

AN EXCEPTIONAL ENERGY CASE STUDY
LPG For Power Generation on Salmon Farms in Chile

A SAFER, CLEANER AND MORE
COST-EFFECTIVE FUEL

WLPGA and Industry Council member Gasco has launched a fascinating LPG for power generation project providing reliable energy to a salmon farm in the southern part of Chile. The project aimed to replace the older diesel systems that were dirty and unreliable and demonstrate that it is possible to cultivate salmon in a more sustainable, economic and safe manner by replacing diesel with LPG.

This Exceptional Energy case study looks at the story behind the system, the challenges faced and how the Gasco solution was put into place.



WORLD LPG ASSOCIATION
182 avenue Charles de Gaulle
92200 Neuilly-sur-Seine - France
www.wlpga.org

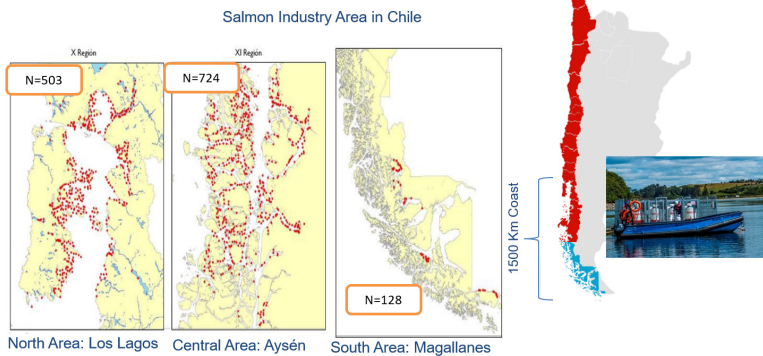


1. The Project

Gasco is promoting the replacement of diesel used for electricity generation in salmon farming by switching to an LPG based energy solution, with an estimated consumption of 130 tons of LPG per year. The project has been implemented by the Salmones Aysén company and is operational in a farming center located in Huito, which is in the southern part of the country.

Chile is the second largest producer of salmon in the world after Norway, and this power generation system proves that it is possible to cultivate salmon in a more sustainable, economic and safe manner by replacing diesel with LPG. Salmones Aysén has within its corporate objectives to implement innovative and environmentally friendly processes and procedures, so the idea of using an LPG power generation system was seen as a natural fit with overall company aspirations. This was the first of four similar projects which were launched at the end of 2019 in the same region of Chile.

Salmon Industry : Geographical location Over 1300 farming facilities – Over 300 off shore



2. The Technology

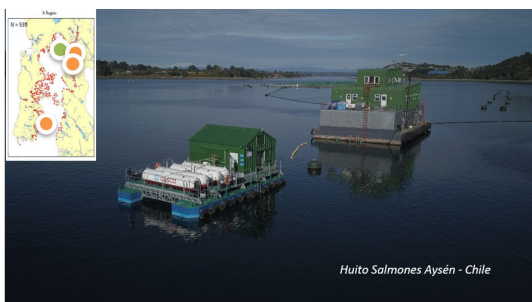
This power system is composed of a marine platform holding three LPG powered generators with a total capacity of 300 kVA, in a 2x120 kVA + 1x60 kVA configuration. It also includes an LPG dispenser for outboard engines and a storage system that holds 16,000 litres.

The solution was provided by CETEC in a package that includes a Doosan engine, Standford and Cramaco generators and a soundproof cabin specially built for operations in marine environments. The platform was designed and built locally as well as the storage tanks which are composed of four tanks of 4000 litres

each. The main objectives of the project are to provide continuous power to the feeding and lighting systems.

Use of night-time LED lights on industrial fish farms has a positive impact on the development of the fish and improves yields. Both the feeding and lighting processes are intensive during the periods that the salmon are growing. They generally complete a harvesting cycle between 12-18 months. In addition, the integrated LPG supply solution for outboard engines allows platform users to save time by avoiding going to land bases to refuel.

