CASE STUDY

OleumTech Helps Grape Grower Meet USDA Regulations With Mobile, Flexible Wireless Temperature Monitoring Solution

THE CHALLENGE

Background

A grape grower based in California had a unique challenge in order to meet USDA temperature regulations. The grower needed to continuously monitor and document that their grapes never exceeded 32 ˚Fahrenheit throughout their storage and processing operations. Aside from creating a historical log of the temperature data throughout the operation, they also needed an around-the-clock alarm system if temperatures approached 32 ˚F so they could proactively mitigate risks of failing to meet regulations and preserve the quality of their product.

Process Conditions

During the processing of the grapes, the temperature of the pallets where the grapes were being stored had to be accurately and continuously monitored under three distinct phases.

- **Phase 1:** Monitor temperature of each grape pallet (29 in total) inside a “pre-cooler” cold storage facility
- **Phase 2:** Monitor the same pallets while they are being transported by a refrigeration truck between two storage facilities (~500 yards/457 meters from each other)
- **Phase 3:** Monitor the pallets once they are moved into the main storage facility until the grapes are sold

Desired Outcome

The grape grower needed a continuous, ambient temperature monitoring and alarm solution to ensure their grapes never exceeded 32 ˚F as they moved from one storage containment area to another.

Using manpower was not an option due to cost, but more importantly, due to inability of capturing a critical situation in real time to mitigate risks of falling out of regulatory compliance. Additionally, they needed a system that was wireless so that each grape pallet can be monitored independently regardless of where the pallets were located throughout the process. With independent temperature monitoring capabilities, the grower can utilize the alarm system to easily identify pallet(s) needing attention. The wireless system also had to be compatible with their SCADA system and their existing RTD temperature sensors for each grape pallet.

THE SOLUTION

The grape grower turned to OleumTech for help with this unique wireless measurement challenge since the application required some level of mobility.

After performing an RF survey of the processing location, OleumTech offered a viable, comprehensive wireless automation solution using its OTC Wireless Sensor and I/O Platform to give the grape grower full wireless coverage of the entire site of operation.

The wireless solution comprised of the following OleumTech products:

Wireless RTD Temperature Transmitters (SM5000-RTM) – 29 wireless transmitters that were compatible with grower's existing RTD temperature sensors which were integrated and mounted to each pallet of the grapes for temperature monitoring across all three phases of cold storage processing.

Key product features:

- Battery-powered, self-contained operation with battery life up to 10 years[1]
- Supports temperatures ranging from -67 °F to 500 °F (-55 °C to 260 °C)
- IP66, -40 ˚C to 70 ˚C
- Support any third-party 2, 3, or 4-wire 100 ohm RTD sensors
- Robust outdoor and indoor RF range with secure AES encryption

DH2 Wireless Gateways (WG-0900-DH2) – The project required deploying two DH2 Wireless Gateways to collect temperature data from the 29 temperature transmitters regardless of their positioning.

The DH2 (A) was installed near Building 1, the pre-cooler cold storage facility, inside a NEMA control panel. An RF splitter was used, allowing dual antennas to be deployed ensuring coverage inside Building 1 and the parking lot as the pallets traveled inside a truck. Temperature and transmitter health data including battery life, RSSI, RF timeout were wirelessly transmitted to the DH3 gateway that was connected to the PLC.

The DH2 (B) was a clone[2] of the DH2 (A) so that it could collect data from the same set of transmitters. It was installed in a similar manner as the DH2 (A), but located near Building 2, the main storage facility. On this cloned gateway, wirelessly sending data to the DH3 portion was removed so that the DH3 would only receive temperature data from DH2 (A) for Building 1. Thus, the DH2 (B) was connected to the DH3 via Serial Modbus connection.

Key product features:

- Modbus Master/Slave functionality
- Peer-to-peer data sharing amongst gateways
- 9-30 Vdc external power
- Up to 40-mile RF range with secure AES encryption

DH3 Wireless Gateway (WG-0900-DH3) - A DH3 Wireless Gateway was deployed alongside DH2 (B) near Building 2, with its own antenna outside of the building so that it can wirelessly collect data from DH2 (A).

