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The most traditional approach to coffee roasting relies solely on the five senses. This method is known as “sight roasting,” “artisan roasting” or “craft roasting.”

Some Like It Hot: Roasting Techniques and Technologies

Tradition and innovation converge in the process of roasting coffee. Empirical data collection and nuanced sensory observation offer different advantages when pursuing various end goals for specific coffee customers.

By Rachel Northrop

Transforming green coffee into roasted beans draws together art, science, tradition and innovation in an activity that can be performed on a stovetop or in an industrial factory. At its most fundamental, coffee roasting is the application of dry heat over time. These two core variables can be plotted as a roast curve, but what appears as a straightfor-

ward curve is the result of meticulous monitoring and adjustment of many more factors, performed by individuals and programmed systems.

Sight Roasting: Artisan at All Scales

The most traditional approach to coffee roasting is one that relies solely on the five senses. Today, iterations of this original

method are referred to as “sight roasting,” “artisan roasting” or “craft roasting.” Companies using these terms may define them slightly differently, but all three imply that—no matter the volume—the roasting process is ultimately controlled by a person.

Chris Calkins began his coffee career developing Starbucks’ restaurant division and then launched the Spinelli’s national wholesale and retail chain. Calkins has experience managing volumes of consistent quality, but he now spends a few days a week at Brooklyn’s Pulley Collective roasting 35kg batches for his company Gotham Roasters, supplying the Manhattan café, Prodigy Coffee. “My desire to sight roast is not just because I am stubborn, it is because, even with a machine as sophisticated as the Loring, I want to remain the chef at the stove using my instincts. I feel this is where the art resides.”

Even when an individual rather than

a program has the final control, software can be used to track adjustments made in order to provide a quantitative summary to accompany the qualitative results of a roast.

Stacy Hawkins, roastmaster for Birmingham, Ala.-based H.C. Valentine Coffee Company noted, “there are a number of variables that can affect how a batch roasts, so there is a definite need for human input and the ability to adjust settings and profiles. We roast 6,500 lbs per week on an Allen-Bradley touch screen module to control and monitor all functions of a Probat G60, gas-fired, solid drum roaster. This allows for control of the supplied heat and air flow as well as easy monitoring of bean, air and afterburner temperatures.”

The same technology can be used differently according to users’ needs and preferences. Tracking the details of a roast profile with digital read-outs is not the same as deferring to software to make adjustments that yield a given roast curve. Slight variations are what make all artisan products personal, from hand-assembled furniture to hand-roasted coffee.

“It boils down to customer acceptance. The parameters of what’s acceptable have to be wider if you want craft roasting to be of acceptable consistency,” said Donald Schoenholt of Gillie’s Coffee, Brooklyn, New York. Finding customers who share a passion for craft is of course vital, as is getting a feel for your equipment. No matter what equipment you use, handling a roaster is, he said, “like driving a new car; once you get used to it you can make it to anything you want.”

The Fast Lane

John Larkin, owner of John Larkin and Company, the Denville, N.J.-based roasting equipment installer and servicer, noted that scale and speed of growth can have a driving effect on equipment needs. “As a company grows into producing larger batches, the features of some of the larger roasters with patented air flows, heat transfer, can become interesting, even if these were not features available when the master roaster first learned to roast. It is kind of like shopping for a new car. You don’t necessarily always buy the same make and model and trim. You ask yourself, “How much of a car do I need? What do I want or need it to do? How much do I want to spend?” And you should always test drive before you buy.”

Across the industry there is a rich heritage of sight roasting on all scales, but this legacy in no way impedes advances in automated and software-controlled technologies that are shaping coffee roasting, present and future.

Technologies for Every Scenario

The spectrum of roasting technologies available today encompasses diverse hardware and software, including advanced platforms for measurement, analysis, and control of the intricacies influencing the roast curve and other dimensions of final quality.

One of the newer additions to the spectrum of drum roasting equipment is Loring Smart Roaster, Santa Rosa, Calif. “The Flavor-Lock Roast Process Technology is unique to Loring Smart Roasters. The design uses a near-zero oxy-



The time/temperature curve is crucial for aroma formation when roasting coffee so Bühler developed systems to influence the shape of curve.

gen atmosphere in the roaster, along with increased humidity, to help preserve the flavor components of the beans. The atmosphere in the roasting chamber is stabilized so roasts can be accurately repeated regardless of the weather, accounting for temperature, humidity and barometric pressure,” said Robert Austin, president and CEO. Loring’s combination of technologies offers not only “true reproducibility in repeating custom profiles, but also an 80 percent fuel savings when compared to a roaster that requires an afterburner to comply with air emission standards,” he said. Loring’s various drum roasters handle batches from 15 to 70kgs.

