

The Change from DE to Crossflow Filtration at the Olgerdin Brewery in Iceland

Sturlaugur Jón Björnsson
Head Brewer
Olgerdin Brewery, Iceland

Stefan Trogisch
Project Manager
Pall Filtersystems GmbH
Bad Kreuznach, Germany

Reiner Gaub
Director Brewing Systems
Pall GmbH
Dreieich, Germany

About Olgerin Brewery

Olgerdin Brewery was founded in 1913 and is one of the oldest and biggest companies in Iceland today. Over the past century Olgerdin products have become an iconic part of the food and drink culture in Iceland.

Olgerdin is the Icelandic word for brewery and as the name suggests brewing was the company's main focus from the start.

Founded by Tomas Tomasson on April 17, 1913, Olgerdin Egil Skallagrimson started life in two rented basement rooms in downtown Reykjavik. In 1917, the brewery moved from the basement to a building in uptown Reykjavik. Tomas Tomasson remained CEO, chairman of the board and Olgerdin's largest shareholder until he passed away in 1978. In 1999, the company began production in a new brewery, one of the best equipped in Europe, located in the suburbs of Reykjavik.

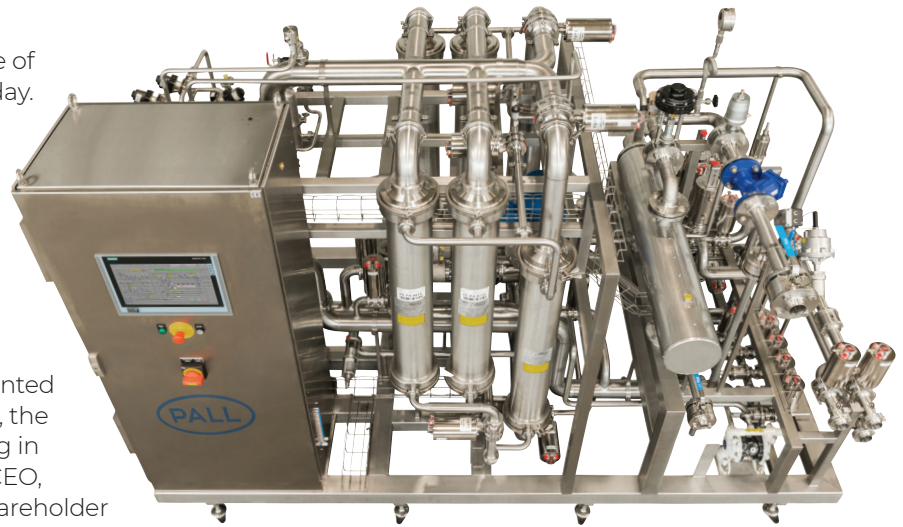


Figure 1: PROFi Craft System

Products

The company's first product was Eglis Malt Extract, still one of the most popular drinks in Iceland and an essential part of any Christmas and Easter celebration. The production of Eglis Pilsner began in 1917, four years after the company was founded. Although it was illegal to produce or sell beer in Iceland until 1989, Olgerdin began servicing British and American soldiers who were allowed to enjoy it.

Today, Olgerdin is producing 15 different brands and different beer styles including Indian Pale Ales, stouts, a wide variety of blond and dark lagers, bitters, light beer and extra strong beer. Their total beer production volume is 120,000 hl/year high gravity. In 2011, Gull, one of Iceland's best-known beers was awarded world's best standard lager at the world beer awards competition. In 2012, Brio was awarded world's best pilsner. The beers are brewed with lava filtered water entirely from locally grown barley. All beers are hand crafted with a true passion.



New Filter Line

For over 30 years, Olgerdin used a manual Kieselguhr candle filter from Steinecker for clarification and stabilization.

The filter itself was in total 49 years old, originally from a Danish brewery purchased after 30 years of service in Denmark. The fast growing number of brands and the increasing challenges with the existing filter system led Olgerdin to begin searching for a new filter system. The critical factors they considered as part of their investigation included operator cost, oxygen uptake, kieselguhr disposal, labor time and most importantly, beer losses.

Evaluation Process to Replace Old Filtration

Based on the key criteria, the various aspects for a technology and supplier comparison were defined. At the start, Kieselguhr and Kieselguhr-free technologies were considered, however, after a short time, it became clear for Olgerdin, that membrane-based technologies offer several advantages compared to classic Kieselguhr filtration.

Powder handling (DE) requires manual work and makes it difficult for craft sized breweries to fully automate. Another challenge is disposal of Kieselguhr. With stricter legislation, the cost associated with disposal has a bigger impact and must be considered as part of the decision-making process. Membrane filtration eliminates the use and disposal of filter aids.

Quality was another important factor. Any impact from iron, manganese and oxygen uptake on beer quality, taste stability and freshness can be avoided with membrane filtration.

From an economic standpoint, considering the overall costs for Kieselguhr, storage, product losses during processing, disposal and quality control, membrane filtration has an advantage. With Olgerdin's many brands, beer losses also played a significant role. Membrane technologies result in lower costs compared to Kieselguhr filtration.

