Production Scheduling:

For Brewpubs and Small Breweries

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Pinthouse Pizza Brewpub

Benefits of Production Scheduling

- Increased Beer Quality and Freshness
- Increased Breadth of Product Offering
  - More choices for your customers
- Inventory management
  - Raw materials – Less "excess" inventory
  - Sellable beer – Less brand redundancy
- Maximizes Equipment Capacity

Where to Begin…

- Know your equipment capacity
  - Know your available labor
- Know your average tank time
  - Know each beers average tank time
- Know the sales of each brand per week
- Know your inventory
  - Both beer and raw materials

Don't be afraid of technology… or dry erase markers!

Calculating Capacity

- Brewhouse Capacity
  - Batch Size (in bbls) – b
  - Brews per Day – B
  - Days per Week – D
  - Weeks per Year – 52

(((b*B)*D)*52)*.85 = Yearly Brewhouse Capacity

Calculating Capacity

- Brewhouse Capacity: Example 1
  - Batch Size (in bbls) – 7bbls
  - Brews per Day – 4 (assumes 6hr brew time)
  - Days per Week – 5
  - Weeks per Year – 52

(((7*4)*5)*52)*.85 = 6,188bbls

Calculating Capacity

- Brewhouse Capacity: Example 2
  - Batch Size (in bbls) – 7bbls
  - Brews per Day – 2 (assumes 6hr brew time)
  - Days per Week – 1
  - Weeks per Year – 52

(((7*2)*1)*52) = 728bbls

Calculating Capacity

- Cellar Capacity
  - FV size (in bbls) – b
  - Number of FVs – F
  - Average tank time – D
  - Days per Year – 365

(365/D)*(b*F) = Yearly Cellar Capacity

Calculating Capacity

- Cellar Capacity: Example 1
  - FV size (in bbls) – 14
  - Number of FVs – 4
  - Average tank time – 18
  - Days per Year – 365

(365/18)*(14*4) = 1,131bbls

Calculating Capacity

- Brewhouse
  - 7bbl brewhouse, 2 brews per week = 728bbls per year
  - 7bbl brewhouse, 20 brews per week = 6,188bbls per year
- Cellar
  - Four 14bbl FVs at 18 day tank turn = 1,131bbls per year

This illustrates how the Cellar dictates capacity in this scenario

Calculating Average Tank Time

- Plan your mix to assume an average tank time
  - Offset lagers with quicker beers if possible
- Find what is right for your tank time
  - DO NOT RUSH YOUR BEER!
    - Especially if you use a known Diacetyl producing yeast
- Diagram your yeast pitching schedule
  - Plan your pitches for at least 6 weeks so you know when you need to prop again.

Knowing Your Weekly Sales

- Track your weekly barrelage
  - POS
    - Use pint, pitcher, growler, to-go sales to find your barrelage
  - Visual count of kegs and server volume

Take current inventory every week on your beer and record it so you have records to compare week over week sales volume

Knowing Your Weekly Sales

If you have your current beer inventory for each brand and your weekly sales trends for each brand, then you can figure out, almost exactly, when you will need the next batch of that beer.

- Avoids styles backing up
- Allows you to “fit in” more new and exciting styles for your customers

Knowing Your Weekly Sales

Example:

Brand A – 7.5bbls in Server

Brand A trends at 2.5bbls per week

SO… you have 3 weeks of beer left in your server

If it takes 18days grain to glass then you have to brew that beer in 3 days…

Knowing Your Weekly Sales

Tips on forecasting:

- Add 2-3days on your average fermenter time
  - This is time spent in the server carbing/clarifying/etc.
- Know your current brand mix
- Know the impact of Seasonality on your brands
  - Look at past trends if you have them
- Know your raw material availability

Assumes the following sales rate

A – 2bbls per week (21 day beer)

B – .5bbls per week (15 day beer)

C – 4bbls per week (18day beer)

D – 1.5bbls per week (18day beer)

E – 1.5bbls per week (18day beer)

Assume 8bbl serving tank volumes

Style	Brew	FV #	Date	Trans	Ready	Runs out
A	1	1	9/1	9/22	9/24	10/22
B	2	2	9/2	9/17	9/19	1/9
C	3	3	9/3	9/21	9/23	10/7
C	4	4	9/4	9/22	9/24	10/8
D	5	2	9/18	10/6	10/8	11/14
E	6	3	9/23	10/11	10/13	11/19
A	7	1	9/23	10/14	10/16	11/22
C	8	4	9/23	10/11	10/13	10/27
D	9	2	10/7	10/25	10/27	12/3
E	10	1	10/15	11/2	11/4	12/11

