agrimarine

sustainable aquaculture technology

Sean Wilton AgriMarine Holdings Inc. Aquaculture Innovation Workshop September 26, 2011 A 2011 TSX Venture 50 Company

Enabling Growth and Sustainability









Company Milestones



Optimal Fish Rearing Environment

Proprietary solid-wall containment system enables control over the finfish rearing environment



AgriMarine's Solid-Wall System Benefits

- Enhanced growth due to control over rearing environment
- $\checkmark\,$ No solid waste pollution to sea beds
- ✓ No escapes, predation, toxic algae
- $\checkmark\,$ No wasted feed that attracts wild fish
- ✓ Superior flesh quality
- ✓ Reduced disease transmission
- ✓ Barrier to sea lice and plankton blooms
- ✓ Better feed conversion
- ✓ Temperature control, all year operation
- $\checkmark\,$ Competitive cost of production
- ✓ Low energy requirements
- ✓ Supplemented oxygen
- ✓ Increased growth rates
- ✓ No fouling



Marine Tank- Middle Bay, BC



Tank Construction



Tank size development:

- Current tanks 24m/3000 m3 and 30m/5500 m3
- Production capacity is limited to risk mitigation and husbandry requirements
- 400 tonnes per tank potential beyond that farmers might want to hedge with multiple tanks + sites

Pumps and Energy Use



- Constant water exchange mimics salmon's natural swimming pattern and promotes schooling
- Low energy pumps water lift less than 4 inches

Flow Stream Model – One Hour Exchange



Fluid Modeling of Particle Tracking



Continuous Solids Collection for Waste Removal and Mortality Recovery



Waste Extraction, Fallowing

- Waste/extraction separator and centrifuge work as designed – intermittent use in MB as fish @ 200+ g
- Full grow out cycle needed to evaluate waste trap efficacy. Results to date in line with computer model flow model @ 95% solid waste removal
- Composting experience limited. Fish waste is dewatered for fertilizer
- No fallowing as benthic impact considered minimal
- Solid wall provides a bio-security barrier between fish groups

Water Quality, Temperature

 Atlantics, Pacifics, Steelheads perform well in CC with supplemented O2, cumulative FCR < 1.2

No lice or plankton losses to date

- Salinity controlled by pumping from depth current locations are highly mixed and there is no stratification of the pycnocline or water column
- Future designs will include greater depth & freshwater influence so that salinity & temperature differences between the surface & deep intakes exist
- Pump controls will then allow for adjustment of salinity by controlling relative pump flow rates from the two sources

Oxygen

- The ambient ocean dissolved oxygen in Middle Bay is reasonably steady between 6.5 ppm and 8 ppm, and we supplement in the tank to maintain 100% saturation
- EWOS We maintain saturations equivalent at the 95th percentile natural level i.e. above normal but within the natural range
- Our results so far agree with Ewos (need reference here).
- Discharge: typically discharge 1.5 ppm above ambient O2 level, or 1500 kg x 1.5ppm = 2.3 grams/second
- Water lease dimension across the prevailing current is 430m, average 16m deep, average 0.5m/s = 3,440m3/s of flow
- If DO is 7 ppm then 24 kg/s of natural dissolved oxygen passes through the lease and we add 0.009%

Wave Stress Load



Anchoring Layout



- Ropes and chains secure tanks to anchors on the seabed
- Anchoring is by grid system (same as circular nets) heavier anchors for greater drag force
- Water depth minimum is presently 15 m– maximum is controlled by anchoring costs, storm exposure and history

Land-Based vs. Ocean-Based System

Suppliers to specialty markets	Scalable design can be adopted industry-wide, on a global scale
 Consistent, optimum rearing environment by re-recirculating system (RAS) But: High energy operating expenses – operating head of water as high as 20 feet High land values Cost of construction of land-based tanks Difficulty in building tanks large enough to rear economically viable amounts 	 AgriMarine has solved two key technical issues on the path to closed containment for the industry: The ability to build an economical but sufficiently rugged tank at very large volumes – 10x in volume The ability to provide an equivalent large flow of water at low energy costs – water lift less than 4 inches

Cost Savings

Inputs	Benefits
Tanks	3,000 -5,500 cubic meters - 25 year operating life, long term amortization rates - No land costs
Higher Production Rates	More biomass per cubic meter rearing space No costly losses of fish due to escapes or plankton blooms
Higher Density	Water exchange and vortical movement sustain higher densities, testing shows no stress
Feed	Higher feed conversions , no loss to drift
Energy	Non polluting hydro-electric three-phase power High volume, low energy pumps, with static pumping head of less than a foot, non-RAS, less than 5% of COP
Transportation	Can be deployed close to market, reducing transportation cost
Oxygen	Supplemented oxygen controlled, unlike in net pens
Harvest Cycle	14 months to market in freshwater, 16 months in seawater
Size	3-6 kilos depending on environment and species
Organic Waste	Secondary revenue stream

