

# Ocean Matters

Daniel Phillips



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# Site and Location

- ▶ Located away from salmon sea cages, which reduces likelihood of enhanced pathogen presence in intake waters.
- ▶ Well connected to major UK road and ferry networks.
- ▶ Water source is very stable.
- ▶ Buried bed pumping system, coupled with an ozonated batch treatment for sterilisation of incoming water.
- ▶ Zero-incidences of pathogen outbreaks during period of operation.



# Brief History of Ocean Matters



Started by private investment group with support from Mowi in 2015

Building started in spring 2016

Plan to produce 1.2 million fish annually

First eggs enter system in spring 2016

Building of 'Phase 1' completed September 2016

First fish harvested in October 2016

1.7 - 1.95 million fish harvested in each season

Expanded operations in late 2018

Became a Mowi Company in April 2019

40% of current site utilised with ability to expand further with investment



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# This is Ocean Matters



# Ocean Matters a commercial Lumpfish RAS

- ▶ Largest UK lumpfish producer.
- ▶ Annual production ~ 2 million 25g juveniles per year, increasing with investment in coming years.
- ▶ Expansion space for production of ~8 million 25g juveniles annually.
- ▶ Focus on use of technology to increase production.



# Egg Incubation Systems

- ▶ Two independent life support systems capable of holding 2 million eggs in each.
- ▶ Site operates a zero-tolerance approach to pathogens from egg suppliers.
- ▶ Systems maintain high water exchange, keeping oxygen levels around 99% saturation, and flush away waste products to filter systems.
- ▶ Temperatures can be maintained to 0.1°C accuracy.
- ▶ UV sterilisers on system, all water sterilised from Irish Sea water coming into system.
- ▶ Over dimensioned LSS means no batch of eggs has ever required supplementary treatment with disinfectants post stocking.



# Weaning Systems

- ▶ Fish stocked from 0.005g to 0.5g in system.
- ▶ Start-feed of enriched artemia nauplii used, which has been shown to reduce juvenile mortality.
- ▶ High quality diets used for weaning stage.
- ▶ 80% of feeding is hand-feeding from staff.
- ▶ Surface area more important than tank volume at this stage to support lumpfish feeding behavior, which involves a 'sit-and-wait' approach.
- ▶ Life support systems are designed to maintain an optimum rearing environment:
  - ▶ Use of ozone and UV on systems.
  - ▶ LSS modified by team in late 2017 to improve productivity.
- ▶ R&D still on-going to further improve production, new diet testing from major live and inert feed suppliers.



# Nursery Systems

- ▶ Designed to provide a greater volume of water for the fish.
- ▶ Fully automated feed, oxygen and flow systems for every tank.
- ▶ Additional surface area provided for rest spaces.
- ▶ Densities supported to around 70kg/m<sup>3</sup>.
- ▶ Variable exchange rates available to allow for high water quality at higher stocking densities. On a pressure feedback system to maintain even flows to all tanks.
- ▶ Life support aims to maintain ammonia < 0.5mg/L TAN, solids removed down to 40 micron, ozone and UV used for sterilisation, blue-water concept employed across the site.
- ▶ New systems designed to improve self-cleaning and workability of tanks.



