

# Roasting Technology Impacts in the Coffee Industry Since WWII

by Mike Sivetz, Sivetz Coffee Inc.

Technical innovations and developments come on in various ways, e.g. machinery, inventions, managerial directives, consumer tastes and styles. Usually changes in one area can influence changes in other categories. Further, traditional processing methods in the food industry tend to be very stable, and changes are slow. External developments such as computers, have also had an impact on manufacturing methods. Types of fuels have also changed from wood to coal, to gas, and then to electricity. The knowledgability of consumer tastes has increased as to coffee origins, freshness of roast and brewing. All this has shaped how coffee beans are processed and consumed.

## Roasting Machines

This process area has had continual changes in the last 100 years. For example, home roasting has been and still is done in some parts of the world in a fired WOK with vigorous stirring taking say 20 minutes, at best. The manually rotated steel drum over a wood fire was a big step forward in increasing productivity. In the early 1900s, an oil-fired blasted flame heated a rotating power-driven sphere. A 60-kg bag of green beans was roasted in an hour. I've seen this type of production in recent years in Argentina, Mexico, and Indonesia.

## Europe

In Europe, Probat became a major fabricator of drum-style roasters, as was Gothot. A four-bag roaster became a traditional size, doing roasts in 15 to 20 minutes, with outside tray cooling of roasted beans in mobile carts. In the United States in the early 1900s Jabez Burns of New York developed and sold similar four-bag drum roasters, with perforated drums. But Burns' major technical breakthroughs were in taking the burner that heated the air out of the drum and creating a separate hot air recycling system which resulted in faster roasts and better conservation of fuel.

## Continuous Drum Roasters

By making the coffee bean roasting process continuous, very high productivities were obtained, with the equivalent of a five-minute

roast time. The big roasting firms in the U.S., like Maxwell House, Folger, Nestle, A&P and others quickly adopted their use, because these machines were more productive, and this

contributed to their domination of the low-priced retail market. Burns licensed Neotec in Germany to make and sell these "continuous Burns roasters" after the Second World War. Probat later built and sold somewhat similar continuous roasters. However, these Probat sales were disappointing and not many units of this type were sold. Probat had developed its own "batch (continuous) roasters" called RZ models. These were made up of a large (12- to 20-foot diameter) slowly rotating hemispheric steel bowl, with hot air entering at the lower center of the bowl and blowing coffee beans up and outward toward the periphery. When the roast ended, the upper steel bowl structure separated from the lower steel bowl, and the roasted beans were blown into an annular cooler ring. This is a "kind of" fluidized coffee bean roasting system. However, these are monstrous machines and there were a number of explosions that occurred in their use. These RZ models are big producers at several tons per hour.

## Fluidized Bed Roasting Machines

In 1975 Sivetz acquired a patent for a fluid-bed roaster design, which was later licensed to Neotec in Germany. Since Neotec never paid Sivetz the agreed-to royalties on each machine sold, contact was broken off until 1988, when the new owner, Neuhaus, acquired full ownership of the business. Neuhaus-Neotec(N-N) wanted to sell the Sivetz-principle roaster in the U.S., but Sivetz' U.S. Patent was still enforceable. A new agreement between N-N and Sivetz was made after most of the original N-N roaster royalties were paid. That royalty license expired in 1993. Neuhaus-Neotec has sold many of the Sivetz-principle roasters all over the world and has been a successful competitor against Probat in this field. So much so that the fluid-bed roaster now dominates many major roasting operations and has captured what were previously drum roaster markets.



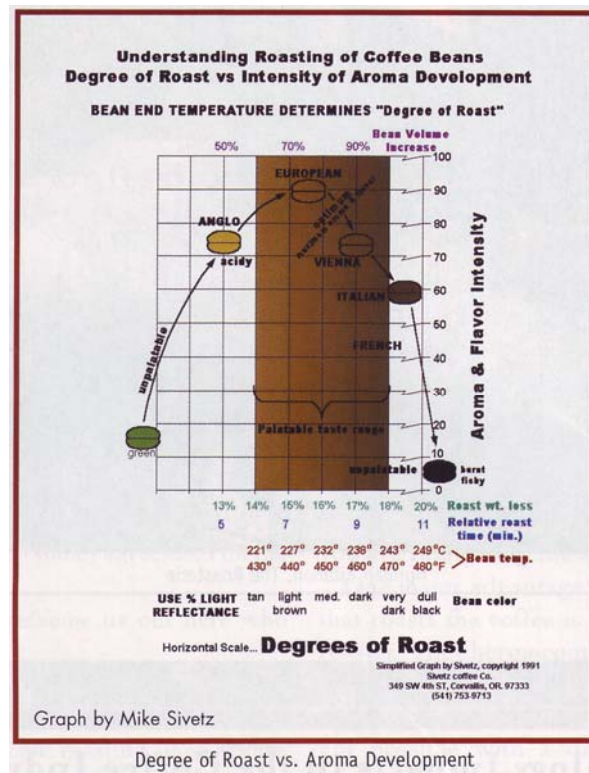
However, the N-N roasters are designed to roast in four minutes to swell the beans, so that 3/4 lb R&G coffee fills a one-liter can, whereas heretofore, one entire pound of

R&G coffee was needed to fill a one-liter can. Faster roasts contribute to more acidity, and make bland tasting, cheaper Robusta beans taste better than when they are slow roasted e.g. in drum roasters. The goals in the application of faster roasting fluid-beds thus differ for buyers of the N-N and Sivetz.

### Small Roasting Businesses

Since the late 1970s, with consumer orientation toward fresher roasted beans and what is called the specialty coffee market, there have blossomed hundreds of new "Master Coffee Roasters" and roasting operations, possibly as many as a thousand in the world.

Although most of these new people use rotating drum machines from Germany, Spain, France, Italy, etc., at least 20 percent are Sivetz/N-N fluid-bed roasters, and the number is growing. The sizes of the Sivetz fluid-bed roasters are usually less than one bag (70 kg) and roast times are in the seven to 10 minute range. An important difference in roaster productivity is that the Sivetz fluid-bed roasts in seven or eight minutes, while the drum roasters take 15 or more minutes to roast. That has a two-fold influence on actual production. There are several reasons why the Sivetz fluid-bed roaster has been sold successfully; not only the higher productivity, but because it is a more accurate and simpler system resulting in a cleaner tasting and more flavorful end product, with virtually no maintenance. One key important feature is that in the Sivetz fluid-bed roaster, the operator knows exactly what the coffee bean temperature is from a digital panel display. One can easily "set" the degree of roast and have reproducibility. Visual examination of the roasting beans requires a personal judgment of degree of roast, (such judgments are not accurate). By referring to the attached "Degree of Roast" chart, one can see the relationship between bean "end temperature," roast weight loss, bean color, and taste. Roast bean colors as sensed by viewing roast beans in a trier" have always been recognized as inaccurate. So even before the Second World War, reflectance colors on R&G coffee were measured and used as a guide to adjusting roasting process variables. However, such guides were "after-the-roast" was



Degree of Roast vs. Aroma Development

completed, and did not help the operator during the processing. Whereas in the Sivetz fluid-bed roasting system, one knows the bean temperature at all times, as well as being able to "set" the "end-bean temperature" for accurate and easy reproduction of degrees of roast. It is well known that the inability to accurately control the degree of roast is one of the major problems for drum roaster operators and their customers.

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Precision coffee roasting since 1992