

rekon

CASE STUDY

TEMPERATURE MONITORING

BIODEGRADABLE WASTE COMPOSTING

Application of a temperature monitoring system in the process of composting of biodegradable waste to the formulation of organic agricultural correctives.





OBJECTIVE

Monitoring of the composting process of biodegradable waste for the production of organic agricultural corrective.

The intervention with the client intended to present a proposal to replace the wired probe + transmitter system with a probe+ wireless transmitter system and the integration with automation of local supervision through the use of the existing analog outputs on the PLUS WG420 gateway, with data transmission to the **Tekon IoT Platform**.

Analyze and monitor the fermentation process through the platform to ensure process compliance and registration.

SOLUTION



GATEWAY

The gateway used in the project was the Wireless Gateway WGW420, also belonging to the PLUS family, which allows the inclusion up to 55 transmitters in the same network and ensures a communication range up to 4km (LoS).



SENSING

The temperature recording is performed by a solution formed by a PT100 probe with one measuring point, connected to the recently developed TWPH-1UT wireless temperature transmitter, of the PLUS product family.

REPEATER

The PLUS family repeater WRP001 was installed to ensure that the communication between the transmitter and the gateway was not influenced by the infrastructure and typology of the surrounding buildings.

EMBEDDED SYSTEM

This technological component was incorporated to serve as a gateway between the RS485 interface of PLUS WGW420, communicating through the Modbus RTU protocol, and the internet connection to send data to the cloud and integration in the Tekon IoT Platform, using the REST API protocol.



TEKON IOT PLATFORM

The web platform fully developed by Tekon Electronics is the solution adapted so that monitoring and data have a new meaning for organizations. The user can choose the desired graphics to view the data in real time, supported by an alarm system configurable for each type of application.



TECHNICAL DETAILS

Waste composting is a static process that occurs naturally. The monitoring of the various phases (hydrolytic, thermophilic, mesophilic) that are characterized by different raw material temperatures and singular duration. The naturalness of this process means that the variation in temperature results in the release of gases with corrosive potential for the metal and other materials in the equipment.

The installed PT100 probes were developed with a holder for a watertight box where it was possible to connect the sensor to the wireless transmitter and house the power supply.

External to the building where the compost residues are deposited and the respective PT100 temperature measurement probe, the PLUS WRP001 wireless repeater was installed to add redundancy of the signal coming from the transmitter, improving the communication signal to the gateway and thus reducing the risk of communication problems.

The data received via wireless by the gateway installed inside another building, in the control and supervision room are read by the attached communication module, through the Modbus RTU communication protocol.



TECHNICAL DETAILS

This connection is physically made by the RS485 interface of the gateway and the module's USB port. The execution flows defined in the Node-RED framework, in addition to ensuring Modbus data registers, are programmed to ensure the interoperability of systems and send data to the Tekon IoT Platform via protocols used in web services, such as REST API and HTTPS.

The communication module is programmed to use the Ethernet port and the internet connection to make the data available for viewing and analysis.

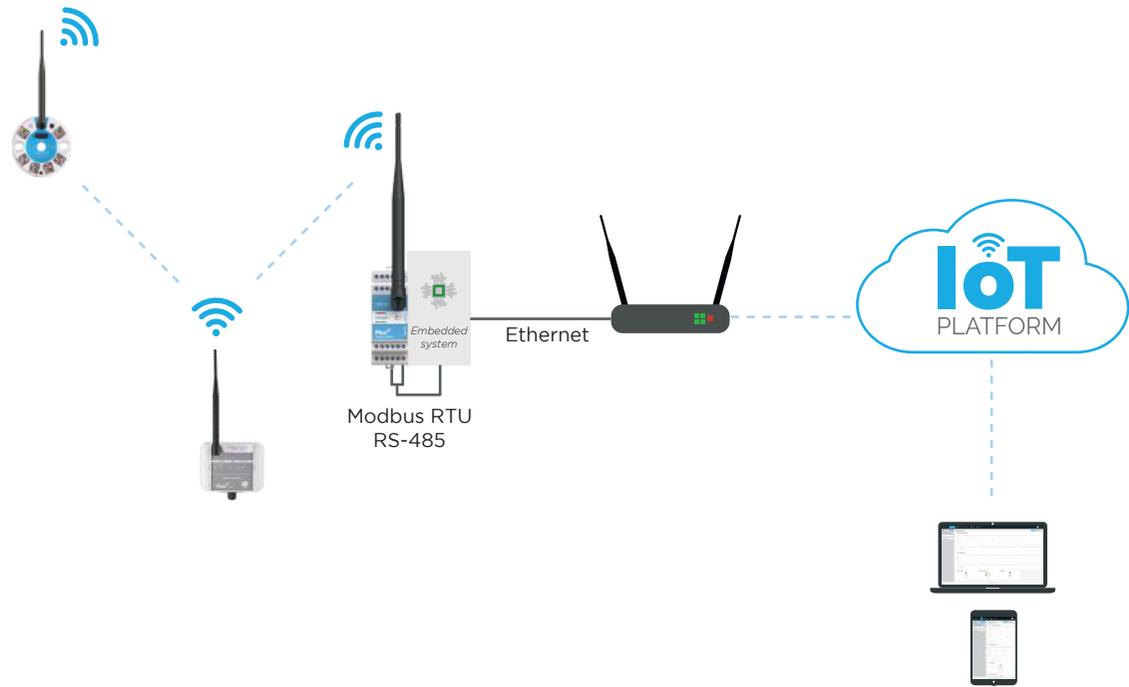
Note: the client network security policies blocked immediate connection to the Tekon IoT Platform instance dedicated to the application. It was necessary to create an internet connection from the use of a mobile service from a communications operator so that access was allowed at the installation site.