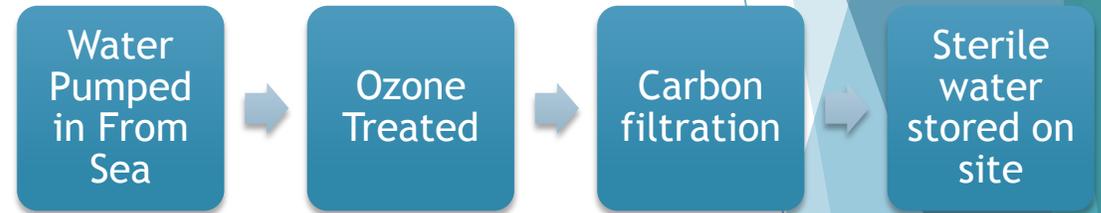
# On-Growing Facilities

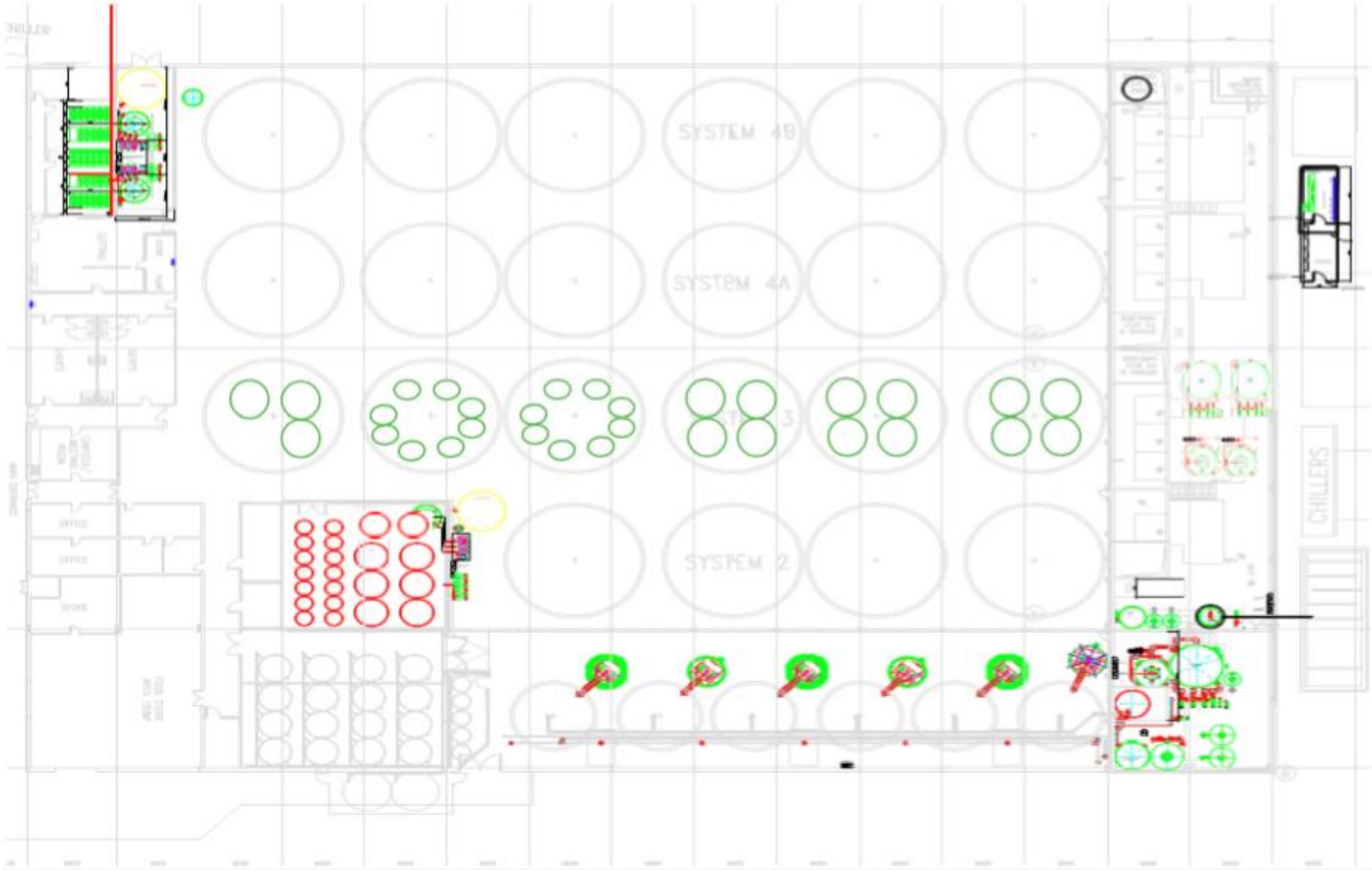
- ▶ All fish individually vaccinated against several pathogens.
- ▶ Systems capable of supporting fish at 70kg/m<sup>3</sup> stocking density.
- ▶ Full automation of feed, flows, and oxygen.
- ▶ High water quality standards maintained.
- ▶ 'Blue-water' technology used to mimic marine environment.
- ▶ Recently expanded operations, with farm team completing design and installation of a full on-growing facility to double operational capacity.