Key product features:

- Ethernet and Serial Modbus connectivity
- Modbus Master/Slave functionality
- 9-30 Vdc external power
- Up to 40-mile RF range with secure AES encryption

SCADA connectivity - the DH3 was connected to the grape grower's PLC via an Ethernet connection and used Modbus TCP/IP. The PLC was collecting two sets of data for the same set of 29 RTD transmitters by utilizing RF timeout data to qualify which set of data was true. An RF timeout value of "0" would indicate that data set was true since it meant there was good communication. If the RF time out value was "1", then that would indicate that the data set was false since that meant there was loss of RF communication.

SCADA role – The PLC qualified and logged the temperature data from the OTC Wireless System. If any pallet was nearing the 32 ˚F threshold, it would trigger an alarm so that the grower's staff can take immediate corrective action.

Temperature Monitoring:

Wireless RTD Temperature Transmitters

OleumTech supplied 29 RTD Temperature Transmitters (SM5000-RTM) that were connected to the customer-supplied FDA-approved RTD temperature sensors. These were individually mounted to each grape pallet. The temperature, device health, and RF communication data were transmitted to DH2 (A) or DH2 (B) depending where the pallets were located.

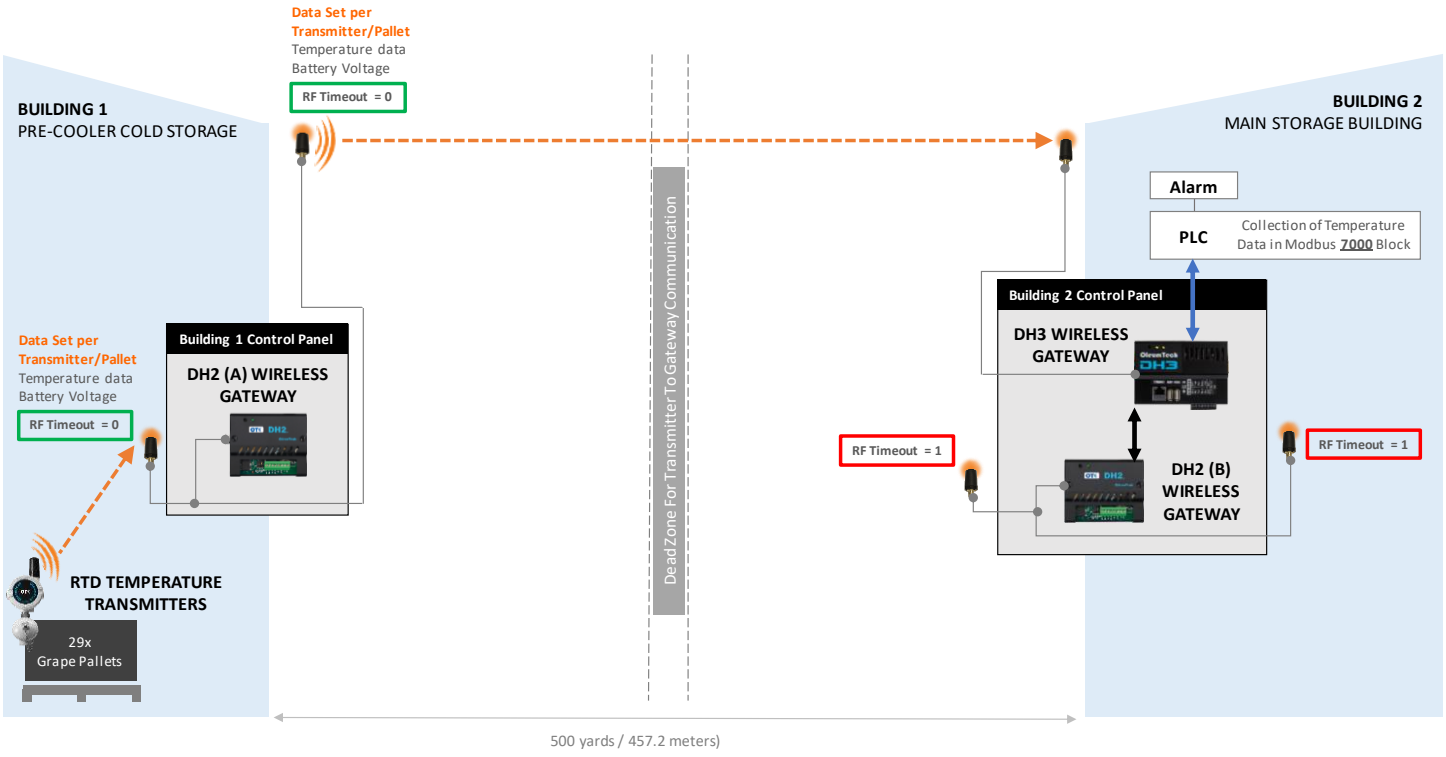
Data Acquisition:

The data set transmitted to two DH2 Wireless Gateways that ultimately ends up at the DH3. Then, the PLC polls the data from the DH3 via Modbus TCP/IP. (Modbus 7000 block for DH2 (A) data and 3000 block for DH2 (B) data).

