Hard Seltzer 101:
Development, Production, and Troubleshooting
From a Brewers Perspective

Mike Scott: Lewis and Clark Brewing Company
Kristi McGuire: Alaskan Brewing Company
Hard Seltzers are a Driver at Retail of Incremental Beer Wine and Spirits (BWS) Purchasing, as well as a Replacement For Other BWS Products

### Hard Seltzers: Source of Volume Summary

<table>
<thead>
<tr>
<th>Contribution to Growth</th>
<th>Net % Volume Change</th>
<th>% From Switching</th>
<th>% From Increased BWS Buying Rate</th>
<th>% From New BWS Buyers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vol MM</td>
<td>+505.9 MM</td>
<td>187.3%</td>
<td>98.5%</td>
<td>72.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16.2%</td>
</tr>
</tbody>
</table>

Source: IRI Consumer Network Households (NCP)
52 w/e November 3, 2019 vs YS - Total U.S. All Outlets, NBD Adjusted (Vol)

47% of Hard Seltzer volume gains are due to BWS Category Expansion

52.6% of Hard Seltzer volume gains are due to BWS Category Expansion

Source: IRI Consumer Network Households (NCP)
52 w/e November 3, 2019 vs YS - Total U.S. All Outlets, NBD Adjusted (Vol)
Seltzers More Concentrated than Craft Which Produces 3x sales via 27x Brand Families…Seltzers More Efficient in Sales per Brand than Imports, Craft, Cider

<table>
<thead>
<tr>
<th>Category</th>
<th>Dollar Sales</th>
<th># of Brand Families</th>
<th>Sales Per Brand</th>
<th>Rank</th>
<th># of Brand Families to Reach 80% of Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Beer</td>
<td>$37,266,568,638</td>
<td>3054</td>
<td>$12,202,544</td>
<td>-</td>
<td>29</td>
</tr>
<tr>
<td>Domestic Premium</td>
<td>$12,160,658,370</td>
<td>24</td>
<td>$506,694,099</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Domestic Super-Premium</td>
<td>$3,333,675,391</td>
<td>24</td>
<td>$138,903,141</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Domestic Sub-Premium</td>
<td>$5,358,941,332</td>
<td>61</td>
<td>$87,851,497</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>FMB</td>
<td>$3,977,394,558</td>
<td>188</td>
<td>$21,156,354</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Hard Seltzer</td>
<td>$1,458,897,116</td>
<td>73</td>
<td>$19,984,892</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Import</td>
<td>$7,491,635,814</td>
<td>411</td>
<td>$18,227,824</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Non-Alcoholic</td>
<td>$131,912,306</td>
<td>30</td>
<td>$4,397,077</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Craft</td>
<td>$4,344,109,934</td>
<td>1986</td>
<td>$2,187,367</td>
<td>8</td>
<td>97</td>
</tr>
<tr>
<td>Cider</td>
<td>$428,258,703</td>
<td>328</td>
<td>$1,305,667</td>
<td>9</td>
<td>11</td>
</tr>
</tbody>
</table>

Source: IRI, BWS Multi Outlet + Conv; 52 Weeks ending Dec 29 2019
Attitudes and Considerations

• Are seltzers right for your brewery?
• Would the addition of seltzer fill a gap in your current brand portfolio?
• Is the cost of additional investment equipment and knowledge worth the benefit hard seltzer would provide?
• Would the addition of hard seltzer conform with your current brand identity?
• Is broadening your customer base important, or would you prefer to focus time and resources catering to customers you already have
• How will marketing decisions affect production?
Attitude and Considerations:

Brand Identity & Off-premise Focus
Attitude and Considerations:

Alaskan Ingredients - Spruce Tips
Seltzers are fundamentally very simple

Sugar  Water  Yeast  Flavoring

Seems pretty easy, Right??
Supplemental Yeast Nutrition is Critical

- Sugar solution is a nutrient wasteland
- Unlike a malt based fermentation, nutrient contribution from fermentables is virtually nothing
- Supplementing with a nutrient blend consisting of organic and inorganic nitrogen, amino acids and trace minerals is not only recommended but necessary
- We supplement to 250 ppm nitrogen incrementally over the first half of fermentation
Process - Building a Fermentable Solution

- 11 pounds of sugar/gallon of fluid/brix point
- *This is a good starting point but will vary with type of sugar and coarseness*
- Adding sugar incrementally and measuring brix as you go is advisable until you get your process dialed for your system
- Desired Brix/11 = lbs sugar per gallon
- 1.2 lbs (desired volume) = total sugar
- Every 13.5 lbs sugar displaces a gallon of fluid
  - *Again, this is dependent on sugar source, but is a solid baseline*

Example For 775 gallon (25 bbl) solution at 13.2 bx

- 13.2 bx/11 = 1.2 lbs of sugar/gallon
- 775 gallon x 1.2 = 930 total pounds of sugar
- 930/13.5 = 68.8 gallons displaced by sugar
- 775 gallons - 68.8 gallons = 706.2 gallons of water needed after displacement compensation