Assumes the following sales rate

A – 2bbls per week (21 day beer)

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C – 4bbls per week (18day beer)

D – 1.5bbls per week (18day beer)

E – 1.5bbls per week (18day beer)

Assume 8bbl serving tank volumes

Major Problems:

- Brew #6, #7 and #8 are same day
- Brews #3 & #4 run out 11/5 so big overlap
- Overlaps:
  - Brand A – 6 days
  - Brand C – 23 days
  - Brand D – 18 days
  - Brand E – 15 days

Style	Brew	FV #	Date	Trans	Ready	Runs out
A	1	1	9/1	9/22	9/24	10/22
B	2	2	9/2	9/17	9/19	1/9
C	3	3	9/3	9/21	9/23	10/7
C	4	4	9/4	9/22	9/24	10/8
D	5	2	9/18	10/6	10/8	11/14
E	6	3	9/23	10/11	10/13	11/19
A	7	1	9/23	10/14	10/16	11/22
C	8	4	9/23	10/11	10/13	10/27
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Assumes the following sales rate

A – 2bbls per week (21 day beer)
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C – 4bbls per week (18day beer)
D – 1.5bbls per week (18day beer)
E – 1.5bbls per week (18day beer)

Assume 8bbl serving tank volumes

Updates:

- Brand A has to stay the same
- Brand C moves to Brew #10
- Brew single batch of Brand F. Doesn't matter when it runs out, not repeated
- No conflicting brew-days

Style	Brew	FV #	Date	Trans	Ready	Runs out
A	1	1	9/1	9/22	9/24	10/22
B	2	2	9/2	9/17	9/19	1/9
C	3	3	9/3	9/21	9/23	10/7
C	4	4	9/4	9/22	9/24	10/8
D	5	2	9/18	10/6	10/8	11/14
E	6	3	9/23	10/11	10/13	11/19
A	7	1	9/24	10/15	10/17	11/23
F	8	4	9/25	10/13	10/15	
C	9	2	10/7	10/25	10/27	12/3
C	10	1	10/16	11/6	11/8	12/15

Knowing Your Inventory

- Both beer and raw materials
- Have the next 5 brews worth of raw materials always on hand.
  - If trends start to change you can react
- Take raw material inventory weekly
  - Minimally account for depletions in your inventory spreadsheets

Creating Your Schedule

- Forecast 1 month with specific brands
- Forecast 2-3 months with general projections
  - Having current inventory makes malt and hop ordering quick and efficient
  - Allows for minimal excess inventory
  - Allows for timely seasonals and specialty brews
  - Excel, Whiteboards, calendars …or all of them

Additional Benefits

- Hop contract forecasting
  - Forecast your hop usage for multiple years out
    - Aids in writing your hop contacts
- Savings on shipping
  - Hops, malt and chemicals
- Early planning on seasonal and specialty brews

Cheers!

- Joe

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Brewhouse/Operations Efficiency – Small Breweries

Brian Royo
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No Label Brewing Co.

Overview

- Efficiency – (calculations)
- Current Setup at No Label Brewing Co.
- Issues – Brewhouse and Operational
- Solutions
  - How have we increased efficiency
- Handout
  - More in depth of brewhouse efficiency
    - We used to increase efficiency
  - Thanks to Van Havig of Rock Bottom Brewery.

Efficiency

- Brewhouse Efficiency – Measure of the amount of extract recovered in the wort compared to the amount of extract available in the malt.
  - It is a measure of how efficient your mashing and lautering procedures are but does not take into account the boil or anything thereafter.
- Operating Efficiency – Production over time

Calculating Brewhouse Efficiency

- Number of pounds of each malt used
- Coarse grind as is extract % for each malt
- Gravity of wort in degrees Plato (P)

  - must be at 20^0 C (68^0 F)

- Volume of Wort

  - must be at 20^0 C (68^0 F)

What is the Coarse Grind as is %?

