



SUSTAINABLE BREWING SOLUTIONS

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Pentair's sustainable brewing solutions integrate our innovative valve technology, membrane technology for water utilities, carbon dioxide (CO₂) systems, cold block systems, diatomaceous earth (DE)- and chlorine-free Beer Membrane Filtration (BMF), microfiltration, and quality control equipment with all functions of a brewery.

This creates a highly efficient and advanced operation and meets the challenges of today and tomorrow.

Higher costs for raw materials, water, energy, and logistics in virtually every geographical area force our customers to change their investment philosophy and optimize their economies of scale. Because of this, large brewing groups tend to design and built multiple three to five million hectoliter Greenfield operations instead of enlarging existing Brownfield plants to 10 or even 15 million hectoliters.

By introducing non-stop high gravity brewing, a continuous flow and a sophisticated use of membrane filtration, significant savings are realized on raw material usage and water and energy consumption. This highly automated brewing process requires minimal labor, which results in operating cost savings.

A compact footprint with an ideal brewery design lowers investments to the absolute minimum making the decision for new greenfield operations even more favorable.

In combination with Pentair's comprehensive Global Service Management that ensures efficient plant performance, better/more accurate control, better economics, and the most optimal utilization, Pentair's Sustainable Brewing Concept offers a viable, long-term and carefree alternative to conventional services.

DO MORE WITH LESS

Sustainability means, after all, conducting activities smartly and efficiently in ways that are economical, renewable and repeatable.

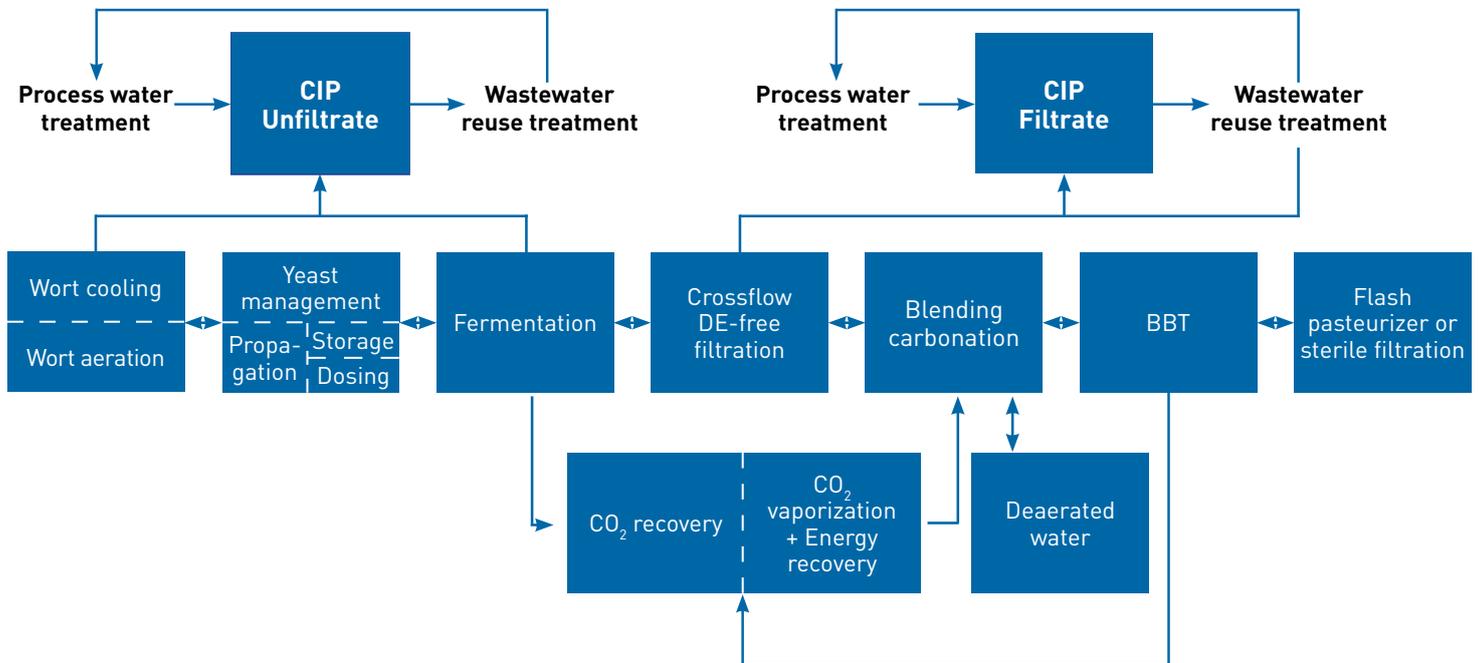
Pentair's Efficient Performance Technology philosophy is geared towards product innovations and solutions that offer measurably higher performance and efficiency against competitive pricing.