***spreadsheets are your friend, but I strongly encourage becoming familiar with the long hand calculation***
Process - Building a Fermentable Solution

- Add predetermined volume of water to mixing kettle
  - Kettle/Whirlpool combination vessel is perfect for this
- Begin adding sugar while mixing thoroughly
  - Recirculating through whirlpool works well
  - If equipped with a direct fire kettle, be careful to avoid scorching
    - I have not experienced this, but it is something I worry about
- Measure brix as the last 10% is added
  - This will become unnecessary as you fine tune your formula to your system
- Boil 15 minutes and add initial nutrient shot
- Knockout as usual, oxygenate and pitch yeast
  - Oxygenate to 6-8 ppm*
  - 3.5 g/gallon yeast (will vary depending on strain)
  - 76* F
- Second Nutrient shot added @ 24-48 hours
- Dependent on the needs of your yeast
- At this time we have not re-pitched from a seltzer fermentation, but will be exploring as a cost saving measure in the very near future
Process-ABV Calculation

- Once solution is fermented to dryness, we now have a strong base that can be diluted to desired strength
  - To find ABV
    - Original Brix + Terminal Brix = Xbrix **if using negative brix, simply convert to positive**
    - Xbrix (.525) = ABV
  - Example:
    - 13.2 + 1.8 = 15
    - 15(.525) = 7.88 ABV
Process-Dilution/ABV Adjustment

- (Current Vol.)(Current ABV) = (Desired ABV)X
  - X = Total Volume in gallons
- Ex.: (775)(7.88) = 5x
- 6107 = 5x
- 6107/5 = x
- 1221 = Gallons Total volume
- 1221-775=446 gallons needed
Backsweetening

- \((\text{Current Volume})(\text{Current Brix}) + (\text{Total Volume} - \text{Current Volume})X = (\text{Total Vol.})(\text{Brix Target})\)

- Ex: \((775)(-1.3) + (1221-775)X = (1221)(.5)\)

- \((-1007.5) + 446X = 610.5\)

- \(446X = 1618\)

- \(X = 3.62\) brix points from sugar

- Assuming 11 lbs of sugar per gallon of fluid per brix

- \(X = \frac{\text{Brix}}{11}\)

- Ex: \(3.62/11 = .329\) lbs of sugar/gallon

- \((\text{lbs of sugar})(\text{total volume} - \text{current volume}) = \text{total amount of sugar needed}\)

- \(.329\) lbs of sugar \(\times 446 = 146\) lbs of sugar

- **if backsweetening and diluting in the same step remember to account for displacement**
Process - Filtration

• If a colorless and neutral tasting base is desired filtration will be necessary

• 2 stage filtration recommended
  • Primary filtration to remove yeast
    • Centrifuge, DE, plate and frame will all work
  • Secondary filtration through activated carbon media to remove color and some fermentation derived flavors
    • Lenticular or plate and frame seem to be most effective
• Best Practice is to store package product cold (>38*)
• Pasteurization is probably most effective but impractical for most small brewers
• Any back sweetened and un-pasteurized product should ABSOLUTELY include preservative to prevent re-fermentation in the package
  • Preservation concerns were one of several reasons we decided against back sweetening
• Common Preservatives include
  • Citric Acid-1.0 g/L addition of Citric acid will increase the TA by about 1.17 g/L and will decrease the pH by 0.08 pH units
    • Some seltzer appropriate yeast strains can ferment <3.0 pH
    • No maximum limit
    • Falls under “natural flavor” in the FDA CFR
  • Potassium Metabisulfite- 200 PPM is legal limit
  • Potassium Sorbate-Classified as a chemical preservative and must be included in ingredient statement
  • Consult manufacturer for dosing guidance
Flavoring

Very much dependent on individual product goals

Possibilities are nearly unlimited

Process can dictate timing and type

Bench trialing during development is critical
  - Flavor houses are typically very generous with samples
  - Start with 100ml of diluted base and a micro pipettor and go wild

Blind tasting panels are also helpful
Alaskan Brewing Company
Innovation Process

- Benchtop Samples
- 5 Gallon Fermentations
- 1 BBL Test Brews
- 10 BBL Test Brews
- 100 BBL Production Brews
Seltzer Base Fermentation Yeast Analysis