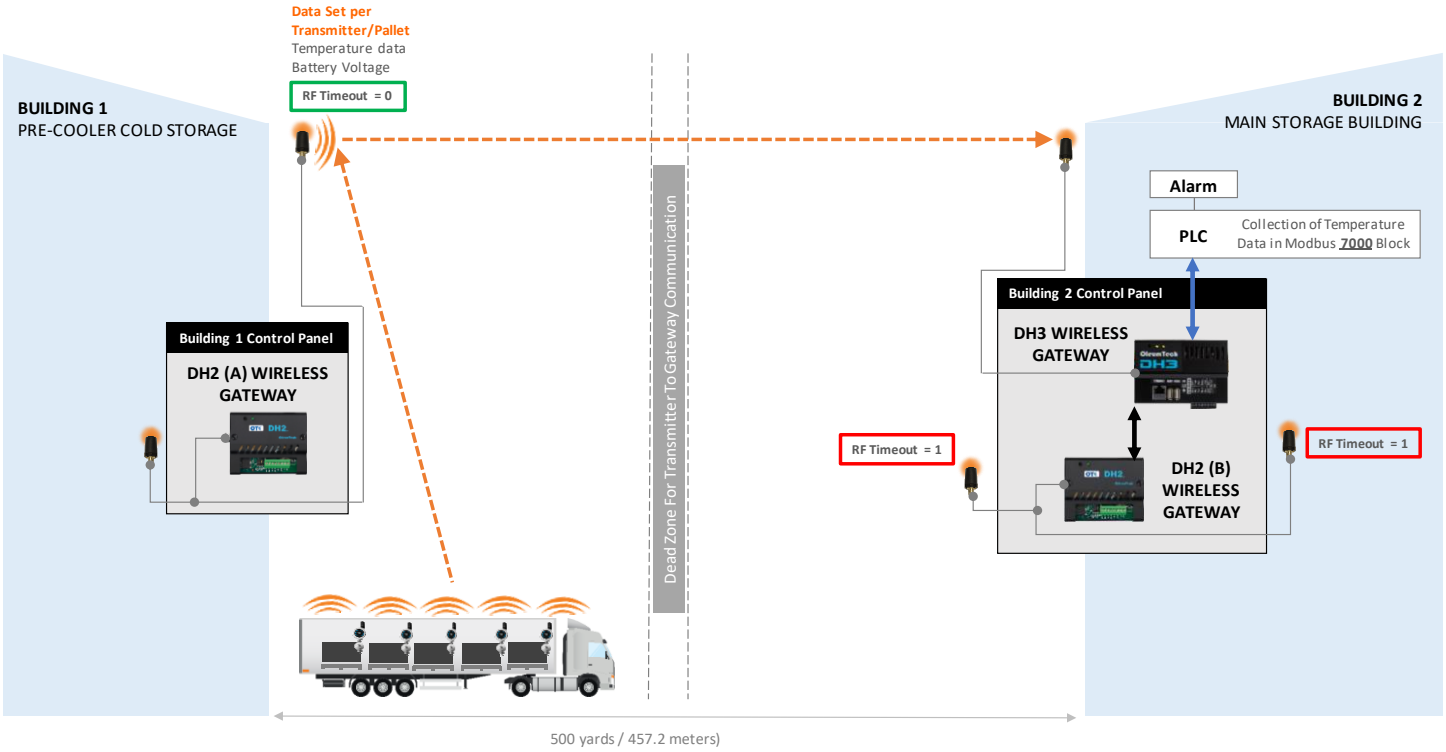
If the pallets are located inside or near Building 1, then DH2 (A) would wirelessly receive the data. The collected data was stored in DH3's 7000 Modbus register holding block for PLC to access.

