          |
| 2016 | Jun-16 | 2844                                 | 6506                               | 1600                  | 9350                 | 5.8                        |

Table 2: Amount of water used in sinks for cleaning, HLT for cleaning, liters of beer brewed, total water used, specific water consumption in Stu Brew from June 15- June 16

## Results & Discussion

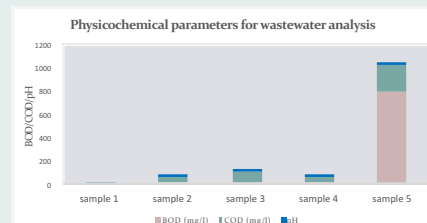


Figure 2: Graph showing the different physicochemical parameters such as, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) & pH for wastewater analysis

## Conclusion

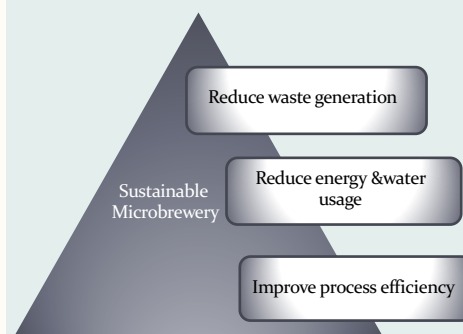


Figure 3: Requirements to achieve a sustainable microbrewery

- Majority of the problems are resolved through good management systems.
- Wastewater is assessed for achieving efficient treatment.
- Experimental data shows the cleaning water without yeast can be directly discharged into the water body.
- For better results it is important to separate the solid waste from the liquid waste, and to pretreat the liquid effluent.

## References

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