

Pittsburgh

Winter 2014

ENGINEER

Quarterly Publication of the Engineers' Society of Western Pennsylvania

CHEERS!

The Engineering Spirit behind Spirits

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Guest Editors Column

By David Borneman and Zach Huth

Welcome to this Winter issue of *Pittsburgh ENGINEER*. The beverage industry is a vibrant part of everyone's life from the consumer to the producer. Be it water, milk, soft drinks, fruit juices or alcoholic beverages. Science and engineering play a part in the invention, production, packaging, delivery and disposal of beverage products. This issue will focus on a few of them. This issue will touch on several of the alcoholic beverage making facilities in Pennsylvania and where you may find them. ALCOA has graciously shared many of their contributions to the development of beverage containers. On the soft drink side of life, we feature an article about a local bottling company bringing back cherry soda.



David Borneman

The Western Pennsylvania region has a long history of beverage making from the Whiskey Rebellion to the use of aluminum for containers to the incorporation of sustainable environmental engineering in making wine and beer to the responsible recycling of bottles, cans and process waste. The production of beverages is very energy conscious and energy efficient. Reducing the water to waste ratios and the use of alternative energy are abundant in the industry.

The beverage industry generates employment and revenue. Annual U.S. beer consumption totals roughly 200 million barrels. The sale of wine and spirits in the Commonwealth according to the Pennsylvania Liquor Control Board (LCB) was \$2.24 billion in 2013-2014 returning well over a half billion dollars to the Pennsylvania Treasury, providing funding for the Pennsylvania State Police, the Department of Drug and Alcohol Programs and other essential programs. This reflects a growing trend in sales for the third year in a row. In the last five years, the PLCB has provided more than \$2.51 billion to the Pennsylvania Treasury. Similarly, there is the growth and following of the craft beer industry in Pennsylvania. TheStreet magazine has listed Pennsylvania in the Top Ten States based on the number of licensed breweries (No. 4).

There are also many public health and safety issues associated with the beverage industry. The soda giants of the soft drink industry have recognized a responsible need to reduce the calorie count by 20% by 2025. In the last two decades, there has

Welcome to the Engineering Spirit behind Spirits! I felt very honored to work with such talented individuals during the development of this Winter issue of *Pittsburgh ENGINEER* magazine. I remember not too long ago, around 2004, when the only micro brews I knew of in Pittsburgh were Penn Brewery on the North Side/Troy Hill and the Church Brew Works in the Lawrenceville neighborhood. Back then, only a handful of restaurants served those brews. Now, nearly 10 years later, this city is full of micro breweries and unique restaurants eager to assist you in the craft brew experience. I feel this goes hand in hand with the growing food scene in this area. Many sections of Pittsburgh now have their own restaurant "scene" and most all of these feature a generous offering of micro brews from the region, and beyond (in addition to other beverages.) Whether your alcoholic beverage of preference is a hoppy IPA or a dry glass of chardonnay, I feel this issue will give you a better understanding of the science and engineering practices behind this growing industry in our region.



Zach Huth

It was very interesting to find out how many engineering practices that exist in the beverage industry also transfer into the industries we are most familiar with. Everything from the use of programmable logic controls that control valves and motors, to the quality standard of pressure vessels used in the fermentation process. A lot of this same equipment and engineering principles are also used in the heavy industry that has been in this area for the last century.

Having said that, another fascinating aspect of the emergence of the local brew industry is the redevelopment of the once-forgotten real estate properties in the region. These rehabilitated properties offer the "shabby/sheik," industrial setting seems to be synonymous with the micro brewing industry. I feel this is one of prime reasons this scene is growing so successfully in Pittsburgh. One of my favorite examples of this is the Brew Gentlemen's establishment in Braddock, PA, which is housed in a former electrical supply store. Something to also look out for in the same area is Kevin Sousa's new Superior Motors restaurant, which is directly across the street from the Edgar Thompson Steel Mill, housed in a reclaimed car dealership. Both of these are examples of the impact the beverage industry are having on

been a growing awareness of drinking alcohol responsibly. The emphasis on not being under the influence of alcohol in the workplace and behind the steering wheel of a motorized vehicle has entered every part of society. The Pennsylvania LCB funds RAMP (Responsible Alcohol Management Program) to give tools to licensees to serve alcohol responsibly. The LCB Bureau of alcoholic education also offers a variety of alcohol education materials free of charge.

We want to thank the authors who have contributed. I have learned from their articles and am pleased with the opportunity to share them with you. Enjoy the "Engineering Spirit of Spirits".

David

our local region and beyond.

In December 2013, Bon Appétit magazine named Pittsburgh the next big food town. Two years later, it would sure appear this prediction was correct! We are very fortunate to have the opportunity to experience this renaissance that is happening right here in Pittsburgh.

To all who made this transformation possible, I say "thank you!" And to those reading, please enjoy responsibly.

Zach

CRAFT BEERS ON THE RISE

Total beer production in the United States is ~200 million barrels annually. Craft beers are making increases in the beer market, but, according to the Alcohol and Tobacco Tax and Trade Bureau, still only account for eight percent of the total beer market in the United States. Here are the top 10 states where these micro-breweries appear, per permitted breweries.

North Carolina 114

Texas 117

Wisconsin 147

New York 172

Pennsylvania 176

Michigan 188

Oregon 208

Colorado 217

Washington 251

California 508

Statistic from the Alcohol and Tobacco Tax and Trade Bureau

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The Evolution of the Aluminum Can and Bottle



By: John R. Smith, Beth Schmitt, Darl G. Boysel, Ken Martchek

As you sit back to watch the game and open your favorite beverage in an aluminum can or bottle, know that the process that enables you to enjoy your canned beverage started here in Western Pennsylvania. In 1886, chemist Charles Martin Hall, with assistance from his sister Julia, developed a break-through process for the commercial-scale production of aluminum. With financial backing from the Mellon family, Hall and Capt. Alfred E. Hunt, one of the foremost metallurgists in the steel industry, formed The Pittsburgh Reduction Company on October 1, 1888, with the first production facility located on Smallman Street in Pittsburgh, PA. (*Ed note: A.E. Hunt maintained a membership in ESWP, and served as a Director, during the 1880's.*) In 1907 the company was renamed Aluminum Company of America.¹⁻³



Charles M. Hall



Julia Hall

Prior to Hall's discovery, aluminum was considered a precious metal, even though eight percent of the earth's crust is aluminum. His innovative approach to efficiently produce pure aluminum resulted in an oversupply to the niche market. The price dropped from \$15/pound to \$0.50/pound in six years. Because of this significant drop in price, new products had to be developed for Alcoa to have a market in which to grow. One of Alcoa's founders, Arthur V. Davis stated, "While it was a great and wonderful thing to invent the process for making aluminum, it was an infinitely more difficult problem to make aluminum commercially, and a still greater problem to utilize the aluminum when made." To grow, Alcoa established its first technology development center in New Kensington, PA to enhance the smelting process and to develop aluminum products. This innovative leadership of Alcoa continues to this day at the Alcoa Technical Center, near the New Kensington location.

Overview of the Integrated Aluminum Manufacturing Process

The discovery of the Hall aluminum smelting process paved the way for the development and growth of the current integrated aluminum production process illustrated in Figure 1.⁴

The key aluminum production steps include.

