



Craft Brewers Guide to Building a Sensory Panel



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Introduction

Brewers know their beer intimately, because they regularly taste the product at every stage of the brewing process. A brewer's evaluation of his or her beer can be biased, however, and can be skewed in a way that prevents objective sensory analysis. The sensory attributes of beer require a methodical and deliberate approach to be fully characterized. Consistently producing beer that is free of off flavors and true-to-brand is of paramount importance to the success of any brewery.

The marketplace is competitive and quality has never been more important to the overall success of a brewery. A trained human palate is a powerful tool and a sensory panel is an essential process to include in a quality program. Microbiological, chemical, and physical tests can help ensure that beer meets certain specifications, but if a beer's flavor is not aligned with the brewer's intent and the beer drinker's expectations, then all other measurements are of very limited use.

Beer is one of the most widely consumed and historically relevant beverages our civilization has created and is therefore subject to the influence of our emotions, biases, and other personal preferences. Sensory program managers must acknowledge, understand, and account for human biases and do everything possible to diminish their influence on beer evaluation.

This guidance is designed to assist breweries of all sizes implement sensory evaluation as part of their quality management efforts. Like the variety of your beer offerings, your sensory methods will continue to develop based upon growing capabilities, knowledge, size and business complexity.

Sensory evaluation is often defined as: "the scientific discipline used to evoke, measure, analyze and interpret responses to products that are perceived by the senses of sight, smell, touch, taste and hearing." (Stone, H and Sidel, JL. 1993. Sensory Evaluation Practices. 2nd ed. Academic

Press: San Diego.) This definition is useful for understanding individual roles, tasting methods, impacts of panel setting, and outcomes of employing a trained sensory panel.

The Evoker –

Sensory Scientist/Technician/Specialist

The evoker's role is to elicit a measurable and relevant response from panelists. It is ideal to hire a trained sensory scientist, but it is not necessary. Educate yourself, or designate someone internally to lead the program. There are a host of classes, books and communities out there to help you gain knowledge, many of which are included in the Appendix.



The Evokees – Sensory Panelists

Who should participate?

Anyone willing to put in the time to be trained and participate on a regular basis, should be considered for a panel. This can include brewers, managers, accountants, and human resources. Anyone who is committed, regularly available and enthusiastic to learn can lend their palates in the pursuit of quality.

How many panelists should participate?

To obtain rigorous data which can be interpreted with a high degree of confidence, you need at least 10 highly-trained and validated panelists to sit on your panel. Depending on the sensory evaluation method, more panelists may be required.



Small breweries should get as many trained and valid panelists as possible to participate in the panel. Small panels can be used to find meaningful pieces of data, but be cautious of making claims about statistical significance. Start by using the resources available, but never depend upon only a single palate. The “brewmaster panel of one” can be misleading because brewers spend a lot of time in the brewery and can become desensitized to DMS and other volatile aromas. Brewers are also prone to bias, and may not be objective enough when informally tasting beer. Remember, there is no such thing as a good panelist, only good panels!

Measuring a response

Training sensory panelists is analogous to calibrating an analytical instrument. You can have the most enthusiastic panel, but if they are not calibrated, they will enthusiastically lead you astray! For this reason, training must be the foundation of any sensory program. First, the panel needs to be speaking the same language and trained on specific attributes. This can be done by

spiking product samples with known quantities of flavor-active chemical standards and measuring responses. Including spiked samples randomly into the panel can help validate attribute sensitivity and alignment with standard descriptors.

Develop a lexicon of standard descriptors to ensure everyone is speaking the same language. Tools like the [Beer Flavor Map](#) help evaluators hone-in on their experience, and more specifically describe the beer’s flavor. Lexicon development comes through exposure to various flavors, be it in attribute training or by evaluating competitor’s beers alongside your brewery’s products. This process gets your panelist talking and associating words with their flavor experience in a consistent manner.

