



## SUMMARY



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### Customer

Marexi Marine Technology Co.

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### Partner

Grupo Alava

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### Persona

Engineering Leader

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### Industry

Manufacturing

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### Challenge

Install an accurate, reliable and durable machine vision solution to classify tuna by species, size and quality.

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### Benefits/Outcomes

- Sorts up to 20 tons of tuna per hour with accuracy rates close to 100%
- Easy-to-use interface that lets the operator choose output categories by species and weight
- Continuously operates with minimal required maintenance
- Durable in harsh working environments

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### Solution

- [Zebra Altiz high-fidelity 3D profile sensors](#)
- [Aurora Imaging Library](#)

# 3D Vision System Nets the Right Tuna

Zebra Altiz high-fidelity 3D profile sensor powers TUNASCAN vision system, sorting up to 20 tons of tuna per hour with accuracy rates approaching 100%.

Headquartered in Spain, [Marexi Marine Technology Co.](#) has been a leader in marine technology for more than 15 years. Its expertise is developing optical scanning systems for marine species built on machine vision. Servicing large industry leaders in fishing, canning and aquaculture sectors, Marexi helps customers achieve a competitive advantage by improving their industrial processes. Its patented [TUNASCAN® system](#) is Marexi's most state-of-the-art machine, a high-speed and high-throughput vision system that scans and classifies tuna by species, size and quality.

Proper visual classification of fish is quite a challenging undertaking, especially once the various species have been frozen. Differences between species become practically impossible to perform reliably without exhaustive testing. An automatic frozen tuna classification system, TUNASCAN was developed and refined over the course of five years. Using cutting-edge 3D profile sensors along with machine learning algorithms, TUNASCAN is able to properly classify and sort tuna by species with accuracy rates of more than 95%.

“Machine vision technology is constantly evolving, and we are always seeking ways to further enhance our solutions in order to keep improving and providing the best service possible,” notes Pau Sánchez Carratalá, vision and robotics engineer at Marexi. “In the interest of improving the classification algorithms used by TUNASCAN, we undertook an overhaul of the entire acquisition system, to offer more robustness, help avoid voids and make the system easier to calibrate.”

## Just Keep Scanning

The TUNASCAN system is a major fixture of Marexi's marine technology offerings; this patented two-channel vision system can process up to 20 tons of frozen tuna per hour, classifying the fish by species and weight. The 3D scanning and classification system is divided into three sections: reception hopper, scanning and sorting. From the reception hopper, frozen tuna are fed into the system and pass through the scanning section, where two Zebra AltiZ sensors perform a 3D scan and a computer classifies each tuna individually, with classification results and location data sent to the sorting system. Once there, each tuna is properly sorted into its appropriate container.

## Clear Fishy Fishy

Upgrades to the TUNASCAN project centered upon Zebra [AltiZ 3D profile sensors](#). "We chose Zebra AltiZ sensors because our application required a strong, reliable way to obtain 3D point clouds from objects moving at a fairly fast speed," Sánchez Carratalá notes. "The application also must be able to deal with a lot of point-cloud noise and dirtiness produced by the tuna as well as physical operation of the machine. As such, an enclosed 3D profiler suited for harsh industrial environments—like the Zebra AltiZ—was a really good choice. In the past, we used separate cameras and lasers for obtaining 3D data, however, Zebra AltiZ 3D profile sensors allow us to integrate all these elements into a single sensor that provides exceptional robustness to the application." The dual-camera single-laser design of the Zebra AltiZ achieves what could not be accomplished with common 3D profile sensors that feature one laser and a single camera and is thus able to attain the high reproduction fidelity that Marexi sought for its system.

TUNASCAN employs machine learning to accurately classify frozen tuna based on the features extracted from the point-cloud representation and calculated weight. Aurora Capture Works—the interactive set-up utility for the Zebra AltiZ—was used to configure the 3D sensor and provide the code snippet for the acquisition portion of the actual application.