1. Bauxite mining. Bauxite is the main raw material used in the commercial production of alumina (Al_2O_3) and aluminum metal. Bauxite is a heterogeneous, naturally occurring clay-like material of varying composition that is relatively rich in aluminum, present as either gibbsite ($\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$) or boehmite ($\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$). In 2013, 250 million metric tonnes of bauxite was mined worldwide for conversion to alumina.^{5,6}
2. Production of alumina. Alumina, the raw material for primary aluminum production, is extracted from bauxite using the Bayer process developed by Austrian chemist Karl Joseph Bayer in 1887. Depending on the source, bauxite can contain anywhere from 27 to 53 percent Al_2O_3 , thus requiring 2-3 tonnes of bauxite to make one ton of alumina, with 90 percent of the global alumina supply of 90 million tonnes used in aluminum production.^{3,7}
3. Production of primary aluminum. Primary aluminum is produced by the Hall electrolysis process with 50.6 million tonnes produced in 2013.⁸
4. Semi-fabrication. This encompasses several industrial processes where the primary aluminum is alloyed prior to casting and goes through rolling, forging or extrusion processing, depending on the product to be made. For the case of aluminum cans and bottles, the rolling process is used.
5. Product manufacture. The fabricated alloyed aluminum part is then used in various products. The inherent attributes of aluminum (lightweight, non-corrosive, malleable, durable, high strength, conductive, look and feel) enable the many uses of aluminum in different products.
6. Use phase. Aluminum is used in many markets including aerospace, transportation, building & construction, consumer electronics, packaging, engineering and cables, and more.
7. End of Life Recovery. Aluminum is one of the most sustainable materials on earth as it is infinitely recyclable, requiring

only eight percent of the energy it took to produce it initially. To put this in perspective, from a total life cycle energy balance perspective, the entire production chain to produce primary aluminum is cited at 190 Gigajoules (Gj)/tonne (including China) and 153 Gj/tonne (excluding China).⁹ Additionally:¹⁰⁻¹³

- Of the estimated 800 million tonnes of aluminum ever produced, about 75 percent is still in use. Facades, windows, doors, etc. make up 32 percent; 28 percent as electrical cable and machinery; 28 percent within moving objects such as cars, commercial vehicles, trains, aircraft, ships; 11 percent other; and one percent packaging.
- In 1990, total aluminum production was around 28 million tonnes (with 8 million tonnes recycled from scrap). In 2010, the total was close to 56 million tonnes (with 18 million tonnes recycled from scrap). By 2020, metal demand is projected to increase to around 97 million tonnes (with 31 million tonnes recycled from scrap).
- To meet the increasing demand, the assumption is that the ratio of 32 percent recycled to 68 percent primary metal will remain constant requiring a proportional increase in metal recycling rates. Today, around 50 percent of the scrap recycled is from end-of-life products. The amount of aluminum produced from this scrap grew from 1 million tonnes in 1980 to 8 million tonnes in 2007 due in large part to a greater awareness of the value of aluminum recycling. Of this 8 million tonnes recycled, 42 percent is from transportation products; 28 percent from packaging; 11 percent from engineering and cables; 8 percent from building applications; and 11 percent from other. For transportation and building & construction products there is an 85-95 percent recycling rate.

Can/Bottle Manufacturing and Innovation

One of the most ubiquitous uses of aluminum in our everyday lives is the beverage can. Of all beer and soft drink cans in the U.S., 100 percent are made of aluminum, with can makers producing about 90 billion aluminum beverage cans per year; and roughly 246 billion cans per year worldwide.

Aluminum's unique properties make it ideal for carbonated beverages. The typical aluminum can weighs less than half an ounce, yet can withstand an internal pressure of more than 90 psi. Aluminum cans are efficient to fill, are lightweight (saving fuel from a logistics transportation perspective), offer superior

taste protection (by blocking 100 percent of light and oxygen), and enable graphics to be printed directly on the bright metallic surface to convey the brands' message and capture consumer interest.

Some facts about the can/bottle manufacturing process:¹⁴⁻¹⁷

- Making aluminum cans requires the same scientific and engineering discipline as making an airplane wing, only with much tighter tolerances.

- The modern aluminum can is constructed from two pieces with each piece a different aluminum alloy. One piece is the body or bottom that is stamped, drawn, and ironed from one piece of sheet aluminum. The sheet is an alloy containing mainly aluminum with one percent manganese, one percent magnesium and smaller percentages of chromium, iron, silicon and copper to

give it strength and formability. The second piece is the lid which is attached and sealed after filling.

- The dome on the bottom of the can is shaped to provide strength to resist the internal pressure and stability for handling. The key to this technology is the dies and forming machines that make the middle portion thinner (0.0038 inches) than either the top (0.0058 inches) or bottom area (0.0108 inches).
- After the open top can is formed, it goes through a washing and drying cycle followed by coating. The first coating is the label, followed by an inside coating that protects the aluminum from the product.
- The final forming steps occur where the top of the can is "necked" to a smaller diameter and a flange is formed. Necking typically is an 11 to 14 step progressive die process. Once the cans are filled, a lid is seamed onto the top to provide a hermetic seal.

This website link provides a good video overview of the can making process: <http://www.youtube.com/watch?v=V7Y0zAzo-ggY>¹⁸

Figure 2⁴ shows how can-making technology evolved from the 1950's to today. Knowledge gained through aluminum can innovation contributed to the development of the aluminum bottle in the mid-1990's and continues today.

Alcoa was a significant influence in expanding the can and bottle technology through innovation, including:

1. The first aluminum can marketed was developed by the Adolph Coors Beer Company using an impact extrusion

FIGURE 1: Aluminum Production and Lifecycle

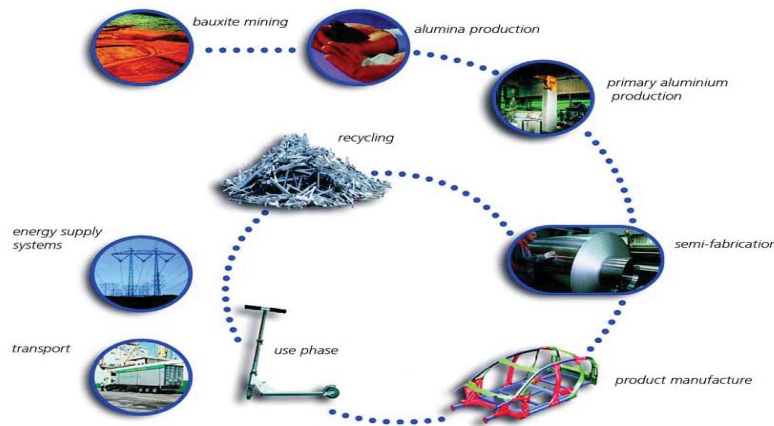
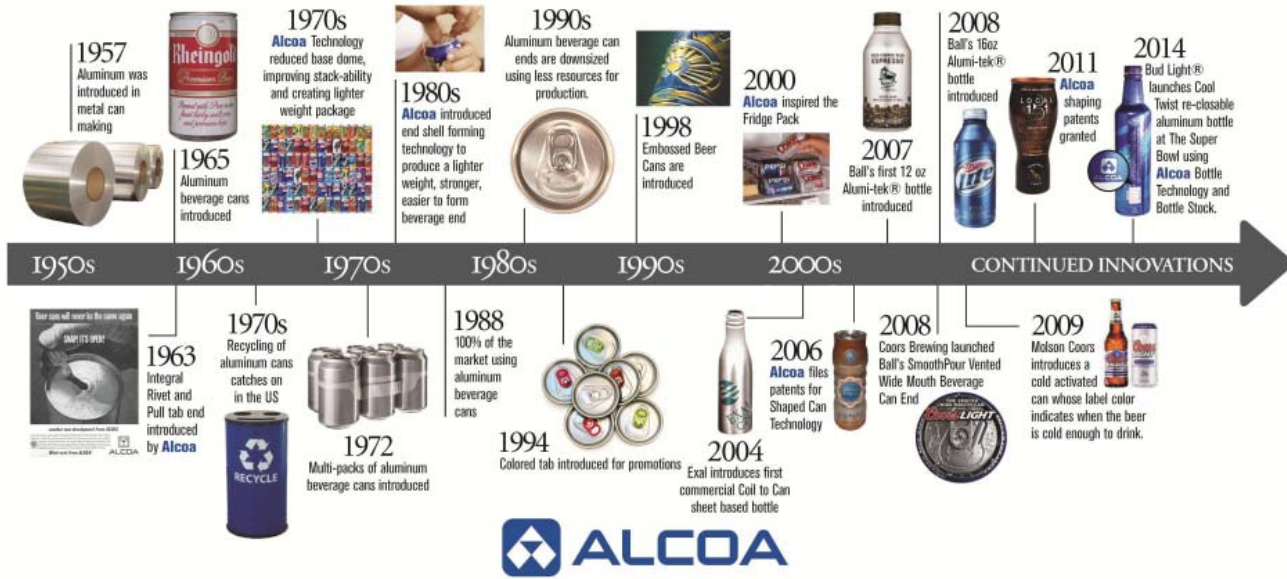


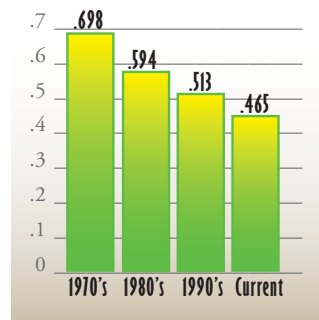
FIGURE 2: Alcoa's Historical Technical Core Competency



