Illustration by Dan Cassaro

Coke Has a Secret Formula for Orange Juice, Too

The cola giant has an algorithm to engineer consistent taste for its OJ

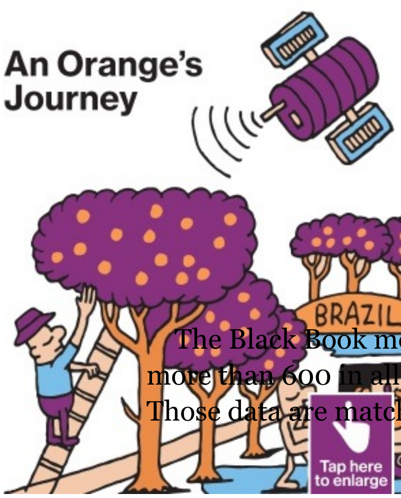
Don't let the name fool you. Coca-Cola's (KO) Simply Orange juice is anything but pick, squeeze, and pour. That cold glass of 100 percent liquid sunshine on the breakfast table is the product of a sophisticated industrial juice complex. Satellite imagery, complicated data algorithms, even a juice pipeline are all part of the recipe. "You take Mother Nature and standardize it," says Jim Horrisberger, director of procurement at Coke's huge

Auburndale (Fla.) juice packaging plant. “Mother Nature doesn’t like to be standardized.”

Coca-Cola, maker of the Minute Maid and Simply Orange brands, is using its balance sheet and distribution reach to methodically build a global juice machine. That includes the U.S., Coke’s largest market, accounting for one-third of its volume sold. PepsiCo (PEP), led by its Tropicana brand, commands a 40 percent volume share of the $4.6 billion U.S. market for not-from-concentrate juices, compared with 28 percent for Coke, according to Euromonitor. Globally, the market researcher says, Coke gets about $13 billion in revenue annually from pure juice and juice drinks. “You see them focusing on still beverages because that’s been outgrowing sparkling drinks for several years now,” says Thomas Mullarkey, an analyst for Morningstar (MORN) in Chicago.

At the core of Coke’s plan in the U.S. is 100 percent not-from-concentrate OJ, for which consumers are willing to pay as much as a 25 percent premium. Yet producing the beverage is far more complicated than bottling soft drinks. Juice production is full of variables, from weather to regional consumer preference, and Coke is trying to manage each from grove to glass.

In bucolic Auburndale, an hour south of Disney World, Coke has spent $114 million in recent years expanding its premier U.S. juice bottling plant, which it claims is the world’s largest. It’s here that Coke has perfected a top-secret methodology it calls Black Book to make sure consumers have consistent orange juice 12 months a year, even though the peak growing season lasts about three months. “We basically built a flight simulator for our juice business,” says Doug Bippert, Coke’s vice president of business acceleration.



Black Book isn’t really a secret formula. It’s an algorithm. Revenue Analytics consultant Bob Cross, architect of Coke’s juice model, also built the model Delta Air Lines (DAL) uses to maximize its revenue per mile flown. Orange juice, says Cross, “is definitely one of the most complex applications of business analytics. It requires analyzing up to 1 quintillion decision variables to consistently deliver the optimal blend, despite the whims of Mother Nature.”

The Black Book model includes detailed data about the myriad flavors—more than 600 in all—that make up an orange, and consumer preferences. Those data are matched to a profile detailing acidity, sweetness, and other attributes of each batch of raw juice. The algorithm then tells Coke how to blend batches to replicate a certain taste and consistency, right down to pulp content. Another part of Black Book incorporates external factors such as weather patterns, expected crop yields, and cost pressures. This helps Coke plan so that supplies will be on hand as far ahead as 15 months. “If we have a hurricane or a freeze,” Bippert says, “we can quickly replan the business in 5 or 10 minutes just because we've mathematically modeled it."

Coca-Cola bought Minute Maid in 1960. The juice company had been founded during World War II by pharmaceutical engineer Jack Fox, an expert at concentrating blood serum, to make OJ concentrate for a military contract. Today frozen orange juice from concentrate makes up less than 4 percent of the entire U.S. orange juice market, according to Coke, and is a tiny piece of Minute Maid sales. Instead the beverage giant has thrown its efforts into fresh juice, doubling global volume sales from 2004 to 2011. Of Coke's 15 brands that each generate at least $1 billion in revenue annually, four are juice-based drinks: Minute Maid globally, Simply Orange in the U.S., Minute Maid Pulpy in Asia, and Del Valle in Latin America.

Coke accounted for 17 percent of the juice-related volume sold in the world's top 22 markets, compared with 9 percent for PepsiCo, according to Nielsen (NLSN) data for the year ended last September. Coke's market share grew 0.9 percentage points in the period, while PepsiCo declined by the same amount.

A short walk from Coke's Auburndale plant, massive storage tanks encased in insulated buildings rise high above the flat Florida landscape. The silos are full of fresh-squeezed juice, chilled to a slushy 30F to 34F. The tanks are owned by Coca-Cola's Brazilian partner in the juice wars, Cutrale, the global fruit procurer that processes the oranges that go into Coke's juice brands. Together the companies buy almost a third of the 145 million boxes of oranges grown by more than 400 Florida growers. Coke and Cutrale educate growers on best practices and ensure that oranges are grown to Coke specifications. Cutrale's experts use satellite imaging to monitor crops in Brazil, so they can order growers to pick their fruit at the optimal time dictated by Black Book. The companies constructed a 1.2-mile underground pipeline from Cutrale's Orlando-area processing operation to Coke's packaging plant to transport juice that previously required 70 tanker-truck trips daily.

Cutrale also constructed a $10 million facility to process and ship orange pulp. About 80 percent of those orange innards are boated frozen to China for use by brands including Minute Maid Pulpy, which was Coke's first billion-dollar brand developed on the mainland. No part of the orange is wasted. Essential oils are bottled and sold for everything from flavoring to household cleaners. Peel is pressed into pellets for cattle feed. The raw juice is then flash-pasteurized and piped to storage tanks as large as 2 million gallons each for up to eight months.

A computer model directs everything from picking schedules to the blend to maintain a consistent taste

Inside the tanks, the juice is slowly

agitated at the bottom so it doesn't settle. A nitrogen gas blanket at the top keeps out rot-inducing oxygen. Batches of juice from various crops and seasons are segregated based on features such as orange type, sweetness, and acidity. In-season juice is typically mixed with off-season juice.

In peak season—roughly April to June—oranges can go from grove to glass in less than 24 hours. Fiber-optic cables keep computers at Cutrale and Coke's juice bottling plant in constant contact so juice is piped more efficiently. Inside the bottling plant, "blend technicians" at a traffic control center carry out Black Book instructions prior to bottling. The weekly recipe is tweaked constantly. Natural flavors and fragrances captured during squeezing are added back into the juice to restore flavor lost in processing.

All that tweaking doesn't suit everyone's taste. Alissa Hamilton, author of the 2010 book *Squeezed: What You Don't Know About Orange Juice*, says most 100 percent not-from-concentrate OJ is more processed than consumers realize. She has argued for stricter labeling so they know the juice has been engineered from various batches of oranges. There's still one part of the process that hasn't changed with time: picking. About 95 percent of the oranges Coke uses for juices are still plucked from trees by hand.—*Duane Stanford*

The bottom line *As noncarbonated beverages grow faster than sodas, Coke expands its orange juice business through a taste-optimized algorithm.*