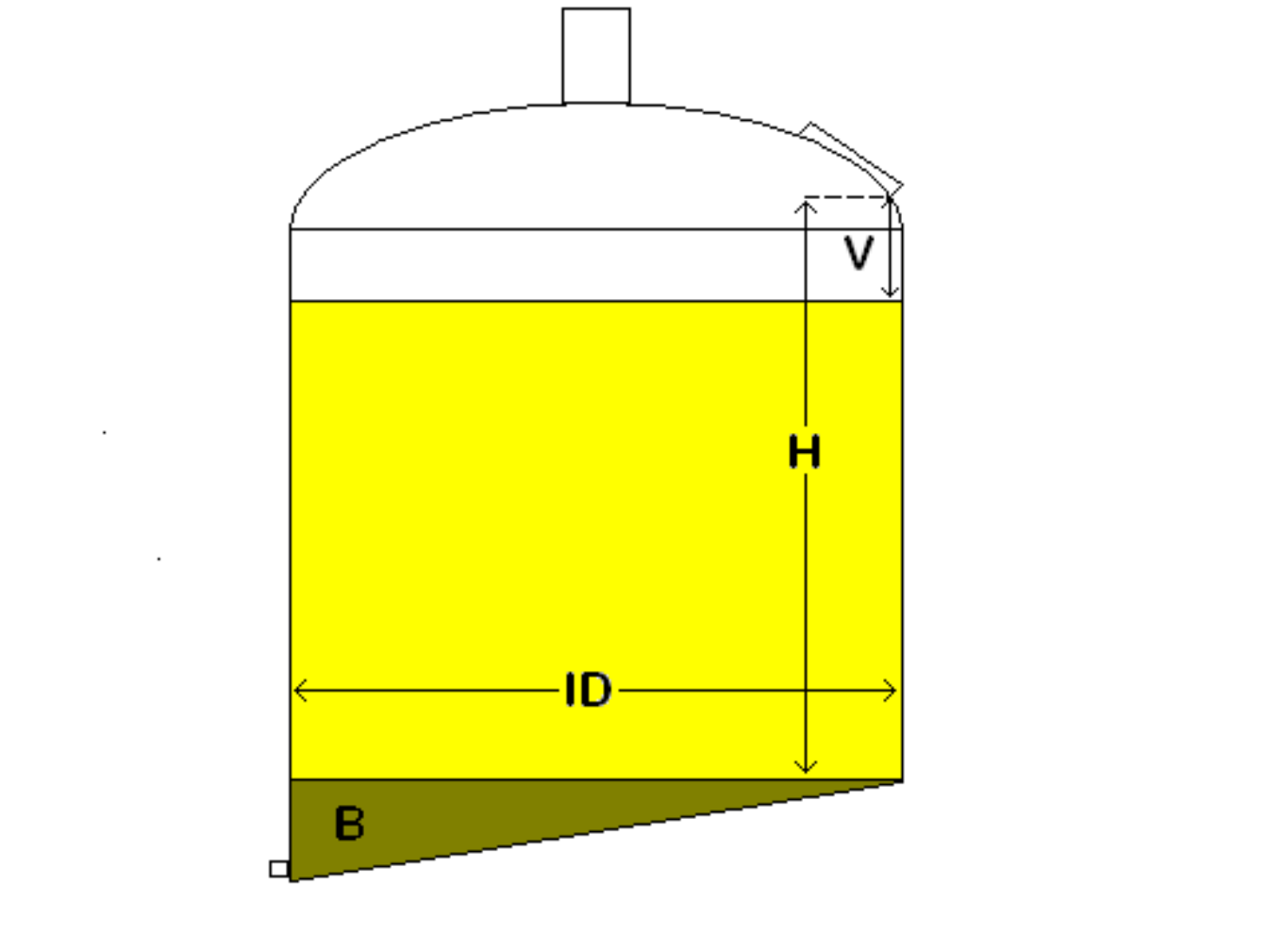
- Percentage by weight of extract obtained from the malt with a coarse grind in a laboratory mash
- Typically in the 75%-80% range for base malts
- Found on the malt analysis sheet available from your maltster

Accurately Determining the Volume of Wort

- Correct calculation is very important!
  - Interior diameter of kettle in inches (often in 3" increments from 48" up) (ID)
  - Volume of liquid in bottom "non-cylindrical" section of kettle in gallons(B)
  - Sidewall height in inches (H)
  - Volume measurement in inches from kettle man way (V)

Note: V is easiest to measure at end of boil, but the wort is at ≈ 100^0C

Wort Volume Calculation



Wort Volume Calculation

- Gallons per inch of sidewall

  $= \pi(ID/24)^2 * 7.48/12 = (GPI)$

- Volume of hot wort (at end of boil ≈ 100^0C)

  $= (((H-V)GPI) + B)/31$

- Volume of wort at 20^0C (W)

  = .96*volume of hot wort

  $W = .96*((((H-V)GPI) + B)/31)$

Calculating Brewhouse Efficiency

- Extract / BBL = ((259+P)*P)/100
- Total extract = (Extract / BBL)*W = (TE)

  i.e. 10 BBLs of hot 14 P wort

  = (((259+14)*14)/100)*10

  = ((273)*14)/10

  = 382.2

Calculating Brewhouse Efficiency

- Total potential extract (TPE)

