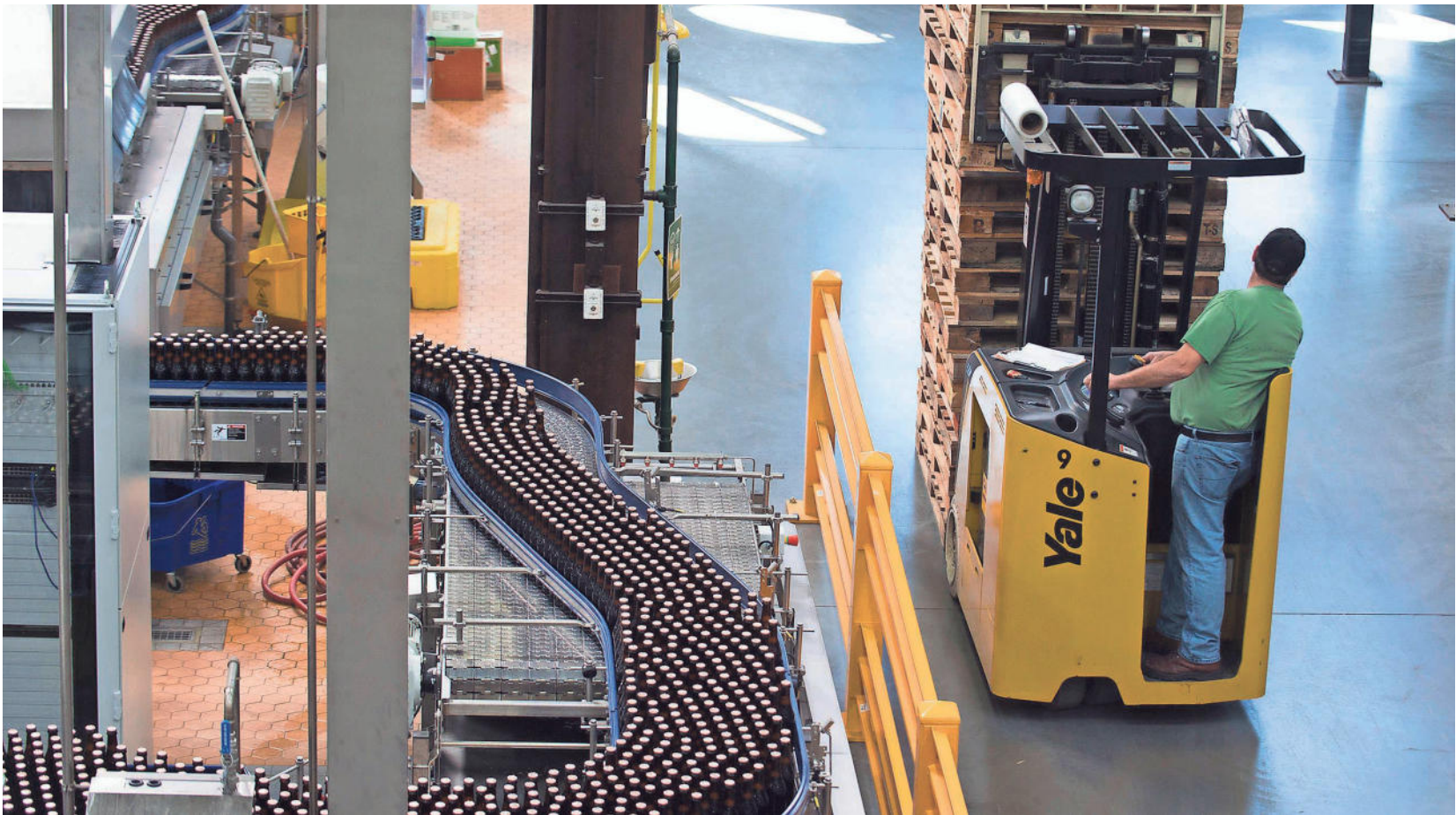




MODELS OF CONSISTENCY



STAFF PHOTOS BY JOE LAMBERTI

Thousands of bottles make their way down various assembly lines at Dogfish Head in Milton. No beer enters the bottling or keg lines at Dogfish without it going through the brewery's sensory panel. Check out multiple videos and photo galleries from the brewery at DelmarvaNow.com.



Process chemist Sean Miller checks the gravity of alcohol in the brewery's lab.

Meet the scientists and machines who ensure Dogfish Head puts out the beer that's just right

JON BLEIWEIS STAFF WRITER

After three-and-a-half years working as a pharmaceutical chemist, April Fools Day 2013 was Sean Miller's first day at his new job.

