

## CASE HISTORY

# Vacuum conveying perks up coffee production

**Café Soluble processes more coffee with fewer workers.**

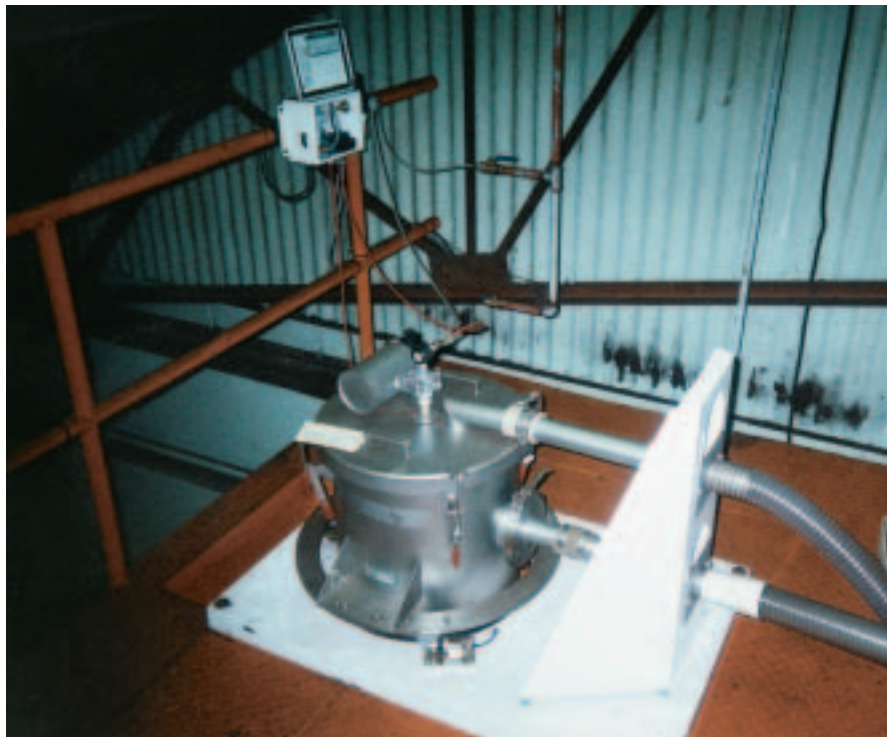
**C**afé Soluble S.A., Managua, Nicaragua, was founded in 1958 to make and market instant coffee. By 1961, the company was exporting instant coffee and other coffees to markets in neighboring countries, North America, and Europe. Today, Café Soluble is an ISO 9000 company and leads the market for instant coffee in Central America, despite competition from well-known multinational corporations.

The company also supplies clients worldwide with instant coffee, traditional ground and roasted coffee, as well as coffee in bulk. Brands include Presto, Musun, and Café Toro. Café Soluble also processes private-label instant coffee for supermarkets in the UK and elsewhere, and it makes instant cereal drinks under the Presto brand. The company employs 400 people and has annual revenue of about US\$34 million.

### Record of strong growth

Café Soluble built its reputation for quality by blending, roasting, and instantizing its products according to the wishes of its customers. As a result, the company has a record of strong growth, interrupted only by Nicaragua's decade-long switch to a planned economy in 1980. During that time, the company escaped takeover by the state, but it could not expand its markets or make needed capital investments.

The election of a democratic government in 1990—coupled with a strengthening Central American common market—restored the company's freedom to grow. The company has since rebounded and has posted strong annual gains. From 1999 to 2000, the company's sales grew more than 23 percent, reaching US\$28 million.



This vacuum receiver is one of two that draws ground coffee from holding bins near the grinder. Each is mounted on load cells over a ribbon blender and each functions as a batch weighing system.

## Roasted and ground coffee

Café Soluble's namesake product is instant coffee, but it also makes traditional roasted and ground coffee, or regular coffee. The process for making each type of coffee begins the same, with green coffee beans passing through a roaster and a grinder. For instant coffee, the ground beans then pass through an extractor and a spray dryer. For regular coffee, the ground beans go

straight to the batching, blending, and packaging area.

Since its rebound, Café Soluble has upgraded several processes for making instant coffee, including the material handling and packaging operations. In 1995, the company's managers planned similar changes for making regular coffee. Rapid growth and the introduction of more coffees were making the operations a bit hectic.

***Vacuum conveyors add flexibility that was impossible with mechanical conveyors.***



Blended coffee gathers in this floor-mounted silo until the packaging machines call for more coffee. It then ascends 10 meters through the conveying lines to four vacuum receivers mounted on the feed hoppers.

“We were doing everything by hand, including the batching, blending, and the intermediate steps,” said Ernesto Hurtado, plant manager. “I had an army of people moving boxes [of coffee] around. We grew so quickly that we couldn’t handle all the material handling for doing the different blends of coffee. So we started looking for options.”

### Choosing the conveying method

The company assigned a project team to evaluate options for improving the material handling, batching, and blending steps. First, the team looked at mechanical conveying methods, including screw conveyors and hybrid systems. The hybrid systems used screw conveyors matched with a batch scale. Those options were rejected for two reasons, Hurtado said. “One reason was the space, and the second was flexibility. We knew that at some point we would change the design, move things around a little bit. With a screw conveyor or a bucket elevator, that would require a lot of space,” he said.

