

Application Note

Temperature Monitoring inside Tanks with Wireless Surface Acoustic Waves Sensors

In this application note, the wireless monitoring of temperature inside tanks with SAW sensors (Surface Acoustic Waves) will be presented.

SAW sensors are fully passive devices and they can be interrogated wirelessly. Therefore, their use inside tanks brings to the customer some key advantages as listed below:

- wireless solution allowing an easy use of multiple sensors inside the tank without having problems of wires and connections,
- passive solution compatible with the monitoring of high temperatures (in this case, monitoring up to 170°C),
- Cartography of the temperature in multiple places with multiple sensors inside the tank in order to optimise the process.

Some industrial and agro alimentary processes require an accurate and continuous monitoring of the temperature in order to guarantee a high level of quality for the manufactured product.

In this example, the SAW sensor was used to monitor continuously the temperature inside a tank during the drying process of milk. This process is very rapid and the knowledge of the temperature variations will allow optimising this critical step. With the current wired and active solutions, only the temperatures at the entrance and at the exit of the tank are known.

The measurement system developed by SENSeOR includes a SAW sensor and a reader with an antenna. The SAW sensor has been placed inside the tank shown in figure 1, as well as the antenna of the reader for the communication with the sensor. The reader was placed outside and connected to a laptop for direct analysis of data.



Antenna of the
reader inside the
tank

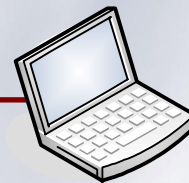


Figure 1: configuration of the test

Typical results are shown in figure 2, with comparisons with thermocouples used as references in different places inside the tank.

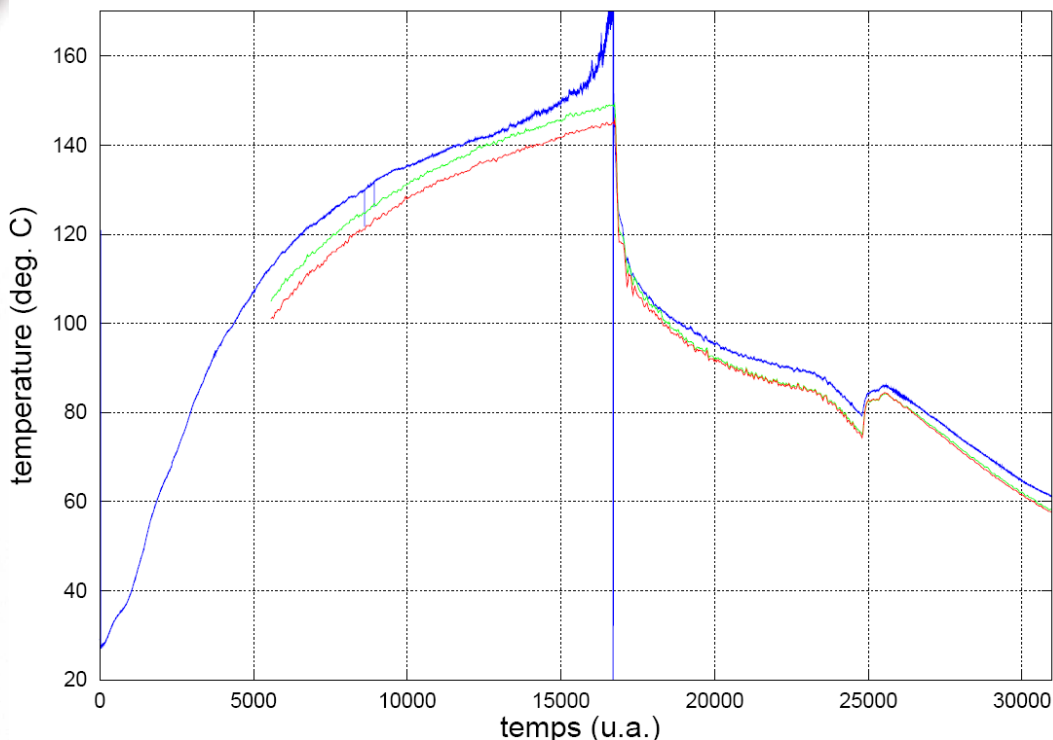


Figure 2: results - red and green curves (thermocouples) - blue curve (SAW sensor)

This trial demonstrates the great potential offered by the SAW sensors in this application: they give the temperature profile while removing the problems of maintenance and installation of cables.

This innovative measurement system is also very interesting when considering the costs saving.

Indeed, battery maintenance can be costly and difficult when monitoring sensors are installed in confined spaces, such as tanks: as passive solution, SAW sensors avoid this problem.

Moreover, the hermetically sealed wireless sensors can remain in the tank for decades without requiring maintenance. Lifetime of such sensors is estimated at more than 20 years.

We must also underline the fact that there is no risk of communication gaps caused by dead batteries with the SAW solution.

Finally, the absence of battery for the sensor will reduce industrial pollution and energy consumption in addition to eliminating battery replacement costs.

SENSeOR is currently developing several systems based on the SAW technology for monitoring temperature, stress, pressure.

Demonstration kits are available on request for preliminary tests: customs solutions can be developed with short time-to-market thanks to our unique simulation tools. These solutions are also protected by an extensive patents portfolio.

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