



Smart Water Solutions for Aquaculture and Marine Environments

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Aquaculture 01-09

Marine 10-15



LINKSENS provides advanced sensing and monitoring solutions for aquaculture, agriculture, and marine environments. By combining high-precision sensors, IoT connectivity, and cloud platforms, we enable real-time water quality monitoring and intelligent control.

From shrimp farms and irrigation systems to offshore aquaculture vessels and marine ranches, our solutions help customers prevent risks, reduce costs, and improve productivity through data-driven operations.

Key Value



Real-Time Monitoring

Continuous tracking of critical water parameters ensures safety and stability.



Intelligent Control

Automated alerts and system integration enable fast response and efficient management.



Proven Performance

Widely deployed across aquaculture, agriculture, and marine applications with measurable results.

Aquaculture

Case Study 1

LINKSENS Smart Sensing Technology Builds a Water Quality Safety Barrier for a Shrimp Farming Base in Haikou, Hainan

► Project Background

A large-scale marine shrimp farming base in Haikou, Hainan (with over 500 acres of aquaculture water and an annual output of more than 2 million shrimp fry) faced three major challenges under high-density farming conditions:

⊙ Unpredictable Risks

Traditional manual testing (1–2 times per day using test strips) could not capture sudden changes in water quality, such as rapid drops in dissolved oxygen (e.g., oxygen depletion by algae at night) and sudden spikes in ammonia nitrogen (e.g., decomposition of residual feed).

⊙ Incomplete Monitoring Indicators

Manual testing was limited to basic parameters such as pH and dissolved oxygen, lacking monitoring of critical pollutants like ammonia nitrogen, nitrite, and total phosphorus. This often led to declined shrimp immunity and extended farming cycles by 10–15 days.

⊙ Low Management Efficiency

The base operates 20 ponds requiring 6 workers for shift-based inspections. This resulted in high labor costs, fragmented data records, lack of precise analysis across ponds, and heavy reliance on experience for feeding and water exchange, causing resource waste.

► Solution

To meet the high-density and high-sensitivity water quality requirements of aquaculture, LINKSENS implemented a multi-parameter intelligent monitoring solution, establishing a system of “real-time sensing + precise control”:

⊙ Comprehensive Multi-Parameter Monitoring

Each pond is equipped with sensors for dissolved oxygen, pH, ammonia nitrogen / nitrite, and total phosphorus / total nitrogen, providing real-time insights into water health conditions.

⦿ Aquaculture-Ready Design

Sensors feature anti-biofouling coating and waterproof, corrosion-resistant housing. Designed for harsh marine environments (high salinity and algae attachment), the system supports long-term underwater operation with only monthly cleaning required, significantly reducing maintenance workload.

⦿ Intelligent Control Integration

Data is transmitted in real time to the aquaculture management platform, accessible via a mobile app. When dissolved oxygen is below 5 mg/L or ammonia nitrogen exceeds 0.5 mg/L, the system automatically triggers alerts and activates aerators and water exchange valves, forming a closed-loop process of monitoring, warning, and response.

► Project Results

⦿ Zero Risk Incidents

With 24/7 continuous monitoring, no shrimp mortality events caused by water quality issues have occurred since deployment. The survival rate increased from 82% to 95%.

⦿ Significant Cost Reduction and Efficiency Improvement

Manual inspection workload was reduced, lowering labor costs by 40%. Feed waste decreased by 15%, and water consumption was reduced by 20%.

⦿ Improved Productivity and Revenue

The farming cycle was shortened by 8 days, and total output increased by 25%.





Case Study 2

LINKSENS Dissolved Oxygen Sensor Safeguards a High-Altitude Salmon Farming Breakthrough in Xinjiang

► Project Background

A large-scale salmon farming base in Xinjiang produces over 3,000 tons annually. Due to extreme day-night temperature differences and rapid atmospheric pressure changes in high-altitude regions, dissolved oxygen levels in water fluctuate significantly.

Traditional manual testing is delayed and cannot respond in time, resulting in a high risk of sudden oxygen depletion, which seriously threatens the survival of high-value fish stocks and overall production efficiency.

