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BROOKLYN BREWERY, NEW YORK – PLANNING AND DESIGNING A UNIQUE CRAFT BREWERY

The chances are high that you have heard or even tried the beers of Brooklyn Brewery. From its humble beginning in 1988 it took the brewery 22 years to get to 100,000 sold barrels per year, but after this only three years were needed to break the annual production mark of 200,000 barrels. Currently Brooklyn Brewery is producing 260,000 barrels and their famous beers are to be found in restaurants, bars, and retailers across 26 U.S. states and in 20 countries. The stellar growth of this craft brewing pioneer is based on the dedication of its founders to brew the best beer possible, on consumers giving preference to craft beers over existing main stream brands, on its commitment to the Brooklyn neighborhood, the rejuvenation of Brooklyn, and also on the rise of social media and using this media to its fullest potential.



Majority owners Eric (left) and Robin Ottaway flank co-founder Steve Hindy. Photo: Buck Ennis

PIONEERING BRAND VARIETY

Since its beginning, Brooklyn Brewery has brewed full flavor beers that enrich the quality of life, tradition and culture of the communities it serves. Its award-winning roster of year-round, seasonal and specialty beers have gained the Brewery notoriety as one of the top craft beer producers in the world.

In order to achieve such an accolade the processes at the Brooklyn Brewery are highly innovative and complex and this is reflected in their beers:

Already the flagship beer, Brooklyn Lager, uses the increasingly common technique of dry hopping – adding hop cones or pellets to the fermenter or storage tank in order to extract the hop oils without adding bitterness. The Brooklyn Dry Irish Stout requires the use (and milling!) of unmalted barley. The traditional Pumpkin Beer Post Road is made using hundreds of pounds of pumpkin and nutmeg.

And when we turn to the real specialties like Local 1 and Local 2, both Belgian inspired strong Ales, natural ingredients like demerara cane sugar from Mauritius, wildflo-

wer honey, Belgian candi sugar, and sweet orange peel are introduced into the process. Furthermore these beers are 100% bottle re-fermented.



In order to produce beers at the outstanding level of Brooklyn Brewery all these raw materials and processes have to be handled in ways that are safe, economical and repeatable.

We found in BeerBev a partner who could bring the utmost in efficient brewery design, minimizing both capex and operating costs, while being mindful of the retail consumer experience and design aesthetic. – Eric Ottaway

PLANNING FOR THE FUTURE

To keep up with growing demand Brooklyn Brewery has teamed up with the brewing, consulting & engineering specialist BeerBev LLC to jointly develop, plan and design a unique craft brewery in a historic industrial building in Brooklyn, New York.

The project scope included the planning and execution of the various design stages while taking into consideration different locations and brewery specific requirements, providing capacity and flexibility for future expansion as well as consumer experience topics including an attractive architectural design.

BeerBev, known for not following conventional paths of standardized brewery solutions was naturally the partner of choice for Brooklyn Brewery for independently exploring and defining tailor-made innovative and cost effective solutions for this challenging project.

BeerBev's scope went beyond technical and technological solutions and included amongst other things also the provision of information and data required by the local authorities for project approval. It also included the development of an architectural design concept that ensured an appealing integration of the new brewery in the historic architecture of the chosen building.

INDIVIDUAL SOLUTIONS FOR A UNIQUE PROJECT

It was clear to Brooklyn Brewery that common industry standard solutions would not achieve the desired project goals and objectives, because brewery specific, complex parameters had to be considered right from the start.



In cooperation with Brooklyn Brewery BeerBev defined the following main project objectives for the new brewery:

- Flavor match with the existing brand portfolio
- Highest flexibility to expand the future brand portfolio including the ability for small batch production between 50% and 100% of total brew size
- Ensuring that the overall brewery design fits in well with the historic building and that the state-of-the-art brewery would be built for maximum production efficiency and capacity
- Ensuring that future project expansions could be carried out in different phases without interrupting production
- Highest production, operation and energy efficiency
- An environmentally friendly and green brewery design
- Visitor friendly design
- Equipment to be manufactured locally as much as possible, in the U.S.A

In our portfolio you'll find more traditional styles – Lagers, IPAs, Stouts, Weisse beers, Saisons – but also beers that explore both new and forgotten techniques, such as 100% bottle re-fermentation, barrel aging, and the use of wild yeasts such as Brettanomyces.
– Eric Ottaway

CHALLENGE APPROACH

Being aware of the complexity and uniqueness of the project, BeerBev first took the time to listen and discuss the project in detail with Brooklyn Brewery to get a thorough understanding of the Brewery's project goals and objectives.

