



Automation Now Making a Splash in Distilleries

By: Jim Offner

Worlds seem to be colliding, as tradition-conscious craft distillers look for ways to build modern efficiencies into their businesses. For an increasing number of proprietors who deem themselves artisans as well as entrepreneurs, technology is the means to that end. H.E.J. (Odin) van Eijk is one such entrepreneur. Van Eijk said he saw the need for more automated systems years ago, so he started developing a robotized approach to distillation and launched a line of automated tools under the iStill banner in Amsterdam, Netherlands. iStill's automated distillery systems are catching on, van Eijk told *Beverage*

Master Magazine, noting that they currently have about 50 systems operated in the U.S. Those systems, with capacities ranging from 26 to 1,300 gallons, can perform automated and robotized mashing, fermenting, and distilling.

These systems are gaining in popularity. iStill expects to sell around 100 fully automated distilleries in 2018 in the U.S. alone, and even more in Europe. "On a worldwide scale, the U.S. (is) a bit behind," said van Eijk. "In Europe, notably the U.K. and Scandinavia, over 70% of new still purchases are now in favor of automated and robotized sys-

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tems.” iStill has more than 570 stills in operation worldwide. By the end of 2017, the company was expecting to have built 200 systems, with plans to produce 300 fully automated and robotized stills in 2018.

The reasons for the growth in popularity of automated distilleries is as varied as the products that come out of them. Perhaps the most telling trend is found in the growth of craft categories. “Many enter craft distilling – or craft brewing – from a hobby perspective,” van Eijk says. Soon, though, the hobby turns into an enterprise, and questions about profit, time savings and consistency pop up.

That’s where automation and robotization help out, van Eijk said. “Computers are great at control, giving the craft distiller repeatable and reliable output without spending all day behind the still,” he said.

The degree of automation a distiller uses can vary, and companies like iStill exist to tailor their products to fill individual business models. But there’s a cost-saving commonality running through each system. “In general, the next generation of fully auto-

mated and robotized distillation equipment is both cheaper to buy and cheaper to run,” van Eijk said, adding that the technology behind traditional plated design stills reaches back more than 150 years. “It does the job of distilling and concentrating alcohol, but at a low rate and high material investments.”

A “next-generation” automated and robotized distillery with 530-gallon capacity costs around \$50,000, whereas a traditional set-up – even without automation – would run at least \$250,000, van Eijk says. “Running costs of an automated and modern system are around 10% of those of non-automated traditional still designs.”

Automated systems are reliable, although new technology typically calls for “an incubation time” for customers to adapt to it, as well as for the technology itself, to grow to a mature quality level. “In general, earlier models do experience some reliability issues,” van Eijk said. “Integrated advanced distilleries with full automation and robotization have only started outperform traditional stills regarding reliability over the last two years. Here, as well, it is the computerized control that helps with wear and

tear and limiting maintenance and downtime.”

Internet-based features for remote monitoring and management and upgrades are helpful in further improving the distillery’s capabilities over the years, van Eijk said. He compares the products’ evolution to “how Tesla upgrades their cars.” It’s reliable too, van Eijk said, noting that his products carry a five-year warranty.

Van Eijk’s professional background centered on “spirits design,” and he developed a robotized approach to distilling out of necessity. “I helped craft distillers – and brewers moving towards distilling – create gins, whiskey, rum, brandy and vodka,” he said. “I felt I needed better tools – distillery equipment – to help me make better spirits.”

As Van Eijk dug into the guts of distillery design, he was baffled to find out the latest innovations had taken place a century and a half earlier. “Process control, inert materials, fine mechanical control were all missing, so I felt I could improve and started designing the first automated units, with ‘distilling made easy’ as the tagline that served as my compass,” van Eijk said. “With every new technology we designed, we always aimed at making distilling easier for our customers.”