  = ∑(#'s of each malt)(CG as is %)

  i.e. = (500#'s pale malt)(.78 CG as is) + (50#'s crystal malt)(.74 CG as is)

  = 390 + 37

  = 427

Calculating Brewhouse Efficiency

- Brewhouse Efficiency = TE/TPE

= $\frac{((259+P)*P)}{100*(\text{wort volume})}$

$\sum$(#'s of each malt)(CG as is %)

= 382.2/427

= 89.5%

No Label Brewing Setup

- 15bbl Single Infusion Direct Fire Brewhouse from Premier Stainless
  - 22bbl HL tank – total volume
  - 22bbl Kettle – total volume
  - Heat Exchanger and 1 pump
  - No Rakes – in the beginning
- Basic System
  - Not the most ideal for large production
  - No Rakes
  - **Not efficient…yet!**

No Label Brewing Setup

- Cellar
  - 3 - 60bbl FV
  - 2 - 30bbl FV
  - 2 - 15bbl FV
  - 1 - 60bbl BT
  - 1 - 30bbl BT
- Brew Multiple times to fill FV
  - Brews need to be fast and efficient
  - 1st Brew was 14hrs!!!
    - Advice…don't throw whole hops directly in the boil.

Issues

- **Brewhouse**
  - No Rakes
  - Incorrect volume calculations on kettle and HLT
    - Cant correctly calculate efficiency w/o correct columes
  - Stuck Mash
  - Low Efficiencies – 75-78%
  - Slow sparges
  - High gravities at end of sparge
  - Very Inconsistent
  - Lack of hot water for multiple brews
    - Extra time between brews
  - Lack of cold water for multiple brews
    - Summer ground water gets above 80F
    - Longer KO

Issues

- **Operations**
  - Lack of Money
  - Lack of water pressure
    - Couldn't do multiple things at once
  - Lack of Hoses
    - Started with 50’ of hoses
      - Transferring wort…couldn’t clean tanks.
  - No Floor Drains
      - We used 55 gallon drum with sump pump.
      - Pumped to a toilet drain.
  - Wasting Time and Money

Solutions - Brewhouse

- Stuck Mash/Low Efficiencies/Inconsistencies
  - Added rakes to mash tun
    - Rakes on during mash in. Drop plow after mash in for about 3 minutes. NO MORE STIRRING!
    - More consistency in mash bed
    - Didn't have to stir by hand
    - Helped with efficiency but not much
    - Didn't solve stuck mashes
  - Volume Calculations
    - If you don't have correct volumes all calculations will be off.
    - Physically measured inside of HL and kettle
    - Used calculations and remarked site tubes
    - Amazingly…calculations worked
    - Still had low efficiency

Solutions

- Stuck Mash/Low Efficiencies/Inconsistencies
  - Adjust Grain Mill
    - Number one thing that improved efficiency
    - Bought Sieves from McMaster Carr - $55 each sieve
      - No 14, 18, 60 and pan/lid
    - Refer to handout

