



PROJECTS

Portfolio of industrial projects

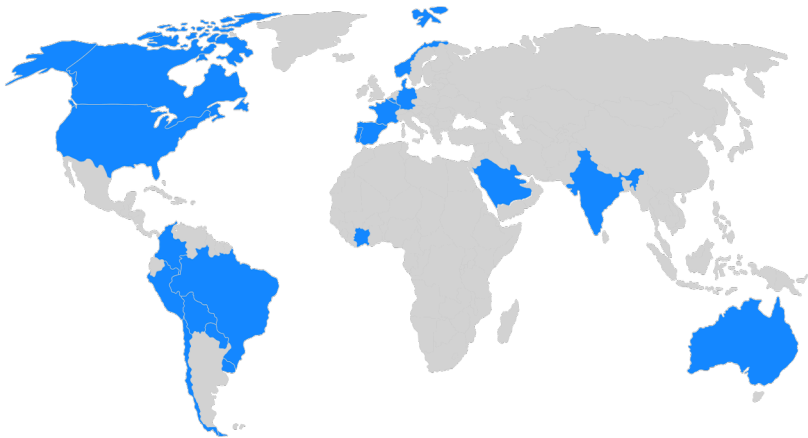
Who we are

We are an engineering company with more than 10 years of experience, specialized in the development of comprehensive technological solutions based on three areas of knowledge:

Robotics






Sensing

Analytics



Our drones operate
Currently in more than 20 countries

What we offer

01 Drones			Hercules X4 Hercules X8	Atlas X4 Atlas X8	Drakon 4000
02 Instruments			LiDAR ISR	Magnetómetro VLF	Hiperespectral Gamma Ray
03 Remote Sensing			Mining Oil & Gas	Civil engineering Environment	Agriculture
04 Projects			Tailor-made projects with a focus on innovation		

Industrial design process

01 Discovery

We analyze the operational context of the project: the existing processes, the conditions of the environment and the interaction between operators and systems. From this analysis, we identify opportunities for improvement and define the technical requirements that will guide the development of the solution

02 Prototype

We develop a functional prototype that allows us to validate the concept in real operating conditions. During this phase, the mechanical performance, the integration of components and the interaction of the system with its work environment are evaluated. Pilot tests allow you to adjust parameters, optimize the design and confirm the technical feasibility before moving towards implementation.

03 Implementation

In the implementation stage, the pilot's learning is consolidated and the mechanical, electrical and control systems are refined. The design is prepared for continuous operation, integrating with existing infrastructure and customer processes. The result is a robust solution, prepared to operate reliably in your real work environment.

Technological solution based on three areas of knowledge



Robotics



Sensing



Analytics

- Development of concepts and product visualization
- Industrial design of machinery and equipment
- Architecture of mechanical systems
- Ergonomics and human-machine interaction
- Design for manufacturing and assembly
- Engineering plans and technical documentation
- Material selection and structural analysis
- Development of functional prototypes