The invention didn’t happen overnight. Van Eijk said the process took three or four years. “Doing test runs here in the Netherlands helped do that, as did the feedback we got from our customers from around the world.”

Van Eijk now is several years into marketing his invention. “The big breakthrough was when we took one of our earlier designs with us to the Chicago area and set it up against a traditional German still that was 10 times the size and 20 times more expensive than our automated and robotized iStill. We first compared stripping runs, to evaluate overall speed. Stripping took us three hours, where that big beast from Germany struggled to do it in 4 hours,” said van Eijk.

The next step was a finishing run on new make spirit (young whiskey) to evaluate taste. “It took both stills five hours, but the new make made with the automated iStill was nice and drinkable, fresh from the still, contrary to the rough spirit produced by the other still,” he said.

The last thing van Eijk wanted to evaluate was a gin run, but the owner of the traditional copper still didn’t want to do that because it would take him two hours to clean out the still, said van Eijk.

By contrast, van Eijk’s process took only a few minutes to clean and only required water. “So, we made the gin on the iStill only; it turned out great, we got drunk in the bar, and I sold seven units that very evening, said van Eijk. iStill has continued to tweak the technology and now has a “next-generation” lineup of products. “Two years ago, we decided it was time to pool everything we learned and create the (new) lineup,” van Eijk said. “Vast improvements over the first generation of automated and robotized have taken place. Production speeds are up by 100%, for instance, and the units are designed to produce for 20 to 30 years continuously and without any issues.”

Automation in Action

Van Eijk impressed Chris and Ashley Cross, husband and wife co-owners of the New World Distillery in Eden, Utah.

Automation has made a difference for the two-person operation, Ashley Cross said. “I don’t know if there’s such thing as fully automated – pushing a button and go home and 10 hours later have a batch of gin,” she said. “There is a process that allows you to multitask.”

It also allows for flexibility, including compensating for changes in barometric pressure, temperature swings and other environmental factors, she said. “We dial in cut points, temperatures, do a lot of manual tasting and checking along the way, but we know what it should taste like at Hour 3 or Hour 7,” Cross said. “If we’re having changes in temperature from day to day, it enables us to have a consistent product.”

Consistency, in fact, is the ultimate product of automation, Cross said. “If you make a product and it’s catching on in popularity and accolades, you can’t turn around the next season and not have that same product.”

Automation has allowed the Crosses to devote a bit more time in developing an array of products, rather than focusing on mechanical processes, Ashley Cross said. “We’ve been open since Dec. 10, 2016.

We're coming up on 11 months with five spirit releases. It's been a pretty aggressive 11 months. We're doing great."

Who Should Automate?

Automation doesn't fit all distillers' needs, but there are some candidates for whom automated systems would provide a lift, experts say. Indeed, Nick Carleton, president Carleton Helical Technologies Inc., a New Britain, Pennsylvania-based equipment supplier, said automation is becoming more common. "They all run into the same issue; typically they come to a crossroad – manpower vs. automation," said Carleton, whose company provides an array of cleaning equipment, primarily for bottles. "We see bottling at 10-12 a minute, where they want to automate. That's a lot of money per year. It's pretty easy to justify ROI (return on investment) at a pretty low level. You put the cost of one person over a year; it's easy to figure the ROI."

Automation is particularly well-suited to large volume operations, said Bill Owens, founder and president of the Hayward, California-based American Distilling Institute. "I think you need to have a huge

volume pulled through," he said, noting that automation likely would be most successful in a distillery that serves a vast marketplace.

However, most distilleries are likely to have some degree of automated control somewhere, said Dan Kahn, founding partner of Minnetonka Brewing and Equipment Co. in Minnetonka, Minnesota. "The question really isn't about whether there is automation; it is how much is needed and where is it best utilized. This is an assessment that every distiller needs to make at the very start of planning their business, and re-assess on a regular basis as the business matures and expands," Kahn said.

