Reducing Food Waste during the Dry Ageing of Beef using IoT Technology

REAMIT Pilot study with Burns Farm Meats

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Interreg North-West Europe REAMIT
European Regional Development Fund

RESOURCE & MATERIALS EFFICIENCY

We are REAMIT

REAMIT is a transnational European territorial cooperation project funded by Interreg North-West Europe (NWE) Programme aiming to reduce food waste. The project focuses on fruits, vegetables, meat, and fish supply chains as these are wasted in large quantities. It is being carried out in Ireland, Germany, France, UK and the Netherlands due to the amount of interconnected food supply chains and huge food waste in these countries. The REAMIT project is using existing Internet of Things and Big Data technologies to best fit the needs of the food supply chain management system in the NWE region. Through testing and adaptation, these technologies are being enabled to continuously monitor and record food quality and signal potential food quality issues. Through analytics, owners of 'food at risk of becoming waste' are provided with decision support options to minimise food waste including redistribution to nearby customers. As part of the technology demonstrations, the REAMIT project team is working with Burns Farm Meats, helping to reduce food waste.

Who are Burns Farm Meats?

Burns Farm Meats Ltd. is a long-established family-owned company located in north Sligo, Ireland. Their main activities include farming, operation of an abattoir, processing of organic meats, and delivery of retail orders to the public. As part of these activities, being firmly committed to animal welfare and providing meat of the highest quality, Burns Farm Meats runs a dry ageing process to deliver tender cut meat of their own locally raised, fed and cared for animals.

Burns Farm Meats are especially interested in the monitoring of the dry-ageing process. In fact, despite increasing the flavour and tenderness of the meat, it is still a costly process for abattoirs because of shrinkage of the meat, trim loss, and risk of contamination

Challenges at Burns Farm Meats

Due to the configuration of dry-ageing chambers, the proximity of beef products to heat sources such as doors and distance from refrigerators can affect the moisture content of the beef. These changes in beef moisture content can affect both business value and the overall quality of the beef. Burns Farm sought a system which would perform the following:

- Real-time monitoring of environmental parameters, i.e., temperature and humidity, in the dry-ageing chambers
- The proposed system should be such that maintaining the equipment does not become an arduous task and does not interrupt their day-to-day operations
- An alerting system should send emails and/or SMS messages to staff notifying if any anomalies occur
- Understand the influence of more even distribution of temperature in the refrigerator on the quality of beef

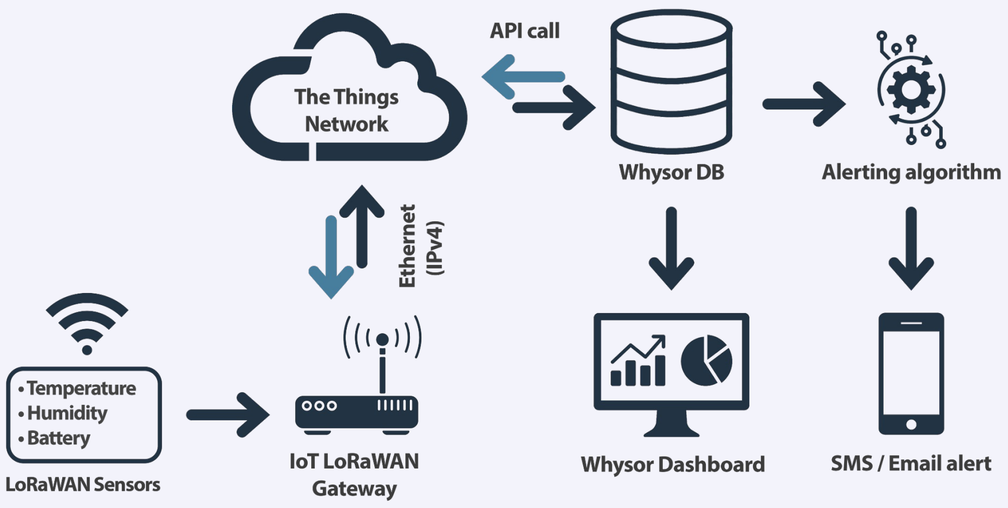
REAMIT's solution

The REAMIT team at University College Dublin evaluated the system requirements by Burns Farm Meats and proposed a real-time monitoring and alerting system for anomaly detection during dry ageing of beef. The ELT-2 Internal antenna (Elsys, Sweden) was selected as the platform for the development of the REAMIT solution. The ELT-2 is enclosed in an IP67 rated box which makes it suitable for extreme conditions. While it is possible to connect external sensors to the ELT-2, it already contains four built-in internal sensors, including temperature and humidity, which will be employed for monitoring of the environmental parameters in the dry-ageing chambers. An ELT-2 is powered by one 3,6V AA lithium battery and has an expected battery life of <10 years (subject to environment and configuration).

For the Burns Farm Meats pilot, we fit several ELT-2 Internal antenna sensors in two refrigerated chambers spatially distributed in such a way, that allows for collecting data from different areas: closer to doors, closer to the refrigeration unit, and in between the former two. The ELT-2 sensors transmit data through LoRa communication signal to a gateway device, a Tektelic Kona Micro IoT Gateway (Tektelic, Canada), which in turns sends the data to The Things Network cloud via an internet connection.

REAMIT partners Whysor (Netherlands) developed the REAMIT dashboard for real-time monitoring and alerting, which was utilized by each pilot study in the project. The dashboard runs on both desktop computer and mobile phone. SMS alerting was provided by Amazon Simple Notification Service (SNS).

System Architecture



Alerting logic. The threshold values for the alerting system were defined by Burns Farm Meats and UCD. Text messages are sent if the temperature in the chambers reach temperatures higher than 7°C.

Results and Conclusion

The IoT temperature and humidity monitoring system was deployed with Burns Farm Meats in September 2022 in two dry-ageing chambers at their abattoir. The system provides real-time environmental condition logging of the fridges. The owners of Burns Farm Meats were given access to the Whysor dashboard for real-time monitoring of the fridges and were added to the alerting service. This allowed them to receive text messages to their mobile phones if an anomaly was detected. After more data is recorded, the REAMIT team will keep on performing analysis and provide recommendations as to how Burns Farm could minimise beef loss during their dry age.

Conclusion. We have developed an IoT solution which monitors in real time the temperature and humidity of dry ageing chambers at an abattoir. The end-to-end solution provides decision support options if anomalies are detected, helping staff correct any issues and thus reducing the spoilage and waste of food. Future work will focus on improving the proposed IoT system and identifying the underlying causes of loss of quality of beef in dry ageing chambers to minimise waste and increase efficiency even further.

Additional Information

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For further information about the REAMIT project, please visit http://reamit.eu