

BREWING MORE WITH LESS

Cabarrus Brewing Company taps into a cavitation technology that lets the craft brewery extract more flavor from its hops while ramping up efficiency and yield.

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YOU CAN'T MAKE A GOOD craft beer without hops. But the booming craft brewery industry has driven up the price of this key ingredient in artisanal beer, putting pressure on the profit margins of small, independent breweries like Cabarrus Brewing Company. The Concord, North Carolina-based craft brewery is tackling the surging costs of hops with a cavitation technology that maximizes flavor extraction from its hops while improving efficiency of the brewing process and increasing yield.

Established in 2015, Cabarrus Brewing Company produces about 10 types of craft beers, mostly a variety of pale ales. The company has grown quickly in three years. In its first year of operation, Cabarrus produced about 800 barrels of beer a year. Now it manufactures about 3,500 to 4,000 barrels annually out of its 15,000-sq-ft, 15-barrel brewing facility, which includes a tap room. As the largest brewery in Cabarrus County, the company not only serves its craft beers in its tap room, but also distributes them to grocery stores, restaurants and bars within a 50-mile radius. While demand for its beers has grown, Cabarrus has had to contend with the escalating prices of hops due to the explosive growth of craft breweries across the country over the last several years.

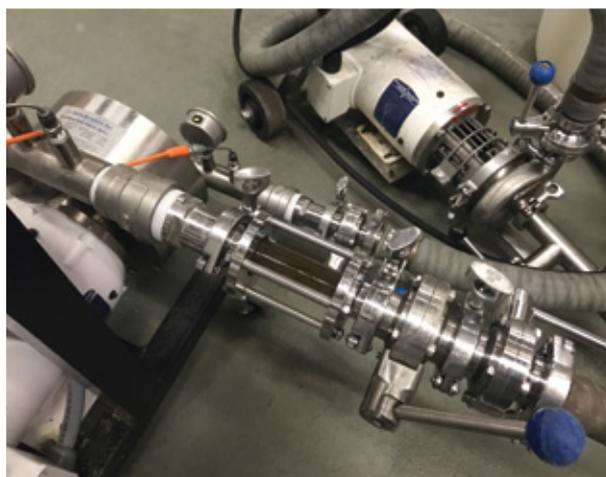
"Hops are very expensive. With more breweries opening up all the time, what we found is that the supply of hops was decreasing as the demand for our beers was increasing. So it's just a simple matter of supply and demand as cost was going up and availability of hops was going down," says Jason McKnight, head brewer at Cabarrus.

On tap

McKnight spoke with several brewing companies and experts to figure out how to cut costs on hops. Many suggested he use a variation of hops, such as hop extracts, hop oils or a powder made of lupulin, which is a concentration of compounds and oils derived from hops that gives beer its bitterness. But using those items would have affected the quality of the beer.

"I didn't want to change my product. I didn't want my beer to change flavor or profile," he says. "I wanted to continue to use traditional hops. I just wanted to try to use less hops and get the same results."

To extract more flavor from its hops, in 2017 Cabarrus installed the ShockWave Xtractor from



ABOVE: Cabarrus Brewing Company uses the ShockWave Xtractor from Hydro Dynamics, Inc. to extract more flavor from hops and speed up the brewing process. Photo courtesy of Cabarrus Brewing Company.



LEFT: The ShockWave Xtractor takes up a small footprint and is placed on casters so that the brewers at Cabarrus Brewing Company can easily move it around to different tanks in the brewhouse. Photo courtesy of Cabarrus Brewing Company.

CASE STUDY

LEFT: Cabarrus Brewing Company uses the ShockWave Xtractor mostly for its India pale ales, which feature a bold hops flavor profile. Photo courtesy of Cabarrus Brewing Company.

RIGHT: The ShockWave Xtractor has proven useful in extracting coffee flavor from premium coffee grounds and injecting that java aroma and taste into Cabarrus Brewing Company's popular Vanilla Coffee Blonde, an American-style cream ale that features French roast coffee beans and vanilla. Photo courtesy of Cabarrus Brewing Company.