Standardize the lexicon by spiking attributes into beer at known concentrations. Multiple commercial spikes are available on the market ranging in price and quality. You can also make your own using the [ASBC Flavor Standard Calculator](#). Please note that some attribute spikes are aroma based and should not be consumed. Be sure to read and understand manufacturer’s instructions and warnings! Care must be taken to ensure the safety of all panelists. Best practice is to purchase food-safe spike kits.

Train panelists regularly. Evaluating beer is not like riding a bike! Panelists must be trained and refreshed regularly if their palates are used as analytical instruments. Regular exposure to specific flavors at known concentrations is essential to maintain valid panels. Weekly refresher training is recommended as best practice. Find a consistent time and place that is free from distractions and make training a priority!

Exercises can be geared toward training tasters to detect flavor changes and identify off flavors, which gives the panel leader the ability to recognize the potential source of variation when running future tests.

Training can take many forms, but the most common and effective method is to spike samples with pure and food-safe standards. Most people have never been taught to master their sensory skills, so it is important to remain patient and persistent and run attribute trainings on a regular basis.



Track progress and document individual panelist's performance. The only way to know if a panel is valid is by tracking their progress. As the sensory program grows, both in numbers and acuity, you need to have the ability to measure their improvement; otherwise, you may just be measuring noise in your data set. For example, if panelists cannot consistently identify diacetyl in training but they continue identifying diacetyl in panel sessions, you may react to a problem that either doesn't exist, or is attributable to an entirely different problem.

Getting Started with Sensory Evaluation **Set a target based on brand descriptions.**

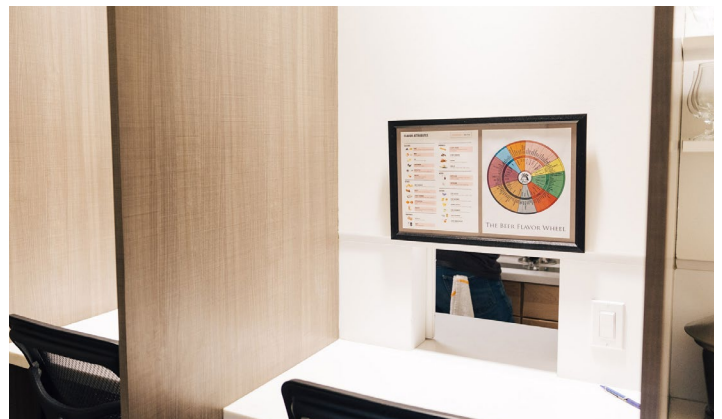
The first thing you need is a target. Each beer has to have a specific description that defines its flavor. This description will be your guiding star to compare all subsequent batches of the same brand. First, generate descriptions, get alignment to ensure the target matches the brewer's intent, and validate that the target is consistent by testing multiple batches against the target. Setting visual, aroma, taste and mouthfeel specifications will take the guess work out of determining if a batch is consistent.

Dedicate an appropriate space to conduct the panel.

Now that you have a trained panel, and targets for your brands, find a time and place where you can consistently hold panel in a controlled room that is free from noise, aromas and other distractions. Late morning tends to work well, after coffee and before lunch.



Sample preparation room with access to sensory booths.



Sensory booths help reduce distraction.



Utilize the best space available to get started.

Determine the initial focus of the sensory program.

Start by mitigating your greatest risk – releasing beer that is not consistent with the brand profile and/or full of off-flavors. You can do this using a production release panel where you simply ask the panelists: “Is this beer consistent with the target description? Yes or no? If not, why?” Keep it simple, elegant and powerful!

Infrastructure for starting up:

It is helpful to get organized before starting a panel. Gather and organize necessary supplies and create the type of documentation used to best track data and have guidelines in place for action based on results.



Glassware can influence the evaluation of the beer’s appearance, aroma, taste and mouthfeel, so it should always be of standardized size, clean and clear with no scratches or defects. Beer evaluation glassware should be washed with hot water and occasionally acid washed. Beware of detergents or soaps, because they can influence the foam quality and other sensory attributes.