Solutions

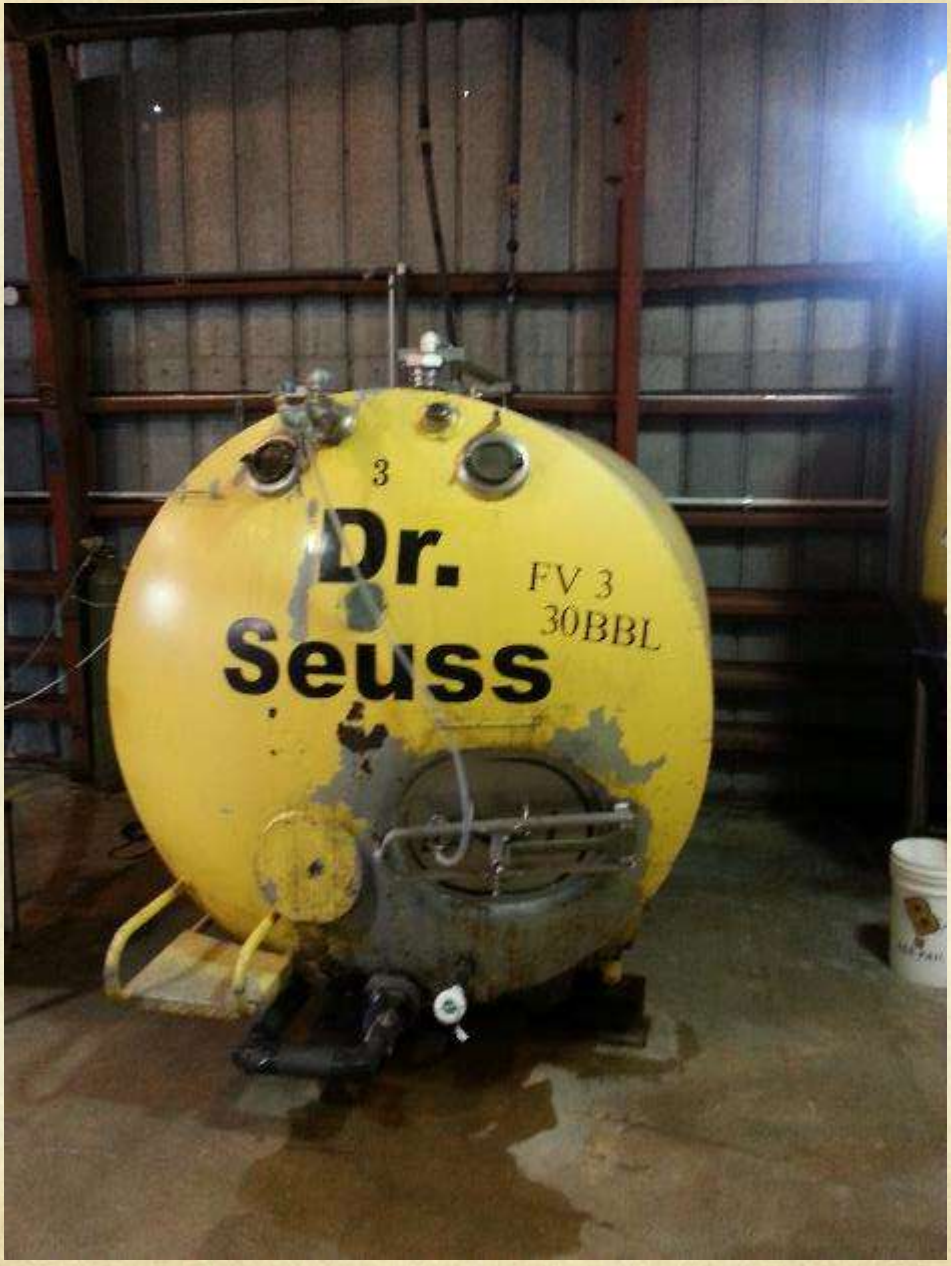
- Stuck Mash/Low Efficiencies/Inconsistencies
  - Adjust Grain Mill
    - Goal for us is to have about 70%-72% in No.14
      - Previous mill setting was ~60% in No.14
      - This changed our efficiency from 75-78% to 88%-90%
      - Solved our stuck mash problems
      - Loose mash bed
      - Faster sparge times
      - No Channeling
    - Easy and cheap way to increase efficiency
    - Check mill every month or when efficiency starts going down.

What does higher efficiency mean?

- More extract from grains
- Ultimately lower cost to make beer
  - Example: 16bbl batch Ridgeback Ale @12.25B
    - 82% efficiency = 936# grains
    - 89% efficiency = 862# grains
    - Difference of 74# per brew
    - 8 brews per month
    - Total of 592# per month
    - Total of 7104# per year
    - Reduced Cost of grains

Solutions - Brewhouse

- **HL and CL Tanks**
- Added 30bbl CL tank with pump and heat exchanger
  - Cost ~$2,500
    - Chill water quickly
    - Constant CL temperature going through BH EX
    - Enough CL for multiple brews
    - Able to recapture HL at correct temperatures
    - Reduced KO time from around 60-90 minutes down to 30 minutes
    - After brewing 4 batches saved 2hrs = TIME


3
Dr.
Seuss
FV 3
30BBL

Solutions - Operations

- **Water Pressure**
  - At the end of the City water line. So old the City would only let us install a 1" line.
  - Added 80 gal pressure tank with pump. Used 15bbl FV as water tank
    - Cost ~$500. Not including tank
      - Multiple tasks at once
        - Cleaning kegs
        - General cleaning
        - Don't have to wait for tanks to fill.
  - Save TIME!!!

Solutions - Operations

- Hoses
  - Buy more hoses!
    - No way to get around it.
    - Your time is worth more.
- Floor Drains
  - Get floor drains!
    - Even if it is one
    - Can do without but makes life very difficult

Thanks

Thanks to Van Havig of Rock Bottom Brewery for letting me plagiarize his presentation (Improving Brewhouse Efficiency for Small Brewers).

p.s. I did get his permission to share with the group. He was excited.

Cheers

Brian Royo

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