I haven't changed my grind size in six months

No really, it’s true. Not once.

Innovation is one our guiding principles at Pilot. We’re fascinated by the complexity of coffee and all of its hidden potential. One of our latest discoveries may change the way you think about grind size forever.

About half a year ago, we launched an experiment: we chose to keep the grind size constant for all of the espresso made at our Tasting Bar. Does this sound kind of crazy to you? Fair enough. But what this did was launch us into radically new ways of thinking about extraction in the context of espresso.

Disclaimer: this isn’t a recommendation for others to abandon the practice of adjusting grind size during calibration. That might not be right for your shop, nor are we going to say it’s the gospel of good coffee. This was a decision that we made to keep pushing the envelope at Pilot, to break new ground and see where the journey takes us.

First things first: equipment. It (almost) goes without saying that the grinder is an essential piece of equipment. We were inspired by the work being done at Colin Harmon’s shop, 3fe, and so we began using the Mahlkonig EK43 for all of our Quality Control programs, and shortly after chose it as the only grinder used for both our espresso and brew methods service at the Tasting Bar.

Another major factor in making this radical shift possible, was the unveiling of Canada’s first Modbar at Pilot headquarters when we opened last March. This was our first espresso machine with pressure profiling capabilities, and that was key for working with fixed grinds. The Modbar uses the variable pressure profiling pump found under the hood of La Marzoccos Strada EP, as well as the flow meter found in most Marzoccos to automatically stop a shot at your desired volume (often referred to as wet weight). Modbar’s control over these two components are the main way we tailor a brew cycle to a coffee.

We didn’t just jump right into working with a fixed grind, it was a process of discovery to get to this point. We started with brewing temperature as our first area of exploration. The system allows you to quickly change your “Brew temp” using a touch screen, and program a temperature for each coffee profile you create. The accessibility of this feature really grew our understanding of temperature’s influence on extraction, and became another tool at our disposal when dialing-in a coffee.

Initially the five espressos on our menu all had different grind sizes. We recorded them daily for accuracy when switching between them. There were some issues with this process: due to the sensitivity of the grind settings, it was difficult to make these minute changes accurately. Also, as you probably know if you work with espresso on a daily basis, the performance of the grinder can really be effected by the weather (temperature and humidity). It was challenging to make uniform adjustments across all grind settings when this happened.

We observed over the first few months each grind setting moving closer together until each was sitting between 1.7-2.2 on our 3fe dial. Our burrs touched at #1 so this range was for a very fine grind. The five pressure profiles were trying to extract a lot of flavour within a standard beverage

weight of 30-40ml, and all began to resemble the pressure profile of a lever machine. After observing similarities in grind size and pressure profiles, some further reading into James Hoffman's experience with pressure profiling became the catalyst for moving to a fixed grind size.

What this constant grind really did for us was illuminate the importance of variables like water temperature, brew ratios, bar pressure, and diffusion as factors that are just as significant as the more commonly adjusted variables (e.g. grind size).

Recently, we've expanded this exploration into isolating pressure profiling as the sole variable in manipulating the rate at which our 5 espressos were extracting. This meant not only fixing our grind size, but our brew temperature, dry dose, and wet dose as well (within 1ml). This showed us that brew time is actually less useful than we thought in achieving the desired amount of total dissolved solids and subsequently our desired extraction percentage. So we let the pressure profiles we created dictate brew time.

We tested out the practicality of pressure profiling by using five coffees that are quite different from each other. All five coffees were rested post-roast between 8-19 days, and they all have an elevation spread of 750m. We used two blends and three single origins, and we chose them to serve as a good representation of the variety of coffees you'll find at the average specialty café.

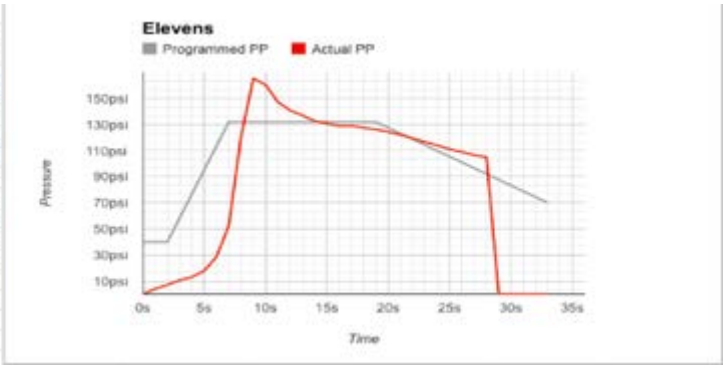
We have been able to successfully brew them within a very small spread in TDS, 10.7% to 11.5%, resulting in an equally small spread of 19.28% to 20.15% in Extraction yield. Our focus of this work is to pursue any changes that improve our espresso service using the taste of the coffees we serve as the deciding factor