Design and
engineering skills

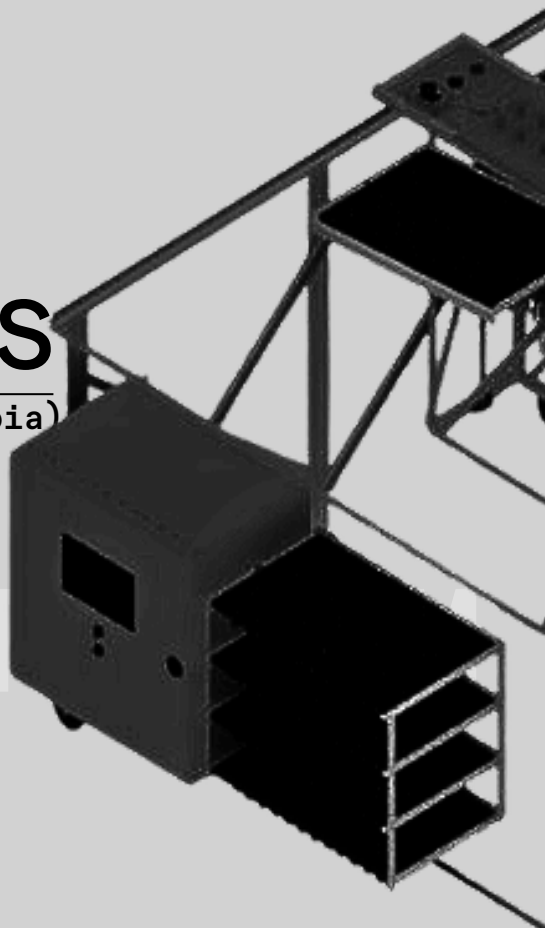


Project

Flowers

(Chía, Colombia)

CRYSANTHEMUM
SOWING
MACHINE



Solution for



Location and year: Chia, 2024

Sector: agriculture

Problem

The planting of the chrysanthemum is currently done manually, forcing the operator to maintain unergonomic postures (knees on the ground and inclined back) for long periods, which can generate health effects in the short and medium term. Currently there is no solution on the market specifically designed to address this problem faced by women dedicated to this work



Solution **Chrysanthemum sowing machine**



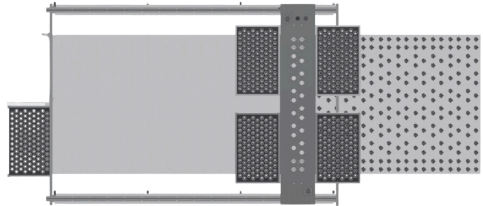
Success case

DESIGN

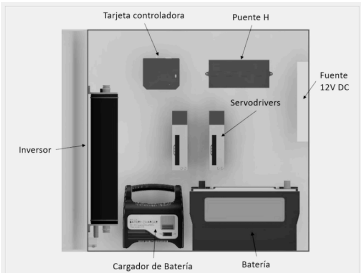
Sower



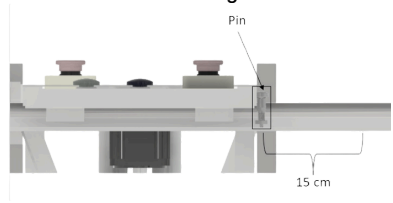
Scrolling platform



Electric dashboard



Fixing mechanism



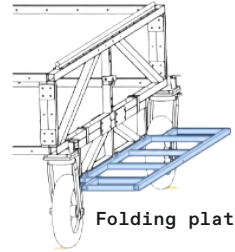
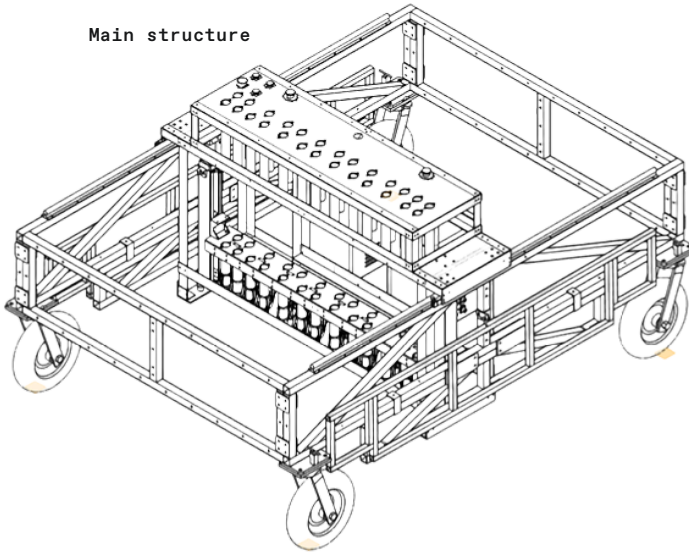
Challenges

