In the United States, 225 million hectoliters of beer are produced every year. That corresponds to the water volume of almost 100 Olympic-sized swimming pools. Craft breweries are already producing one-tenth of that.

The flavor of success

In the United States, small local breweries are in demand. They rely on creating a nostalgic setting – and state-of-the-art technologies. Thanks to double-digit increases in revenue, nationwide they hold a market share of approximately ten percent.

Gleaming steel brew kettles fill the old brick factory building. Pipes are visible everywhere, and the sound of hissing steam fills the room. The history is fascinating: In Stratford, Connecticut, Baird is a company that used to produce machinery, but the good old days are now 50 years in the past. The building stood empty and abandoned for decades, a relic of the company's former industrial heyday. Production started up again about a year ago – this time, of beer, not machinery.

Two Roads Brewing Company is typical of the craft breweries that have recently come into vogue in the United States. These small breweries employ artisan production methods and rely on customer proximity, creative marketing ideas, a nostalgic setting, and regional sales. At Two Roads, for example, visitors can observe the brewing process and enjoy a beer tasting outside in the beer garden.

In an era when the majority of beer is industrially produced by a handful of major international companies, the Americans are turning to an old art form. Only 30 breweries existed in the United States in 1980; today, that number has grown to more than 2,400 – many of which are small local breweries. »People enjoy experimenting and discovering new tastes,« remarks Brad Hittle, the founder of Two Roads. »We are not just a flash in the pan – this is a trend.«

Yet none of this would be economically feasible without state-of-the-art technology – technology that often includes Siemens Braumat automation systems that help master brewers with their work. Siemens has already delivered dozens of these systems to craft breweries in the United States, and concrete discussions are already taking place with other interested parties. In the U.S. market for brewery technologies, Siemens commands a market share of approximately 20 percent. Sales to large breweries like Anheuser-Busch InBev account for most of that market share.

On the rise, however, are breweries that are experiencing strong growth despite being unknown internationally, such as Stone Brewing in San Diego, California, Bell's Brewery in Kalamazoo, Michigan, Lagunitas Brewing in Petaluma, California, and Yazoo Brewing in Nashville, Tennessee. In the summer of 2012, Siemens delivered the Braumat Compact system to Two Roads and the brewery began using it for production in September 2012.

Quality is key

»The most important factor for success is a consistently high-quality beer,« says Hittle, who has extensive experience in consumer goods and the beer business. The name Two Roads comes from a poem by U.S. poet Robert Frost, and illustrates Hittle's philosophy of life – to always take the road less traveled. True to this motto, he quit his secure job as the head of marketing at Pabst Blue Ribbon, the traditional beer brand of Pabst Brewing Company, to establish Two Roads Brewing Company.

Hittle is pursuing a two-pronged strategy for economic success: First of all, he wants to establish an independent beer brand. But for economic reasons he also needs to fully exploit his brewing capacities – »

Proven technology for the process industry

Braumat technology from Siemens has been available since 1977. Braumat is the first SPS-based, recipe-controlled automation system for breweries. The centerpiece of this process control system is the Simatic PCS 7 controller. The process control system is scalable and used in numerous process industries.

Viewed from the outside, the turnkey Braumat Compact consists of a stainless steel cabinet with a touch panel for operation that is tailored specifically to the requirements of smaller breweries. The inside of the cabinet contains switching elements that perform various functions, such as setting up the motor for pumping and opening and closing valves. Braumat has integrated libraries that offer off-the-shelf solutions for the production processes of smaller breweries – brewing, fermentation, storage, and filtration.

The control functions for heating and cooling are energy-optimized to keep operating costs low. A production planner organizes brews and cleaning, and also offers features like the monitoring and recording of process data. The process instrumentation – sensors, motors, and valves – is connected via the Profibus universal field bus system.

www.siemens.com/braumat

The entire Braumat production process at a glance: brewing, fermentation, storage, filtration. The centerpiece of the technology is the Simatic PCS 7 process control system, which is also used in other process industries.

something that is currently not supported by Two Roads' sales figures. For this reason, his brewery operates concurrently as a contract manufacturer for other breweries experiencing production bottlenecks.

»Having the best state-of-the-art facilities is the key factor in securing these kinds of orders and having the flexibility to manage them,« says Hittle. A »sight for sore eyes« is how he refers to his gleaming brewing equipment, which he had built by Rolec, a German specialist located on Lake Chiemsee. Rolec also drew his attention to the control systems from Siemens. It was a decision that was easy to make, because other breweries he works with had also recommended the Braumat solution.

Just six months after its opening, Two Roads was handling twice as many outside orders as had originally been anticipated. The list of customers includes ten companies that commission Hittle to brew 40 different kinds of beer. But Two Roads' own beer production is also outstanding: Sales are twice as high as projected in the business plan. In the state of Connecticut alone, more than 850 businesses sell beer from Two Roads.

Two Roads markets ten different types of beer. The variety of recipes would bring a master brewer with no control software to the brink of despair. With Braumat technology, however, variety is not a problem. Braumat can be used to produce a nearly limitless number of beer types – the number is limited only by the performance of the computer to which it is connected.