Instead, Café Soluble turned to Vac-U-Max, a supplier of pneumatic conveying equipment based in Belleville, NJ USA. “We purchased a complete packaging line for our instant coffee in 1992, and the filler was fed by a Vac-U-Max system,” Hurtado said. “So in 1995, when we had this need to move product quickly, we contacted them.”

Compared with screw conveyors and bucket elevators, the supplier’s pneumatic conveyors are “very easy to move from here to there,” Hurtado said. “You just plug in your air connection, and you’re ready to go. You just need suitable overhead support, and it can be as elegant or as crude as you like. You can even just hang it up with wires from the roof. It’s a very flexible system.”

The costs of installation and operation also favored pneumatic conveying. “[Pneumatic conveying] was a little bit more expensive initially, but we are going to save a lot on installation costs,” Hurtado said. “We do the conveying and weighing in one operation, whereas if we used separate components, I would



**These feed hoppers deliver the blended coffee to the packaging machines. Each has two vacuum receivers that work in tandem to fill the hoppers when a level switch gives the signal. Throughput is 500 kilograms per hour.**

have had to buy the screw conveyors or bucket elevators from one source and the weighing equipment and the controllers from another source. Getting it all in one package was a great advantage cost-wise. On the batching system, we realized a big savings compared with a separate system.”

### The operation

Café Soluble overhauled its material handling and batching systems with the installation of six vacuum receivers. Two of them are outfitted with load cells and a weight control system and function as weigh hoppers over two blenders. The other four vacuum receivers are installed in pairs, with a pair on each of two hoppers that feed the packaging machines. The installation has virtually eliminated manual handling.

The operation begins at the grinder, which discharges the ground coffee into small hoppers, each dedicated to a variety of coffee. As the coffee fills these hoppers, the vacuum receivers over the blenders generate negative pressure and pull the coffee from the various hoppers through conveying lines.

When the coffee reaches the end of the 10-meter conveying line, it fills a vacuum receiver until reaching the target weight. Typically, a vacuum receiver will pull 20 pounds (9 kilograms) of coffee from a hopper before discharging it to the blender below. By repeating the operation 16 times, the batch grows to 320 pounds (145 kilograms). A worker then makes minor additions by hand to finish the recipe, and the blender mixes that batch of coffee. As that blender operates, the other receiver is loading the second blender. This transforms a batch operation into a continuous one. One batching cycle—loading, blending, and discharge—takes about 15 minutes.

***Automation eliminates “an army of people moving boxes,” says the plant manager.***

After blending, the coffee discharges into a screw conveyor that feeds a bucket elevator. The bucket elevator carries the blended coffee to a floor-mounted silo that holds the coffee until it’s required at the packaging machines. When that time comes, the four vacuum receivers mounted on the packaging feed hoppers work in tandem to withdraw the coffee. It travels 10 meters vertically before discharging into the feed hoppers.

Level switches control the operation of the four vacuum receivers by signaling for more coffee when the level drops below a certain point. The switches also stop the vacuum receivers when the level in the hopper reaches the high set point. The coffee then flows to the vertical form-fill-seal packaging machines, each with four lanes. The machines package about 1,750 pounds (800 kilograms) of coffee an hour.

### Better handling with fewer workers

Thanks to the automatic operation of the vacuum conveyors, the blenders, and

the packaging equipment, Café Soluble has increased its production and flexibility while reducing labor. Most important, coffee quality remains high.

“The batching system gives precise control of coffee to the blenders, and the transportation and proportioning of it is all in one package,” Hurtado said. “Now I have a lot of flexibility. If we need more capacity, I can increase the weight per cycle. As long as I have ground coffee on top for feeding the grinders, [the vacuum receivers] will go on and on and on. We go 24 hours around the clock.”

Before overhauling the operation, Café Soluble needed 40 workers over three shifts. “It was because of all the handling,” Hurtado said. “They had to get it from the grinder discharge, then get it up to the blenders, then someone would have to carry that in boxes. Then from the discharge of the blenders, we had to feed the [packaging] machines by hand. So I used to have a lot of people moving boxes.” Now Café Soluble needs only 12 workers over three shifts.

Furthermore, conveying the coffee pneumatically did not affect quality, such as from exposure to air. “It hasn’t been a concern,” Hurtado said. “We use pneumatic conveyors both for instant coffee and roasted and ground coffee. I’ve never had a problem.” In fact, Café Soluble strives to process the coffee quickly to minimize exposure to air. “All our coffee is very fresh. We don’t store more than 6 or 7 hours of freshly roasted coffee before we go to the grinders. Then, from the grinders to the packaging machines, the retention time in the silos and in the system is maybe 20 minutes. We don’t store the coffee exposed for any extended period of time.”

### Conclusion

In short, the installation has been a complete success. “Vac-U-Max is just a plug-and-play type system. If you got your selection right based on what you are going to move, there is nothing to worry about. We specified them to move just coffee, but they also moved our powdered cereals just fine, and they

are maybe 50 percent more dense than the coffee.

“From a mechanical standpoint, there are no moving parts, except for a blower, which is very basic. I would say, in all confidence, that if you make the choice to use vacuum like we did, you have no worries.” *PBE International*

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