Chrysanthemum growing solutions

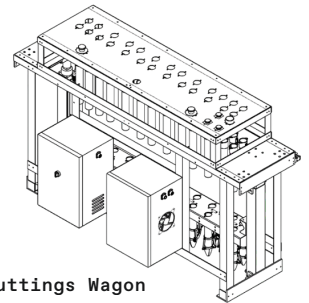
	Traditional approach	BLACKSQUARE Solution
Worker's health and ergonomics	Sowing is done manually, forcing the workers to work with their knees on the ground and their backs tilted for long periods, which can cause damage to their health	Assisted sowing system that allows the operation to be performed from an ergonomic position, reducing the physical load and the risk of injury.
Sowing speed and productivity	Manual insertion of cuttings one by one, depending on the rhythm of the operator.	Punch system that allows sowing 26 cuttings simultaneously in a cycle, up to 338 cuttings for each section of 2 m (every 15cm) of cultivation
Planting accuracy	The depth and position of the cutting depends on the skill of the operator.	Mechanical control of penetration by means of punches driven by linear actuators.
System control	Manual process	Electrical dashboard with controllers, servodrivers, operating interface and calibration system.

Technical Specifications

Main structure



Folding platforms



Cuttings Wagon

Dimensions

2.30 m long

1.73 m wide

1.15 m high

Operating capacity

Requires 2 operators

Processes 26 cuttings per line

Energy requirements

220V electrical connection

Manufacturing materials

Aluminum, Steel A36, Steel, stainless 304,

PLA, Nylon 12

Optimal operating conditions

Temperature: 10 °C to 30 °C

Relative humidity: 20% to 70%

Sowing system

System of servo actuators and motors that execute the sowing routine automatically.

Success case



Project

Cocoa

(Mosquera, Colombia)



COCOA PROJECT

Solution for



Location: Mosquera

Period: June 2022 - June 2023

Sector: Education, Science, and Food Industry

Winner of the SENA INNOVA 2022 program

Problem

Cocoa collection centers receive grains from small family farms, where fermentation and drying processes vary considerably. This generates a high variability in the quality of the grain received. Currently, the quality assessment is carried out by extracting small samples (100 g per 25 kg bag to complete 1 kg), whose grains are cut with a guillotine to analyze their interior. However, this sampling method can lead to inaccurate classifications: if the sample is of low quality, the 250 kg of grains from which it comes can be classified in the same way. As a result, the price per kilogram at which the entire batch can be sold is reduced.



P.	
PICTURE 1	A
1	Fermentado
2	Defectuoso
3	Fermentado
4	Fermentado
5	Fermentado
6	Fermentado
7	Defectuoso
8	Fermentado
9	Fermentado
10	Fermentado
Fermentado	38
Defectuoso	12

Solution **Cocoa sorting machine**

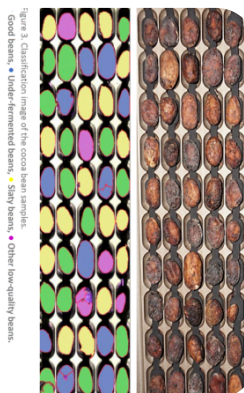
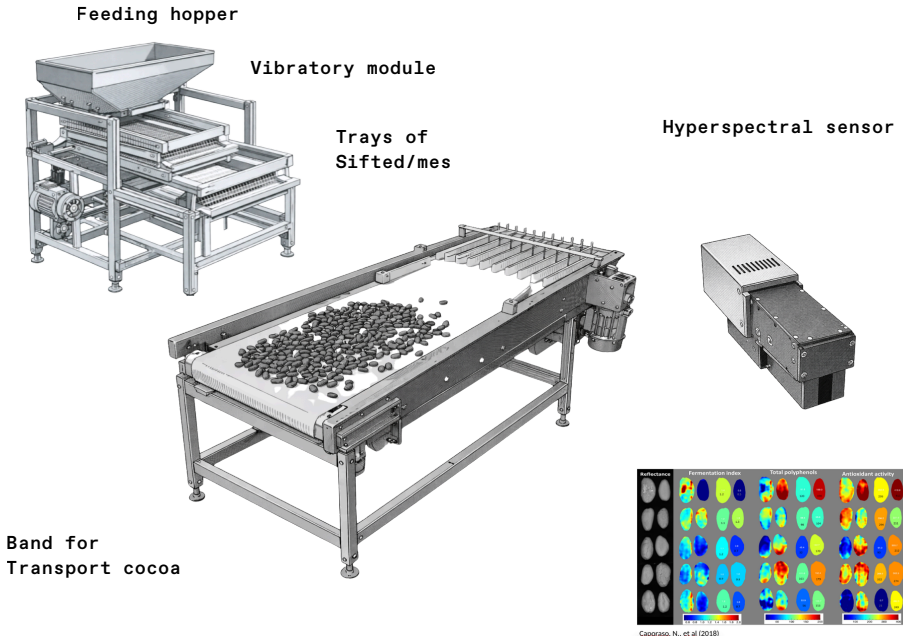


