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Application Note

Improved Coffee Blending with Rotary Batch Mixer

From its humble beginnings in a residential garage in 1996, Kicking Horse Coffee has grown dramatically. According to A.C. Nielsen, it has been the bestselling Fair Trade Organic coffee in Canada for 13 years in a row, with a total trade volume of about 60,000 lb (27,200 kg) a week. The company uses only shade grown beans from the best coffee growing mountains in the world to produce 11 single-bean varieties and, with the help from gentle blending of a Munson Rotary Batch Mixer, 7 different blends of award winning gourmet coffee.

Although the quality of the beans varies by region and by the conditions under which they are grown, there are actually only two coffee varieties – Arabica and Robusta.

Committed to Fair Trade

The company is committed not only to producing the world's finest coffee, but also to sustainability and Fair Trade. Farmers who grow the beans organically use renewable resources and avoid the use of pesticides and herbicides. The beans are grown in the shade under a light canopy of varied vegetation at high altitudes.

"Once the beans arrive at Invermere, they are sorted by the region in which they were grown and roasted in one of three different ways," explains Tom Hoyne, Manager of the Roasting Department. "Dark roasts provide a rich, full bodied, sometimes chocolaty flavor. Medium roasts are smooth and well balanced between acidity and body. Light roasts can be floral, fruity, sweet and rich. Of the eighteen varieties of Kicking Horse coffee, eleven are single-bean varieties and seven are blends of as many as seven different beans roasted to different degrees of darkness. Our Three Sisters blend, for example, uses two different lightly roasted beans, two different medium beans and three different dark beans, all roasted for different times at different temperatures before blending."

When the company first began production at Invermere, the roasted beans were blended using a wire type blender that badly damaged them. "Since our goal was to produce the world's finest coffee, this was unacceptable," says Hoyne. "We quickly decided that we needed to replace that blender. I had seen a Munson blender at a trade show I attended a few years ago and was greatly impressed with it, so they were the first company we called."

Coffee roasting a complex process

"Roasting coffee is both a science and an art form", explains Hoyne. "It involves coordinating heat, air flow, time and technique and requires lots of experience. Our roasters typically operate at temperatures between 160° and 450°F (71° and 232°C) and the beans are roasted for between 14 and 18 minutes, depending on the degree of darkness desired. Initially, the process is endothermic, which means that it is absorbing heat, but at around 400°F (204°C), it becomes exothermic, giving off heat. This means that the beans are now heating themselves and we may need to adjust the heat source. At the end of the roasting cycle, the steaming hot beans are dumped from the roasting chamber and cooled with forced air to ambient room temperature."

Once cooled, the beans are manually weighed and transported by forklift in custom fabricated aluminum bins to the blender, a Munson 700-TS-110-SS Rotary Batch Mixer with a capacity of 110 cu ft (3.1 cu m). The forklift positions the bin directly over the blender, and a slide gate is manually opened for the beans to discharge.

"The blender rotates continuously even while the beans are being loaded, so there is no stratification or waiting until all the beans are loaded for the mixing process to begin," says Hoyne. "Mixing time is

two minutes regardless of the size of the batch or the number of different types of beans being blended. We have run batches as small as 780 lb (353.8 kg) and as large as 2600 lb (1179 kg). The blender has enough capacity to handle even larger batches, but this is the largest batch we normally run. Of course, the more different types of beans we're blending, the longer it takes to load the blender, but mixing time remains constant at 2 minutes."

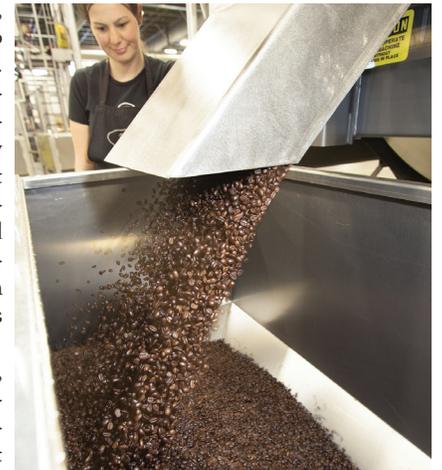
The bulk density of the beans varies by geographic region, by the different conditions under which they were grown, and by roasting time and temperature, but bulk density has no effect on mixing time. "I do a very rough measurement of bulk density pretty much for my own information, but the Munson blender produces a thorough blend in just two minutes regardless of the variation in bulk density," says Hoyne.

The blender's "tumble, cut, turn and fold" mixing action assures thorough blending without damage to the relatively fragile beans. The tumbling action is caused by constant rotation of the drum. At the same time, specially designed lifters within the drum continuously cut out portions of the batch and fold them back into the center of the blend. As displaced beans move toward the outer edge of the mix and come into contact with the drum's walls, they are gently folded back into the main body of the batch.

Once mixing is complete, the drum continues to rotate and the lifters direct its contents toward the discharge spout, preventing stratification and promoting complete emptying of its contents. "The same aluminum bins we used to transport the roasted beans to the blender carry the finished blend to the packaging line," says Hoyne. "Before they are packaged in traditional bags that we form ourselves from roll stock, however, we brew a small sample for taste testing, a process we call cupping. We also analyze each roast with near-infrared energy at specific wavelengths just to make sure it's perfect. If it's not, it is never packaged and sold."

Cleaning between batches not required

"Because the blender does not cause dust formation and discharges 100 percent of its contents, there is no need for cleaning between batches," Hoyne explains. "We simply make sure the blender is completely empty before adding a new batch of beans. We can hear as few as one or two beans rattling around inside the blender, so we know for sure when it's empty. However, we do thoroughly clean the blender once a week using a biodegradable surfactant to remove any oils that may have accumulated on the inside surface. This is the only time we use the optional side doors."



Continuous rotation of the drum during discharge prevents stratification of the batch.