CHAPTER 5

Reading the Shape of Spent Grounds

In every percolation brewing method (drip, siphon, etc.) the shape of the spent coffee bed is a significant indicator of the uniformity of flow during the drawdown. The shape betrays the presence of channels or favored flow paths during the drawdown.* Note that a well-formed spent bed does not guarantee a uniform extraction; it indicates only the best-possible extraction during the drawdown. A brew with a well-formed spent bed may have extracted unevenly due to a problem earlier in the brewing process. Causal factors include unequally distributed turbulence; concentration gradients; or initial wetting.

The best-known example of reading the shape of a spent coffee bed is examining the puck in a portafilter after making an espresso. Many baristi know that moist or

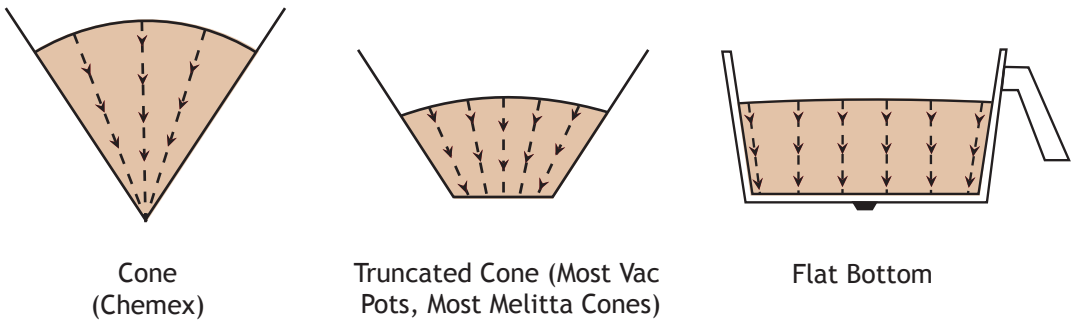


Figure 9. If one were to draw a perpendicular line from any point on the surface of an ideal coffee bed to its outlet at the filter, every such line will be the same length. Note that these lines represent ideal flow paths only during the drawdown; the flow paths earlier in percolation may be more erratic.

* Given that the total contact time may be similar for all areas of a channeled bed, why does channeling during the drawdown matter? The reason is that greater liquid volume and velocity in a channel increase extraction from the grounds in the channel, much the way aggressive, localized turbulence would.

Continually pat down the bloom until it has shrunk to a thin, moist layer.

The bloom is almost completely free of gas.

Carefully remove the vac pot from the heat source when the timer sounds. Stir the slurry as soon as coffee appears in the lower tube (not shown).

This spent bed is symmetrical but taller than ideal.

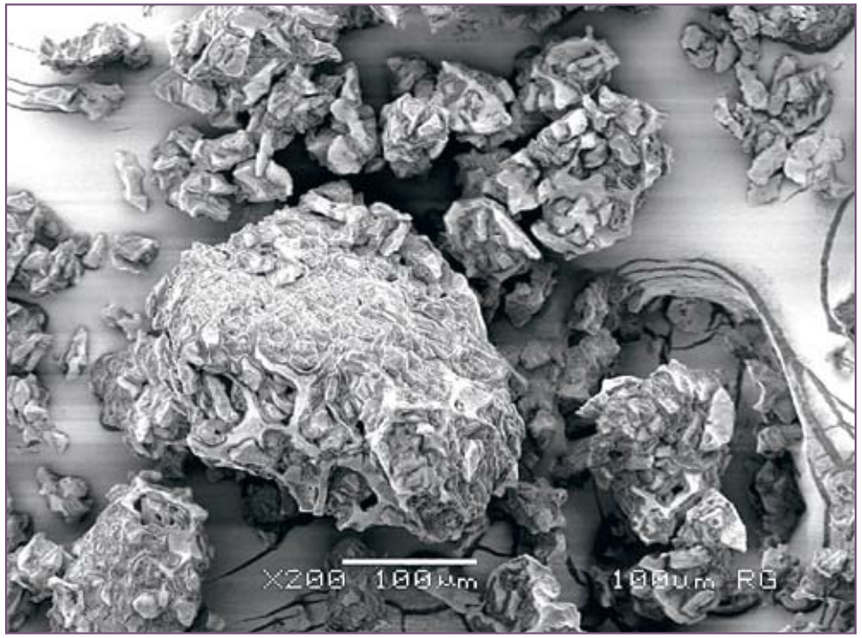
Fines

Fines are tiny cell wall fragments (i.e., particles with no intact cells) produced during grinding. Given that roasted coffee bean cells average 20–50 microns in diameter and cell walls average 5–10 microns in thickness[5], particles smaller than 50 microns in diameter rarely, if ever, contain intact cells. Therefore, as a reasonable standard, I will consider particles smaller than 50 microns in diameter to be fines.