Having a base understanding of building a pressure profile with the ModBar will be beneficial in reading the graphs below. We know that within the first ⅓ of brewing, an estimated 70% of your final soluble material will have been dissolved into your cup (reference brewing handbook or vince vst). This resonated with our experience building profiles as our most nuanced changes occurred within the first 6-10 seconds of each brew cycle. When building a profile you must set a maximum pressure (MP). Then through 4 time-based waypoints you dictate how quickly to move up and down from that max pressure. The first time field, "T0", allows water to begin flowing through the coffee puck without engaging the pump; effectively functioning as our pre-infusion tool. "T1" engages the pump and rises to your max pressure, "T2" is the length of time at max pressure, and "T3" moves from max pressure to a set end pressure (End P). Due to a fixed grind size these features are how we manipulate our rate of extraction. Currently all programmed max pressures remain at 9 bars as our goal throughout this process has been to produce a "standard" espresso shot but to do so with a new type of control.

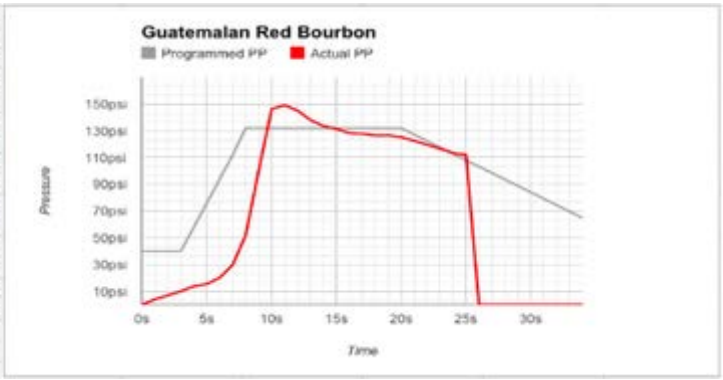
Below are the results of an experiment we conducted to showcase the influence pressure profiling can have on the rate of extraction. We used the LED display on the espresso module to record the pressure being exerted in real time to compare against the programmed pressure profile listed on the left. This is how actual end pressure (A endp) and actual max pressure (A mp) were recorded. The coffees in this experiment were all calibrated an hour before the test was held and then pulled one after the other to replicate a common service at the bar.

Each coffee was brewed at 202 f, used 18.2 grams of ground coffee to produce a beverage weighing between 31.9-32.9 millilitres, with a grind setting of 1.65 on our EK43.

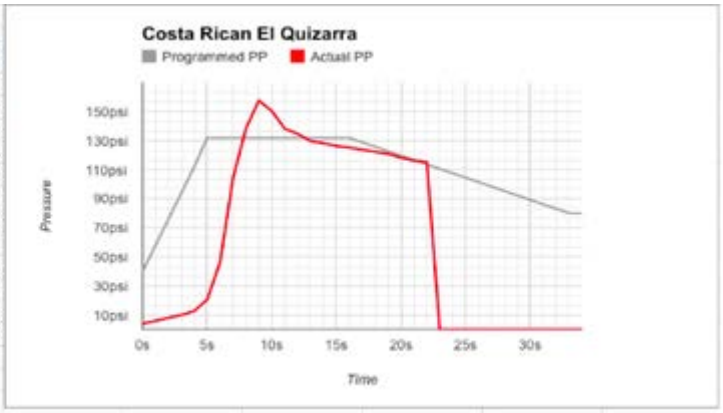
Parameters	Results
T0	2.8
T1	3
T2	13
T3	15
End P	70
A endp	105
Set MP	132
A mp	166.6
Dry Dose	18.2g
Bvg Weight	32.6ml
Brew Time	28sec
Rest Period	19days
T.D.S	11.1
Ext %	19.88



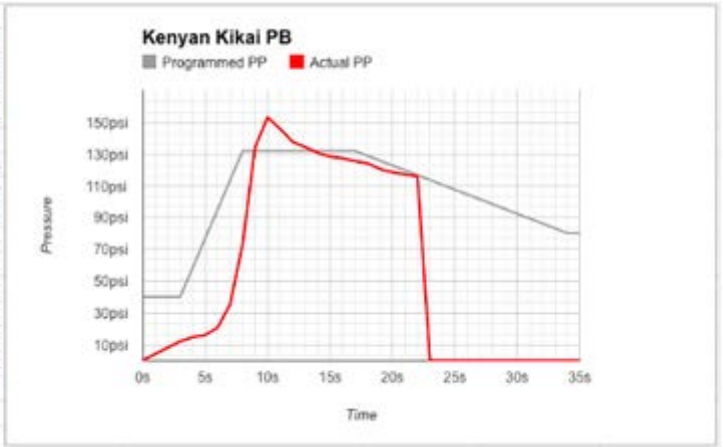
Parameters	Results
T0	3.3
T1	4
T2	12
T3	15
End P	80
A endp	112
Set MP	132
A mp	149.1
Dry Dose	18.2g
Bvg Weight	32.7ml
Brew Time	25sec
Rest Period	8days
T.D.S	10.90%
Ext %	19.58%