# Unique Water Treatment Systems

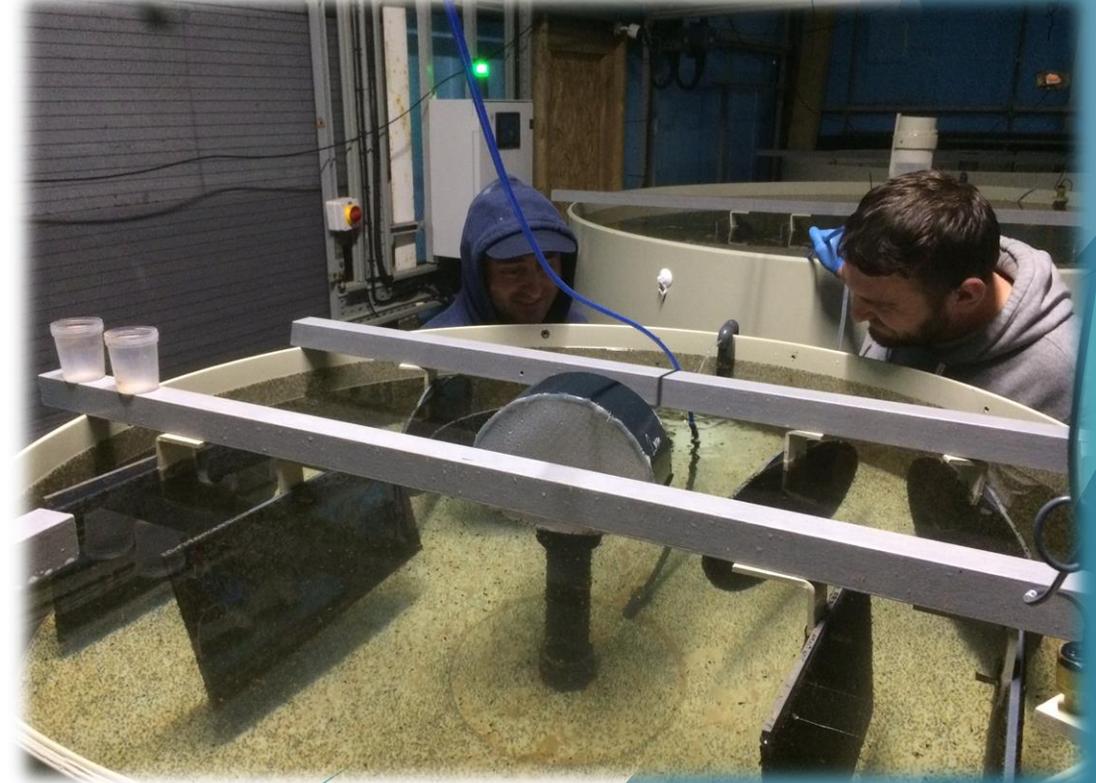
- ▶ Site batch-treats all water that enters the farm using a high level of ozone-treatment.
- ▶ Pumps ashore from a buried bed intake preventing ingress of large particles and unwanted organisms.
- ▶ Systems utilise a 5-10% daily exchange rate.
- ▶ Irish Sea water from the Menai Strait very stable in water quality parameters:
  - ▶ 34-35ppt salinity all year round.
  - ▶ pH 8.1 all year round.
  - ▶ No salmon farms nearby reduces pathogen transfer risk.
- ▶ Power&Water electro-flocculation system for effluent treatment. Produces spreadable de-watered fertiliser and clean discharge water.





# Future Areas of Improvement

- ▶ Increasing levels of automation in lumpfish farming.
- ▶ Labour reduction across larval areas of the business.
- ▶ Developing technology to count smaller lumpfish accurately without handling risks.
- ▶ Optimisation of diets throughout the rearing cycle.
- ▶ Review of broodstock development programs to encourage selective breeding of species, and push for future sustainability.



# Points to Consider

- ▶ Direct employment of 16 staff.
- ▶ Developing skills of both unqualified and qualified persons through Mowi programs, ensuring better skill-sets and employability in local area.
- ▶ Has provided a revitalization of a defunct and 'failed' fish farm model that was operating on the site previously.
- ▶ Directly supports sustainability in the UK's largest aquaculture sector.
- ▶ The largest fully marine RAS operating in the UK at present, a technology that has struggled globally to be cost-effective.
- ▶ Started with private-equity.
- ▶ Historically used Welsh business development loans to assist with modification costs, showing schemes can be positive and do provide a pay-back.



Thank you for your time



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