Document panel and training results using either pen and paper or a computer. Even if you do not brew the same beer twice, having relational data between batches can help detect process anomalies or systemic issues in the brewery. Pen and paper can be used as long as there is a mechanism to track batch-to-batch variation using excel

or other sensory software packages. The ultimate goal is to build a body of knowledge that is easily referenced on an ongoing basis.

Develop a **standard ballot** for use in every panel. Use of scales are seldom appropriate when the question is whether or not a beer’s flavor profile is within the limits of normal process variation. Once a flavor target is locked in, simply ask if the beer’s flavor is in line with the set target. The GABF judge form is a good place to start as it simply asks if the beer adheres to its set guidelines while allowing for comments.



Category _____	Beer Number _____
Subcategory Letter _____	Judge Number _____

GABF Judge Tasting Notes

• Appearance – color, clarity, foam

Too Light |-----| Appropriate |-----| Too Dark |-----| Too Clear |-----| Appropriate |-----| Too Hazy

Low foam |-----| Appropriate |-----| High foam

comments: _____

• Aroma

Appropriate |-----| Not Appropriate

comments: _____

• Taste – sweetness, bitterness, sourness

Sweetness: Too Low |-----| Appropriate |-----| Too High

Bitterness: Too Low |-----| Appropriate |-----| Too High

Sourness: Too Low |-----| Appropriate |-----| Too High

comments: _____

• Mouthfeel – alcohol, carbonation, body

Alcohol: Too Low |-----| Appropriate |-----| Too High

Carbonation: Too Low |-----| Appropriate |-----| Too High

Body: Too Low |-----| Appropriate |-----| Too High

comments: _____

• Aftertaste and Finish

Appropriate |-----| Not Appropriate

comments: _____

• Technical Quality

Excellent Very Good Good Acceptable Needs Improvement

|-----|

comments: _____

• Style

Very Representative of Style |-----| Somewhat Representative of Style |-----| Not Representative of Style

comments: _____

Other Comments:

Beer Evaluation Technique:

The method employed to evaluate beers can influence flavor perception, so a standardized evaluation method is required to enable evaluators to utilize their senses effectively. The following steps provide a roadmap to successful evaluation, but there are many variations, some of which are outlined in the additional resources in the Appendix.

1. Hold the taster glass: The glass used to evaluate beer can influence the biases and perceptions of the sample. Make sure to choose glassware that is consistent and easy to clean. Glassware that is scratched or not cleaned properly will have less visual appeal and potentially impact flavor.



2. Visual: Look at the beer for inputs about the color, clarity, head formation and retention.

3. Distance: Look through glass from a distance for the same visual clues. Distance can help with making distinctions in hue, tint, and clarity by examining the beer from multiple perspectives.

4. Olfaction Wake Up: Take the glass and quickly pass it under your nose, inhaling as it passes. The olfactory system makes up a tremendous amount of the data your brain gets in flavor and aroma perception. This just “wakes up” the olfactory system to know it is about to do its job.



5. 1-Second Sniff: Inhale briefly through your nose to take in the volatiles from the beer. Carbonation in the beer helps release volatiles out of solution. Swirling a beer can also help release volatile compounds. This first smell should give the indication of the type of beer being tasted in terms whether it is an ale or lager, malty or hoppy, or has added flavors like chocolate, fruit, etc.

6. 2-Second Sniff: Inhale deeply with a longer sniff, to analyze quality of aromas present and identify any notes that are not desired by the brewer.

7. Cover: You can cover the sample with some neutral material, which helps build volatiles in the glass. This can help capture and concentrate certain aromas between sniffs.



8. Taste: This step adds gustation (through activation of the taste buds, e.g. salty, sweet, sour, bitter, and umami) and trigeminal sensations (through activation of the trigeminal nerve in the mouth, e.g. cold, hot, prickle, tickle) to our olfaction perceptions to create a complete sense of flavor. Take a sip of the beer, allowing it to coat the tongue and sit in contact with the mouth for a moment, then swallow.