New Solutions: Electricity generation based on LPG engine



- ❖ Power 300 kVA (2x120 + 1x60)
- ❖ Electricity supply for feeding and photoperiod processes
- ❖ Annual estimated LPG consumption : <256k litres/annum/facility
- ❖ 16k litres storage (= 80% of maximum capacity)
- ❖ Refilled approx every 15 days

In operation : Huito Under construction: Calbuco, Millagro, Rilán

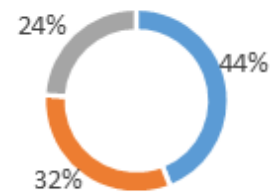


3. Benefits for the Country

Chile's salmon industry is among the world's biggest in terms of annual export volumes. The main export destinations are China, the United States, Brazil, Japan and the European Union. The use of less polluting LPG to produce the salmon allows for a reduction in the product's carbon footprint, as well as improving the industry's operational efficiency. LPG is also cheaper than diesel increasing the competitiveness of the industry.

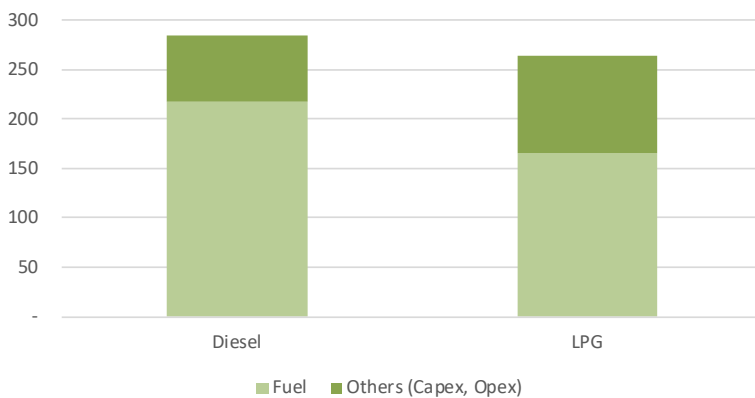
It is estimated that out of the total energy required for salmon farming (fish, seawater and processing plants), 30% is consumed by marine platforms. So it is important

Energy consumption - Salmon farming



■ Fresh water ■ Marine farm ■ Process plant ■

Total energy cost (USD/MWh)

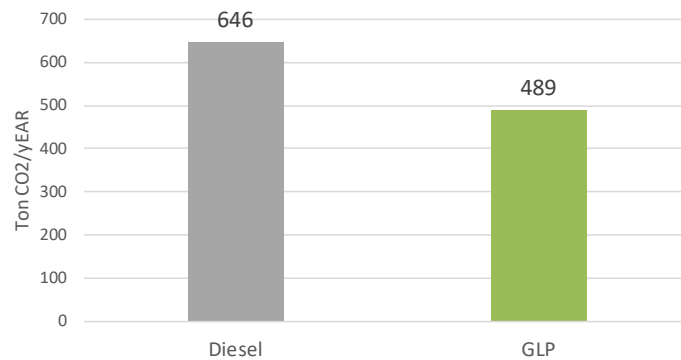


for the industry to use energy technologies that generate a lower impact on the environment. Also, due to its physical and chemical characteristics, LPG reduces the risk of spills into the water and their impacts. Unlike diesel, an LPG leak will completely dissipate virtually removing the risk of bioaccumulation of hydrocarbons in the fish. LPG is also non toxic, allowing for improved yields and improved safety standards for the industry

4. Advantages for the User

For Salmones Aysén this project will create a 7% reduction in total costs including investment, fuel and maintenance. These savings are generated mainly by the 24% reduction in fuel costs. Also the project will reduce the site's CO2 emissions by approximately 24% as well as controlling fuel consumption more effectively and removing the risk of damaging and dangerous spills of diesel.

Huito CO2 emissions (t/year)



5. Timeline (17 months)

Project design three months:	June - August 2018
Project construction six months:	January - June 2019
Commissioning four months:	July-November 2019



6. Contributors

- Gasco: project design and Project management
- Cetec: generators, switchboard and remote monitoring
- Salmones Aysén: operations