There are numerous factors that affect that assessment, Kahn said, listing money available for capital investment or improvement, types of stills used and products made the number of production tasks performed simultaneously, and the number of staff performing those duties among them. "All of these factors are likely to change dramatically over the lifetime of a business," Kahn said. "There are lots of steps in the process of transforming grains (or other carbohydrate source), water and yeast into fine spirits, and every one of these steps requires con-

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The image shows a large, custom-made copper distillation system in a rustic, barn-like setting. The system consists of a large copper pot still on a stand, connected to a copper condenser and a collection vessel. The background shows wooden beams and other equipment, suggesting a professional distillery environment.

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The image features a variety of brewing and distilling equipment, including a tall copper still, a condenser, and a large metal barrel with a wooden interior. The equipment is arranged in a way that highlights the company's offerings. The background is dark, making the metallic surfaces of the equipment stand out.

trolled conditions and/or actions that are candidates for automation. This runs the gamut from supply of steam or other heating source for multiple processes, cooling medium at multiple steps, propagation of yeast, cleaning operations, product packaging and so on.”

Automation sharpens control over the distilling process. “With technology, you can have more control over what you’re making and guarantee the quality of that product. Replicability is a huge factor,” New World Distillery’s Cross said.

iStill’s van Eijk said automation could benefit both small and large distilleries differently. “For a smaller craft distillery, batch reproducibility is more difficult; they benefit from automation,” he said. “On a bigger scale, cost-effective production becomes an issue. There too, automation can make a huge difference.”

Automation and robotization take effect if they are combined with a full redesign, for example, replacing old technology with new, a more modern boiler and column and management systems, so that a distiller can receive the full benefit of technological advancements.

Automation Pros and Cons

Kahn lists numerous reasons for automating a distillery in part or whole. Among them, automation improves product consistency, leads to more efficient product yield and utility use and improves labor productivity. Cross says automation is about consistency in product quality. “Replicability is the No. 1 consideration,” she said.

The craft brewing and distilling industries have tended to explain away variances in final products, due to the human element that goes into the process, Cross said. “We’re using that up. That’s a lame excuse, not having a replicable product. They expect it to be consistent. I think the consumer expects that and the craft distiller that doesn’t acknowledge that is lying.”

Carleton said automation works three ways – achieving consistency, making the most of the available labor and creating “higher-level” jobs for workers. “You could go back many years where manpower was plentiful and cheap, and you could get a lot of bodies, and it works; you get automation, you’re

getting consistency,” he said. “It’s probably not a manpower thing; you’re probably just moving that person to a monitoring situation. Consistency is a pretty important thing.”

There are arguments against automation, Kahn said. Among them, the cost of implementation evaluated against the return on investment and the loss of decision-making at a control point, as well as the risk of a bad outcome chosen automatically. “Automation is about controlling a process without having to manually perform the actions,” Kahn said. “But, a process cannot be controlled unless it is measured. The downside to automation – aside from cost – is for something to be done that is a mistake, without the judgment of a person to correct the situation.”

For example, an automated cleaning routine for a tank, where there is a timed series of cycles for rinsing, circulating cleaning solutions, final rinse and sanitation, and the presumption is that the tank is ready for use after this process. “But, if nobody inspects the tank in between each step of the cleaning process, there could be residue that never gets removed, meaning the tank cannot actually be sanitized, and problems result,” Kahn said. “The takeaway is that steps that are the most readily measured and easiest to control are the first ones to automate, and the steps that involve the most variation and judgment are the last.”

There also are perceptions, valid or not, that can push against automation. “It’s a good thing because it gives you more control and better product with less time and money invested,” van Eijk said. “The bad thing can be – and this is a personal consideration for many distillers – that new technology does not look as magical as old, copper stills. Then again, distilling is science and chemistry and not wizardry.”

Research Before Acting

Experts agree that distillers should research automation before moving forward with upgrades. “There is a lot of planning that should go into designing control system upgrades and expansions, and future needs should always be a big part of that,” Kahn said.