Fines play a significant role in determining extraction yield, percolation flow rate, and *body* during espresso preparation. In addition, if the brewing liquid drags enough fines to the bottom of the coffee bed (known as *fines migration*), the fines can disrupt flow by forming a dense layer and clogging the filter basket holes.

In drip and other non-pressurized brews, fines are important contributors of body but trivial contributors of solubles. As in espresso percolation, fines influence, and can disrupt, non-pressurized percolation. If too many fines are present and migrate to the bottom of the coffee bed, they can clog the filter's pores and slow the flow of extract from the coffee bed. Because dull burrs produce a higher proportion of fines, automatic drip contact times get progressively longer as a grinder's burrs dull with use.

Many coffee professionals believe that the presence of too many fines results in very bitter drip and French press coffee. Although fines contribute easily perceived bitterness



Ground coffee at 100x magnification. Thank you to MPE Chicago for generously supplying this image. Note the large number of small particles.

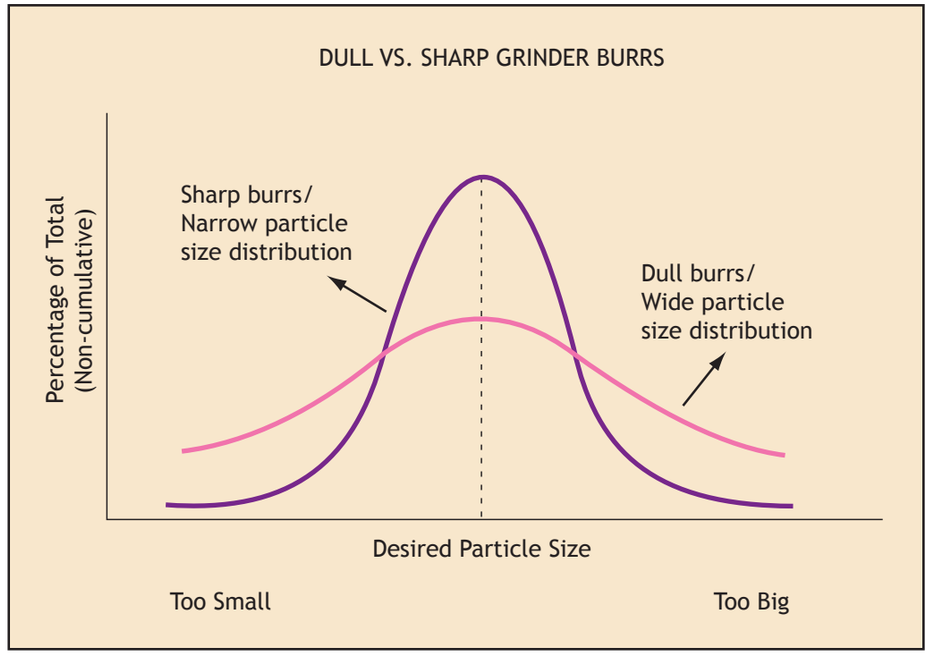


Figure 3. This diagram is slightly modified from a graphic generously provided by MPE Chicago.

to espresso, they may not have a significant effect on the taste of non-pressurized brews. At the medium and coarse grind settings used for non-pressurized brewing methods, fines make up perhaps 2% to 4% of the ground coffee mass. Given this small mass, the bitterness blamed on fines is most likely due to wide particle size distribution, assuming the overall extraction yield is not too high.