Parameters	Results
T0	1.5
T1	4
T2	11
T3	19
End P	80
A endp	113
Set MP	132
A mp	149.1
Dry Dose	18.2g
Bvg Weight	32.2ml
Brew Time	22sec
Rest Period	13days
T.D.S	10.90%
Ext %	19.28%



Parameters	Results
T0	2.7
T1	3.8
T2	10.5
T3	18
End P	80
Actual End P	115.8
Set Max P	132
Actual Max P	153.3
Dry Dose	18.2g
Bvg Weight	32.9ml
Brew Time	22sec
Rest Period	19days
T.D.S	10.70%
Ext %	19.34%



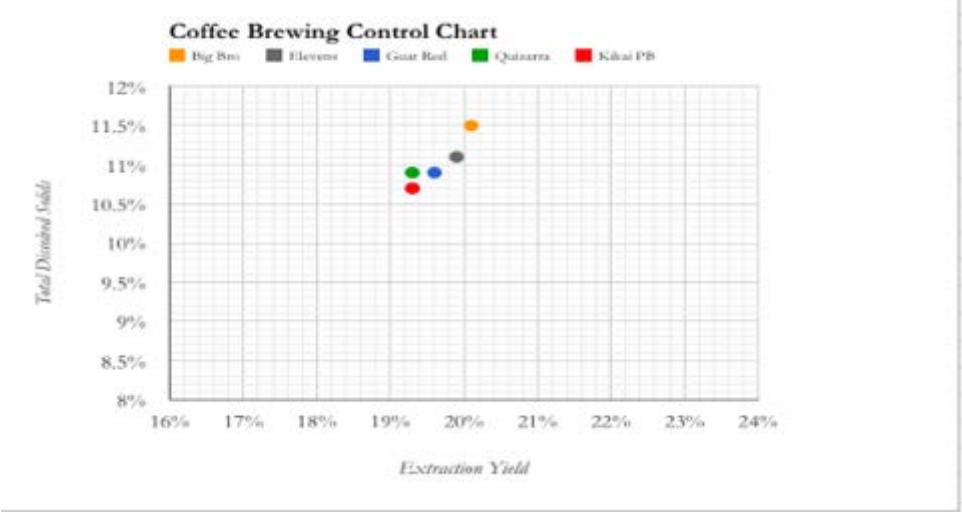
You can see how although the numerical values to each time field change coffee to coffee, there is a similar pressure arc that has been successful in creating a standard style espresso. The

central tenet of this technique is to prioritize the rate of extraction so it matches your final beverage weight.

There is a distinction to be made between the rate of flow and the rate of extraction, even though they are closely linked. The rate of flow is simply the rate at which liquid passes through the coffee bed. The rate of extraction refers to how much of that liquid is penetrating the coffee particles to dissolve flavour versus liquid being forced to bypass particles due to the diffusing co2 gas that is created during roasting. This is why proper pre-infusion has been critical to building successful pressure profiles.

Developing our understanding of pressure profiling will continue to be an ongoing process but equating it to turbulence in the bed, and controlling the pre-infusion stage has helped a great deal.

Samples were removed from each of the 5 espressos charted above in order to obtain a measurement of the total dissolved solids in each, and from that calculate the extent to which they were extracted. Previously we stated that the concentration or strength of each coffee was within a percent, as were their extraction yields; below you can see the 5 coffees plotted on a coffee brewing control chart.



We've always been driven by our fascination with how many ways you can approach brewing coffee, and taking the initial leap to omit grind size as a variable is exciting new terrain to explore.

Whichever variable you choose to work with – and we encourage you to isolate and experiment with all of them – the key is that all variables need to be accommodated for in some fashion, and then held in harmony. As these areas get explored more and this level of performance becomes available in standard equipment, the potential to offer many coffees with confidence will only grow.

If you've been testing out new methods of brewing and exploring different ways to extract espresso, we would love to hear about it. Get in touch and tell us all about your latest adventures.

Yours in coffee,

Pilot Coffee Roasters.

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