20 percent growth

Quantitatively, a relatively small number of large breweries define the beer business in the United States. The market for beers from craft breweries currently accounts for less than ten percent. However, in the last ten years, the demand has risen by an average of 20 percent annually, while the consumption of industrially produced beer has decreased slightly.

During the economic crisis, the demand for beers from small breweries actually increased. In the past, beer in the United States was sold primarily through television advertising. Advertisements focused solely upon emotions to create brand loyalty; taste was considered to be secondary. In the United States, most beers from large breweries have a similar taste: light, refreshing, but also rather bland. Beer drinkers are now increasingly looking for individuality and distinctive flavors.

»Siemens has played an active role in the brewing industry for more than 100 years; for over thirty years, it has worked on automation with major players in the beer industry,« says Rüdiger Selig, Siemens' expert in brewery automation. »Seven years ago, we came up with the idea of supporting craft breweries by offering our control technology in the form of a Braumat Compact turnkey solution to smaller breweries.« It is clear that this has been a thoroughly successful approach.

Braumat is a system used to control the brewing process, and is similar to automation systems Siemens supplies to other sectors of the process industry. In the past, Siemens automation was usually delivered by German machine manufacturers along with the production plant itself. For smaller breweries, however, this package was often too large. With Braumat Compact, the entry-level costs for brewery automation have dropped to less than US$50,000 – an amount that even start-ups can shoulder. The investment pays for itself starting with an annual production volume of approximately 5,000 hectoliters.

To distinguish their beers from the uniform beer produced by large competitors, craft breweries focus their attention primarily on the ingredients and the authenticity of the product and less on a process that operates with maximum efficiency. »Owning a Braumat system does not mean that you simply press a button, leave, and then have finished beer after 20 days,« says Edward Montgomery, the person at Siemens responsible for business with U.S. breweries. In his experience, breweries that decide to go with Braumat continue to do many tasks manually. That is no problem for the technology. »Braumat can accommodate work that is done manually, which enables customers to retain the artisanal aspects of their brewery. For that reason, we have not yet encountered any reservations about too much automation.«

Many craft breweries begin as the proverbial garage operation, where the brewing process is still performed manually in large vats. Water and malt are added by hand and mixed into a mash. The mixture has to be heated five times followed by a rest period to activate the enzymes that

Largest beer producers in the world
(Output in millions of hectoliters)

China	490
U.S.	225
Brazil	133
Russia	98
Germany	96
Mexico	82
Japan	56
United Kingdom	46
Poland	38
Spain	34

Source: Barth-Haas Group, 2011

The mashing process is complicated: The mash has to be heated five times, but the temperature must never exceed 78 degrees Celsius (left). Two Roads Brewing Company (right) has relied on the Braumat Compact system from Siemens since September 2012.

will later convert starch into sugar. During this process the temperature must never exceed 78 degrees Celsius. During fermentation, the temperature must be constantly monitored in order to identify the right moment to separate the wort and undissolved parts of the mash, also referred to as lautering, and begin the pumping process. After boiling the wort, it is transferred via the beer cooler to the fermentation and storage tanks, where the beer ages for three to five weeks until it is bottled.

If a brewery increases its production at a later time, it not only needs more tanks for the aging process: It also frequently needs to start a new batch of beer. »Transfer processes between the fermentation and storage tanks occasionally occur in the middle of the night,« says Selig. For small operations with manual production, that is anything but a desirable time. It is even worse if, for instance, cooling fails to occur in the fermentation and storage tanks. In these cases, Braumat in conjunction with an alarm control system automatically sends a warning message to the master brewer's cell phone; whereas breweries that are manually controlled run the risk that an entire batch of beer will be ruined. »That represents a tremendous financial risk,« says Montgomery. »Initially some craft breweries decide to buy our system simply to monitor their brewing process.«

Turnkey product

Braumat is a turnkey product. In contrast, competitors in the U.S. market typically only supply individual components that the breweries have to assemble themselves. »Braumat Compact is a standard product with uniform quality regulations, support, a training hotline, and a product lifecycle – in other words, the usual standard found in all our products,« says Montgomery. One weakness of individually assembled systems is often the maintenance, because it can only be provided by the specific plant builder. »Siemens, on the other hand, offers superior hardware as well as incomparable customer service,« says Montgomery.

Another benefit is that Braumat Compact helps when it comes to trying out new recipes. »Experimentation is very user-friendly, because Braumat Compact records every step and makes it reproducible,« says Hittle.

At Two Roads, Hittle has already exceeded his growth plan at an unexpectedly early stage, so he is thinking about expansion. As a first step, in early 2014 he plans to expand sales from Connecticut to Massachusetts and New York: »We are located just a stone's throw from Interstate 95 – a freeway that extends from Maine to Florida,« says Hittle. He already regards the entire East Coast of the United States as a market for his beers. As a result, he is thinking about expanding not only sales but also his production capacities: »In five or six more years, we'll need another brewery.« ■