

# THE ELEMENTS OF PROPER BREWING

## WATER

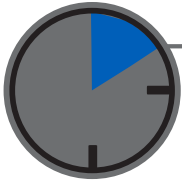


Fresh, good-tasting water is essential since it makes up more than 98 percent of a cup of coffee. Mineral content can affect taste. For best results, water should never be artificially softened and should not exceed the following parts per million (ppm) of dissolved minerals:

- **Ideal** – 50-100 ppm (50-100 mg/L) or 3 to 6 grains of hardness
- **Acceptable** – Below 300 ppm (300 mg/L) or 18 grains of hardness

BUNN offers a complete line of commercial-grade water quality filtration systems for use with BUNN commercial brewing equipment to ensure customers are getting the best tasting beverage possible.

## TIME



The brewing time, or the time water is in contact with coffee grind, determines the amount of coffee material extracted. This is the major component affecting flavor.

**Contact/brew time should never exceed 8 minutes.**

## TEMPERATURE



The temperature of the water during brewing affects flavor and extraction.

- **Ideal Water Temperature** – 195° - 205°F (90°C to 96°C)

Higher temperatures may result in undesirable coffee flavor and lower temperatures will result in poor extraction.

## TURBULENCE



Turbulence is created as the water passes through and over the coffee. It should cause the particles to separate and create a uniform flow of water around them for proper extraction.

## FILTRATION



Paper filters produce the clearest cup of coffee. BUNN filters are:

- Porous enough to allow free flow of the extracted coffee solubles.
- Perfect for coffees requiring exact brewing, like decaf and flavored coffees.
- Strong enough to prevent collapsing.

The paper stock used in manufacturing BUNN filters is produced using an elemental chlorine-free method.

## CLEANLINESS



Make sure everything related to coffee brewing and serving is clean and free from lime and hard water deposits. Specifically, assure the following are spotlessly clean:

- **Serving area**
- **Sprayhead/Funnel**
- **Servers**
- **Water Reservoir/Pitcher**

Never clean with a steel wool or other abrasives which can cause flaking or scratching which can lead to further pitting, corrosion and deposits.

# THE SCIENCE OF THE BREWING PROCESS

## Wetting

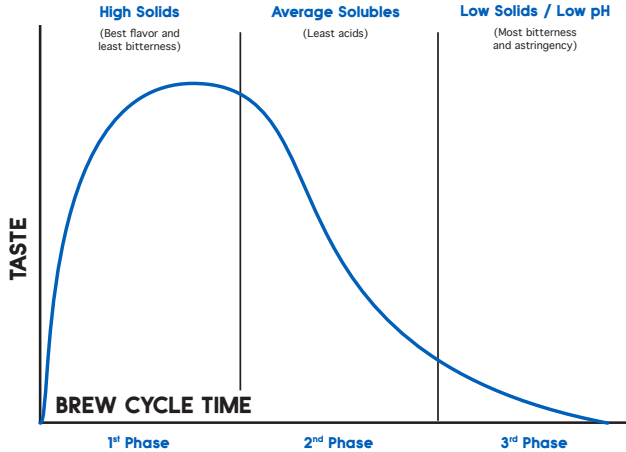
The grounds begin to absorb the hot water from the sprayhead and release gasses from the coffee. For consistent extraction from all parts of the coffee grounds, the entire bed of coffee must be evenly wet in the first 10% of the brew cycle time.

## Extraction

The water-soluble materials dissolve and move out of the coffee grounds and into the water. The best flavors are extracted at the beginning of the process as seen in the Brew Cycle Time table.

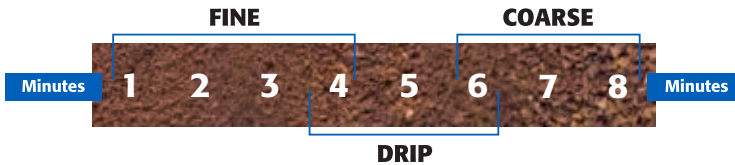
## Hydrolysis

Through this chemical reaction, the materials created during extraction break down further into water soluble proteins and sugars.



## MATCH THE GRIND TO BREW TIME

The brewing or water contact time with the coffee grounds is primarily determined by the grind size and bed depth. A longer brew time is required for the water to penetrate the larger grind particles. The recommended brewing contact times for each grind size are shown here.



General Guideline: The finer the grind, the shorter the time.