At the other end of the spectrum, the fluid air bed RFB (Rotational Flexible

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Batch) roasters of processing and roasting equipment manufacturer Neuhaus Neotec, Hamburg, Germany, are designed to roast several thousand kilos of green coffee per hour. “The RDRF Roaster combines drum and direct air feeding technology, with a freestanding heater and conduction of the hot air through a pipe to the roasting drum, which is accessible from all sides. The machine casing is only heated where required, affording the option to conduct the hot air directly into the drum to determine airflow and temperature individually. The necessary vacuum in the roasting drum is always maintained, and air can bypass the roasting drum—and hence past the coffee—to regulate the coffee temperature for targeted aroma development,” said Andreas Jürß, marketing manager, Neuhaus Neotec.

Jürß said coffee can be roasted with or without recirculation. “You may benefit from the energy-saving potential, and you can process



With Neuhaus Neotec's RDRF Roaster, coffee can be roasted with or without recirculation.



Stacy Hawkins, roastmaster, H.C. Valentine Coffee Company believes human input is essential when roasting, it cannot all be automated.

recipes that prevent the return of the roasting air partially or completely with the same machine. The ultimate aim is to offer a much higher flexibility in coffee roasting.”

Flexibility can also come in the form of inverting the order in which technologies are applied. Sight roasters use software to track decisions individuals make at the roasting helm, but the software can also come first, with individuals designing roast profiles that equipment executes.

“You can design a roast curve—for example, to start slow and have a fast final, which would have a quite dramatic impact on flavor and physical properties like bean swelling—and the system will make sure it can handle it,” said Dr. Stefan Schenker, head of coffee market segment for coffee processing and roasting equipment manufacturer, Bühler, Uzwil, Switzerland, of Bühler's IRC Process

Control software. “The time/temperature curve is crucial for aroma formation and so Bühler developed systems to influence the shape of curve.”

Bühler's highly reactive roasters can quickly modulate energy intake into the roasting chamber, requiring a process control that can respond appropriately. Their software controls flavor by both influencing mechanical changes that beans undergo and by controlling air and bean temperature to maximize consistency. “Whether you have seasonal changes or are starting on a cold roaster in the morning, all these variables can be compensated for,” said Dr. Schenker.

Currently, this software is available on Bühler's various drum roasters, but at Interpack in Düsseldorf, Germany, (May 8-14), Bühler is presenting an innovation in “industrial-scale technology for full profile roasting—for both traditional and non traditional roast curves. Drum roasters will always have their place in the market, but they have their limitations. Development of this new technology started three years ago and is now ready for market,” said Dr. Schenker.

Fractions of a second differentiate one roast from another, and developing ways to manage these minute details is invaluable. Just as no athlete will replicate his or her race time down to the same number of milliseconds, sight roasting will never deliver the precision of repetition that automated equipment controlled by advanced software can.

Sipke de Schiffart, former sensory expert with Douwe Egberts (now D.E Master Blenders), Amsterdam, and cur-

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Loring Smart Roasters' new Flavor-Lock Roast Process Technology uses near-zero oxygen atmosphere in the roaster, along with increased humidity, to help preserve the flavor components of the beans.



rent micro roaster, noted that all roasting technology, in its essence, is a tool for delivering coffee's inherent attributes more completely to consumers. "I always say, 'roasters can be simple, it's the coffee that is complicated.' Aromas are a complex matter. There are at least 1200 different aroma components in coffee of which maybe 700 are known," he said. "These aromas in total give us the smell as we

know coffee, the crucial question remains, 'What does your customer like best? How can I find the optimum roast curve to bring out the best aromas?'"

Begin with the End in Mind

Consumers build strong emotional attachments to aromas and flavors, so if the goal is to deliver these same aromas and flavors year after year, then the

automation of roasting with profile-saving equipment and responsive machinery is a must.

If the goal is to offer a variety of nuanced coffees that vary from microlot to microlot, then the roasting process must rely on a person who can illuminate these idiosyncrasies by applying his or her best judgment to each roast.

Decisions around which roasting technologies to employ are most heavily influenced by the desired end product. When that is clear, roasting techniques practically choose themselves. Larkin surmised, "the ultimate determinant is really the ability of a roaster in your price range to produce the cup that has brought you success to date." ☕

Rachel Northrop is the author of "When Coffee Speaks: Stories from and of Latin American Coffeepeople," a compilation of interviews with people working along the coffee production chain. Visit whencoffeespeaks.com for more information and to order copies of the book.

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