► Solution

LINKSENS deployed an intelligent monitoring and control solution based on fluorescence-based dissolved oxygen sensors.

⊙ Accurate Monitoring

The system utilizes membrane-free fluorescence-based sensors with strong anti-fouling capability, requiring minimal calibration while delivering real-time and highly accurate dissolved oxygen measurements.

⦿ **Intelligent Integration**

Data is wirelessly transmitted to a cloud platform where safety thresholds are predefined. Once abnormalities are detected, the system immediately triggers APP alerts and can automatically activate or stop aerators, achieving an integrated “monitoring and control” system.

▶ **Project Results**

⦿ **Enhanced Safety**

Achieved 24/7 continuous oxygen monitoring and control, successfully preventing large-scale fish mortality caused by oxygen depletion.

⦿ **Cost Reduction and Efficiency Improvement**

Reduced manual testing costs by 90% and lowered energy consumption by approximately 20% through optimized aeration control.

⦿ **Benchmark Establishment**

The project has become a model of high-tech, modern smart aquaculture, significantly enhancing brand value.



Case Study 3 — Smart Agriculture

LINKSENS Spectral Buoy Safeguards the Lifeline of Tens of Thousands of Acres of Farmland in Yancheng, Jiangsu

► Project Background

A large agricultural irrigation district in Yancheng relies heavily on water quality for soil health and food safety. However, traditional monitoring methods lack the ability to conduct real-time and large-scale assessments.

Water quality has long depended on experience-based judgment, posing significant ecological and food safety risks.

► Solution

LINKSENS deployed integrated spectral monitoring buoy stations at key locations such as irrigation inlets and main/branch canals.

⊙ Comprehensive Monitoring

Built-in spectral sensors continuously monitor key parameters such as COD, ammonia nitrogen, and turbidity, enabling rapid detection of water quality abnormalities.

⊙ Flexible Deployment

Powered by solar energy and equipped with 4G wireless transmission, the buoy stations can be quickly deployed in canals, ponds, and lakes, effectively covering the “last mile” of monitoring.

⊙ Centralized Management

All data is transmitted to a central monitoring platform, where operators can view the overall water quality status of the entire irrigation district on a single dashboard.

► Project Results

⊙ Safe Irrigation

Prevents substandard water from entering farmland at the source, providing reliable data support for soil health and crop safety across tens of thousands of acres.

⊙ Intelligent Upgrade

Accelerates the transition from traditional, experience-based irrigation to data-driven smart agriculture.

⊙ Cost Reduction and Efficiency Improvement

Significantly reduces manual inspection costs and avoids agricultural losses caused by poor water quality.



Case Study 4

LINKSENS Brings Laboratory-Grade Monitoring into Fish Ponds, Creating a “Five-Star Home” for Koi in Kunming, Yunnan

► Project Background

A high-end koi farming base in Kunming specializes in breeding high-value ornamental fish. Koi are extremely sensitive to changes in water quality parameters such as dissolved oxygen, pH, ammonia nitrogen, and nitrite. Any parameter exceeding safe limits may lead to disease or even death.

Traditional manual testing methods are infrequent and slow in feedback, making them unable to meet the stringent requirements of high-density, high-value aquaculture for stable water quality.

► Solution

LINKSENS customized a multi-parameter online water quality monitoring system, effectively bringing “laboratory-level” monitoring into the fish ponds.

⊙ Comprehensive Monitoring

Multiple digital sensors, including dissolved oxygen, pH, ammonia nitrogen, and ORP (oxidation-reduction potential), are integrated into the recirculating water system, enabling 24/7 continuous monitoring of critical water quality parameters.

⊙ Centralized Monitoring

All data is wirelessly transmitted to a central control room, where operators can view the real-time water quality status of all ponds on a single screen and set alert thresholds for abnormal conditions.

⊙ Precise Control

Real-time data provides a reliable basis for controlling aeration pumps, circulation pumps, and protein skimmers, ensuring a stable and consistent water environment.

► Project Results

⊙ Improved Fish Health

Effectively prevents stress, disease, and mortality caused by sudden water quality fluctuations, significantly improving survival rates and fish quality.

⊙ Labor Saving

Eliminates the need for frequent manual testing, saving over 90% of testing time and allowing staff to focus on routine farm management.