## Brewer Cycle Timing

The brew cycle delivery time of a coffee brewer assists in determining the recommended coffee grind to produce a quality cup. Experimenting with a coarser or finer grind will help operators discover the preferred coffee flavor profile.

## Bed Depth

The ideal depth of the coffee bed in the brew basket is 1-2 inches (2.5-5.1 cm) regardless of the volume of brew. If a coffee bed is less than 1 inch (2.5), the water may move through it too quickly and under-extract. Water moving too slowly through a bed depth of more than 2 inches (5.1 cm) may cause over-extraction and a bitter taste.

## Solids in the Brew

During the brew process the water-soluble materials (solids) dissolve and move out of the coffee grounds and into the water. The level of solids changes while brewing, effecting the flavor, color, body and aroma of the coffee.

### Brew Time

#### 1<sup>st</sup> Phase



#### High Solids

Best flavor and least bitterness

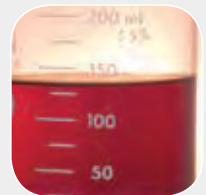
#### 2<sup>nd</sup> Phase



#### Average Solubles

Least acids

#### 3<sup>rd</sup> Phase



#### Low Solids / Low pH

Most bitterness and astringency

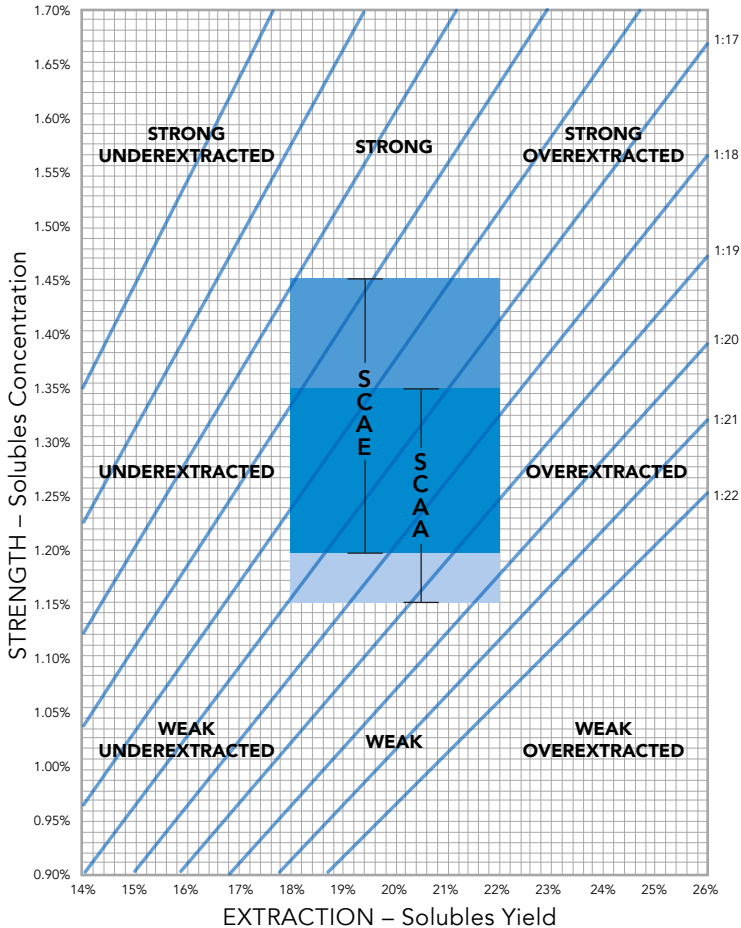
*This is why coffee should never be served before the brewing process is completed! All three phases combine to produce the ideal flavor.*

# THE TECHNIQUE OF BREWING CONTROL

## COFFEE BREWING CONTROL CHART

According to this chart developed through years of research and testing and now used by the Specialty Coffee Association, every great cup of coffee has three important variables—strength, extraction and brewing ratio. By plotting the relationship between these factors, it is possible to produce the ideal coffee flavor and drinking experience.

**Coffee Brewing Control Chart**  
Coffee to Water Ratio (oz:oz or g:g)



### Brewing Ratio

The blue diagonal lines represent brewing ratios of ground coffee used per half-gallon of water. The ground coffee measurements are displayed in ounces across the top and down the right side of the Chart.

### Strength (Solubles Concentration)

The left side of the Chart indicates strength as a percentage. Other Control Charts may include total dissolved solids (TDS). The ideal percentage of coffee flavoring material in the finished cup is 1.15% to 1.35%, and is most accurately measured by a Brew Strength Meter, hydrometer or refractometer.