Figure 3. Classification image of the cocoa bean samples.
Good beans, ■ Under-fermented beans, ● Stinky beans, ◆ Other low-quality beans.

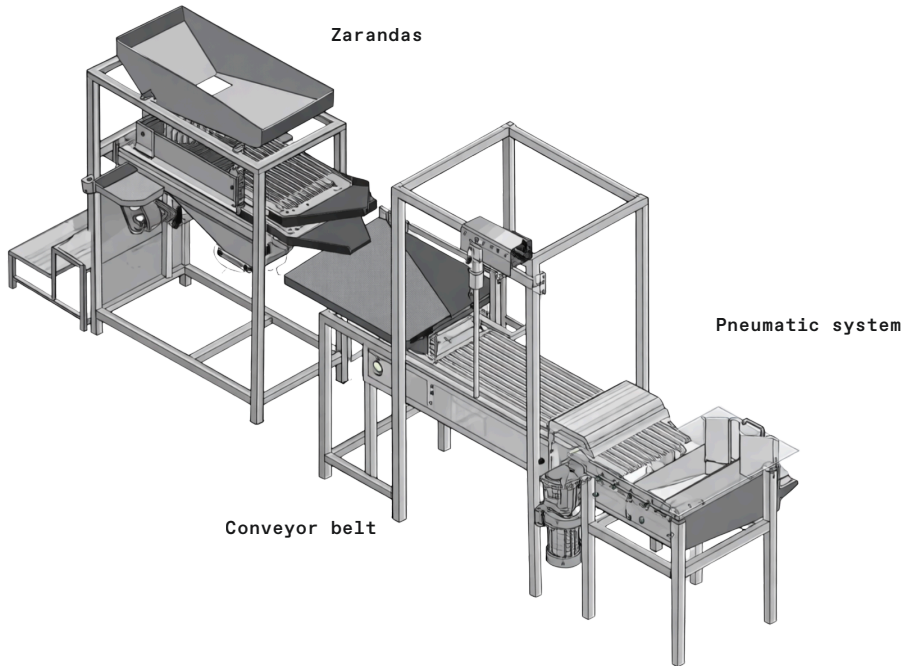
DESIGN



Challenges Solving challenges in the cocoa sorting machine

	Traditional approach	BLACKSQUARE Solution
Quality assessment	Sampling of small amounts of grains	Grain-by-grain evaluation using real-time hyperspectral sensors
Method of analysis	Manual grain cutting for visual inspection	Non-destructive evaluation based on spectral signature
Lot representativeness	A sample may not represent the actual quality of the batch	Individual classification of each grain
Precision in classification	Dependence on the criteria of the evaluator which can generate waste	Artificial intelligence model trained with hyperspectral data
Separation of grains	Manual or batch sorting	Automatic classification system with pneumatic ejection