⊙ Brand Value Enhancement

A stable “five-star” water environment has become a key competitive advantage, strengthening customer trust and enhancing brand value in the high-end market.





Case Study 5--Offshore Aquaculture

LINKSENS Self-Cleaning Sensor System Powers the World’s First Smart Aquaculture Vessel, Building an “Offshore Intelligent Farm”

► Project Background

The world’s first 100,000-ton smart aquaculture vessel has pioneered deep-sea salmon farming using a “ship-based tank aquaculture” model. Compared to traditional nearshore net cages, its enclosed farming compartments present a far more complex environment, with water recycling systems and extremely stringent requirements for water quality stability.

Even minor fluctuations in water quality parameters can be amplified under high-density farming conditions, leading to significant economic losses. Traditional manual testing is impractical on a

moving vessel, creating an urgent need for a fully automated, online monitoring system capable of withstanding harsh marine conditions.

► Solution

LINKSENS customized a multi-parameter online self-cleaning digital sensor system, acting as an “intelligent life-support monitor” for the aquaculture compartments.

⊙ Core Monitoring

Digital monitoring modules integrating sensors for dissolved oxygen, pH, temperature, ammonia nitrogen, and turbidity are installed in the recirculating water system of each farming compartment, enabling 24/7 real-time monitoring of critical life-support parameters.

⊙ Key Innovation

The sensors are equipped with intelligent self-cleaning devices that automatically clean the sensing surface at regular intervals. This effectively prevents biofouling (such as shellfish and algae) and feed residue buildup, eliminating data drift and measurement failure while ensuring long-term accuracy and reliability.

⊙ System Integration

All data is transmitted via interference-resistant digital signals to the central control system, which is integrated with aeration, feeding, and water treatment subsystems. This enables fully automated, intelligent control based on real-time water quality data.

► Project Results

⊙ Controllable Risk

Achieved millisecond-level monitoring and early warning of water quality changes, effectively preventing production incidents caused by oxygen depletion or ammonia spikes, and ensuring the survival rate and health of high-value fish stocks.

⊙ Unmanned Operation

Enabled fully unmanned inspection and monitoring of aquaculture compartments, addressing the challenges of high labor costs and harsh working conditions in offshore aquaculture.

⊙ Improved Quality and Efficiency

Accurate data supports precision feeding and energy optimization, reducing feed conversion ratios and improving overall farming efficiency, setting a new global benchmark for industrialized aquaculture.



Marine

Case Study 1--Marine Environment

LINKSENS Monitoring Buoy System Safeguards the “Blue Granary” in Sandu’ao, Ningde, Fujian

► Project Background

Sandu'ao in Ningde is the largest large yellow croaker breeding and aquaculture base in China, known as the “Hometown of Large Yellow Croaker.” The area is densely populated with aquaculture cages, and as farming scales expand, the risk of water eutrophication continues to increase.

During high-temperature periods in summer, oxygen depletion events (“pond overturning”) are highly likely, posing a fatal threat to high-value fish stocks. Traditionally, farmers rely on experience and cannot monitor real-time changes in dissolved oxygen and temperature in deeper water layers. A sudden hypoxia event can lead to losses of millions, posing serious challenges to the sustainable development of the industry.

► Solution

LINKSENS deployed a real-time marine environmental monitoring buoy system, acting as an “intelligent sentinel” for the “blue granary.”

◎ Precise Monitoring of Core Parameters

The buoy is equipped with high-precision dissolved oxygen and temperature sensors, anchored in the core farming area. It continuously monitors dissolved oxygen and temperature profiles from surface to bottom, accurately capturing the formation of thermoclines and oxygen stratification.

☉ Marine-Grade Robust Design

The buoy and sensors are constructed with corrosion-resistant and anti-biofouling materials, capable of withstanding typhoons, wave impacts, and marine organism attachment, ensuring long-term stable operation under harsh ocean conditions.

☉ Intelligent Alerts Direct to Farmers

Monitoring data is transmitted in real time to a cloud platform via a solar-powered wireless system. Farmers can access water quality trends through a mobile app. When dissolved oxygen falls below critical thresholds, the system automatically sends SMS and voice alerts, enabling timely activation of aerators to mitigate risks.