### Extraction (Solubles Yield)

Approximately one-fourth to one-third of a roasted coffee bean is matter that will readily dissolve in water during the brewing process. The other portion is bean fiber that isn't soluble during normal brewing. The bottom of the Chart converts the fraction of the original dry ground coffee that has ended up in the finished cup to a percentage. The ideal range is 18% to 22% of the solubles. Grind size and brew time play a critical part in extraction.

### Optimum Balance

Balancing strength and extraction produces a standard designated as "Golden Cup" by the Specialty Coffee Association.

## USING THE CHART

By using the weight of ground coffee in the brew basket, the volume of water used, and the strength of the brewed coffee, you can plot these to determine the extraction. The objective is to get to the Optimum Balance area. If you use 4 oz. of coffee and the strength of the brew was determined to be 1.40%, follow the red line labeled **4.00 oz** down the red diagonal to the **1.40%** grid line, and then straight down vertically to the bottom of the chart to extraction which is approximately **20.5%**. Even though the extraction falls within the ideal range, this coffee is **STRONG**. To move the outcome, extraction needs to decrease to 18% - 19.8% by decreasing the brew time and/or increasing the grind size.

# BUNN TECHNOLOGY GIVES YOU CONTROL

We manage the science of brewing so you don't have to. BUNN offers a line of precision brewing and serving systems that are designed to produce optimum flavor. The machine matters!

Equipment featuring Digital Brewer Control™ gives the operator control of the brewing process to create a variety of coffee recipes from a single origin of bean, or perfect recipes for different blends of beans.

## Pre-infusion:

### Control over the wetting process

The sprayhead dispenses hot water and then turns off, allowing the wetting phase to complete. Pre-infusion ensures that the coffee will be ready for the extraction phase when the sprayhead turns back on.

## Pulse Brew:

### Control over the extraction phase

The sprayhead dispenses hot water then goes through a cycle of turning off and back on. Pulse brew enables you to adjust the flavor of your coffee by extending brew times.

## Variable Bypass:

### Control over brew strength

Bypassing a percentage of the water around the ground coffee allows you to create unique flavors.

## Digital Temperature:

### Control over brew temperature

With Digital Brewer Control, you have the option to set the brewing temperature precisely where you want it. The low temperature brew lock-out feature ensures adequate water temperature.

## Extraction Systems:

### Control over water distribution

From traditional BUNN Sprayhead designs to the 17 or 21-hole BUNN Peak Extraction® sprayhead, you can choose the spray pattern that yields the ideal flavor for your taste profile.

## HOLDING AND SERVING KNOW HOW

Brewed coffee should be enjoyed while flavor and aroma are at their peak. BUNN offers a range of holding and serving equipment designed to keep your coffee at its best.

## Ideal holding temperature:

175°F to 185°F (80°C to 85°C)

Most volatile aromatics in coffee have boiling points well below that of water and continue to evaporate from the surface until pressure in the serving container reaches equilibrium. A closed container can slow the process of evaporation.

## Ideal serving temperature:

155°F to 175°F (68°C to 80°C)

Volatile aromatics in coffee are not perceived when coffee is served at lower temperatures.

## Ideal holding time: 20 minutes in an open top decanter / 60 minutes in a closed container

Holding coffee longer will result in loss of the smooth, sweet and complex flavors and instead produce a scorched or bitter taste.



# COFFEE TERMS

The process of running hot water through coffee removes various materials from the grind. Those materials are:

**Soluble Materials:** Compounds that dissolve in water.

**Non-soluble Materials:** Compounds that do not dissolve in water.

**Volatiles:** Soluble materials that evaporate easily.

**Non-volatiles:** Soluble materials that do not evaporate, but stay in solution.

The terms used to describe the characteristics of the coffee drinking experience are:

**Fragrance:** Sometimes confused with aroma, this is the smell of ground coffee before the addition of water.

**Aroma:** The gases that evaporate as ground coffee is exposed to water.

**Flavor:** The liquids that are responsible for the overall taste of coffee.

**Acidity:** The taste of coffee that creates differing sensations on certain areas of the tongue.

**Body:** The solids that determine the way coffee feels in your mouth.

**Aftertaste (or Finish):** The lingering remnant of taste after the coffee is swallowed that often changes over time.



5020 Ash Grove Drive, Springfield, IL 62711 USA  
(800) 637-8606 | +1 (217) 529-6601 | [www.bunn.com](http://www.bunn.com)