9. Retro-nasal Evaluation: For this method, sip the sample while holding your nose, then exhale through your nose. This technique helps isolate sample aromas from the outside world, and enables the taster to identify specific hop varieties, esters, potential attribute defects and other nuances.



10. Mouthfeel: Beer is carbonated to a specification level and must be swallowed for proper mouthfeel evaluation. Beer can also have thin to full body viscosity, finish dry or sweet, or be smooth or astringent. Take a taste while focusing on the mouthfeel and finish of the beer.

Collecting Data and Analyzing Product

The appropriate method of data analysis depends on the test objective and the type of sensory data produced.

1. Collect only actionable data! Collecting nonactionable data takes time and does not help in making decisions about what beer is suitable for sale to the public. Create an action plan for

responding to unintended attribute flavors and aromas in the beer. Advanced sensory programs should include decision trees to standardize reactions.

2. Use descriptive testing for research and development, pilot batches and new products.

a. The brewer should set descriptive targets that can be analyzed by panelists. Use a standard lexicon to describe the flavors and aromas of the beer.

b. Once the descriptive targets have been set, the panel can determine whether a batch is “true-to-brand” based on the agreed descriptions and specs.

3. True-to-brand analysis is the ultimate goal of a trained panel. Once targets have been agreed upon, descriptions of beers are formalized, and panelists are aligned on meaning. This method is used to track consistency between batches of the same brand. Good test design will provide current and trending data that helps keep beer consistent as ingredients change, processes evolve, or palate creep emerges.

“Palate creep” can present itself in many forms. A beer can change over time as result of process changes, equipment changes, raw ingredient changes and sensory panelists can develop either false attribute identification habits or bias for beers, which can affect the sensory program. Care must be taken to be proactively aware of this potential and work continually to hone the panel’s awareness.

4. Shelf-life testing can help the brewery determine what the sales window is for every beer. Beer is a biological product that changes over time. Oxidation will also change the flavor of the beer over time. This type of screening is even more important when breweries sell beer in cans or bottles. Wholesale partners want to know how long they can sell the beer before significant change is noticed by customers. Breweries should maintain an archive of individual batches, and compare different batches to determine if acceptable flavor is maintained over the stated shelf-life of a product.

5. Batch tracking should be done using date codes on packaging, and documentation throughout the process, including malt and hop lots, vessel status, process aids and packaging information. If there is a problem with a beer in the field, a sensory panel can help identify what happened to that beer, when combined with process documentation. A recall plan should also be implemented to ensure that a brewery can isolate and retrieve any batches which need to be removed from the market.

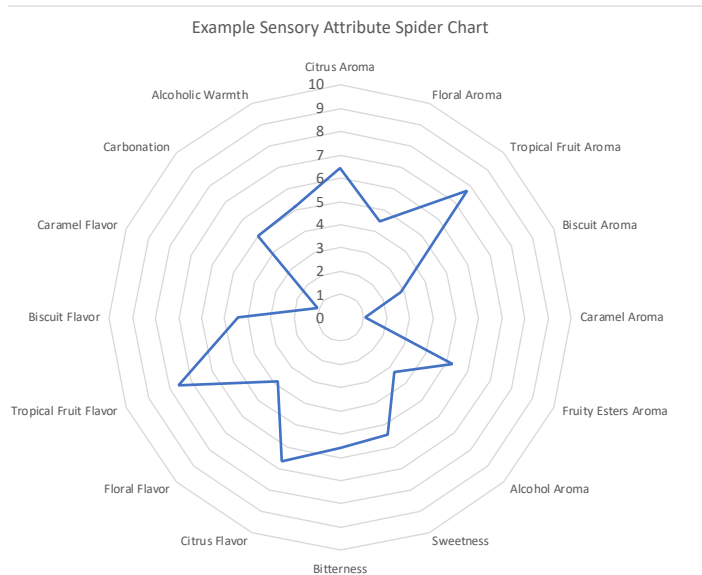
Interpreting Results

Raw data needs to be put to use, otherwise it is useless. Numerous techniques can be used to interpret data, but it's important to keep it simple to start.