- process.
- Next came a hybrid beer can with a steel body and an aluminum top. This resulted in doubling the shelf life compared to an all-steel can as the aluminum end altered the galvanic reaction between the beer and the steel.
 - In 1959, Eral Fraze devised an integral rivet and pull tab end. Alcoa was involved with that development and participated in introducing the technology to the market in 1963.
 - In 1963, Reynolds Metals Company first introduced the two-piece drawing and wall ironing process, enabling mass production of the all-aluminum can.
 - Can technology innovation continued through the decades focusing on light-weighting the can body and lid, including the more ecologically friendly stay-on-tab, and enhanced coating technology. From a light weighting perspective, Figure 3⁴ illustrates a current 12 oz. can weighs 33.4 percent less than a can in 1970's.⁴ With an annual production of ~90 billion cans domestically, this represents a total annual aluminum mass use reduction of over 1 billion pounds per year.
 - In 2001, the aluminum beverage bottle was first introduced to the North America market. Like early aluminum cans, this technology utilized an impact extrusion process. To view the bottle making process, visit the website <http://www.youtube.com/watch?v=ifl0-re-tV8>¹⁹ and <http://www.youtube.com/watch?v=VYCOOn-MvGrQ>.²⁰
 - Alcoa has developed technology that allows for the manufacture of aluminum bottles from flat sheet using the

standard can making forming processes. The resulting sheet based bottle weights 30 - 40 percent less than an equivalent sized impact extruded bottle, and at two to four times the manufacturing speed. Along with bottle forming technology, Alcoa developed a new technology that allows for iconic shapes of cans or bottles, depending on customer needs. On-going efforts are focused on making the bottle manufacturing process more efficient with fewer steps, light weighting, innovative tapering for different shapes, and innovative labeling. A recent example of Alcoa's technology can be seen on the Anheuser Busch - InBev "Cool Twist" reclosable aluminum bottle. Based on Alcoa's patented technology, it uses Alcoa's aluminum bottle sheet and shows the Alcoa logo on the package.

FIGURE 3: Historical Light Weighting of the Aluminum Can

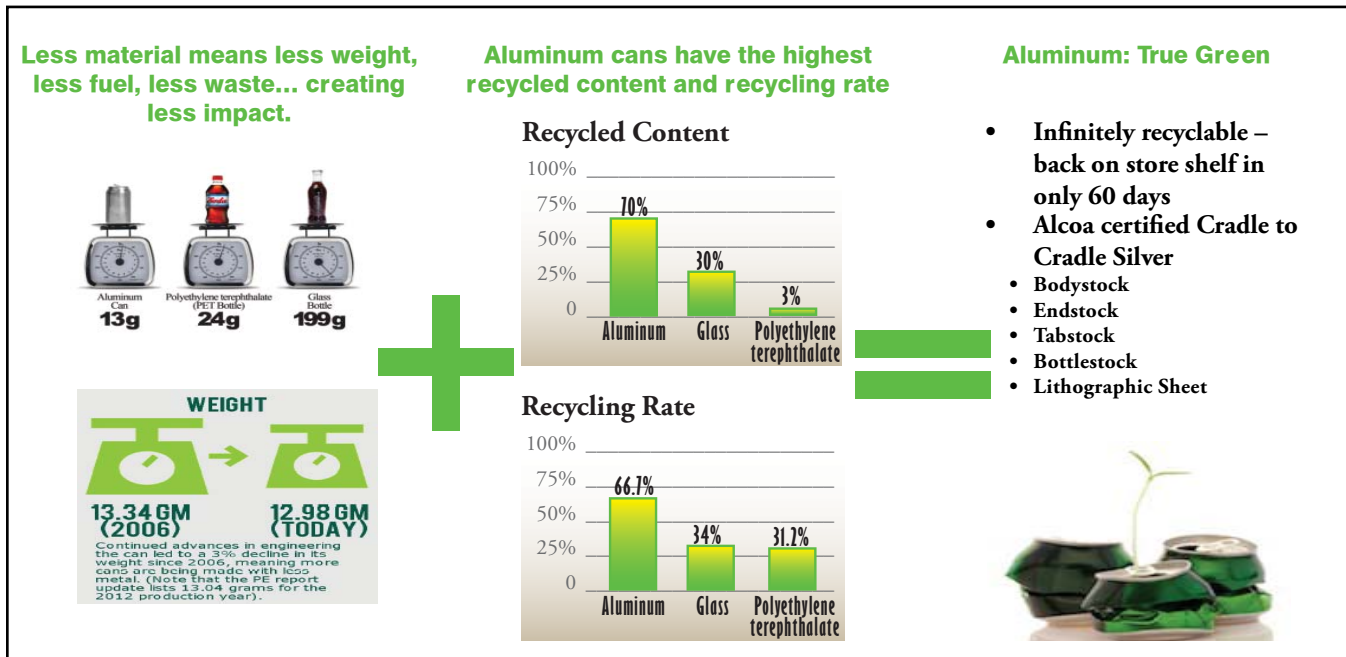


Enhancing Aluminum Can and Bottle Recycling

Aluminum cans and bottles are the most recycled aluminum products in the world, are infinitely recyclable, creating the most sustainable beverage package worldwide (See Figure 4).⁴ More than 100,000 aluminum cans are recycled every minute in the U.S. and are processed and returned to store shelves in as few as 60 days. Because of the aluminum can's measurable sustainable value, the can sheet produced by Alcoa has been certified by the "Cradle to Cradle" Products Innovation Institute.²¹⁻²⁴

From a worldwide perspective, the aluminum can average recycling rate is 70 percent and varies for different countries, ranging from 30 percent to nearly 100 percent in countries like

FIGURE 4: The Aluminum Can is the Most Sustainable Beverage Package



Brazil and China. For the U.S., aluminum cans and bottles represent the most recycled beverage packaging type with a recycling rate of 66.7 percent achieved in 2013 (See Figure 5).⁴ This represents an increase of 77 percent over the 1972 rate of 15 percent when the U.S. Aluminum Association started reporting recycling rates. This marks the third consecutive year the rate has held above 65 percent, compared to a 54 percent average during the previous decade. In 2013, the industry recycled 1.72 billion pounds of used aluminum beverage cans – the equivalent of 60.2 billion cans with imports. Since it takes just eight percent of the energy to produce recycled versus new aluminum, the energy saved from this effort is enough to fuel more than one million cars on the road for a full year.

Despite a 66.7 recycling rate in 2013, \$812 million worth of aluminum cans were not recycled. These land filled cans present an enormous opportunity to save energy and create jobs, since every 1 percent increase in recycling rate in the U.S. corresponds to approximately \$22 million of enhanced market value. The

U.S. Aluminum Association reports that tossing away an aluminum can wastes as much energy as pouring out half of that can's volume of gasoline.

While the rate of industry can recycling has risen significantly over the past decade, some of the growth has come

environment and economy.

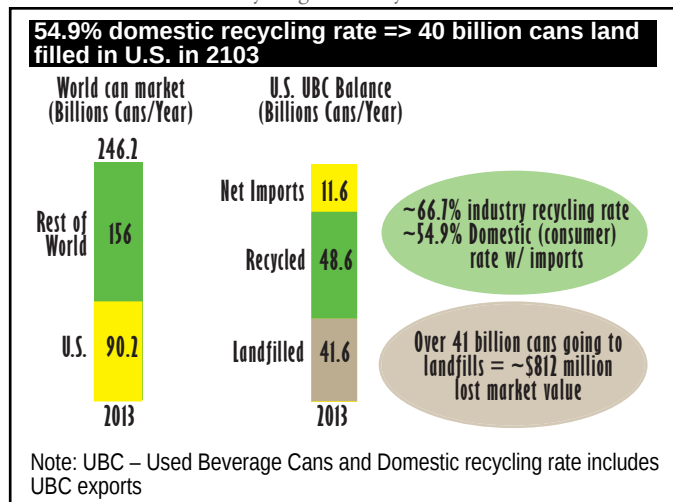
To increase the recycling rate, the industry continues its efforts to educate, increase access to recycling infrastructure, and increase the commitment of consumers to recycle. As part of this effort, Alcoa released an aluminum recycling app called "Aluminate" that helps make can and bottle recycling easier for consumers.