▶ Project Results

☉ Effective Risk Prevention

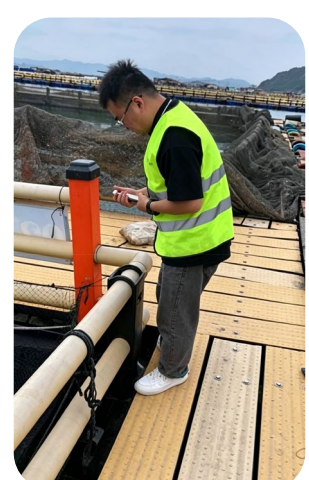
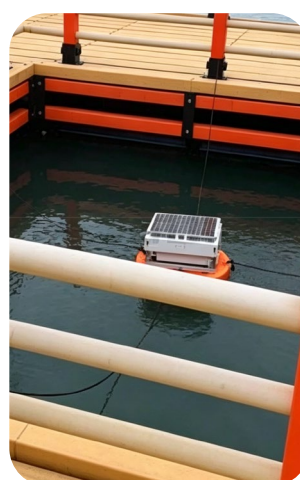
Successfully provided early warnings for multiple bottom-layer hypoxia events caused by high temperatures and stagnant weather, helping farmers take preventive measures and avoid major economic losses. The survival rate of large yellow croaker has significantly improved.

☉ Transformation to Scientific Aquaculture

Replaced traditional experience-based farming with data-driven decision-making, enabling precise aeration and feeding. This reduced feed conversion ratios and energy consumption while improving overall farming efficiency.

☉ Industry Benchmark

This solution has become a standard infrastructure model for developing modern “marine ranching” systems in Ningde, providing a proven example for environmental monitoring and disaster warning in high-risk coastal aquaculture areas.



Case Study 2--Marine Research

LINKSENS Multi-Parameter Sensor System Empowers Marine Ecological Research in Xiamen, Fujian

► Project Background

Xiamen is one of China's key hubs for marine scientific research. Local research institutes have long been engaged in advanced studies on marine ecosystems, red tide mechanisms, and the impacts of climate change.

Such research requires long-term, continuous, high-frequency, and multi-dimensional oceanographic profile data. Traditional methods rely on research vessels for periodic sampling, which are costly, produce fragmented datasets, and fail to capture transient changes. This makes it difficult to deeply analyze ocean dynamics and environmental evolution.

► Solution

LINKSENS provided a high-precision multi-parameter marine water quality monitoring system, functioning as an "unmanned laboratory" deployed in target sea areas.

⊙ Synchronized Multi-Parameter Monitoring

The system integrates sensors for temperature, pH, dissolved oxygen, turbidity, and chlorophyll, enabling simultaneous acquisition of physical, chemical, and biological parameters from the same water body, forming a comprehensive ecological dataset.

⊙ Research-Grade Data Accuracy

Sensors adopt high-sensitivity, low-noise detection technologies, ensuring that collected data meets scientific research standards and provides reliable support for modeling and mechanism studies.

⊙ Customized Data Services

Data is transmitted wirelessly to the LINKSENS cloud platform. Researchers can remotely configure sampling frequency, download historical data series, and use built-in tools for time-series analysis, correlation analysis, and trend visualization, significantly improving research efficiency.

► Project Results

⊙ Improved Research Efficiency

Achieved 24/7 continuous automatic monitoring, generating high-resolution and long-term datasets that were previously difficult to obtain. These data provide critical support for studying red tide dynamics and hypoxia evolution.

⊙ Driving Scientific Discovery

Continuous, multi-dimensional data effectively capture the interactions among marine environmental parameters, supporting new research breakthroughs in areas such as ocean acidification and ecosystem response.

⊙ Enhanced Observation Capability

The successful deployment of this system has significantly strengthened the institute's capabilities in coastal marine monitoring and scientific research, becoming a key component in building a "transparent ocean" observation system.