Carleton said labor needs figure into calculations involving the necessity of automation. “I guess it comes down to today one thing is manpower avail-

ability, vs. the consistency of automation that you're going to get," he said. "I don't think it takes a lot of effort for a company at some point when you're starting to hire more people you think you need, you can ROI your equipment. When they start seeing so many bodies, it's time to move to automation. That way, your hires are based on a particular job. Throwing bodies in it just to do the same job, doesn't work."

If only a couple of workers are needed to do work "at a reasonable level," automation may not be a priority. "If you need more, there's a point where automation becomes the best option," Carleton said. "It's probably a second- or third-level thing from the initial startup from when you're making small batches."

Automation also comes with variations in cost, reliability, and durability of sensors, valves and control components. "One needs to cognizant about where in the facility explosion proof components are a priority, and automated valves, motors or



sensors that are part of a still or distillate/product handling steps need to have spark free operation, low-voltage, or pneumatically actuated," Kahn said. "Pneumatic valves are usually less expensive than electric solenoids, so if one decides that pneumatic valves are justified anywhere, it makes sense to utilize them as much as possible."

Kahn said it's safe to assume that when some automation is justified, it will lead to more as production increases. Distillers should plan accommodations for additional tanks or process steps to be controlled in the future, as well as control blocks and PLC input/output capacities.

Cross said research is part of the standard "due-diligence" process in evaluating automation's value to a distillery. "Take classes – as many as you can – on hands-on courses and exposure to equipment and talk to experts before you invest thousands of dollars in equipment that will have really limited capabilities," Cross said. "You have to have something for everybody that walks through the door. If you invest all your money on one still that makes whiskey and brandy, how are you going to be able to produce a clear?"

The Crosses conduct quarterly distilling courses. "We're about to do our third course in January, and it's interesting to see the kind of people that come to the course, knowing the kind of equipment we have and why they're drawn. Without fail, it's the desire to produce a premium spirit with replicable capacity. It makes sense in 2018 to throw technology at it. Why are we still using antiquated still designs and think we can produce multiple products on one still design? The proof is in the product in the bottle," said Ashley Cross.

Van Eijk recommends visiting an automated distillery for a first-hand look. "Talk to the owners and distillers to get a feel of how they like it and why they like it," he said. "A logical next step is to reach out to a manufacturer like iStill and visit them, as well. Striking a personal relationship with an OEM (original equipment manufacturer) may well be as important as what still and what level of automation one needs. If you buy a unit to work for you for over 20 years, you better choose a party you feel comfortable communicating with, right?"

The research process comes with a caveat, though, ADI's Owens warns. "There's about seven or eight equipment manufacturers, and they'll each tell you a different way to automate," Owens said. "You have three primary products – whiskey, gin and vodka. If you're a vodka distillery, yes, you'd like to be automated, but to have the cash and set that up, it requires time to recoup that investment."

He said automation also is better-suited to large-scale distilleries, which rubs against the trend to buy locally. "The model of the future is local," Owens said. "People want to come, tour, buy a bottle, have a cocktail and take a bottle home. Who wants to deal with 50 different states and wholesale distribu-

tion systems? Before you know it, you're just sitting in meetings with wholesalers. The joy of a small business is gone."

The lure of the local craft distillery dissipates as automation takes over. "I don't see anybody on their website saying, 'We're fully automated, come and visit us,'" Owens said. "You want to meet the owner, distiller, person in the gift shop. It's a social event, visiting a distillery."

Distillers would be shrewd to choose diversification over automation. "The marriage of the future is these breweries can add on a distillery real easy, and there's a natural marriage because a lot of the processes – the fermentation, the milling, -- are the same," said Owens.