Hydro Dynamics, Inc., a Rome, Georgia-based company that harnesses the power of cavitation, which applies energy to fluids in order to extract flavor from hops, wood chips, fruits and other compounds for beer and liquor.

Cabarrus uses the ShockWave Xtractor to produce its India pale ales (IPA), which feature a higher concentration of hops and a bolder hops flavor profile than other beers. The IPAs initially undergo the same brewing process as the other beers at Cabarrus before the ShockWave Xtractor is used as part of the crucial dry hopping process unique to IPAs.

Bucking tradition

After the beer completes primary fermentation, Cabarrus uses a dry hopping process to transform that beer into an IPA. Dry hopping involves adding more hops to the fermentation tank to steep, in order to inject additional hops aroma and flavor to the beer without significantly increasing the bitterness. Instead of traditionally letting the hops soak and macerate for several days, Cabarrus connects the ShockWave Xtractor to the tank and pumps the beer through the reactor, using pressure fluctuations to extract a more concentrated flavor from the hops at an accelerated pace.

The ShockWave Xtractor features a specially designed rotor with dead-ended cavities. As the rotor spins, it creates low pressure at the bottom of the cavities. The centrifugal force produces cavitation bubbles that form and collapse in these low-pressure zones, generating shock waves in the beer. The pressure fluctuations of the shock waves push and pull the beer through the pores and crevices of the hops. That push-and-pull motion exposes the beer to more of the hops and therefore extracts more flavor from the hops. It allows brewers to increase their yields because they use less hops to deliver the same amount of flavor

to the beer. In addition, less hops means less beer is trapped in the hop waste, which also boosts the output of beer.

"It's getting better extraction than you would get out of just having the hops sit in the liquid itself," McKnight says.

Value proposition

Cabarrus has already tapped into the benefits of the ShockWave Xtractor. In addition to extracting more flavor from the hops during the dry hopping, Cabarrus uses 30 percent less hops and gets about half a barrel more beer per batch, according to McKnight.

The ShockWave Xtractor also increases the speed of the dry hopping and ultimately boosts the efficiency of the brewing process overall, McKnight says. The initial brewing and fermentation process takes about 10 days at Cabarrus before the IPA moves into the dry hopping phase. Prior to using the ShockWave Xtractor, the dry hopping process took anywhere from four to 12 days for Cabarrus to extract the flavor it needed from the hops depending on the type of IPA it was producing. Today the ShockWave Xtractor can complete the dry hopping process in about two hours. That means Cabarrus can produce and package beer every 10 days instead of every 14 to 22 days.

"The real value is the time [the ShockWave Xtractor] saves us," McKnight says. "If I can get the same results dry hopping in one day by running it through the machine for an hour or two versus [steeping the hops for a] week or two, I can finish that beer out and use that tank again to brew something else. It allows me to turn beers over quicker, so I get more efficiency out of the equipment. I can brew more beer on my existing equipment without having to buy more tanks."

Cabarrus is also drawing on the ShockWave Xtractor to produce its Vanilla Coffee Blonde, an American-style cream ale that uses French roast coffee beans and vanilla. After initial brewing and primary fermentation, Cabarrus puts the coffee grounds into the fermenter and runs the beer with the coffee grounds through the ShockWave Xtractor. It not only extracts more coffee flavor from the grounds, but Cabarrus uses 15 to 20 percent less coffee beans now.

With the ShockWave Xtractor in place at the brewery, McKnight is confident that Cabarrus will be able to weather any supply and cost issues pertaining to hops now and in the future. "I don't have to worry so much about the availability of hops now that I'm buying less," he says. "We're still able to use and produce the same products. We're just getting a better extraction out of it." **PFW**

Hydro Dynamics, Inc.
www.hydrodynamics.com