- **Nucleocounter Count**
- **Viability**

<table>
<thead>
<tr>
<th>Hours from Pitch</th>
<th>Viability %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100.0%</td>
</tr>
<tr>
<td>50</td>
<td>80.0%</td>
</tr>
<tr>
<td>100</td>
<td>60.0%</td>
</tr>
<tr>
<td>150</td>
<td>40.0%</td>
</tr>
<tr>
<td>200</td>
<td>20.0%</td>
</tr>
<tr>
<td>250</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Million cells/ml</th>
<th>Viability %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100.0%</td>
</tr>
<tr>
<td>5</td>
<td>70.0%</td>
</tr>
<tr>
<td>10</td>
<td>50.0%</td>
</tr>
<tr>
<td>15</td>
<td>30.0%</td>
</tr>
<tr>
<td>20</td>
<td>10.0%</td>
</tr>
<tr>
<td>25</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
Filtration Trials
Process & Scaling
If you are already producing beer you have most of what you need to get started:
- Kettle/Whirlpool combination vessel is perfect for mixing solution
- Moving thousands of pounds of sugar around effectively can be challenging
  - Specialized handling equipment may become necessary
  - A self priming flex pump for fruit juice is at the very top of my wish list
- Activated Carbon media for existing filtration equipment
- A reliable flow meter is essential
- Micro pipette is handy for bench trialing when tiny and precise measurements are called for
Hard Seltzer Regulations Reference—TTB/FDA
TTB Regs

- **Surgeon General Warning** is still required on Hard Seltzer/IRC Beer
- **Definitions**
  - Malt Beverage—requires both malt/hops
    - Malt >25% of Total
    - Hops > 7.5 lb/100 BBL
  - Flavored Malt Beverage
    - Doesn’t require any malt
    - Hops are optional
  - Beer—doesn’t require any malt or hops
- **Most Hard Seltzers are <6% FMB’s**
  - Malt Based Gluten Reduced
  - Cane Sugar/Dextrose Gluten Free
- **IRC defers to State Laws**—Does your state allow/define FMB?
  - Example—Oregon—Hard Seltzer is classified as a Wine so you need a wine license to make it.
- No hops/malt and <6% ”IRC” beer—TTB formula is required if you process/remove color or flavor [i.e. Activated Carbon use]. You need lots of info on the Flavor and Flavor Company:
  - ALC/VOL from Flavor
  - Max. ALC/VOL from Flavor
  - Flavors need to be registered # and have a FIDS#
  - Flavors qualify for a Tax credit called a Drawback since Taxes are paid when you buy from the supplier and again when you sell the Hard Seltzer
- **TTB Summary—Common Sense Language:**
  - [https://www.oregonlaws.org/ors/471.001](https://www.oregonlaws.org/ors/471.001)
- **TTB Summary from ‘15 CBC:**
- **Circa 2002 Historical Context on FMB:**
- **Current FMB Regs:**
  - <6% then Max ABV from flavor is 49% of Total
  - >6% then Max 1.5% of Total Volume from Flavor
  - [https://www.ttb.gov/faqs/flavored-malt-beverages](https://www.ttb.gov/faqs/flavored-malt-beverages)
- **The TTB 2008-3 Ruling—Acronyms from Hell:**
  - IRC vs. FAA/TTB—MB, FMB, Beer
FDA Packaging Regs

- No formal submittals for Label Approval by FDA, but:
  - Don’t be Misleading
  - Avoid Nutritional Claim language on alcoholic beverages
  - Be accurate
  - Required if selling in only home state
  - Recall Plan is Required

- Nutrition Facts Panel:
  - Calories
  - Carbs—“Added” Sugar, Citric
  - Protein
  - Not a significant source of,…see Nutrition Facts changes link

- Principle Display Panel:
  - FDA has oversight if <7% and Cocktail names are OK** as long as they’re not misleading [imply DS are present, or contain a DS company in the name]
  - TTB has oversight >7% and has limitations on Cocktail names/usage.

- Ingredient List:
  - Descending order by weight
  - Must use Standard of Identity definitions
  - Water SOIs—purified [hard to meet/bottled] vs. filtered
  - Gluten Free [verification/testing/documentation is required] vs. Gluten Reduced
  - Allergens must be declared if used, including wheat
  - Non-GMO—includes sugar & dextrose [refined]
  - Natural/Limitation Flavors
  - No Vanilla limitation like Beer has
  - All Ingredients must be GRAS

- General Food Labeling Guide—PDP/NFP/IL:
  - [https://www.fda.gov/food/food-labeling-nutrition/changes-nutrition-facts-label](https://www.fda.gov/food/food-labeling-nutrition/changes-nutrition-facts-label)

- Generally Recognized as Safe:

- Filtered vs. Purified/Bottled Water:

- TTB Cocktails:

- 2020 Revisions to the NFP:
  - [https://www.fda.gov/food/nutrition-education-resources-materials/new-nutrition-facts-label](https://www.fda.gov/food/nutrition-education-resources-materials/new-nutrition-facts-label)

- 2020 Voluntary/2022 Mandatory Bioengineered Declarations and Exemptions
  - The 5% Exemption
    - The Refined Exemption—HFCS, Cane Sugar and Dextrose are all Non-GMO (i.e. no DNA present)
Conclusions

• Hard Seltzer volumes are expected to continue to grow off-premise
• Yeast nutrition is paramount
• In addition to TTB and state regulatory bodies, hard seltzers are regulated by the FDA
• Flavor possibilities are nearly endless, apply the same creativity you’ve been using in your beers
• Investment in equipment to get started is very minimal
• It is advisable to have lab verification before making labeling claims
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