"It was a heck of a date to start," he said about his position as a process chemist at Dogfish Head Craft Brewery in Milton. "This isn't a joke."

Consistency at the brewery is not a joking matter. Being consistent is one of Dogfish Founder and President Sam Calagione's three main pillars to any successful brewery. With Dogfish expected to produce 250,000 barrels of beer in 2015, that leaves ample opportunity for unwanted variation.

It's Miller and four coworkers who make up the brewery's quality control team, the group responsible for gathering information about every Dogfish product that goes through every tank and process line at the Milton brewery.

"With the dozens and dozens of checkpoints that every beer goes through and the talents of that part of our team, I'm always amazed and proud of how consistent and quality driven our beer is," Calagione said. "These guys are really talented, specialized, coming from a deep scientific background and really important to our company."

Quality technician Jeremy Lum has a degree in biotechnology. Quality technician Karen Taylor came to Dogfish in September after working in an organic chemistry lab doing environmental science research. Quality technician Aimee Garlit joined Dogfish in August, armed with a Ph.D in microbiology. And quality supervisor Ryan Mazur — who began at Dogfish in 2005 as a fork-

lift operator loading trucks and joined in the lab when it started about two months later — has a degree in marine biology.

"We have science degrees, but I never imagined myself working in beer," Mazur, 36, said. It's a common sentiment from the team. He tried to put his degree to use but at the time, the Delaware Division of Natural Resources and Environmental Control wasn't hiring, so he turned to plan B.

"My mom's always like 'Ryan, marine science' and I say, 'Well mom, it's sharks, OK?'" Mazur said, referring to the brewery's dogfish shark logo.

Yeast: Taming the beast

Calagione describes yeast — one of the core four ingredients in beer — as "a temperamental animal," but one that must be relied on. If it's not doing its work in the perfect environment, it can go in a direction that adversely affects the beer's quality.

It takes someone with "an almost maniacal focus to detail" to be a member of the quality control team, he said.

"You've got to be really, really detail-oriented and wake up every day thinking about how single-cell-sized animals can be kept happy and can be kept safe," he said.

To understand how the animals work, people who come with that scientific background of biology, chemistry and the scientists are needed, Calagione said.

"You kind of have to have a wide array of knowledge to be able to work with beer," Lum said, adding he's seen many biotechnologists, such as himself, join the beer world. "It's microbi-

ology. It's biology. It's a lot of chemistry. It's a little bit of everything."

The five members of the quality control team regularly rotate through responsibilities, which range from the packaging line, to microbiology and sensory, though each one has an expertise.

Lum likes being able to enlighten people to the side of beer most don't get to often see.

"Most of the time when I tell people I'm a quality technician to somebody I'm just meeting, they say 'That means you taste all day,'" he said. "I'm like it's part of it, but there's so many other things that are happening on a daily basis to produce a quality product out there in the market."

In the lab, the product gets evaluated whenever something happens to it. Once it goes into the fermentation tank, a sample is taken. When dry hops are added, a sample is taken. When it goes from tank to tank, when it gets filtered and when it gets in a bottle, samples are taken.

"We want to make sure what's living in our beer are the specific things we want to be living in our beer," Garlit said.

A wide array of machines in the lab measure various characteristics of samples, including color, alcohol content and how much of certain sugars are contained in a vial.

"As a home brewer, you kind of dream about all the different tests that you could do and the different equipment you could use," said Garlit, who has home brewed for seven years.

"Here, you have access to that, which

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Quality technician Aimee Garlit holds a petri dish with a strain of yeast as she works on the microbiology aspect of brewing at Dogfish Head in Milton.

"These guys are really talented, specialized, coming from a deep scientific background and really important to our company."

SAM CALAGIONE
DOGFISH HEAD FOUNDER & OWNER

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HOME COOKING

Dogfish

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is nice.”

A machine that recently arrived is a gas chromatograph, much to the delight of Taylor, who used the machine while in academia. For the purposes of the brewery, it will help the brewers know when to end the fermentation process and show much diacetyl — a compound formed during yeast fermentation — is in a sample of beer.

Diacetyl can give the beer a buttery off-flavor. If it's detected, the brewers can adjust the temperature of the beer as it ferments, and the yeast can reconsume the compound and convert it into a compound that is aroma-less and tasteless, Taylor said.

But at the end of the day, Garlit hopes nothing too eventful happens.

“I like to think if my day is really boring, that's really good for the brewery,” Garlit said. “If I'm busy doing stuff that's weird, it's maybe not the best thing.”

Tasting time

No beer enters the bottling or keg lines at Dogfish without it going through the brewery's sensory panel, a group of about 45 trained co-workers who taste test beer at different stages to make sure the product looks, smells and tastes like it should.