Technical Specifications



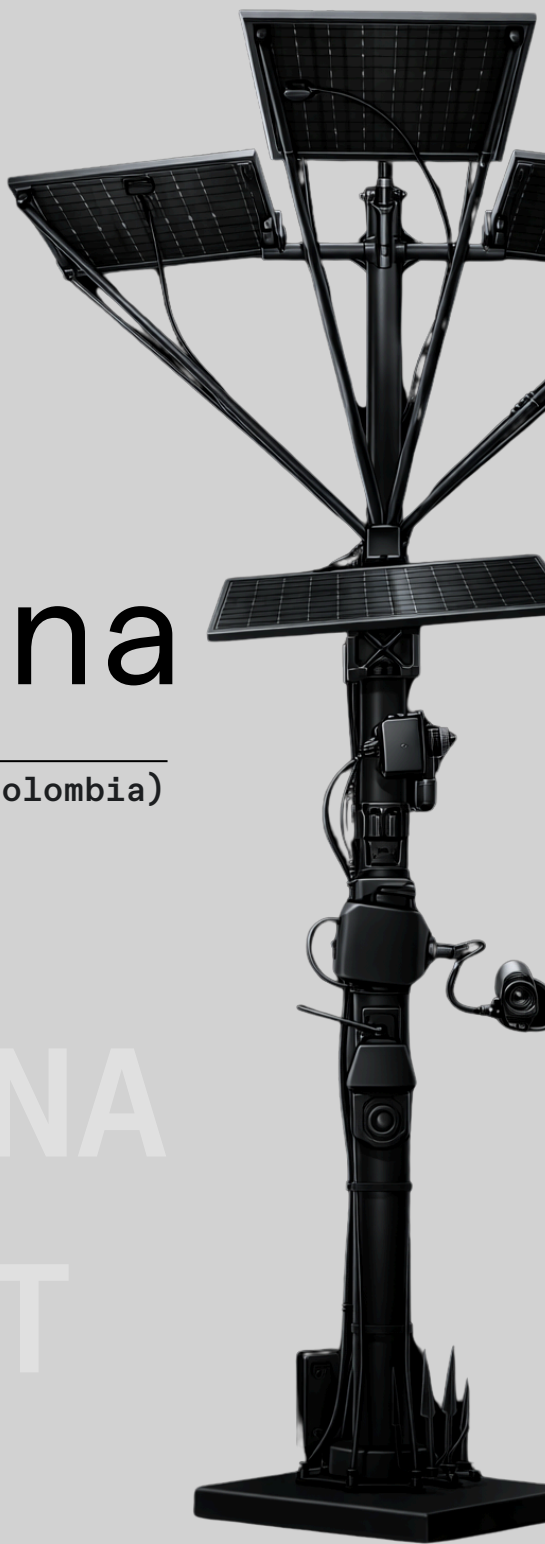
Dimensions	Band width 30–50 cm Band length 1.5–2.5 m
Power supply	110–220V AC / 24V DC (according to market)
Materials	Food grade PU or PVC band material Structure Structural aluminum and stainless steel
Sensor and control	Hyperspectral camera (400–1000 nm) PLC/PC industrial con HMI, integración IoT
Band speed	Variable (0.2–1.5 m/s)
Pneumatic system	Quick-ejection valves and actuators
Certifications	Food grade, CE, INVIMA, ISO 9001



Project
Avifauna

(Soratama Park, Colombia)

AVIFAUNA
PROJECT



Solution for



Location and year: Cerros Orientales, Bogotá, 2024

Sector: Environment and species conservation

Problem

Avifauna monitoring is required both during the day and at night in Soratama Park, located in the northern area of the city, at a site where there is no electrical connectivity.

Therefore, a pole equipped with solar panels and batteries is required to provide continuous power for a camera monitoring system operating 24 hours a day.



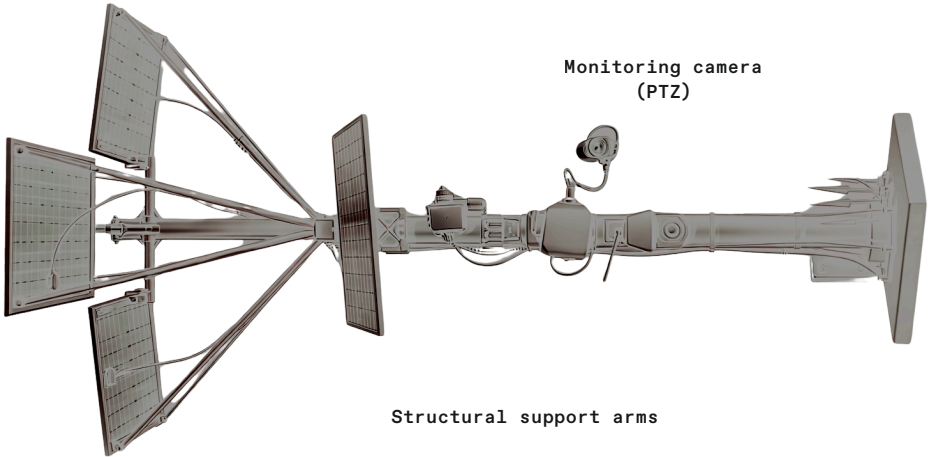
Solution **Autonomous avifauna monitoring system**