1. Spreadsheets: Spreadsheets allow for data to be captured in rows and columns. Data is entered into cells which can provide an organized visual look at the data. The data can then be used in formulas to create relational changes to a data set. Most spreadsheet programs have additional abilities to chart data visually in easily workable formats such as bar graphs, pivot charts, and pie charts.

2. Spider Charts: Spider charts record multi-variate data into a two-dimensional plot of 3 or more variables. There is a single foci in the middle and

variables record outward in a web-like line away from the center. Connecting plots with lines creates a star shape that can be compared to other samples recorded in this format, which is useful for comparing attributes in various samples. These charts can also be used to compare hops, grains or other raw ingredients.



Reacting to Information

Data can be used to track long term variances in beer consistency as well as make decisions in the moment; however, a sensory program must be fully integrated into the company's quality program to be effective.

1. Standard operating procedures are the foundation of any quality program. Step-by-step instructions for common procedures or tasks allow for uniformity, safety, quality and accountability. Establishing SOPs for sensory panels ensures that data is produced and collected in a standardized form.

a. Recall Plan: Brewers need to be prepared for voluntary or mandatory recall of packaged beer. Date codes and other forms of traceability will help keep consumers safe if a recall is warranted. A written plan will also help with any FDA audit and prepare a brewery to respond when action is needed.

b. Decision trees are flowchart-like maps that show the various outcomes of a set of related outcomes. In sensory programs they can chart go/no-go decision making, recall protocol, and other decisions that should be data driven. Decision trees can help prevent biased decisions when determining whether to release a particular product, or initiate a recall.

Total Company Buy-In

Total company buy-in is critical to the success of any sensory program. Quality is not just done by a team member or two - it is a philosophy that the whole company embodies and to which all team members can contribute. Success for sensory panels can be hard to define and investment can be hard to justify, but the problems sensory panels can help prevent need to be outlined and advocated for regularly. Ample resources must be provided to keep the program going.

An agreement must be made regarding the program's value before starting, so that there is not pushback during time that it takes for this program to be developed. If there are managers who do not believe in the program, those team members push back against the program, and sometimes actually get in the way of its implementation and success. Panelists will be giving valuable time to the help the sensory program manager produce data and they need to have the support of their managers to be able to leave their other work to make panel times and classes. Managers who are not supportive can make it hard for a panelist to participate. Senior management needs to have unified support of the program to make sure it is budgeted for and supported appropriately.

Once validated data is collected, there is an opportunity for decision making around whether a beer is true-to-brand and up to quality specifications, which may affect the release of a beer. Without senior management buy-in, decisions may be made solely with emotional bias, the bot-

tom line, or retail and wholesale partner supply in mind. Guidelines for the release of beer need to be set and agreed upon at the highest levels of the organization, if a sensory panel is going to be successful and useful.

It is also important for sales and marketing teams need to have an understanding of the program, regardless of whether they participate. There may be times when a beer is not released due to quality issues found by the sensory panel, which may result in wholesale and retail partners not getting orders fulfilled. Sensory and quality programs must be a part of the company culture to have the best chance of success.

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Sensory Evaluation Texts:

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O'Mahony, M., (1986) *Sensory evaluation of food: statistical methods and procedures* (Vol. 16). CRC Press, Boca Raton, FL.

Additional Resources:

Pellettieri, M., (2015) *Quality Management: Essential Planning for Breweries*. Brewers Publications, Boulder, CO.

Bamforth, C. W. (2002) *Standards of brewing: a practical approach to consistency and excellence*. Brewers Publications, Boulder, CO.

Available Coursework:

- University of California Davis, Applied Sensory and Consumer Science Certificate Program
- Siebel Institute, Sensory Panel Management course
- Beer Judge Certification Program
- Cicerone Certification Program Sensory Evaluation Standards:
- American Society of Brewing Chemists, Methods of Analysis, Sensory Methods of Analysis
- ASTM International, Sensory Evaluation Standards, Standard Guide for Sensory Evaluation of Beverages Containing Alcohol