Developing clean process technologies is an exciting achievement, but it only means something when they are applied in ingenious ways in a customer's plant.



TURNKEY SYSTEMS - INTEGRATION & AUTOMATION

NON-STOP FROM WORT COOLER TO FILLER: FULLY INTEGRATED SOLUTIONS FROM ONE SOURCE



HYGIENIC & INDUSTRIAL COMPONENTS

Pentair is the name behind the world's most comprehensive range of valves, actuators and associated flow control products. Supplying a host of leading global brands, Pentair offers the best selection of sanitary, aseptic and industrial process valves and components for breweries.

HYGIENIC PUMPS

Pentair offers an extensive range of hygienic stainless steel centrifugal pumps for beverage and food applications. Designed specifically for continuous operation on thin liquids like beer, these pumps offer a very gentle product treatment. Pentair's hygienic pumps, which are EHEDG certified and suitable for cleaning-in-place (CIP), are the ideal solution for challenging and sensitive product applications.

PROCESS AUTOMATION

- PLC, e.g. Siemens, Allen-Bradley/Control Logix/Compact Logix, Modicon/Quantum
- Scada, e.g. Winn CC, RS View, GE Fanuc/iFix, Wonderware/Intouch
- Integrated Systems, e.g. Proleit/Brewmax, Siemens Braumat/Sistar, Krones/Botec
- Decentralized control options, such as the state-of-the-art IntelliTop® 2.0, offer unique functions for a clear and structured process setup and contribute to the performance and efficiency of a plant

APPLICATION

- Control application software developed in accordance to ISA S88.01

COMPLETE ON-SITE SOLUTIONS

- Turnkey fermentation and beer processing plants, pressure tank cellars with panel technology, pipe fence, or double seat valve technology



BEER PROCESSING



BEER MEMBRANE FILTRATION

The brewing industry has passed the sustainability point of no return. Having reached its maximum potential, the industry is quickly leaving conventional solutions behind in favor of clean technologies that satisfy ever-increasing expectations in terms of quality, sustainability and flexibility at, of course, low cost levels.

Pentair's Beer Membrane Filtration (BMF) system establishes a sustainable brewing process and a matching working environment void of the health and safety risks that were present in the Diatomaceous Earth (DE) era of filtration.

In addition to BMF systems for large breweries, Pentair offers a pre-assembled standalone BMF system that meets the specific demands of mid-size breweries with an annual capacity of up to 1,500,000 hl. The BMF-18 Compact has the same advantages and benefits as the original BMF concept while lowering the investment costs to an absolute minimum.

Cost comparison	BMF	DE
Beer losses	•	•
Maintenance and service	•	•
Solid waste disposal	•	•
Labor	•	•
Stabilization with silica gel	•	•
Separator	NA	•

FLASH PASTEURIZER OR STERILE FILTRATION

More stability and a longer shelf life for liquid products can be achieved with either flash pasteurization or sterile filtration. With flash pasteurization, the pump block, heat exchanger and holding section are designed as three single skids that work together and are automated as one unit. If required, a buffer tank can be added to this unit.

For particle reduction or sterile filtration a fully automated filtration unit, which allows for steam sterilization, Cleaning-in-place (CIP), integrity testing, and CO₂ overlay, is offered. Custom-made systems with additional features are available on request.

PLUG-AND-PLAY SYSTEMS

- Yeast storage and propagation
- Swing-bend panels
- Tank-top equipment
- Water deaeration
- Pigging
- CIP

HIGH GRAVITY BREWING

High gravity brewing is used to increase the production capacity without investing in larger brew houses, fermentation tanks, filtration lines, and overall footprint. The high gravity brewing process involves the production of highly concentrated wort and the dilution of the final beer.