The sensory lab opened in 2006 and Mazur was tapped to lead it from its inception. Samples are tasted from every fermentation tank and every bright tank daily.

“We have a lot of analytical equipment in this lab that can measure anything about the beer you want — alcohol, color, carbonation, you name it,” he said.

“There's nothing over there that can tell you what it tastes like, so you need people for that. That's where this comes in.”

In the minutes leading up to 10:30 a.m. on a recent Wednesday, Mazur pours sets of five, 3-ounce samples of beer — two each of 60 Minute IPA and 90 Minute IPA straight from bright tanks, along with a batch of Namaste that is being sampled from a fermentation tank — into 9-ounce glasses. From 10:30-11:30, his coworkers enter an adjacent room, where they sit in front of a window at one of five tables and flip a switch.

From Mazur's perspective, once the switch is flipped, a red light turns on, indicating someone has arrived. He greets the colleague and presents the five glasses, indicating what they are testing today, along with sheets asking whether the sample is true to the type of the beer in question overall, and in terms of appearance, aroma, flavor and mouthfeel.

“These glasses of beer may only hold 3 ounces of beer but this represents 800 barrels of beer out in the cellars,” Mazur said. “We're making big decisions based on these glasses.”

The panelists, who hail from a variety of different departments in the brewery, have each gone through a 40-hour course taught by Mazur to know how to evaluate the samples, including being taught a specific technique for tasting.

Beer, unlike wine, is swallowed when it's tasted, because bitterness is tasted in the back of the tongue. It takes two sips and two whiffs to know whether the product is right. Tasters must put their biases aside when it comes to the panel.

“It's not about what you like or hate. It's about this brand's profile

demands X, Y, Z, yes it meets those requirements,” Mazur said. “I may not like it, but hey, it's good, it can go.”

Mazur trains the panel by occasionally spiking samples with one of 27 different spikes that bring out an undesired attribute of the beer, such as metallic, buttery, or skunked. Purposely spiking the beer helps train the panelists to know when the problems actually occur. Depending on the attribute being described by the taster, Mazur knows where in the process something went wrong, whether it be with raw material, fermentation, yeast, or an infection.

Job title doesn't matter, when it comes to the panel, Mazur said. If 16 of 20 people say a product is great and the brewmaster says it's bad, he's trumped because here, he's just one person.

“I don't care what you do in the brewery,” he said. “In this room, you're all one of the same.”

The panel is the last line of defense, when it comes to what goes into bottles or kegs. When the panel is done for the day, Mazur tallies up the responses, and if the beer garners enough support, the tank is released.

Packaging testing

In the Off-Centered Center — the name for the warehouse which opened in 2013 as part of a \$52 million expansion — resides a state of the art German-made bottling line capable of filling 650, 12-ounce bottles of beer per minute.

The machinery offers several checks for the quality control staff to make sure the bottles are just right. Before a bottle is filled, the Linatronic inspects each bottle to make sure there are no nicks or cracks. If there is, it gets taken off the line.

Bottles are filled by one of the line's 100 filling heads and capped off by one of 15 crowning heads. Through a computer, a technician is able to call for bottles that were filled or crowned by specific heads to evaluate whether the line is doing its job correctly. Throughout a week, all 100 filling heads are checked to make sure bottles are filling up exactly to the brewery's specifications, Lum said.

Bottles go through the check mat, where a snapshot of the bottle is taken and fill heights are measured, to make sure the bottle is filled within the range Dogfish wants. The Orbisphere 6110 determines how much oxygen is in the bottle and breaks it down between the headspace between the liquid and the cap, and liquid oxygen.

When it comes to the caps, the Secure Seal Tester makes sure a bottle can withstand pressure in the marketplace, while a set of rings are placed atop each bottle to see if the cap is on too loose, too tight, or just right.

“A fraction of a millimeter can make all the difference,” Lum said.

“Perfection that doesn't exist”

Mazur knows customers anticipate certain tastes, looks and aromas when they are consuming Dogfish Head beers.

“When they go to crack that beer, it's got to maintain that level of expectations,” he said. “It's our job to maintain that.”

The evolution of the quality control program is what Calagione is the most proud of, when it comes to the last five years of the brewery's 20-year history, he said. He couldn't be happier with the direction it's going, but he knows the



Brewing supervisor John Klein checks on the packaging line at Dogfish Head in Milton.

STAFF PHOTO BY JOE LAMBERTI

work is never done.
“We're never going to have a perfect quality control program because these animals we live

with every day have some level of unpredictability, like any animal,” Calagione said, referring to yeast.

“All we have to do is keep improving and shooting for perfection that doesn't exist.”

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