Technical Specifications

Photovoltaic solar panels

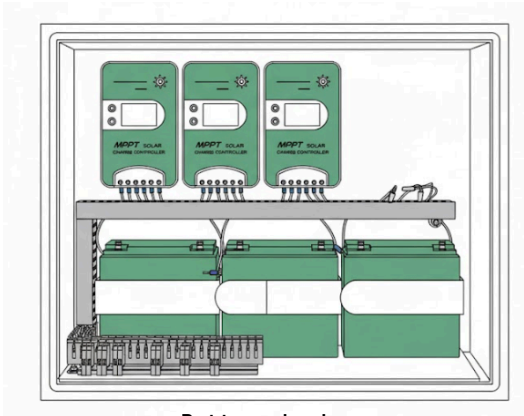
Monitoring camera (PTZ)



Structural support arms

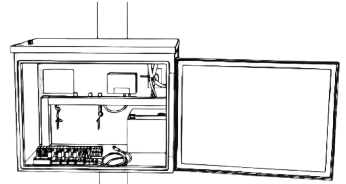
Energy source	100 W monocrystalline photovoltaic solar panel
Charge controller	60 A MPPT/PWM controller for 12/24 V systems
Energy storage	Steel and aluminum structure with sealed electrical cabinet for environmental protection
Structure	Metal pole with electrical cabinet for environmental protection
Monitoring system	Surveillance camera for daytime and nighttime avifauna monitoring
Energy autonomy	System designed for continuous 24-hour operation
Installation conditions	Autonomous system for areas without electrical connectivity

Solar MPPT controllers



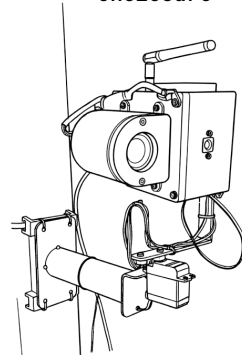
Battery bank

DESIGN



Outdoor electrical enclosure

Monitoring camera



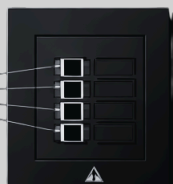
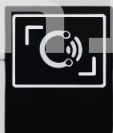
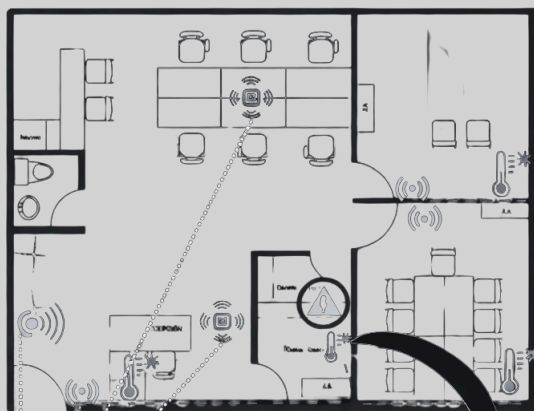
Challenges

Solving challenges in avifauna observation

	Traditional approach	BLACKSQUARE Solution
Energy availability	Equipment limited to locations with access to the electrical grid	Autonomous solar-powered system for continuous monitoring
Monitoring continuity	Occasional observations during field visits	Continuous recording of environmental activity
Access to information	Manual data collection in the field	Digital capture of images and records
Research and conservation	Fragmented information on species behavior	Evidence generation for biodiversity studies