CHAPTER 4

Filters, Fines, and Flavor Clarity

The taste, *aroma*, and body of a cup of coffee derive from different types of compounds:

- Dissolved solids determine coffee's taste.
- Volatile aromatics provide coffee's aroma.
- The *insoluble* material (fines and oils) suspended in coffee creates the sensations of body and *mouthfeel*.[4]
- Coffee oils play a secondary role, providing flavor and decreasing the perception of *acidity*.

The fines and oils in brewed coffee bind to form *brew colloids*. The higher the concentration of brew colloids, the less *flavor clarity* coffee has. Therefore, for a given coffee there is a trade-off between flavor clarity and body.

Four factors determine brewed coffee's balance of flavor clarity and body:

1. The proportion of fines in the grounds

In most cases, the higher the proportion of fines in a coffee bed, the greater the brewed coffee's body.*

2. The brewing method

Different brewing methods tend to trap different proportions of insolubles in the coffee bed. When more insolubles are trapped in the coffee bed, fewer make it into the cup, producing a brew with more clarity and less body. Here are three examples:

Vacuum pot brewing, also known as vac pot brewing or siphon brewing, traps a high proportion of insolubles in the coffee bed. Insolubles remain in the coffee bed because most of the insolubles float in the bloom at the top of the slurry while the

*The exception is when there are so many fines that they coat the filter and block flow paths, leading to channeling and erratic percolation.

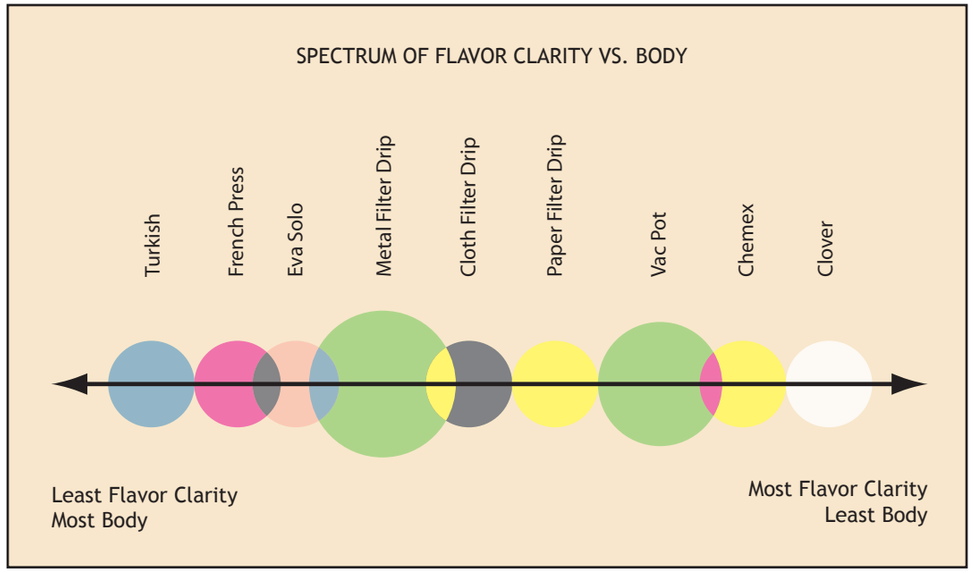


Figure 4. Each circle's location on the spectrum indicates its balance of flavor clarity versus body. For example, French press coffee always has heavy body and low flavor clarity, while Chemex coffee is always light in body, with excellent flavor clarity. The greater the range of porosities within a filter category, the larger the circle.

slurry drains from the bottom. This "clarifies" the brew and lessens, but does not eliminate, the importance of the type of filter used.

During **drip brewing** the coffee bed traps a modest proportion of the fines and oils as the brewing liquid percolates through the bed.

An immersion brew such as a **French press** allows the greatest amount of oils and fines to make it into the cup.* This is because a large proportion of the insolubles come in contact with, and pass through, the very porous filter.

3. Brew strength

Generally, the lower the *brew strength*, the less body and more flavor clarity a coffee will have. However, if a brew is too dilute (weak), flavor diminishes and becomes more difficult to perceive.

4. The porosity of the filter used

In most cases, the porosity of the filter is the dominant factor in determining a cof-

* One study measured the oil content of French press coffee to be 30–100 times that of a drip brew made with a paper filter. (Percolation brews made with metal filters measured comfortably between the two.)[9]

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