Now, go ahead and pop open that aluminum can or bottle and go back to watching the game. Just make sure you recycle ALL the empties for the current and future generation!

John R Smith is the Director, Sustainable Technology Commercialization, for Alcoa, Inc.; Darl Boysel is the Manager of Technology for Alcoa, Inc.; Beth Schmitt is the Global Manager, Sustainability and Recycling for Alcoa, Inc.; and Ken Martchek is a Consultant with Ken Martchek Consulting

Ed Note: Please see following page for reference listing.

FIGURE 5: U.S. Can Recycling Summary for 2013



from the addition of imported used cans in the U.S. recycling stream. The U.S. recyclers often import used cans from Canada, Mexico, Saudi Arabia, and other countries. Through increased domestic recycling, the U.S. can offset this importation and improve both the

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Sustainability!

It's Working in Pennsylvania's Wine Industry

By Denise M. Gardner

The national wine industry is not immune to the rising issues of climate change and finite resource depletion. Invasive species, fracking, increased disease pressure, extreme growing conditions, and increased energy costs have all impacted Pennsylvania wine producers in the past decade. In general, wineries are affiliated with heavy use of water, electricity, and land for wine production. Many experts recognize that it takes about 10 L (2.6 gal) of water, on average, to produce 1 bottle (750 mL) of wine, most of which is used in the winery. Energy use can vary according to winery production size, but there are several energy expensive operations associated with wine production: refrigeration and cooling, use of pumps and fans, lighting, compressed air, packaging and bottling operations, transportation and distribution, amongst others.

Sustainable practices, while individually defined by each winery, will vary based on business economics, practicality, production operations and size, and regional location. For example, while wineries in California may deal with routine, annual droughts and water restrictions, wineries in Pennsylvania are less likely to have this issue based on climate and may not require things like vineyard irrigation. Additionally, California lacks low winter temperatures that could contribute to cooling cellars during storage months or cold stability operations, in which wines are chilled to a very cold temperature to allow tartratic acid crystals to drop out of solution. This improves stability and minimizes sediment in bottles. However, many in Pennsylvania may be able to take advantage of the few cold months in the winter to reduce energy use in the winery.

The Pennsylvania wine industry contains about 200 licensed wineries - as a comparison there are slightly more than 750 in Washington state and 3,450 in

California. The 2011 Economic Impact report indicated that the wine and juice grape industries contributed \$1.9 billion to the Pennsylvania economy, producing about 525,000 cases of wine. While the number of wineries is growing, the Economic Impact report showed that about 9 in 10 wineries produce 5,000 cases or less annually, which is a relatively small production size comparatively to other wine-producing regions. Cost of production, therefore, is typically higher than large wineries (>50,000 cases per

“it was surprising to see how many wineries throughout Pennsylvania were actively implementing common sustainable practices”

year) that benefit from bulk production and bulk [supply] purchasing.

Knowing these economic statistics, it was surprising to see how many wineries throughout Pennsylvania were actively implementing common sustainable practices affiliated with wine grape growing and production. Wineries range in sustainable practices, but the most common ones that were reported included:

- Use of solar power for energy generation
- Implementation of geothermal energy
- Use of natural cold temperatures during winter months for maintaining cellar temperatures and bitrtrate stability
- Use of earth-sheltered buildings to reduce heat loss or gain (especially in barrel rooms or cellars)
- Rainwater collection or water recirculation systems
- Use of compost in the vineyard and minimizing chemical sprays or using more efficient equipment for chemical sprays that were needed

- Use of cover crops for weed control
- Use of Integrated Pest Management (IPM) practices to minimize chemical use in the vineyard
- Implementation of gravity-flow systems to minimize energy input in the winery
- More sustainable or lighter packaging, especially if wineries can source local materials
- Greater use of LED lighting
- New buildings being built with local resources or natural materials (e.g. straw) and/or green roofs
- Improving winery structures for LEED certification

While other regions may be implementing some of these practices due to needs or increased regulations, it was fascinating to see the number of Pennsylvania wineries that were implementing sustainable practices based on a passion. Many felt that these practices were essential to improve winery efficiency and long-term survival. Others felt strongly about retaining the environment, while growing grapes or making wine, to ensure its existence for future generations. Almost all wineries found additional economical or marketing benefits supplementing decisions to integrate sustainable operations. Several have plans to continue executing more sustainable practices or technologies in stages as the business continues to grow.

For a copy of the Pennsylvania Wine Industry Impact Report visit: http://pennsylvaniawine.com/sites/default/files/Pennsylvania%202011%20EI%20Report_FINAL.pdf

Denise M. Gardner works for Penn State University as their Extension Associate in Enology (the science of winemaking), which focuses on education for industry professions that are looking to improve wine quality. Denise's expertise is focused on wine sensory and flavor, including wine defects.



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PA Brownfields Conference 2015

May 13-15, 2015
Erie Bayfront Convention Center, Erie, PA

The PA Brownfields Conference is a collaboration between the Engineers' Society of Western Pennsylvania (ESWP) and the Pennsylvania Department of Environmental Protection (PaDEP). This partnership was formed to develop a single brownfields conference for the Commonwealth that consolidates our collective experience, expertise, and resources. **NEW FOR 2015!** We will recognize the 20-year anniversary of Act 2 legislation as part of the PA Brownfields Conference

Exhibit and Sponsorship opportunities are now available

Learn more at www.eswp.com/brownfields/index.htm

Sustainable Engineering Investments at Pennsylvania Wineries

A Compilation of Success Stories

By Tanya McCoy-Caretti, and Denise M. Gardner



The Key-stone state is home to upwards of 200 licensed wineries, many of which reside along one or more of 12 “wine trails” that cut across the state, making it easy for wine lovers to sample the wide mix of Pennsylvania’s local offerings. From the southwest corner to the chilly northeast, Pennsylvania’s diverse wine regions are ripe for exploring.

Thanks to a commitment from many in the industry, today you can explore not only the wide array of white and red local flavors, but also the full spectrum of green ... sustainable practices, that is.

The white and red flavors are born from native species, sophisticated European varieties and countless hybrids. The sustainable green is born from juice-only operations where vintners never touch a grape, to full-scale agribusinesses, where most enologists spent their formative years waiting for their grape vines to grow. The permutations of green—sustainable, carbon neutral—are as varied as the backgrounds of the winemakers themselves, as nuanced as the wines they bottle, and as far-ranging as their reasons for going green.

We’ve encouraged them to share with you, in their own words, some of the improvements they have made and some they intend to make in the future, and “because inquisitive minds want to

know” ... we have included their contact information and websites at the end of each write up.

A wine maker loves to tell a tale and we encourage you to encourage them to tell the tale, not only of their reds and their whites, but also their green!

Manatawny Creek Winery Douglassville, PA

We are attempting to practice sustainable agriculture as much as possible. Instead of chemical fertilizers, we are solely fertilizing our vines with compost made from horse manure at our local horse farms and from grape skins, seeds and stems leftover from processing our grapes.

We use pheromone ties and an insect growth regulator to interrupt mating of the grape berry moth, a severe pest, instead of conventional insecticides. Better canopy management practices, like opening up the fruiting zone, are being employed to increase air movement and decrease use of pesticides.



Natural fertilizers are used at the Manatawny Creek Winery, prepared by dumping grape pomace from the press into the compost pile.

Weed growth in the vineyard, particularly underneath the vines, is always an issue. We have stopped using pre-emergent herbicides which can remain in the environment for long periods of time and are using only post-emergent herbicides which break down quickly. We are currently experimenting with various techniques to try and eliminate herbicides altogether.

Our biggest step taken to reduce use of natural resources at Manatawny Creek Winery is to install an 11 kilowatt solar energy system which has greatly reduced our need to buy electricity. If you drive around

the winery, you will see an entire roof filled with solar panels, also known as photovoltaic modules. When the sun’s energy hits the silicon cells of a module, electrons are stimulated to flow in a circuit. This electricity is in direct current (DC), so it goes to 3 inverters we have installed on the crush pad for inversion into alternating current (AC). Then the electricity goes to the electric panel where it can be distributed throughout the building to power equipment. If the solar electricity is not needed, it travels out to the electrical power grid for someone else to use. Producing clean electricity in this manner is a great example of environmental sustainability!