Project Céntrica



CÉNTRICA
PROJECT

Solution for



Location and year: Colombia, June 2024

Sector: Energy efficiency management

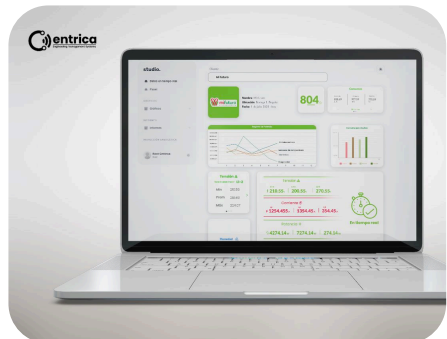
Problem

An electrical variables measurement system is required to measure the circuits of an electrical panel individually, store the information in a database, and ultimately generate reports for energy audits.



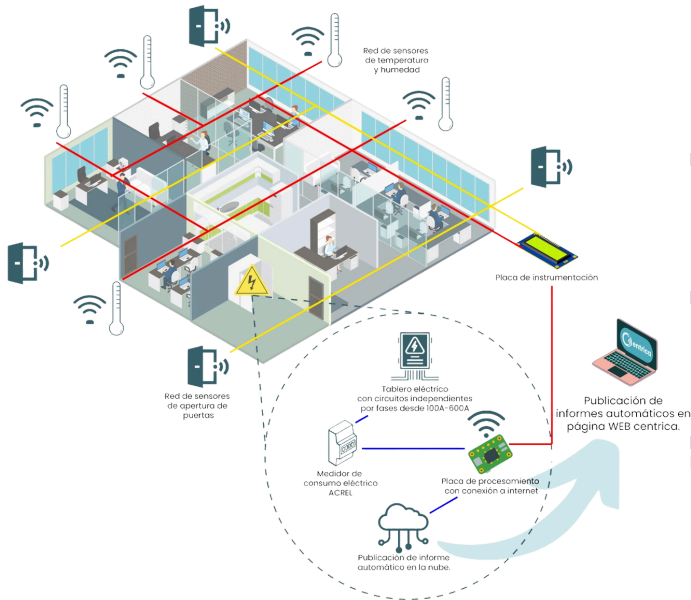
Solution **Energy management system**

An electrical variables meter is proposed, connected to a microprocessor through ModBUS (wired) or LoRa (wireless), depending on the site's infrastructure. The microprocessor sends real-time data to a cloud server when internet connectivity is available; otherwise, it stores the data locally and transmits it once the connection is restored. Additionally, the cloud server runs a web application that allows access to the electrical variables database and enables the generation of graphs and reports for energy audits.



Success case

Technical Specifications



Energy Diagnostics



Energy Monitoring



Energy Consumption Forecasting

User Access & Management

Web and mobile platform with role-based user profiles

Real-Time Monitoring

Continuous visualization of electrical variables and energy consumption

Analytics & Visualization

Dynamic dashboard with interactive charts by circuit and time period

Alerts & Notifications

Customizable alerts via email and mobile devices

Data Management & Storage

Historical database with integration of external data sources

Reporting & Export

Automated reports with download options in PDF, Excel, and CSV formats

Audit & Sustainability

Audit management and tracking of CO₂ emissions

DESIGN



Dynamic Dashboard



Energy Consumption by Circuit



Consumption Details



Current by Phase



Power by Phase



Gráficas dinámicas

Challenges

Addressing challenges in energy consumption

	Traditional Approach	BLACKSQUARE Solution
Access to energy information	Manual readings or occasional measurements	Continuous monitoring of electrical variables
Data availability	Scattered information in manual records	Automatic storage in a database
System connectivity	Dependence on a permanent internet connection	Data transmission via ModBUS or LoRa depending on infrastructure
Measurement continuity	Data loss when connectivity is unavailable	Local storage with later synchronization
Energy analysis	Manual data processing	Web platform for visualization and analysis



Project Lighting

(Tunja, Colombia)



Solución para



ALCALDÍA MAYOR DE TUNJA

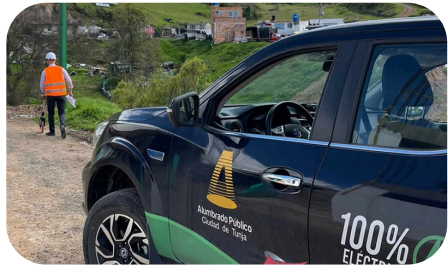
Location and year: Tunja, 2024

Sector: Public lighting management
for Mayors' office of Tunja

Problem

The inspector must carry out periodic inspections throughout the city of Tunja, visiting different lighting fixtures and completing a form to report findings. Additionally, periodic reports must be generated on the current condition of the city's lighting infrastructure.

