New sustainable craft brewing major at WMU and KVCC

By: Sam Meads

Two local universities have created the first sustainable craft brewing major.

Imagine sitting in Kalamazoo's Bell's Brewery, one of the largest craft breweries in the United States, looking at the taps of some of the 29 different beers they offer. If you are a craft beer fan, the City of Kalamazoo is like Paradise.

Several local brewing companies such as Arcadia Brewing Company, Paw Paw Brewing Company and Bell's Brewery will be advising and helping to develop a curriculum for a new sustainable craft brewing program. Two local universities, Western Michigan University and Kalamazoo Valley Community College, will begin this program in Fall 2015. This program is the first college brewing program to put a focus on sustainability.

"The program will focus on teaching students on how to maximize profits in their business while at the same time keeping sustainability in mind and minimizing negative environmental impacts," said Steven Bertman, WMU chemistry professor and one of the developers of this new sustainable craft brewing degree program.

Breweries can be more sustainable in the brewing process by using water, energy and waste more efficiently, Bertman said. Students will be taught from day one to think about corporate ethics of energy and water usage, Bertman said.

"We want to teach students to run profitable businesses while still being innovative to not impact the environment negatively," Bertman said.

This green approach to brewing will be incorporated into the many steps involved in the brewing process.

The first step of the brewing process is to mill the grain, said Mike Babb, a former master brewer at Coors and consultant for the new brewing program. During this step, different types of malt are crushed together to break up the grain kernels in order to extract fermentable sugars to produce a milled product called grist, a grain that is prepared for grinding, he said.

The second step of the brewing process is called the mashing process where the grains are mixed and heated with water for 60 to 90 minutes, Babb said. After this process is over, a sweet, sugary extract called wort is created out of the malted grain, Babb said, and this wort is boiled before the addition of hops which gives the beer a lot of its flavor.

After boiling, during the third step of this process, the wort is transferred to a whirlpool for the wort separation where any malt or hop particles are removed to leave a liquid that is ready to be cooled and fermented, Babb said. Yeast is added during the start of fermentation which converts the wort into beer by producing alcohol, flavor and carbon dioxide, he said. Fermentation is a process that converts sugar into acids, gases or alcohol.

The final step of the brewing process is for the beer to mature and go through a three to four week cellaring process before and can be packaged, Babb said.

A major issue that craft breweries face related to sustainability is water usage and how to reuse wastewater, Bertman said.

` "One of our major concerns for craft brewing companies is how we can reuse water and not just flush it down the drain," Babb said.

Craft breweries, on average, use between six to 10 bottles of water to produce one bottle of beer, Babb said. He estimated that a company like Arcadia Brewing Company uses 5,000 to 10,000 barrels of water per year.

"The brewing industry's goal is to reduce the water usage to three to four bottles of water for every bottle of beer," Babb said.

The biggest use of water by breweries is for cleaning their tanks after they have finished brewing, Babb said. Many breweries use clean-in-place systems, or CIP, which cleans the tanks automatically and helps to reduce the amount of water used, he said. Babb said that the sustainable brewing program will teach students ways on how to use less water. One of the ways will involve collecting the water used in the CIP and use it for cleaning other things, he said.

"It isn't city water, but you don't need that for this cleaning process," Babb said.

Another way to save on water is recycling the water used to lubricate conveying systems in the brewery, Babb said.

"Instead of just dumping it down the sewer like most craft breweries do, we can reuse that water for other things," Babb said.

The water can be reused mostly for cleaning and for heating up other water, Babb said.

Waste is something else that can be used more efficiently in breweries, Babb said. Many craft breweries will discard all of their spent grains to landfills and send the wastewater down the sewer after the brewing process is over, said Dave Sippel, director of brewing operations at Arcadia Brewing Company and sustainable brewing advisory board member.

After the brewing process, there are solid wastes that remain in the barrels once the beer is removed, Babb said. This solid waste can be recycled as well. Yeast is the biggest byproduct from the brewing process, he said. Breweries can reuse yeast by taking the leftovers and instead of throwing them away, heat the yeast up and break it down for the flavorful extract that can be used as flavoring by the culinary program as well for soups and gravy, he said.

Babb suggested that spent grains can be used in several different ways. For example, he said that spent grains can be used for animal feed and for growing mushrooms. Babb said the plan for this program is to take all of the spent grains they have left over from brewing at KVCC and give them to the culinary program where they can use them to bake bread.

Babb also plans on taking the waste products that they may not be able to recycle and give it to some of the bigger local brewing companies like Arcadia and Bell's where they can recycle it. Bell's is able to turn their waste into methane and produce energy out of it, Sippel said. Arcadia sends all of their leftover yeast to a sludge tank and generates it into ethanol for fuel, and ethanol distillery plants pay for the new ethanol, Sippel said.

"Instead of flushing the yeast down the drain and spending money using city water, Arcadia actually makes a profit by recycling their leftover yeast," Sippel said.

Another way Arcadia uses waste efficiently is through their farmers in Oregon who collect chicken waste and use it as a fertilizer for growing hops, Sippel said.

"Craft breweries aren't as economical and sustainable as the major brewing companies," Babb said. He said this newly developed brewing program will teach students that if they open their own craft brewery, sustainability has to be a top priority.

Energy is the third major area for promoting sustainability in brewing. Students in the new WMU/KVCC program will be taught ways to minimize energy use, Babb said. One method that will be taught is to take vapor from the wort being boiled and put it through a heat exchanger and use it to heat up water, Babb said. This hot water can be used to heat up water for other brewing processes, cleaning or any other uses in the building.

Carbon dioxide is a major byproduct in the brewing process, Babb said. It is generated during fermentation and vented or captured for reuse. Fermentation is a process that converts sugar into acids, gases or alcohol. If breweries are able to capture and reuse the carbon dioxide, it

will lower operating costs and reduce the risk to the product and provides the opportunity to improve energy efficiency within the brewery, Babb said.

This new sustainable brewing program begins Fall 2015 and will require 96 course credit hours, including the 30-hour KVCC certificate, for completion.