During harvest time, we generate quite a bit of waste pomace, the skins and seeds of the grapes that are separated from the juice or wine in the press. All of the pomace goes out to our composting area where it gets mixed with the neighborhood horse manure and turned into valuable compost for our vineyard. The stems which get removed in the destemmer/crusher also get added to the compost mix. In addition, we are experimenting with composting our used filter pads from the filter press in order to eliminate sending them to the landfill.

ESWP Member News

More than 75 firms are represented in the Corporate Member program of the Engineers' Society of Western Pennsylvania (ESWP). Memberships are available at 3 levels: Gold, Silver and Bronze. Gold members are entitled to 14 memberships that can be exchanged by employees; Silver, 9; and Bronze, 5 — annual dues are \$2400, \$1700, and \$1000 respectively. In addition, ESWP Corporate Member Firms may add 2 additional individuals in our Under-35 age category at no additional cost. More information can be found at eswp.com. Please contact the ESWP Office (412-261-0710) for additional details.

NEW! For Government Agencies, Corporate and Individual Memberships are available at a 50% discount!

Membership in ESWP comes with a long list of benefits! From our continuing education opportunities earning you Professional Development Hours (PDHs), to the business networking events in our fine dining city club, there is something for everyone in your organization. Also, ESWP is helping the next generation of engineers with student outreach programs, giving you the opportunity to participate in many rewarding programs.

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Winery Website: <https://www.manatawnycreekwinery.com>

For more information contact Darwin Levensgood: joanne@manatawnycreekwinery.com

Happy Valley Vineyard & Winery, State College, PA



Happy Valley Vineyard & Winery

Our goal is to conduct our business in the “greenest” way possible. Our vineyard planting, building materials and engineering, solar panels, and equipment are on site because they fit into our ‘green scheme.’ We converted the lighting in the building to LED. We produced 11050 KWH of electricity over the past twelve months. Additionally, we compost all of the wine making waste. The finished compost goes back onto the vineyard and vegetable garden.

Land planted to grapes is land that supports a very large avian, small mammal, and insect population. A vineyard provides one of the most desirable and visually pleasing landscapes in the commonwealth. In short, the data shows that a vineyard and winery serves to boost the economy of a region and or neighborhood. Happy Valley Vineyard & Winery invested more than a quarter million dollars back into the local economy last year (2013) and is set to exceed that amount this fiscal year. Much of that income was generated through sales to tourists visiting State College. Owners and staff at Happy Valley Vineyard & Winery pay mortgages, rent, tuition at Penn State, buy fuel for cars and heating, food, clothes, gifts, frequent restaurants around

town, and appropriately enjoy the State College night life. We have equipment repaired at car dealerships and at a local welding shop. The winery was built by Morton Building, and the tasting room was constructed by Envinity, a very local and growing company.

As much as possible, our purchases are made locally – and if not local, ecologically sustainable. Hardy board siding was selected for the building because it is made up of recycled paper and concrete, long lasting, and not subject to hail damage. Murus Corporation provided the SIPs panels. The timber frame is local Eastern Hemlock, the flooring is local Green Ash. Solar panels, inverters, controllers are made in the

USA. Many of the eco bottles we use for bottling our wine are made from sand mined near Mt. Union PA. As well, most of our wine bottles are manufactured at the Port Allegheny bottle factory.

Winery Web Site: www.thehappyvalleywinery.com

For more information contact Elwin L. Stewart at hvwinery@gmail.com

Tamanend Winery Lancaster, PA

We have an 80 KW solar array that more than covers the winery’s power consumption and even puts back enough energy that we get rebates from PPL (Pennsylvania Power and Light). We use tankless water heaters and our refrigeration system has been completely insulated to improve its overall efficiency

We use novel packaging to reduce our carbon footprint by 70% -- from the use of bag in box packaging to the use of full size plastic bottles that have a glass lined inner surface at 0.001” of glass to give the effect of a glass bottle for wine preservation but the energy savings, freight cost savings associated with the use of plastic bottles. We are the only winery in the

United States using this bottle for our full sized wine bottles!

We have developed vineyard practices that increase grape yields with high quality fruit production that reduces the overall impact our vineyards have on the environmental.

Winery Web Site: www.tamanendwinery.com

For more information contact Richard Carey at rcarey@tamanendwinery.com

6 Mile Cellars , Erie, PA

We recently built a water recirculation system for our water bladder press at 6 Mile Cellars. It is super small scale, almost comical, but I think it shows the spirit in a very simplistic way that many could understand. We save 50 gallons of water every press load! We are also planning to insulate our tanks, changing incandescent bulbs to LED, and use gravity as often as we can.

Winery Web Site: www.6milecellars.com

For more information contact Patrick Walsh, pwash21@gmail.com

Nissley Vineyards Bainbridge, PA

At Nissley Vineyards we have a great neighborhood farm composting program. Working collaboratively we use the manure and corn fodder generated at the farm next door to generate a fine compost to support our growing activities. It has been a great relationship and a good example of sustainability -- two farms working together!

Winery Web Site: www.nissleywine.com

For more information contact Steve Foreman at se4man@live.com

Stargazers Vineyard Coatesville, PA

In the vineyard we use low impact or organic pesticides and we avoid the use of insecticides until monitoring indicates the necessity of application of a specific insecticide for a particular insect, the process known as Integrated Pest Management or IPM. We also use mechanical hoeing and apply green and animal manure to supplement mineral



Nissley Vineyard in Bainbridge, PA. Photo by Mark Chien, courtesy of Pennsylvania Wines.com

fertilization in lieu of herbicides to the extent feasible; the only herbicide used is one which decomposes upon contact with the soil. We also use cistern water (collected rain water) as our spray water in the fields.

We also employ many very exciting sustainable practices in the winery, some examples here, we:

- use cistern water (collected rain water) in our jacketed tanks to control fermentation temperature; we have no refrigeration in the winery whatsoever. We also use cistern water for general tank washing.
- accomplish cold stabilization over the course of the winter by natural cooling of the wine cellar
- clarify juice from the press by use of a flotation device, which operates at ambient temperature, thereby saving the energy required for settling by refrigeration
- rely on outdoor winter temperatures to chill sparkling wine bottles and “warm disgorging” equipment so that we can disgorge without using electricity to freeze the necks of the bottles
- our still wine bottles are made primarily of re-cycled glass, thereby reducing the energy required to make the glass
- buy bottles in bulk – then there are no excess cartons to discard; we buy cartons only as we need them and re-use them to the extent practical
- use the label backing paper for wrapping bottles sold

There is no heating or air-conditioning in our wine cellar or tasting room. The cellar is earth sheltered on three sides, the press pad/tasting room is warmed by the sun and cooled by natural ventilation.

Most significantly, we generate electricity by means of photovoltaic panels, a 9 kw array.

Winery Website: www.stargazersvineyard.com

For more information contact John at Stargazers: stargazers1@verizon.net

Evergreen Valley Vineyards Luthersburg, PA:

We believe in doing our part directly! Many of our visitors are especially interested in our ecologically friendly power plant. We produce most of our electricity from a combination of wind and solar energy. We are entirely off of the commercial power grid!

Winery Website: <http://www.evwinery.com/>

For more information contact Mark Gearhart



The solar panels at Cullari Vineyards fill more than 80% of their energy needs

Cullari Vineyards & Winery Hershey, PA

We use geothermal for heating and air temperature control and solar panels to provide 80% of our annual energy needs.

Winery Web Site: www.cullarivineyards.com

For more information contact Salvatore Cullari at scullari@sprynet.com

Tanya McCoy-Caretti, Pennsylvania Market Manager, ARCADIS, and Denise M. Gardner, Penn State Enology Extension Associate, and Participating Pennsylvania Vineyards



Yes, it's a cocktail party, but...

Yes, it's called a cocktail party, but that doesn't mean that you should forget about the wine drinkers.

But how much and what kind do you buy?

How much?

- Estimate two glasses of wine/ wine drinker in the first hour and a glass an hour after that.
- Each glass is approximately a 5 ounce pour
- Each 750 ml bottle contains 5 glasses of wine
- Buy a few extra bottles, it's not going to go bad if you don't open it

What kind?

