Silage system on board fishing vessels: exploiting the full potential of white fish

Abstract

This white paper explains a new, hull-integrated silage solution that does not require a bigger boat, but instead capitalizes on available tank capacity by first creating silage of fish waste, separating the fish oil, and thereby evaporating the liquids that does not represent any economic value. The solution aims to produce high quality fish protein concentrate (FPC) silage that can generate a market price of NOK 12-15 per kilogram, compared to today's level of NOK 2 per kilogram.

Introduction

Today, approximately 30 percent of a white fish is used for human consumption. The rest of the fish is primarily utilised for animal feed purposes. While vessels that operate close to port are able to gain an acceptable price for their white fish waste, trawlers that operate far from home port either discharge the waste to sea or sell it as a low quality product at a relatively low market price (approximately NOK 2 per kilogram), typically to an onshore feed factory.

While discharging fish waste is coming under increased scrutiny in fish quota regulations (EU has already implemented regulations against doing it), transporting untreated waste takes up valuable cargo space on board the vessel. The industry has attempted to solve this dilemma with on board fishmeal factories, but high costs and energy requirements plus demand for own crew on board have so far resulted in slow adoption levels for this technology, which also requires significant space on board.

Relevance

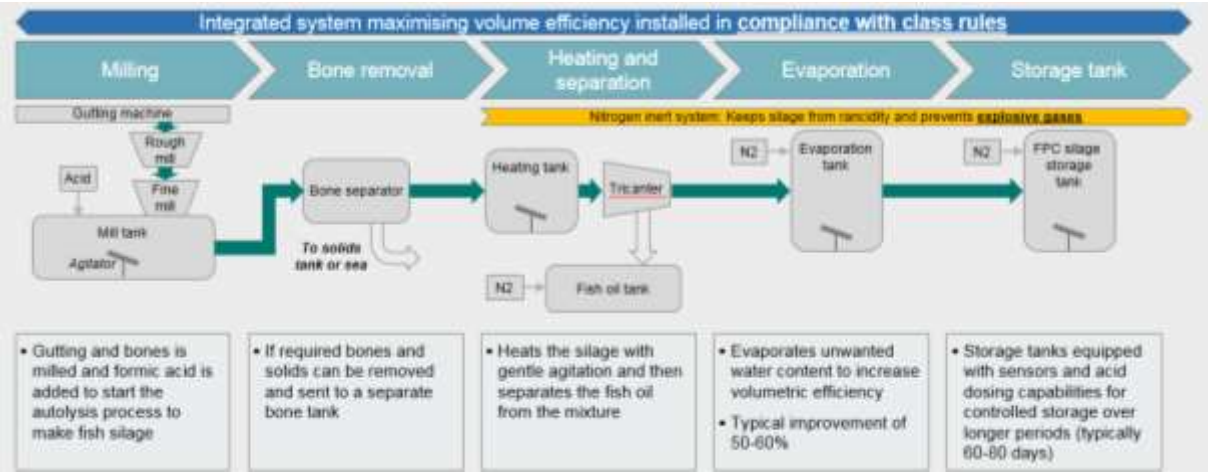
The solution – called PG Silage – is relevant for long-distance fishing vessels that have quotas that allow them to operate relatively far from home port for weeks at a time. Typically 70-100 metre long vessels. An effective silage system will increase the vessels' range.

PG Silage aims to handle almost all types of white fish as it can easily adapt to critical temperature levels of different fish proteins and oils, through remote monitoring of tanks, piping and pumps from the bridge or control tower. Vessel crews can also receive online help from onshore-based experts to adjust system parameters.

Solution

The PG Silage solution is based on a system where treatment and storage tanks are integrated into the vessel hull, to avoid avoid taking up valuable fillet storage space. The system creates silage of fish waste, separating the fish oil, and thereby evaporating the liquids that does not represent any economic value. It is based on known and proven components and automation methods, where PG Flow Solutions combines its competence from vessels, piping technology, pump solutions and liquid handling.

The process can be briefly summarized as this: fresh raw material is gathered in a tank directly under the on board fillet machine. After milling, the autolysis process takes place in this tank. The majority of the fish bone is separated here. The silage is then transported to another tank, which is heated up to its maximum tolerance level in order to separate the fish oil and move it into a separate storage tank. The system uses recycled heat from the main engine to manage the heating process. The silage is then moved to a new tank, where remaining liquids are extracted through evaporation. When sufficiently evaporated, the silage is moved to storage tanks that allows it to be sold as fresh FPC. See also process outline below:



PG Flow Solutions will define all specific requirements for volumes, pumps and tank designs that a ship designer requires to accept as a guarantee for the silage process.

The PG Silage solution has patents pending.

Costs and benefits

PG Silage aims to function as cost effective method of generating a high-value end product that satisfies current and future regulatory requirements, and has low energy consumption. A key feature of the solution is that it will be integrated into the ship's hull to avoid taking up valuable storage space required for the fillets.

Approximately 2,700 tonnes of fish is required to generate 1,000 tonnes of fish fillet. The remaining 1,700 tonnes is fish waste and equivalent to approximately 1,700m^3 with a density of 1kg/l. The PG Silage method manages to reduce this to approximately 310m^3 of fish oil and 530m^3 concentrated FPC. The concentrated product can be stored up to two months, so that a high quality FPC product can be supplied to a feed producer at a typical price of NOK 12-15 per kilogram.

At a conservative price of NOK 12.50, the 530m^3 concentrated silage will generate revenues of NOK 6.6 million, while 310m^3 of fish oil will generate revenues of approximately NOK 3.1 million (NOK 9.7 million for both products). Payment for fishbones comes in addition to this.

PG Flow Solutions estimates that the total purchasing cost for the silage system, tanks and piping systems, including engineering, production and start-up costs, will be approximately NOK 50-70 million for a freezer trawler with 1,000 tonnes fillet storage capacity.

Based on a calculation where a 1,000 tonnes freezer trawler conducts five trips annually with deliveries as specified above, including all associated operational costs, the repayment period for the entire PG Silage system, excluding depreciation, interests and tax deductions, is estimated at less than two years.

Conclusion

This white paper has demonstrated how a hull-integrated fish waste silage solution can produce high quality FPC and fish oil without taking up valuable storage space on board the vessel. As a result, fishing vessels can increase their financial income significantly and ensure that they operate in full compliance with the EU regulatory framework for fish waste.

For further information

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