If the pallets are located inside or near Building 2, then DH2 (B) would wirelessly receive the data. The collected data was stored in DH3's 3000 Modbus register holding block for PLC to access.

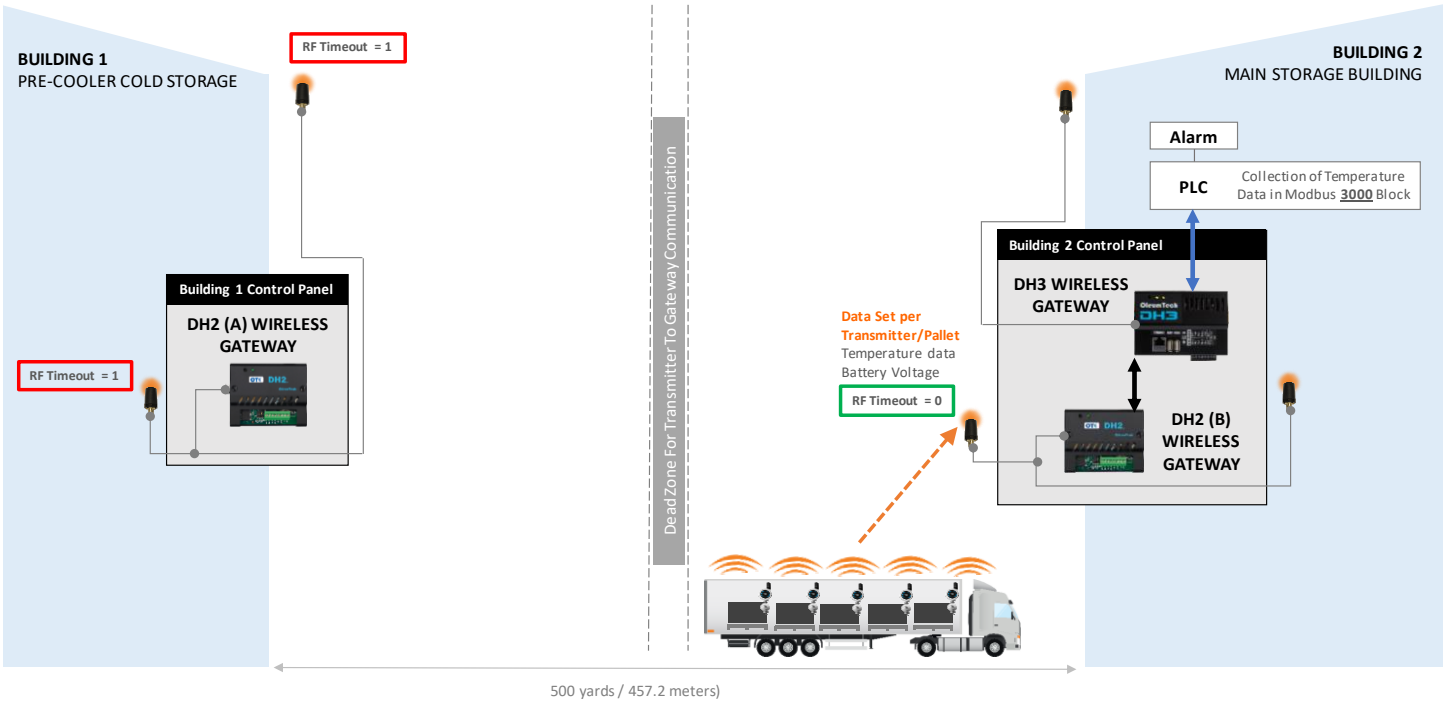
Phase 1 – Pallets are stored in the "pre-cooler" cold storage room, Building 1 – DH2 (A)