- Attempt to determine ahead of time what wines your guests prefer
- Offer one red and one white, too many selections becomes too confusing
- The pinot's (noir/red & grigio/white) may appeal to a broader audience

Craft Beers go mainstream

By: Chriss Swaney

More than 11 percent of all micro-brewers nationwide are engineers. And that trend of engineering excellence has found a home right here in Pennsylvania where local engineers are joining the stampede to help keystone state breweries bubble up as craft beer goes mainstream.

Here in Pennsylvania, there are 170 operating breweries with more on the way, according to the Pennsylvania Liquor Control Board. Entrepreneurial engineers report that brewing beer is a perfect hobby and ultimately a great business opportunity for any creative tinkerer.

Robert S. Parker, for example, took no time buzzing into the world of craft beer. When his wife admonished him to get a hobby, Parker said he never dreamed that it just might turn into a mainstream business.

Although Parker, a professor of chemical and petroleum engineering at the University of Pittsburgh's Swanson School of Engineering, only now brews about 50 gallons of craft beer a year from his home, he's thinking about being more entrepreneurial.

“Entrepreneurial engineers report that brewing beer is a perfect hobby and ultimately a great business opportunity for any creative tinkerer”

“I brew about 10 batches a year to share with friends and family,” he said. “I even

share the process of making craft beer with my students because engineering concepts like fluid dynamics, reaction engineering, and heat transfer are endemic in process engineering,” Parker said.

Parker also notes that it is a very different landscape than it was even five years ago.



Dr. Parker and Dr. Cole discuss the future of craft beers

industry has matured and people's tastes are becoming more sophisticated,” said Parker. “I think demand is going to exceed expectations as Pennsylvania breweries continue to bubble up and capture a whole new market of consumers.”

However, the concern now is not about the growing number of breweries to compete against, but whether the existing breweries can bubble along and continue the pace of making quality brews.

Still, experts like Bart Watson, chief economist for the Colorado-based Brewers Association argue that there is more of a boom than a bubble about to pop in the craft beer market. The statistics are overwhelming, with at least one and a half

new breweries opening daily nationwide. Existing breweries are purchasing new equipment and ingredients which stokes local and regional economic engines.

“And if you look at how much beer is sold in general, we could have one thousand breweries and it would not saturate the market,” added Watson. The Brewers Association figures indicate production volume of craft beer increased 18 percent in the first half of 2014. And this fall, at least a half dozen new breweries went mainstream in central Pennsylvania, including Alter Ego Brewing in Harrisburg, Moo-duck Brewery in Elizabethtown and Molly Pitcher Brewing company in Carlisle.

Watson reports that the craft beer boom is following the farm-to-table restaurant trend where diners are gravitating toward ordering meals made with locally sourced produce, meats and cheeses.

“If you look at how much beer is sold in general, we could have one thousand breweries and it would not saturate the market”

Local beer distributors also are seeing increased interest in craft beers. Craft and import beer – not including Corona or Sam Adams – make up about 20 percent of business at Salute Beer Distributor in Plum. Eight years ago, craft and import beer made up about 7 percent of sales

at the Eastern suburb distributor which is just a stone's throw away from Full Pint Brewery in North Versailles and Rivertowne Brewery in Export.

Full Pint Brewery offers seven, year-round craft beers and seven other brews that change by the season.

“Nationwide, the number of craft breweries... increased from 500 to about 3,000 over the past 20 years”

Rivertowne Brewery offers six signature varieties that are available at retailers in four states.

Craft beer costs an average of \$50 per

case or \$4.25 a bottle, which is at least twice the cost of Budweiser or Miller Lite. Although the ingredients are healthier, the alcohol content is higher so consumers typically drink less than three per sitting.

Industry experts also point out that craft beer offers more of a social connection to consumers compared with the mass marketing done by big companies on television.

Others say craft beer has a down home feel to it.

Daniel Cole compares craft beer to cooking. “It’s a wonderful hobby where you’re at the intersection of the old right brain debate between creativity and problem-solving.”

Cole, an associate professor of mechanical engineering and director of the nuclear engineering program at the University of Pittsburgh’s Swanson School of Engineering, said the whole micro-

brewing craze began in the 1980s. “People are more discerning and educated today about what they want to drink.”

Cole, who dabbles at home with different beer making brews, said the hobby remains extremely attractive to engineers. “There are lots of gizmos and gadgets used throughout the beer making process that make it ideal for the innovative engineer,” Cole said. “There’s a whole new generation of young entrepreneurs out there just waiting to help saturate the growing market. But I think I’ll continue making it a hobby, and watch others draft those different types of beer.”

Nationwide, the number of craft breweries independent of Anheuser Busch and MillerCoors increased from 500 to about 3,000 over the past 20 years, according to the national Brewers Association.

Chriss Swaney is Managing Editor with Dick Jones Communications.

Large vs. Small Scale Brewing

By: Brandon Capps

Like many industries, beer production varies substantially when it is scaled from small to large quantities. Smaller breweries usually rely on more look and feel, manual interaction and minimal automation, while larger production facilities rely entirely on automation to facilitate the brewing process. Where a brewer of in our facility may be found using a measuring stick to determine water volume, and a paddle to agitate the mash, large breweries utilize pressure sensors for volume and motor actuated agitators to keep fluids homogenized. Much of this difference is directly related to cost, as well as necessity, when your brew kettle is only feet tall a measuring stick is fine, but when it is 3 stories that becomes unrealistic. While the equipment and levels of automation may vary substantially, the low level scientific processes remain the same. Temperature, time, pH, pressure, concentration, and many other factors scale between large and small, and it is possible to produce a very similar product regardless of the size difference. When scaling between the two however there are many considerations, on the small scale there are a lot of simple things that we can do that are hard to imitate on large scale. Using mesh bags to retain spices, decoction mashing with pots, using more unique ingredients that are difficult to process in large quantities, and many other artisanal practices that small brewers hold dear. Conversely, small brewers deal with the difficulties of manual controls, intensive labor, reduced instrumentation for measurement, and other process components, that are automated on larger scales.



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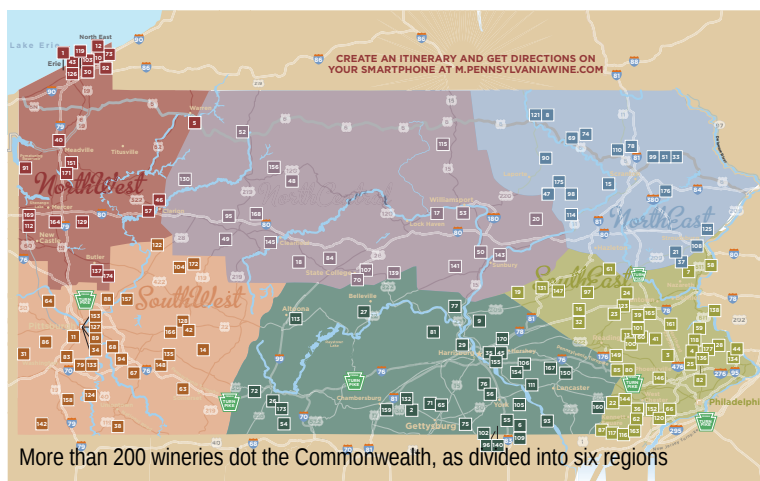
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Welcome to the Pennsylvania Wine Trails



Map courtesy of Pennsylvania Winery Association

In 1683 William Penn reportedly planted Pennsylvania's first vineyard in an area now called Fairmont Park in Philadelphia. For many reasons this vine didn't take root but that hasn't stopped Pennsylvanians from working diligently to become wine-makers, and we have! We have branched out from those original acres in southeastern Pennsylvania to take advantage of the beautifully diverse landscape that we all know and love so deeply. We relish in the Erie County winters and the delayed frost risk that the lake affords us, we bask in the longer warmer growing seasons in the south, and we pay homage to our beloved critters and name our longest wine trails after them (him).

Nearly \$2 Billion in economic impact

No one of us needs to travel far from home to pass a day or a weekend enjoy-

ing the fruits of our neighbors labors and sampling some of the finer wines produced east of the Mississippi River.

PA is ranked 7th nationally in number of wineries

The Keystone state is home to 12 wine trails that cut across the state. Wine trails are groups of wineries located within close proximity to each other. Because

Pennsylvania's climate and growing conditions vary throughout the state, wine trails often have their own distinct identity when it comes to the wines they produce and experiences they offer.