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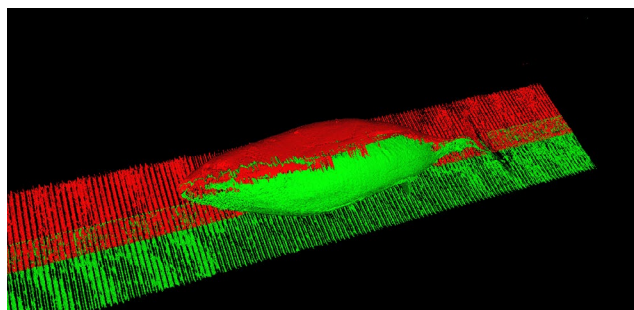
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**Pau Sánchez Carratalá,**  
Vision and Robotics Engineer  
Marexi



For the TUNASCAN system, the Zebra Altiz devices are set to generate a point cloud. The laser lines trace the contours of the fish, and the embedded algorithms in the 3D sensors then produce a point cloud; each point represents a single measurement. The point cloud is stitched together to create a complete 3D rendering of the tuna. The algorithm ensures greater control over invalid data, resulting in more robust 3D reproductions. A challenge for this system was acquiring data at a relatively high rate as the frozen tuna moved across the line quickly, something that the use of two Zebra Altiz 3D profile sensors accomplished with ease.

The TUNASCAN system also includes several ultrasonic sensors that trigger the Zebra Altiz to begin 3D capture only when there is a fish available to scan. Special low-temperature infrared sensors are responsible for monitoring the temperature of each fish and assuring the proper behavior of the system.



### Fishing for Results

Operator interaction with the TUNASCAN system is minimal. An easy-to-use interface lets the operator choose output categories by species and weight, so that, in addition to sorting by species, the same species of tuna can be sorted into different groups according to their weight. TUNASCAN automatically sorts every incoming fish into the selected categories by container. When a container is full, the system informs the operator so that the full container can be removed from the line and a new one added to the operation. TUNASCAN manages multiple containers, automatically assigning a new container for output while the full container is being replaced, ensuring the system remains in continuous operation.

TUNASCAN systems are deployed in harsh environments and regularly exposed to cold, salt, dirt, fish scales and humidity. The systems operate continuously, leaving very little opportunity for maintenance or calibration. “One of our installations has been working up to 20 hours a day, six days a week for almost three years, with barely any maintenance required,” Sánchez Carratalá smiles. “All that, and with accuracy rates approaching 100%! Our clients could not be more pleased with the system.”

### In the Swim of Things

Development of the TUNASCAN system involved about 20 individuals, including computer engineers, physicists and mathematicians, among others, all with extensive experience in machine vision systems. The TUNASCAN project has been underway for nearly five years; as part of Marexi’s commitment to continuous improvement of its products, it has been regularly improved and optimized over that time. “We faced some challenges at the start of the project, mainly because it is a very complex and disruptive system, and we needed to guarantee its robustness and efficacy. We are really happy with the assistance offered by the technical support team, as well as the help received from Grupo Alava,” Sánchez Carratalá reports. “We know we can always count on getting help from both of those teams. We’ve solved our development problems thanks to them, and now the equipment is a reality and available to customers.”



## SUCCESS STORY

MAREXI MARINE TECHNOLOGY

Building on the success of the TUNASCAN upgrade, Marexi is currently working on a different project for the fish industry that also integrates a Zebra Altiz 3D profile scanner, along with [Aurora Imaging Library](#) software. Marexi has four other projects in development that incorporate Aurora Imaging Library, and it anticipates starting three more soon. A notable example of a project already being commercialized is called UVPpress, which uses the deep-learning capabilities in the Aurora Imaging Library to properly identify, count and evaluate anisakis infections in fish samples. Marexi has received inquiries from many international clients about the TUNASCAN system. “Commercial negotiation periods for this type of product can take upwards of a year, as they are often dependent on government permits, and other factors outside the client company itself,” Sánchez Carratalá notes.

## Conclusion

Marexi reports that its current clients with TUNASCAN installations are very satisfied with the system and value it provides their businesses. “

“Our TUNASCAN application really leverages the strengths of the Zebra Altiz-based system,” Sánchez Carratalá concludes. “Not only do the sensors deliver very accurate 3D data at really high conveyor speeds while dealing with a challenging product like frozen tuna, but the Zebra Altiz functions optimally in extremely harsh environments and works for really long periods of time without maintenance.”



For more information, visit [www.zebra.com](http://www.zebra.com)



**NA and Corporate Headquarters**  
+1 800 423 0442  
[inquiry4@zebra.com](mailto:inquiry4@zebra.com)

**Asia-Pacific Headquarters**  
+65 6858 0722  
[contact.apac@zebra.com](mailto:contact.apac@zebra.com)

**EMEA Headquarters**  
[zebra.com/locations](http://zebra.com/locations)  
[contact.emea@zebra.com](mailto:contact.emea@zebra.com)

**Latin America Headquarters**  
[zebra.com/locations](http://zebra.com/locations)  
[la.contactme@zebra.com](mailto:la.contactme@zebra.com)