The main steps are water deaeration, blending of the high gravity beer with deaerated water, dosing, and finally the carbonation of the blended beer to meet the sales CO₂ content. Deaeration, blending, dosing, and carbonation can be combined in one single skid.

Custom-made systems including all necessary units, pipework and valve manifolds can be designed for larger capacities.



WATER MANAGEMENT

When assessing and reducing the environmental footprint of a brewery, one focus area is the reduction of the water footprint. Because water is essential to the brewing process, both as an ingredient and in the production process, it must be given special attention. Pentair's expertise in water use and its wide range of technologies provide the ideal solutions for brewery water management.

- A Water Audit determines the current water usage and water streams in a production plant and highlights opportunities to reduce overall water consumption.
- Process water polishing prepares product water to comply with the specific needs of a brewery utilizing membrane technology and activated carbon (decolorization and THM removal).
- Wastewater treatment with Membrane BioReactor (MBR) technology provides better water quality, smaller footprint, less sludge, adherence to regulations and reduced handling costs when compared to conventional wastewater treatment.
- Effluent polishing prepares effluent for specific process requirements with activated carbon or membrane treatment.



Water type	Usage	Typical water consumption in a modern brewery		Pentair's optimal water balance
		%	hl	hl
Brewing water	Brewing	30	1.2	1.2
Brewing water	Process cleaning	17.5	0.7	
Soft water	Bottle/keg cleaning	20	0.8	
Plant water	General service	10	0.4	0.4
Denim water	Boiler feed	2.5	0.1	0.1
Flush water	Rinse/concentrate from RO/IEX	20	0.8	0.8
TOTAL		100	4.0	2.5



CARBON DIOXIDE SYSTEMS

CO₂ SYSTEMS

CO₂ is an essential ingredient in both beer and soft drinks and has a large influence on the quality and customers' acceptance and perception of the product.

In most breweries CO₂ recovery is common practice. Advanced breweries look to early CO₂ recovery whereby they are able to recover food-grade CO₂ from fermentation and become CO₂ self-sufficient.

In addition, they can sell excess CO₂, for example, to beverage producers for the production of carbonated soft drinks. All of this is done with a minimum consumption of utilities.

HEAT RECOVERY SYSTEM LIQUIVAP

A CO₂ recovery plant consists of several processes, of which CO₂ liquefaction and CO₂ evaporation account for a large portion of the plant's energy consumption.

With LiquiVap, the required energy can be reduced by up to 60%. Effectively, LiquiVap simultaneously facilitates the **Liquification** of incoming CO₂ gas (from the fermenters) and **Vaporization** of liquid CO₂ (from the CO₂ storage tanks to the consumers).

CO₂ GAS ANALYSIS SERVICE (CAS)

Pentair supports your quality assurance process by analyzing CO₂ samples taken at various stages of the CO₂ recovery and CO₂ consumption process. The CO₂ samples are analyzed with a gas chromatograph. The sample composition is quantified in a CAS report and benchmarked against international and/or customer specifications. This makes CAS an essential tool to resolve CO₂ issues and optimize CO₂ quality and/or CO₂ recovery plant performance.

QUALITY CONTROL EQUIPMENT

A good definition for a quality beer is a beer that consistently meets specification. To ensure consistency of the required specifications, each step of the production process in a brewery should be controlled, starting with the arrival of raw materials, through production to the analysis of beer samples taken randomly among bottles and cans in the holding room. Pentair's laboratory, at-line and in-line equipment covers all the important aspects within the quality control chain for beer production:

- Total CO₂ and O₂ management
- Foam measurement
- Turbidity measurement
- Alcohol/Extract measurement
- Monitoring of filled packages

- Monitoring of downstream processes such as pasteurization or keg/bottle washing

Total Lab Solution

Pentair Haffmans supports you in building a new laboratory by designing the lab, delivering and installing all equipment. This also includes a training program for the operators on the delivered instruments.



