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Scientists develop climate resilient strategy for Ethiopian coffee farmers

Barometer finds chocolate “too cheap” to be sustainable

Rainfall sees Brazilian crop concerns ease and prices nosedive

New standards help PNG meet buyers' requirements



Rotary batch mixer blends coffee in minutes

From its beginnings in a garage in 1996, Kicking Horse Coffee in Canada has grown dramatically. According to AC 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 27,200kg a week. The company uses only shade grown coffee to produce 11 single origin coffees and, with help from gentle blending by a Munson rotary batch mixer, seven different blends of award winning coffee.

"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," explained Tom Hoyne, manager of the roasting department at the company. "Dark roasts provide a rich, full bodied, sometimes chocolaty flavour. Medium roasts are smooth and well balanced between acidity and body. Light roasts can be floral, fruity, sweet and rich. Of the 18 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."

Avoiding damage

When the company first began production at Invermere, the roasted beans were blended using a wire type blender that damaged them. "That was unacceptable," said Mr 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 impressed by it, so they were the first company we called.

"Roasting coffee is both a science and an art form. It involves coordinating heat, air flow, time and technique and requires lots of experience," said Mr Hoyne. "Our roasters typically operate at temperatures between 71 degrees C and 232 degrees 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

A rotary batch mixer supplied to Kicking Horse Coffee efficiently produces blends without damaging the coffee it handles



The mixing drum rotates while beans are being loaded to prevent stratification, limiting cycle times to two minutes regardless of batch size

204 degrees 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 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 aluminium bins to the blender, a Munson 700-TS-110-SS Rotary Batch Mixer with a capacity of 3.1m³. 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 Mr 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 354kg and as large as 1,179kg. The blender has enough capacity to handle even larger



Beans are transported from roasters to the mixer in aluminium bins

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 two 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," said Mr Hoyne.

The blender's 'tumble, cut, turn and fold' mixing action ensures thorough blending without damage to the beans. The tumbling action is caused by constant rotation of the drum.

Tumbling action

At the same time, specially designed lifters within the drum continuously cut out portions of the batch and fold them back into the centre 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 aluminium bins we used to transport the roasted beans to the blender carry the finished blend to the packaging

line," said Mr Hoyne. "Before they are packaged in traditional bags that we form ourselves from roll stock, however, we brew a small sample for cupping. We also analyse 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."

"Because the blender does not cause dust formation and discharges 100 per cent of its contents, there is no need for cleaning between batches," Mr 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."

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Mechanical conveyor ensures segregation without degradation

When a well-known co-packager of coffee and tea products was faced with a problem with product degradation when transporting coffee pneumatically to a packaging line it decided to opt for an alternative that would not damage the product: aeromechanical conveying.

Coffee and other friable bulk materials can present problems to a pneumatic conveying system. Coffee beans sometimes crack and break when conveyed pneumatically, and a gentle handling action in an enclosed dust-free system is required.

Mechanical conveying can be highly effective in applications where product degradation and dust is a concern. Not only is dust avoided, but the gentle nature of mechanical conveying preserves the integrity of bulk materials. In comparison with 'lean phase' pneumatic conveying material tests, Aerocon Aero-Conveyors recorded a bulk density variation of 0.1 per cent after three vacuum conveying trials. By contrast, the pneumatic system increased the bulk density of the product by 12 per cent.

Inside the mechanical conveyor is an endless cable with discs that are equally-spaced along its length. The polymer discs form a natural barrier for the segregation of fines as the product travels.

The Aerocon Aero-Conveyors selected by the company transport products in a fluidized state, or by gentle pushing of the material along the tubes. In both cases the impact between product and conveyor is minimized resulting with very low degradation of the bulk ingredient.

Neuhaus Neotec supplies green coffee solution for capsules

In September 2014, Nestlé inaugurated its largest production facility to date for Nescafé Dolce Gusto capsules in Schwerin in Germany. Neuhaus Neotec designed and implemented the entire green coffee handling solution for the facility, and supplied everything from the green coffee intake equipment through pre-cleaning, a tubular conveying and weighing system to the storage of the green coffee in silos with a storage capacity of 560 tonnes. From these silos, the product is fed to processing stations. After the coffee has been roasted it is transferred to roasted coffee silos which are also manufactured by Neuhaus Neotec.

As Neuhaus Neotec notes, handling is extremely important throughout the process. The product must be transported gently and without quality loss between the individual stations. This is especially important at the new capsule plant given the long distances over which it is transported, so the requirements for the conveying system were particularly high, especially as roasted coffee is a very brittle and sensitive product. To avoid breakage the coffee is conveyed pneumatically by means of compressed air to the processing stations, and to protect the flavour of the roasted coffee, the conveying systems are of closed-cycle design.

Nestlé also had particularly high requirements for product quality, so Neuhaus Neotec installed a particularly efficient cleaning plant for the green coffee in order to remove any potential impurities, such as stones, broken coffee beans or other material. This multi-stage cleaning system ensures that the silos are only fed with perfectly clean, correctly sorted coffee. After roasting, and before it is ground and placed in capsules, the coffee is once again fed into silos, and automatically weighed by means of a proportioning weighing machines.

Full production at the Nestlé plant in Schwerin has not yet been reached. Eventually up to 40 tonnes of green coffee will be received every hour, cleaned, weighed and transported to the silos, so it was particularly important for Nestlé that it should be able to adjust the equipment for handling green coffee to meet the demands of the plant's final production capacity.



Multi-stage cleaning system with screening machine, destoner and magnet separator



Tube divider at the green coffee silos