In the Southwest - Southwest Passage Wine Trail, Groundhog Wine Trail

The hilly, high elevation terrain around Pittsburgh and the Laurel Highlands yields everything from chardonnay to merlot to sparkling wines. The wineries fall into two trails; the Southwest Passage and the Groundhog Trails and stretch some 120 miles from Altoona, Pennsylvania to the Allegheny National Forest.

In the Northwest - Lake Erie Country, Groundhog Trail

Tucked away in the state's northwestern corner is the Lake Erie Country trail, the largest grape-growing region east of the Rockies! These wineries benefit from near-perfect growing conditions: gravel loam soil left behind by glaciers and the moderating effects of Lake Erie on the climate.

North Central Wine Trails: Groundhog Wine Trail, Susquehanna Heartland Wine Trail

The north central region that encompasses the "Pennsylvania Wilds" has two climates: a cool one up north and a warmer one with well drained loam soil in the south. Both trails feature unique varieties of white and red varieties such as Traminette and Chambourcin. The Susquehanna Trail has only been around since 2003 but is going strong with 13 wineries.

In South Central - Susquehanna Heartland Wine Trail, Hershey-Harrisburg Wine Trail, Mason-Dixon Wine Trail

If you're looking for reasonably priced French-style wines, you've come to the right place. The south central region's nice rolling hills benefit from plenty of sunshine and a longer growing season than almost anywhere in Pennsylvania. The area also got very lucky with its soil, a schist soil where traditional European varieties thrive.

Over 80% of PA Wine is sold directly from the wineries or wine outlets

There are over 200 licensed PA Wineries

In the Northeast - Endless Mountains Wine Trail

This corner of the state is home to our newest wine trail! The area is cold so it is no

surprise that wineries along this trail specialize in hardy grapes like the Riesling and Cabernet franc. The cooler nights help the grapes to hold on to their acidity, and much of the vines are supported by well drained shale soil. This region is also producing fine flavors in newer hybrids, such as the Marquette (a medium bodied, red with cherry and black pepper flavor) and la crescent (a German style

white with a citrusy aroma).

In the Southeast - Berks County Wine Trail, Brandywine Valley Wine Trail, Bucks County Wine Trail, Lehigh Valley Wine Trail, Montgomery County Wine Trail

Pennsylvania's southeast corner benefits from a more temperate climate, as well as five wine trails -- more than any other region! The region is large and diverse in its landscape and soil structure, which is reflected in the diversity of the grapes grown through this region. North of Philadelphia through the Lehigh Valley region these picturesque wineries produce many European styled wines, and the cooler temperatures result in lovely Rieslings.

According to Pennsylvania Wine (www.pennsylvaniawine.com) some wine trails offer passports, which grant holders access to special events or other privileges, such as discounted rates on products, wine tastings and hotel packages. Though the passports may cost a small fee up front, the rewards are well worth the initial investment!

The only thing better than visiting one Pennsylvania winery is visiting several Pennsylvania wineries, and if you're making a day of it, or planning a weekend road trip, why shouldn't you?

Content and statistics adapted from information provided by the Pennsylvania Winery Association. Learn more at www.pennsylvaniawine.com

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ENGINEERING TECHNOLOGY IN BREWING

By: Brandon Capps

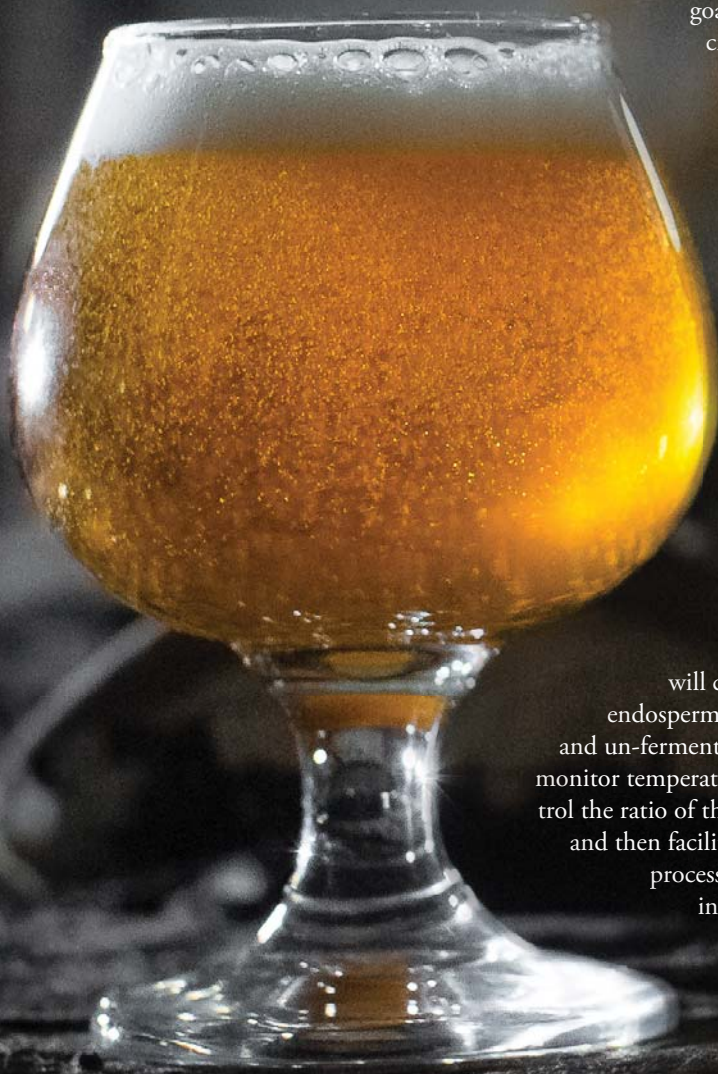
From an outside perspective, brewing may seem like a largely artistic trade, and it is, but it also encompasses enumerable aspects of engineering. Starting on what we call the “hot side”, where brewers produce the pre-fermented sugar water known as “wort”, we track temperature, enzyme activity, pH, water chemistry, dissolved oxygen and sugar concentration, while equipment operation involves detailed knowledge

of thermal dynamics, fluid dynamics, instrumentation and mechanical systems. Moving over to the “cold side” where yeast ferment the wort into beer, we are dealing with largely biochemical interactions that are much less predictable. The ability of the brewer to properly monitor and control fermentation is arguably the most impactful aspect of the brewing process, and by far the most complicated.

We will begin by taking a more in depth look at the hot side or wort production. The overall goal of the brewer is to create a solution comprised of water, malt derived fermentable and un-fermentable sugars, hop derived isomerized acids and essential oils, oxygen and nutrients required for a healthy fermentation. The first part of the process, called the mash, involves the mixing of germinated grains into hot water, where amylase enzymes, present in the grains, will convert the starchy endosperm into fermentable and un-fermentable sugars. Brewers monitor temperature and time to control the ratio of the sugars produced and then facilitate the extraction process known as lautering. Once the sugar rich water has been clarified and separated from the remaining solids, known as “spent grain”, the wort

is then boiled, and hops are added to decrease pH, impart bitterness and add hop flavor to the beer. Finally the wort is cooled using counter flow heat exchange, oxygenated and sent through a sanitary wort way to the fermentor. In addition to monitoring these processes, it is necessary to understand the performance of the equipment. Most brewers use direct fire or steam to heat their kettles, both of which are controlled by automatic PID instruments as well as manual valves. Wort is transferred from vessel to vessel by way of centrifugal pumps, where flow rate and head pressure are of significant importance. When wort is cooled, it is important to monitor the temperature and flow rate of both cooling fluids and wort in order to ensure that the proper temperature is achieved at the start of fermentation.