Currently, all these processes are carried out manually.

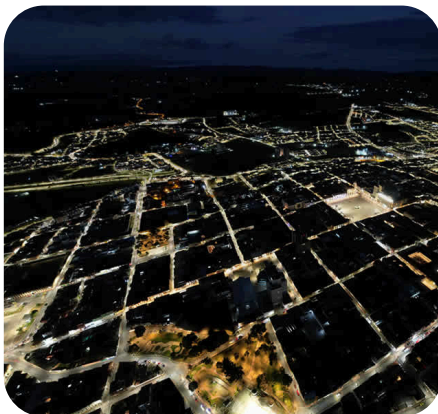


Solution

Web application for streetlight

A web application is proposed that, when executed from a tablet, allows the inspector to identify the different lighting fixtures on a map and complete the required forms.

Once the information is consolidated in a database stored on a server, periodic reports can be automatically generated with a single click

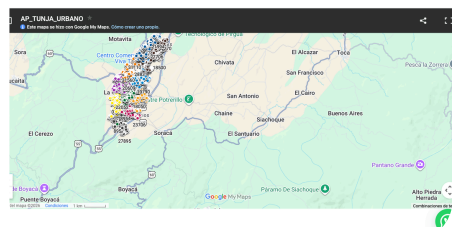


Mapa de Ubicación de las Alumbraduras Sector Urbano

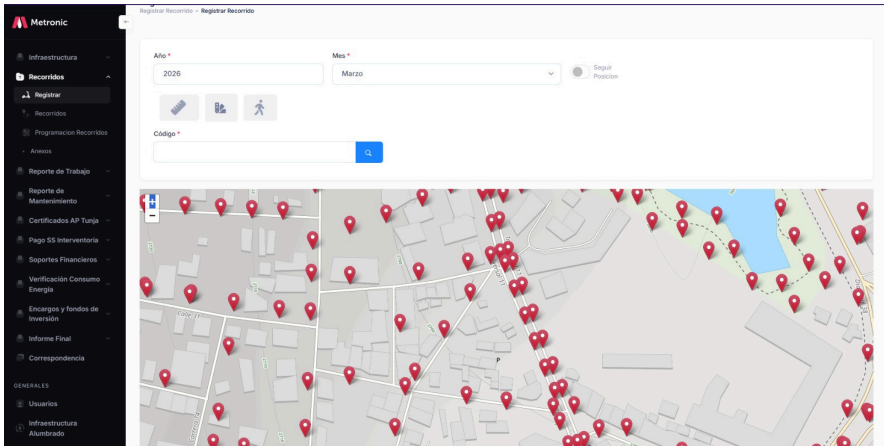


La información de las alumbraduras del Sector Urbano Alumbrado Público Ciudad de Tunja que representan el 86% del parque lumínico de la ciudad. Alumbrado Público Ciudad de Tunja ha dividido la ciudad en ocho grandes sectores. Puede consultar el número de cada luminaria conociendo el sector en donde se encuentra la luminaria Alumbrado Público Ciudad de Tunja®

«Más Luz, Más Seguridad»



DESIGN



Challenges

Addressing challenges in streetlight inspection

	Traditional Approach	BLACKSQUARE Solution
Information recording	Inspectors complete manual forms during field inspections across the city.	Digital data entry from a tablet through a web application.
Streetlight location	Manual identification of streetlights during inspections.	Interactive map displaying all streetlights across the city.
Data consolidation	Data must be collected and organized manually after each inspection.	Information is automatically stored in a centralized database.
Report generation	Manual preparation of periodic reports.	Automatic report generation with a single click



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