How to Implement Automation

Automation comes in different degrees, and a distiller has to figure out which one will fit his or her operation, experts say. They note that it's not necessarily a quick or easy process. Knowing "how automated to go" is mostly an ongoing assessment based on present circumstances and projected growth, Kahn said. "Hopefully, automation can be implemented to avoid problems before they surface, rather than remediate problems that are occurring, but some of both happen in practice."

Carleton said it's important to find out what other distillers are doing. "There's a wide cross-section of level so you can compare yourselves pretty easily," he said. There's no risk of revealing any "trade secrets," Carleton said. "The confidential part is how they make their product, not how they package it. Putting it in a bottle, label and cap is somewhat common ground, and I think there's a lot of technology that's easy to obtain and there's a lot of similar levels of distillers that would share that kind of information," Carleton said. "The proprietary part is their formulation and not their automation."

Carleton said trade shows could be worthwhile investments for craft distillers who are pondering automation. "All the equipment is geared toward that, and (attendees) get a feel for what kind of equipment is out there at all levels," Carleton said. "It's like buying a car: You want to put your hands on it, see it, feel it."

One of the most significant challenges any startup

business faces is projecting revenues and operating costs, Kahn said. "Knowing exactly how much automation will be justified initially is very difficult, and startups typically err on the side of conserving capital until the need to spend money is obvious," he said. "Once a distillery is in operation, it is much easier to see what operations are taking up a lot of labor that could be reduced with automating some steps or processes, or where consistency can be improved."

When implementing automation in a gradual, step-wise fashion, it is necessary to start with the most straightforward and easily measured and controlled processes. "For example, if steam is the heat source, a boiler will have some degree of automation to maintain an available range of pressure throughout the system," Kahn said. "Installing automated solenoids to provide steam to the pot and mash tun jackets to maintain set point temperatures measured by a temperature sensor is a fairly simple upgrade. Having a programmed set of temperature rests for certain time periods is a further step that requires a PLC controller to integrate the sensor inputs, control outputs, and recipe elements."

Certain operational steps form logical groupings as potential control blocks that can be independent of each other. "For example, if a whiskey distillery has several different grain combinations for different products, it makes sense to automate controls for everything purchased in bulk and stored in silos; ingredients used in small enough amounts that they are used by the bag are easiest added by hand," said Kahn. "But being able to automate bulk grain additions, grist to water ratio, and mash temperature profiles can go a long way to improving the mash consistency, and all of those functions would be appropriately grouped onto a single control unit."

Fermentation temperature control would be another natural control block, which may include agitation as well as temperature control. "Almost any still will require some temperature control tied to a temperature sensor, but there are many options for where to place such a sensor: in the pot liquid, pot or helmet vapor, a bubble plate vapor space, or the vapor path above a dephlegmator," said Kahn. "It might also be beneficial from a product consistency basis to automate water flow through dephlegmators to maintain temperature set points in either a vapor path or cooling water point."

On the other hand, automating aspects of the process, such as where to make cuts, is complicated, and even useless, unless the previous steps of mashing and fermentation are established to be very consistent and well controlled. “There is a spectrum of how appropriate different steps are for automation, and those that require organoleptic assessment and personal judgment – like where to make cuts, aging and blending decisions – are the least appropriate for automation,” he said. “Purely mechanical procedures like packaging finished product are the most appropriate, and packaging is a step that is very labor-intensive when manual, and one of the first to automate with increasing production, and probably the easiest to calculate labor savings for.”

Kahn said benefits of other automation upgrades might be more difficult to quantify, but it can be feasible for a single person to manage more operations simultaneously when individual steps can be automated and not require constant attention and oversight. “This is the type of benefit that cannot be evaluated until one is actually operating and noting how time and attention are divided for the people running the operations of the distillery,” said Kahn.

How much of an operation needs automation ultimately depends on the choice of equipment. “We make choices based on automation capability, but if that’s not factoring into your decisions regarding equipment choices, you should not do that,” said Cross.

Cheap to Operate?