Continuing on to the “cold side” of the brewing process, our focus shifts to the bio-chemical interaction known as fermentation. On the surface level, we simplify fermentation to yeast consuming the available sugars, and producing CO₂ and alcohol, but there are innumerable more interactions at work. Everything starts with picking the right yeast strain; different strains and species of yeast have specific enzymes and genetic pathways that affect the bi-products that they release during fermentation. Some of these bi-products will include fusel alcohols, esters, phenols, organic acids and sulfur compounds, but yeast are capable of producing hundreds of other, less prevalent compounds. Fermentation begins about 12 hours after the yeast is “pitched” into the beer. During the first 12 hours, called the lag phase, the yeast uptake oxygen, nutrients, sugars and other compounds, begin multiplying and adapting to their new environment. Once fermentation has begun, the yeast start to produce alcohol and CO₂, as well as consume and process the compounds created





The tap heads at the back bar display "what's on tap" at the Brew Gentlemen Beer Company

during the lag phase. Once fermentation is complete, the yeast will continue to transform the compounds present into other flavor and aroma compounds. Throughout this process, brewers monitor pH, oxygen, alcohol, and temperature. Because fermentation is largely an enzymatic process, pH and temperature will have the greatest impact on the rate of reaction, stability of enzymes, and subsequent bi-products. The rate of reaction will also affect the hydro dynamics of fermentation, which has a great impact on the amount of volatile compounds left in the fermented beer. Brewers utilize cold rooms, glycol cooled tanks and submersible cooling coils to keep the beer at its proper temperature, fermentation produces a large amount of heat, so no additional heating is usually necessary. Throughout fermentation, the beer is measured and evaluated for aroma and flavor to ensure that the final product meets expectations. As with the hot side, it is equally important to understand the systems that control and impact fermentation. It is essential with glycol and refrigeration systems, to ensure that the cooling units are capable of enough heat transfer to keep up with the rate of heat generated during fermentation, therefore most systems are purposely oversized. To control these systems, brewers use various forms of automation including PID controllers, PLC computers and microcontrollers. Another important factor of fermentation, is understanding the effect of hydrostatic pressure on the yeast. When yeast finishes fermenting,

it falls out of the solution and into the bottom of the tank where it experiences greater pressure. If the yeast are left under pressure for extended periods of time, they can undergo a breakdown process that will ruin the finished beer.



The Brew Gentlemen brew process in action

An example of how factors throughout the process affect the finished product, is seen in the production of high alcohol beers. Starting with the mash, larger amounts of grain and hot water are used to provide a higher concentration of sugar once extracted. With many high alcohol worts, the mash temperature is kept lower to ensure that there is ample fermentable sugar for the

fermentation to complete. In the boil, additional simple sugars such as sucrose, dextrose and fructose can be added to increase the fermentability of the wort, while nutrients are often added to aid the yeast in fermentation. While the beer is being transferred to the fermentor, oxygen is dissolved into the wort at higher than normal concentrations, to ensure that ample is available for the formation of fermentation precursors and yeast multiplication. During fermentation, additional oxygen, sugar and nutrients can be fed to the yeast to help fermentation run to completion, and when the fermentation has completed, the yeast are quickly evacuated to prevent rapid decomposition after a stressful fermentation.

High alcohol beers usually require a maturation period, during which the intense fusel alcohol created during fermentation, can be transformed into more delicate esters and smoothed out over time.

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Natrona Bottling Company

Beats the Odds

By Chriss Swaney

It could be billed as a classic “David vs. Goliath.”

Natrona Bottling Co. is a small player in the gargantuan marketplace of the competitive carbonated soft drink arena. But that fact never intimidated Vito Gerasole.

Gerasole, dubbed the “sultan of soda,” has tenacity and grit and that has helped him elbow his way into the \$76 billion carbonated soft drink market.

“We have a very unique product,” said Gerasole, who is rejuvenating a 110-year-old soda pop maker as others have closed shop. The Red Ribbon soft drinks that Natrona makes are sweetened with cane sugar. And this traditional way of making soda has helped engage a new set of consumers at a time when the largest beverage makers are suffering declining sales.

“There’s no doubt there is a subset of consumers who are interested in sodas with sugar instead of (high-fructose-corn syrup),” said John Sicher, editor and publisher of the trade publication Beverage Digest. “But I do think it is a bit too early to call it a trend. However craft sodas seem to be catching the attention of the bigger producers,” said Sicher.

Industry analysts also report that more and more consumers are taking their doctor’s advice and eating healthier foods. Foods sweetened with high-fructose corn syrup have been blamed for contributing to America’s growing obesity problem.

Carbonated soft drink sales have fallen at an increasing rate, declining 3 percent in 2013 after falling 1.2 percent in 2012 and 1 percent in 2011, according to Beverage Digest.

The downturn was initially fueled by the appearance of bottled water in the mid-to-late 1990s. Consumers loved it. Then soft drink prices climbed. Consumers didn’t love that.

Because craft sodas are now creating an interesting niche, big companies like PepsiCo started a craft soda line called Caleb’s Kola, and there is increased interest in what consumers call “Mexican Coke,” both made from cane sugar.

But Natrona has benefited from sticking to its craft tradition. Red Ribbon soda has always

been made from cane sugar long before the rise of other niche players, and the company’s growth rate reflects its quality and consistency.

Between 2010 and 2013, the company’s sales grew 60 percent, and revenue through the third quarter of 2014 has substantially increased.

Gerasole said the company’s sales have grown through online sales and by expanding its sales from four states a decade ago to 17 states through a network of third-party distributors.

Customers in Western Pennsylvania can find its Red Ribbon brand in corner stores, pizzerias, and retail beer distributors.

“I updated the bottle design and bought a 1964 Ford delivery van and carried around an old-fashioned metal cooler packed with soda, offering samples to store owners,” said Gerasole.

One of those savvy retailers was Chris



Jamaica's Finest Ginger Beer in the production process at the Natrona Bottling Company



Vito Gerasole, with Red Ribbon Cherry Supreme Soda

J. Beers, owner of Grandpa Joe's Candy Shop, with locations in the Strip District and Beaver. Beers carries 55 brands of soda and 175 flavors. Natrona's flavors stand apart.

"The cherry is super and many of my

customers enjoy the Plantation Style Mint Julep," said Beers. Even at a premium of \$1.87 per bottle, Natrona's are among Beers best sellers.

Gerasole also tapped a new market, the craft beer drinker. Bartenders use the sodas in cocktails, said Gerasole. Natrona

products are served at beer festivals where they are served as designated drivers.

But Gerasole said this process is the "heart and soul" of Natrona. "We want quality not quantity."



"I'm not looking for explosive growth because I want to retain our quality," said Gerasole. Natrona's soda is packaged on bottling equipment that is at least 70 years old. The "pinpoint" carbonation method, which uses dry ice, is an inefficient technique that other bottlers abandoned years ago.

Chriss Swaney is Managing Editor with Dick Jones Communications.



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RESPONSIBLE HOSTING

When you care enough about your guests to plan for both fun & safety

If you are planning a party or a social gathering, you have the choice whether or not to serve alcohol. If you choose to serve alcohol, you'll want to keep guests from drinking excessively and causing problems for themselves and others. Gathering with others allow people to connect, make new friends and create lasting memories.

When people begin drinking together, usually they feel more at ease with themselves and one another. With each alcoholic drink consumed, judgment and self-control diminish. A little alcohol can become too much alcohol very quickly. In addition to property damage and physical injury, people's behavior while intoxicated can easily damage feelings and relationships.

As the party is ending, check in with all of your guests. Thank them for coming, and ask if they would like a ride home or invite them to stay the night if necessary. Nobody should be put in a vulnerable position due to their alcohol use.

Source: Pennsylvania Liquor Control Board, Bureau of Alcohol Education

Here are a few tips that can help you and your guests have a fun and safe celebration:

- Do not make alcohol the focus of the party. Plan one or more activities that do not revolve around alcohol. Do not play drinking games.
- Be sure to serve plenty of food. Foods rich in starches and proteins stay in the stomach longer and help to slow the absorption of alcohol.
- Stop serving alcohol at least two hours before the end of the party.
- Respect the privacy of guests who choose not to drink alcohol. Do not ask intrusive questions or call attention to them.
- Do not store large amounts of alcohol in one location or leave containers unattended. Make sure empty cans, bottles, and disposable cups are placed in trash or recycling bins and use caution when gathering and disposing of broken glass.
- Alcohol-free parties are recommended when the guest-list includes minors, believers of religions which do not condone drinking alcohol, recovering alcoholics, or pregnant women. If you do serve alcohol, make sure that all guests have enough to eat and drink throughout the party.
- Invite couples and family members. People are less likely to overconsume alcohol if family or loved ones are present.
- Be a friend and stop serving alcohol to visitors before they have had too much to drink. If someone is already drunk, take steps to ensure their safety. You will earn the respect of many people, and build a reputation as a good host.

Show your guests that you care—don't let them drive home impaired!



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