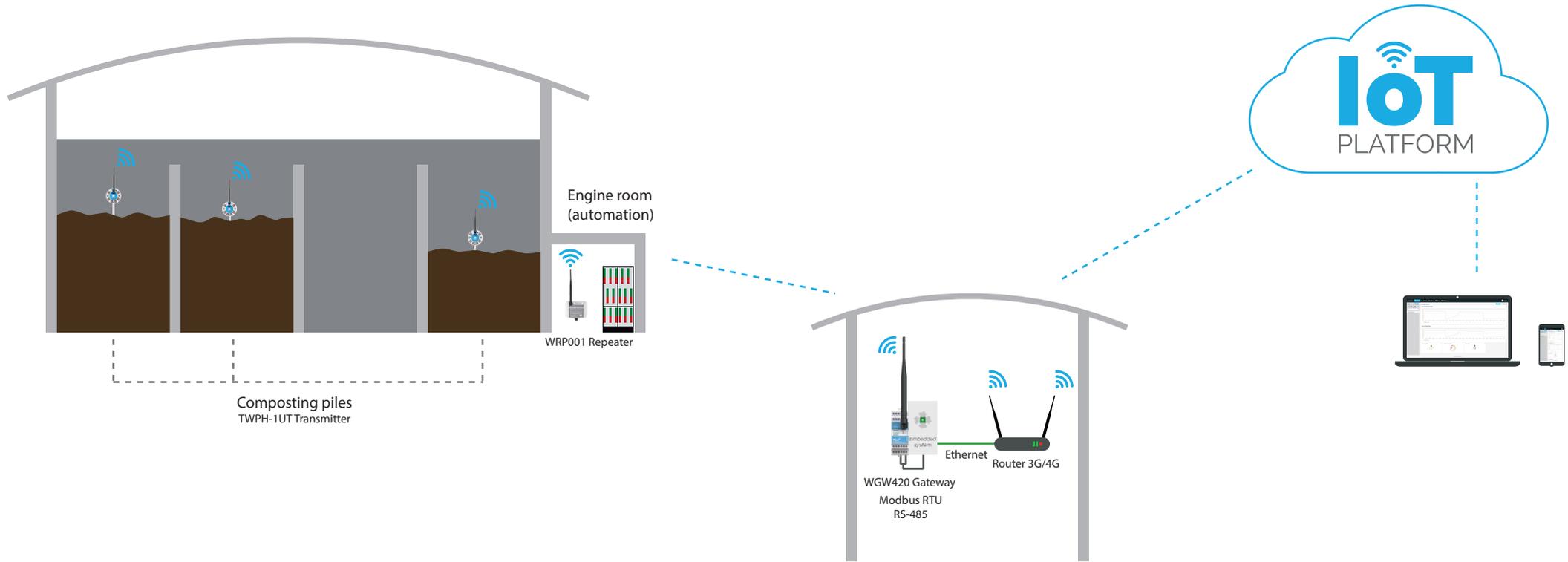
TECHNICAL DETAILS

It was possible to visualize the cadence of the composting process and ensure the necessary safety profile for the application with the configuration of alarms with reference to temperature monitoring and signal quality.

Following all configurations and implementations, a deep technical analysis was carried out on some of the collected data - RSSI, probe temperature, internal temperature and supply voltage of the transmitter. This analysis intended to detect any error related to the measurement of temperature and communication between devices, thus allowing to evaluate and measure QoS (Quality of Service) metrics.



APPLICATION DIAGRAM



CONCLUSION

The presence of cables over the compost piles leaves open the possibility of technical problems caused by the circulation of machines and operators. The absence of cables in the temperature measurement solution developed by Tekon Electronics offers increased mobility as well as improved safety for equipment and workers. The designed application proved to be a successful case study both for the customers process and for the technologies implemented by Tekon Electronics.

The main advantages noted in this application:

- Reduction of damage on temperature probes caused by machines when handling compost piles;

- Easy calibration of the probes by external laboratories, simplifying the process of removing the probes from the site;
- Exporting process data for product tracking;
- Detection or prediction of communication failures, problems with temperature probes and problems with data collection based on the Tekon IoT Platform alarms;
- Probe portability that allows monitoring of compost piles and intermediate stations;
- Increase of the monitoring network up to 55 points per gateway, reducing installation and integration costs.





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