After the decision for a membrane-based solution was made, one question remained: what type of membrane technology should be chosen? While multiple crossflow technologies are available in the market, the **PROFi Craft System** from Pall was selected. The PROFi Craft solution combines a centrifuge with Pall's hollow fiber crossflow system. The centrifuge separates the bulk of solids (yeast, trub, hop remains) which can widely vary especially at craft breweries. This pre-separation maximizes crossflow system efficiency significantly resulting in longer filter runs at lower crossflow velocity, lower water consumption and lower cleaner consumption. In standard crossflow systems without a centrifuge, the membranes are exposed to higher solids throughout the filter runs resulting in known disadvantages including high crossflow velocity and more intensive cleaning requirements.

During, initial trials, the two technology platforms yielded similar data and characteristics in beer quality, oxygen uptake and ease of use.

Operation costs were also comparable. The cost to run the centrifuge with the PROFi system was equivalent to the higher beer losses, and increased energy with standard crossflow technologies given their bigger crossflow pumps and necessary cooling.

During reference visits for the different system technologies, the Pall PROFi system combined with a Westfalia Centrifuge was selected. The brewery believed, that this combination better fit the requirements and needs of Olgerdin brewery.

Craft breweries with many brands and different types of beer typically show a wide variation in solid load, batch quantity and filterability. By implementing a centrifuge, this variation is equalized in a pre-treatment step and allows a more constant and stable filtration process. With dead end crossflow operation, set-up is simpler, allows the direct filtration of late hoped beers and requires no intermediate rinsing steps during a filtration run. Also, the overall line volume for PROFi was smaller, providing another advantage during brand change with pre and after run volumes.

Olgerdin placed an order for a turnkey system in 2016 for the following combination:

- Centrifuge Separator Type PROFi 100 GEA Westfalia
- Centrifuge buffer tank
- PROFi Craft 12 including membrane cleaning unit and valve block
- Filtrate buffer tank
- Control system including remote operator station at brewhouse

Installation and commissioning took place in January 2016 and lasted 15 days in total. Final acceptance was approved mid-February, 4 weeks after start up.

Design Data

Maximum capacity of HGB to be filtered per day (hl)	1,000	Filtration weeks per year (1-52 weeks)	50
Maximum capacity of HGB to be filtered per week (hl)	3,000	Operating days per week including CIP (1-7 days)	5
Maximum capacity of HGB to be filtered per month (hl)	12,000	Average blending factor from HGB to FGB* (%)	20
Maximum capacity of HGB to be filtered per year (hl)	120,000	Average amount of brand changes per day (1-X)	3

* HGB = High Gravity Beer, FGB = Final Gravity Beer

Positioning and Operation

As space is always limited in an existing brewery, the PROFi Craft 12 was positioned in the maturation tank area. The small footprint and the limited height allowed positioning between the tanks. The centrifuge was installed in a separate room, as noise regulations are very stringent in Iceland.

The system is fully automated and operation is done by the brewer in the brew house. A remote operator station was added to the existing brew house control system. For quality control and product traceability, a data logging program records all relevant parameters for analysis and documentation. The interface communication is between the PROFi Win CC platform and the Botec program.



Beer comes directly from fermentation/maturation tank to the centrifuge and from there into a small buffer tank, which compensates for the pressure variations during centrifuge de-sludge. From the centrifuge buffer tank, beer goes into the PROFi filter block followed by a small filtrate buffer tank and then to the carboblender and bright beer tanks.

The flux rate is constant at 80 hl/h typically achieving batch sizes up to 500 hl/h.

For Clean-in-Place (CIP), the existing brewery installation is used for piping, centrifuge, buffer tanks (inline cleaning due to small volumes) and carboblender. The membrane block has its own small CIP (membrane cleaning unit) directly installed on the filter block. This allows a cleaning in parallel and ensures minimized water and cleaner consumption.

Quality

During ramp up of the PROFi system, the taste and quality of the filtered beers have been monitored and measured extensively. One main advantage that was noticed right from the start was a significantly lower oxygen uptake throughout the overall filtration process.

Economics

After five years of filtration, the PROFi system has shown a reliable operation. Compared to the previously installed Kieselguhr filtration system, the filtration costs, beer quality and process stability have improved.

The crossflow membranes operate in a stable way with no damages or membrane blockage observed during this time. Even beers with very high gravity and high hopping levels, the system achieves a constant performance.

The microbial situation has also improved with the new technology. Beer at the filter outlet is free of yeast.

SUMMARY

Olgerdin's decision to move away from Kieselguhr has been the absolute best decision for the new filter cellar. Selecting the PROFi system, the combination of a centrifuge and a dead-end crossflow system has been proven to be the right selection. With many different brands at different gravity and hop levels, a significant cost savings from fast and easy brand changes at low beer losses was immediately noticed. Also taste stability and freshness improved. Olgerdin would decide again for this technology.



+1-866-905-7255 **Food and Beverage toll free**
foodandbeverage@pall.com

Corporate Headquarters
Port Washington, NY, USA
+1-800-717-7255 toll free (USA)
+1-516-484-5400 phone

European Headquarters
Fribourg, Switzerland
+41 (0)26 350 53 00 phone

Asia-Pacific Headquarters
Singapore
+65 6389 6500 phone

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