Experts agree that automation does change a distiller’s labor dynamic. “It decreases labor costs, your production times – enough that we can run a business like ours with only two people and have five spirit releases in 10 months with a staff of two,” Cross said.

Carleton said automation leads to better, smarter workers. “It allows you to maintain and upgrade your employee base to a better job,” he said. A distiller may grow to a point where it is necessary to hire additional workers to do simple jobs that automation can handle more efficiently, Carleton says.

Bringing in an automated system, he says, doesn’t mean “getting rid of personnel;” it does mean “using them in a better way.” “That’s why automation works,” Carleton said. “Henry Ford proved

if you automate, it actually makes your employee more valuable. Instead of being a primal employee, you become a more knowledgeable employee. Automation allows people evolve in their job, rather than putting the same basic employees there. Automaton allows you to maximize your labor force, ultimately.”

Owens also believes that automation could cut costs, long-term. “But with the initial capital investment, it would take a long time to amortize that out,” he said. Some processes, such as bottling, may not require automation for labor-savings, Owens said. “You can hand-bottle 30,000 cases per year,” he said. “I used to be able to 1,000 bottles in three hours. It goes fast when you get everything ready to go. You don’t need to spend \$250,000 on a bottling machine.”

Kahn says automation should do one of two things – improve the consistency of the process – and, therefore, the product – or improve labor efficiency. Otherwise, there is no point in it. “Sometimes, there may be new measurement tasks that accompany the automation of some process, but that should contribute to improved consistency,” he said. “There is always a necessary relationship between measurement, control, and consistency, and one way or another, QA/QC work has to be done, and be sufficient to achieve product standards.”

Larry Taylor, the owner of Riviera Beach, Florida-based equipment supplier StillDragon North America LLC, said automation does tamp down labor costs. “If you wanted to get a lot of things done but are running on a bootstrap budget and don’t have the payroll to bring people in, you can set up a system to allow preheating. [This allows you the freedom to] do other more productive things in the distillery instead of specifically having to watch your system,” he said. “My understanding is... all the manual labor that used to occur, now only two people are required to do what 40-50 people did a couple of decades ago.”

More Production Through Automation

How much more productive can automation create? That depends on numerous factors. “The types of products that a distillery can make well depend on the equipment available and processes used,” Kahn said. “Automation can certainly make it easier to make products like vodka with efficiency

and consistency, and reduce the physical activity required to operate and clean a still with 20 bubble plates and CIP spray balls, but it is possible to make the same product on the same still with or without automation. If a distillery gets to the point of regularly running two or more labor shifts a day, or 24-hour operation, automation can go a long way to standardizing production schedules and keeping everything running smoothly.”

On the other hand, steps that are dependent on variable materials do not lend themselves to automation at all. “If a distillery is macerating fruit to make flavored vodkas, for example, it is impossible to avoid tasting product to determine proper amounts and maceration times,” said Kahn. “There is too much inherent variability in the flavor characteristics of agricultural products like fruit to automate their use and get a consistent product. The more variable and complex a spirit is, the more critical organoleptic analysis and human judgment are in the process.”

iStill’s van Eijk argues that automation does translate to higher production volume. “With modern day automated and robotized iStills, a distiller can now make any product on one still, without even changing one part to that still,” he said. “The only thing he or she does is dial in a different program. For rum or vodka or gin or brandy or whiskey... and the still will provide the parameters to do that run – or tailor it to the master distillers wishes.

When Would Automation Not Work?

StillDragon’s Taylor said there are situations in which automation would not be the best path for a distiller.

A lot of my customers are brand-spanking-new to the industry; there’s a lot of people trying to get into the game, and some have no experience whatever,” he said. “The automation does not establish the protocol, make the spirit. You as a distiller have to understand the process first and then adjust the equipment to behave accordingly. If you don’t know how to do this first, you can’t apply input and make world-class spirits. You have to have to know how to drive that airplane with a joystick before you can put it on autopilot.”

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