Tank Manufacturing in China

Manufacturing outsourced to state-ofthe-art plant in Shenyang, China

- State-owned and publicly listed enterprise
- Specializes in high quality resin infusion techniques, including windturbine rotor blade production
- Multiple fabrication locations

Cost effective

 One-third of the cost of North American manufacturers

Time effective

- Manufacturing can be completed in four weeks
- Assembly and installation by AgriMarine completed in two weeks

Manufacturing Capability



Baotou, Inner Mongolia, China



Hami, Xinjiang Province, China



Jiuquan, Gansu Province, China



Lianyungang, Jiangsu Province, China



Shenyang, Liaoning Province, China

Proposed ASC Standards – AgriMarine Exceeds the standards in the following:

Feed Loss	In solid-wall containment, discharge of uneaten pellets (whole or fragments) to the environment is prevented, thus avoiding the disruptive introduction of nutrients into the aquatic environment and the unwanted wildlife interaction.
Sea Lice	AgriMarine has reared seven generations of salmon in solid-wall containment with no sea lice infestations. Possibly attributed to the increased depth of seawater intakes, oxygen supplementation and optimal rearing controlled environment.
Energy and greenhouse gas impacts	On-farm energy consumption only a small part of the total energy and greenhouse gas footprint incurred to deliver cultured fish to market. AgriMarine's energy usage is 1/10th of land-based containment systems. Energy impact further offset by AgriMarine's reduced waste feed and feed utilization efficiency, reduced benthic impacts and proximity of our farms to market.
Waste	90% of settleable fish waste is channeled into a waste separator and collected in order to prevent waste from polluting the surrounding ecosystem.

Key Lessons

- Real world performance is validating the fluid dynamics modeling of the performance of these large tanks
- Wave performance, particle movement dynamics, solids clearing and energy performance are all matching expected design performance
- Large marine tanks are complex and subject to large cyclic forces and as such each component needs to be designed, analyzed and built to withstand these forces and to prevent fatigue failure
- Big Tanks Work!

Future Milestones

China

- Additional tanks at Benxi
- Develop Benxi site #2
- Develop Project at Siping
- Commercial scale farm for yellow croaker
- Commercialization of vaccines for various cold water fish bacterial and viral diseases

Canada

• Additional tanks at Middle Bay

Japan, Norway

- Trial project for Bluefin tuna
- Technology licensing in Norway and Europe



Supporting Innovation

- MBSAI Consortium: AgriMarine Industries, Middle Bay Sustainable Aquaculture Institute, Sustainable Development Technology Canada, Gordon & Betty Moore Foundation, Coast Sustainability Trust
- ENGO support





THE COAST SUSTAINABILITY TRUST



David Suzuki Foundation



Georgia Strait Alliance Caring for Our Coastal Waters





Healthy Oceans. Healthy Communities.



For further information please contact:

Sean Wilton

Director, Licensing and Project Joint Ventures (250) 619-8828 sean@agrimarine.com

Safe Harbour Statement: The information set forth in this document contains "forward-looking statements". Statements in this document, which are not purely historical, are forward-looking and include statements regarding beliefs, plans, expectations or intentions regarding the future. Except for the historical information presented herein, matters discussed in this document contain forward-looking statements that are subject to certain risks and uncertainties that could cause actual results to differ materially from any future results, performance or achievements expressed or implied by such statements. Statements that are not historical facts, including statements that are preceded by, followed by, or that include such words as "estimate," "anticipate," "believe," "plan", "intend", "expect", "may" or "should" or similar statements are forward-looking statements. Risks and uncertainties for the Company include, but are not limited to, the risks associated with the impact of general economic conditions in countries in which the Company conducts business, the impact of competitive products and pricing, product demand and market acceptance, new product development, the continuation and development of key customer and supplier relationships, and the availability of high quality, qualified personnel and management. Other risks include but are not limited to factors affecting development and expansion activities generally including access to capital to meet all of the Company's financial requirements, and the Company's ability to control costs. There can be no assurance that the Company's efforts will succeed and the Company will ultimately achieve sustained commercial success. These forward looking statements are made as of the date of this document, and the Company assumes no obligation to update the forward-looking statements, or to update the reasons why actual results could differ from those projected in the forward-looking statements. Although the Company believes that the beliefs, plans, expectations and intentions contained in this document are reasonable, there can be no assurance those beliefs, plans, expectations or intentions will prove to be accurate. The information contained in this document has been prepared by management of the Company who takes full responsibility for its contents. This document shall not constitute an offer to sell or the solicitation of an offer to buy any securities of the Company in any jurisdiction.