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Aquaculture

FACT SHEET

Background

The demand for protein, especially meat and fish, grows with increasing affluence. Because farmed fish do not expend energy opposing gravity or controlling their body temperature, they convert feed into edible meat more efficiently than farmed land animals. The \$43 billion marine aquaculture industry produces 21 million tonnes of seafood products annually. Aquaculture is the only means to meet the projected growth in fish consumption of ≈ 40 million tonnes per year by 2030.

History

- The use of copper alloy mesh in fish farming originated with small salmon farming enclosures in the Northeastern U.S. in 1975.
 - Today copper alloy mesh is successfully used in Japan, Australia and Chile.
 - Development activities and trials of improved copper alloy materials, mesh forms and aquaculture system configurations are underway in Panama, China, Turkey, South Africa, Korea, Scotland and the U.S.
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Copper Benefits

Improves fish health and production

- Limited biofouling enables excellent water exchange and reduces pen fouling, decreasing the number of parasites, disease organisms and the use of antibiotics.
- Minimal cleaning and maintenance required over typical five-year life cycles, thereby promoting fish growth and development, lower mortality and improved feed conversion.

Resists predator attacks and escapes

- Strength of copper alloys deters predator attacks (especially by those that can bite through traditional netting) and reduces fish escape.
- Unfouled copper alloy mesh reduces drag and decreases cage deformation in strong sea conditions.

Minimizes cost and effort

- Copper alloy mesh reduces operational costs associated with net cleaning, changing, sterilization and treatment with antifouling coatings.
- Copper alloy mesh requires less logistical support (boats, trucks, barges), resulting in a smaller carbon footprint.
- Copper alloy mesh reduces fish loss due to predator attacks, excess handling and net-maintenance-induced stress.

Supports and promotes sustainability

- Each copper alloy net provides a working life of at least five years and loses little mass over this time.
 - Copper alloy mesh nets are 100 percent recyclable.
 - The initial production of copper alloy mesh includes recycled material, further reducing the emission of CO₂ versus traditional polymer nets.
 - Copper alloy mesh aquaculture cages improve the sanitary conditions, productivity and sustainability of operations for fish farmers.
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Types of copper alloy mesh

1. Expanded metal mesh in diamond pattern; ≥ 80 percent open area; 1 mm thick; 90/10 Cu-Ni. Service life is 10+ years. Suitable for situations where material will not be subjected to mechanical abrasion. Commonly attached to rigid structures; can be welded.
2. 65/35 Cu-Zn chain link mesh; 4 mm in chain link form with 40 mm sq. mesh opening; 2.5 mm wire in woven form with 25 mm sq. mesh opening. Service life is 5 – 8 years depending on application conditions. Suitable for flexible mesh containment systems. High resistance to general corrosion, mechanical abrasion and wear. Resistant to dezincification and stress corrosion cracking.
3. Resistant welded mesh with 13 x 13 mm, 25 x 25 mm and 50 x 100 mm openings; Cu-Si containing 1 percent manganese and micro-alloying elements. Suitable where rigid mesh is appropriate or where panels can be assembled with flexible connections.

Market Potential

- Annual copper market opportunity is estimated at 130,000 tonnes per year from retrofit of existing cages and new market growth.
- The total copper market opportunity from the retrofitting of all applicable aquaculture growth systems is 455,000 tonnes of copper.
- Larger, more sophisticated cages and new cage designs can be improved with copper alloy mesh. Copper mesh can be used to replace Round High-Density Polyethylene (HDPE) cages, Square Steel cages and Square Steel cages with platforms.

Copper Delivers Benefits for Fish Farmers

- Over a three-year period in Australia, growers reported a 15% reduction in feeding costs; a decrease in fish mortality from 20% to 10%; and a reduction in losses due to predator attack, from 5% to less than 0.1%.
- Cost advantages using copper alloy cages in Chile are estimated to be at least \$50,000 per cage annually.
- In China, the replacement of conventional cages with copper cages provides significant benefits for regional fish farmers.

Target Markets

- Salmonid fish
- Other Marine Finfish
- Crustaceans
- Mollusks

ICA Activities

- Demonstrate effectiveness of various copper alloys in actual fish farm environments in different geographies with different species
- Establish physical, environmental, productive, and economic performance of copper alloys used in different types of aquaculture cages
- Provide practical and scientific evidence that using copper in marine aquaculture improves fish health
- Enable aquaculture equipment suppliers to use copper alloy mesh with confidence