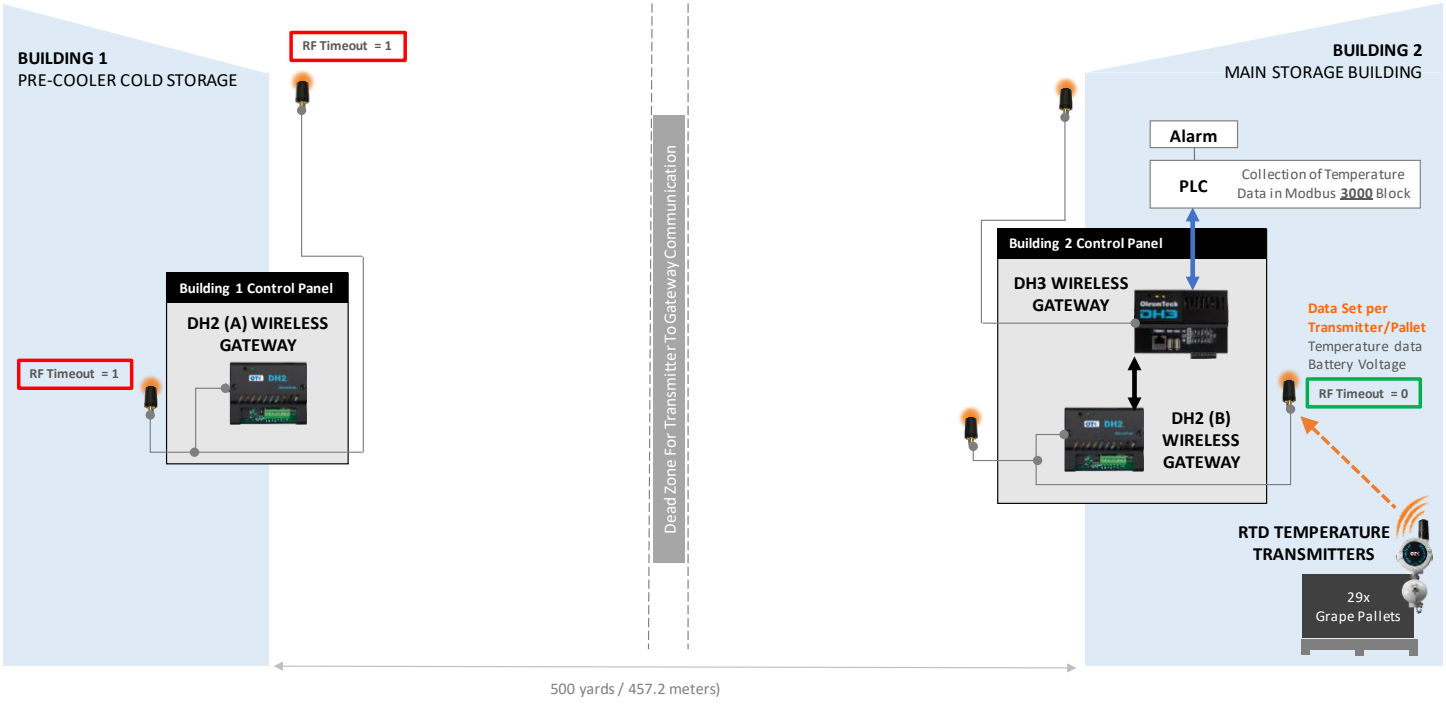
Phase 2 (a) – Pallets are transported by a refrigeration truck within RF range of Building 1 – DH2 (A)



Phase 2 (b) – Pallets are transported by a refrigeration truck within RF range of Building 2 – DH2 (B)



Phase 3 – Pallets are stored in the main storage building where they are held until they are sold – DH2 (B)



THE RESULT

As a result of deploying the OTC Wireless Sensor & I/O Network platform, the grape grower achieved their objective of seamlessly monitoring temperature data of each pallet of grapes on all phases of their storage and refrigeration operation.

BENEFITS/ADVANTAGES

- The OleumTech wireless transmitters provided precise, continuous, and near real-time temperature monitoring throughout the grape grower's entire operation: two storage facilities and transportation system
- The company was able to comply with the USDA standards and be alerted 24/7 with near real-time alarms if temperatures approached 32 degrees in all phases of the operation so they can immediately mitigate temperature falling out of compliance
- The OleumTech wireless system offers a quick return on investment by enabling the organization to save money on manual labor and avoid losing revenue, thus improving their quality process and inventory preservation

LEARN MORE

For more information or for help solving measurement and automation challenges, please contact an OleumTech representative today by phone at 1.949.305.9009 or by emailing sales@oleumtech.com

[1]Ambient temperature and one transmission per 1 min interval without any retries were used to calculate battery life. Actual battery life may vary depending on environmental factors, application, and usage. Use data shown above only as general point of reference. See OleumTech Battery Life Expectancy Chart for predicted battery life based on reporting interval.

[2]The DH2 (B) was cloned using a separate project file so that it can have the same RF settings as the DH2 (A) on critical items such as RF channel, group and host ID, and security settings.