BeerBev reviewed and examined brewery specific technologies and techniques, and also examined many other parameters such as brand variety, extract targets, production relevant ingredients, fermentation and storage time, applied hopping procedures such as dry hopping or cone hopping, clarification time up to filling, and also packaging parameters which included brand specific secondary packaging requirements to ensure that the filling, packaging and warehouse requirements were fully understood and considered to enable an optimum and holistic project solution.

“We spent a significant amount of time reviewing all of our requirements in excruciating detail to make sure that everything was taken into account – Eric Ottaway

In close cooperation with Brooklyn Brewery, BeerBev defined the following topics as value engineering areas:

- Developing different capacity models to cover the Brooklyn Brewery's sales volume projections
- Milling system: conditioning, wet, or dry milling
- Brewhouse sizing: one or two brewhouses



- Integration of existing equipment
- Tank farm: fermenting, storage or combi tank, open or closed process
- CCT dimensioning for 0.5 brews, 1-2 brews, 4 brews etc.
- Hop dosing systems
- Energy recovery system
- Hot water or steam heating for vessels
- Kieselguhr-free filtration technology versus kieselguhr filtration
- Beer recovery from yeast and sediments
- Applicable filling and packaging technologies
- Recycling of caustic, acid and disinfection
- Refrigeration plant operation with NH₃ or glycol multi-stage cascade system
- Wastewater handling: is it necessary to build a wastewater treatment plant or can waste-water be discharged into the municipal sewer system
- Co-generation plant in combination with absorption refrigeration plant

- Utilization of solar power to generate electricity
- Green brewery concept design
- Green building design
- Automation level

CRAFTED SOLUTIONS

In order to provide Brooklyn Brewery with the appropriate decision-making tool, BeerBev developed a specific “decision support note” for each of the above mentioned topics, Besides presenting a technical and technological evaluation and production impact BeerBev also included a costing overview and comparison regarding investment costs (CAPEX), operational costs (OPEX) as well as Total-cost-of-Ownership (TCO) for selected equipment, technologies and possible alternatives

For investment overview purposes BeerBev developed a detailed budget overview considering:

- Purchasing price of equipment
- OPEX saving (incl. head count)
- Energy cost saving
- ROI calculation
- TCO calculation

During the engineering phase BeerBev input its vast experience and know-how for the benefit of the project – a contribution which often went far beyond standard solutions.

BeerBev's attention to even the smallest details combined with its innovative and holistic project approach had a big impact, as shown by the following examples:

- Heating device in the mashtun designed for 30° Plato and 13° Plato mash types
- Consideration of special mash pumps
- Increase in whirlpool capacity due to higher trub volume from hop usage
- Brew size that can handle volumes between 60 to 120 bbl / brew
- Energy savings of up to 60% in the brewhouse
- Water consumption of only 2.7 bbl per bbl sales of beer

- Minimizing losses in each area
- Energy consumption calculation of 73 MJ /bbl
- Minimization of headcounts due to optimized operation and automation

“We found BeerBev's suggested solutions to be very innovative, often challenging standard assumptions, and proposing unique ideas.”
– Eric Ottaway

Following the value engineering exercise, BeerBev provided Brooklyn Brewery with a comprehensive documentation containing technical specifications, layouts, construction drawings for local manufacturing, P&ID diagrams, process description, budget prices, and tender documents.

FRUITS OF LABOR

By applying its unique holistic project approach, BeerBev was able to optimize each area of the brewery producing the most efficient and effective brewery performance and operation, minimizing energy and water consumption, as well as reducing losses.

The comprehensive documentation and decision support provided by BeerBev enabled Brooklyn Brewery to get a clear overview of the investment required for each phase including opportunities to shift investments between phases, and showed CAPEX savings of up to 20%

“Working with BeerBev we came up with an extremely advanced design that would allow us to be both very efficient and innovative at the same time. We could not have completed the project without them.”
– Eric Ottaway

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