Case Study 3--Marine Ranching

LINKSENS Intelligent Sensing System Builds an Ecological Safety Barrier for a "Blue Marine Ranch" in Weihai, Shandong

▶ Project Background

Weihai is a national-level marine ranching demonstration zone, home to large-scale offshore aquaculture areas such as Ailun Bay Marine Ranch. Key industries include high-value products such as kelp, abalone, and fish.

However, marine ranches face significant risks, including seasonal hypoxia, algal blooms, and abnormal water temperature fluctuations. Traditional aquaculture relies on manual sampling, with slow data updates that fail to capture sudden water quality changes. In the past, unexpected oxygen depletion events have caused large-scale mortality, resulting in substantial economic losses.

Additionally, nearshore farming areas are affected by land-based pollution and climate variability, creating an urgent need for a 24/7, multi-parameter, highly reliable intelligent monitoring system to transition from experience-based to data-driven aquaculture.

► Solution

To address the complex marine ranching environment, LINKSENS developed an integrated solution combining shore stations, monitoring buoys, and mobile platforms:

⊙ Coordinated Deployment of Multi-Parameter Sensors

(1) Shore-Based Monitoring Stations

Integrated water quality stations are deployed along the coastline, equipped with pH, dissolved oxygen, ammonia nitrogen, and turbidity sensors to monitor discharge outlets and nearshore water conditions in real time.

(2) Marine Monitoring Buoys

Solar-powered buoys are anchored in core farming areas, equipped with sensors for temperature, salinity, chlorophyll-a, and dissolved oxygen. Data is uploaded every 15 minutes, enabling precise early warning of algal blooms and hypoxia events.

(3) Mobile Monitoring Platforms

Unmanned surface vessels are used for regular patrols, collecting underwater profile data and covering blind spots of fixed monitoring devices.

⊙ Technological Innovations for Marine Challenges

(1) Anti-Biofouling Design

Sensors use specialized materials and self-cleaning mechanisms to resist attachment from shellfish and algae, ensuring long-term data accuracy.

(2) Energy and Communication Assurance

Buoys adopt a solar + battery hybrid power supply and support satellite communication (e.g., BeiDou), solving connectivity challenges in remote offshore areas.

(3) Intelligent Early Warning Platform

All data is aggregated into a cloud platform. Algorithm-based models predict dissolved oxygen trends, and abnormal conditions trigger multi-level alerts (SMS, APP, and audio-visual alarms), automatically linking with aeration systems.

► Project Results

⊙ Accurate Disaster Early Warning

(1) The system successfully predicted bottom-layer hypoxia during high-temperature periods, allowing farmers to activate aeration in advance and avoid economic losses.

(2) Chlorophyll data supported algal bloom prediction and optimized feeding strategies, increasing survival rates by 15%.

⦿ **Significant Reduction in Operational Costs**

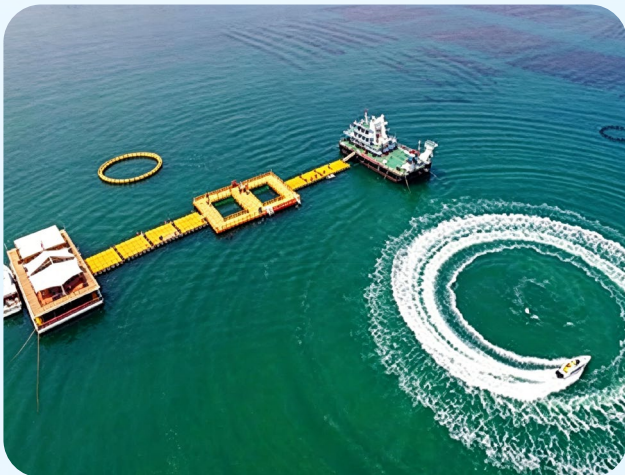
(1) Replaced 80% of manual inspections, reducing operational and maintenance costs by 40%; precise aeration control reduced energy consumption, saving approximately RMB 250,000 annually.

(2) Data-driven feeding and disease prevention improved feed utilization by 20% and reduced chemical usage.

⦿ **Enhanced Ecological and Brand Value**

(1) Continuous water quality data provides a scientific basis for environmental management and ecological compensation policies.

(2) A transparent monitoring system increases consumer trust and enables premium pricing, supporting the development of Weihai's "premium marine ranching" brand.





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