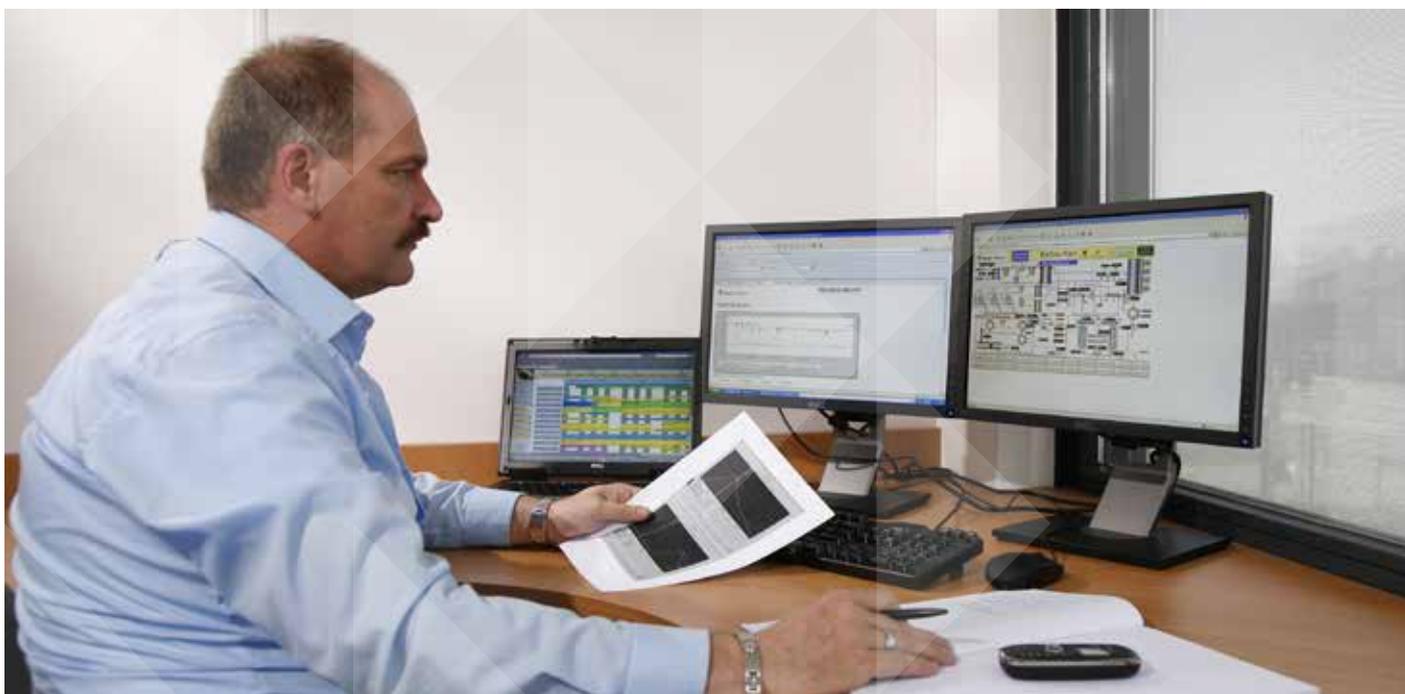
Inpack TPO/CO₂ Meter, type c-TPO

MICROFILTRATION

Effective microfiltration is essential at many stages of the brewing process. Pentair provides an in-depth spectrum of air, gas, steam, and liquid filters with the advanced CPM® filter design. CPM® Ecofilters feature a modular design that offers the highest filtration flexibility and security and provides Total Cost of Ownership (TCO) savings of up to 50 percent.



CPM® Sterile Filter, type PSF



GLOBAL SERVICE MANAGEMENT



Today, service is much more than just repair and maintenance. Service contracts are an integral part of your preventive maintenance program. It begins during project management when Pentair's service team is introduced to the customer and assists with commissioning.

On-site the service team gathers valuable information about the local conditions of the operation. With performance data monitoring, we are able to acquire long-term information, which ensures that troubleshooting and service activities can be very efficient if an emergency occurs.

By taking advantage of the full service contract a company can be assured that the potential for continuous improvement of a plant is explored on a regular basis, and thus place its focus on the core business.

Pentair's life cycle/service management is divided into two phases: design and operation. Proposal/planning, contract management, and engineering up to commissioning are typical design services.

Start-up, monitoring, consulting (24/7 helpdesk), maintenance/replacement of components, evaluation, and optimization are part of the operation services. The overall goal is to ensure that a plant is constructed and operates in the best possible and most cost-efficient way.



FOOD & BEVERAGE

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