

# STUDY AND DEVELOPMENT OF EXTENSIONS FOR A WIRELESS AND LOW-POWER ACQUISITION SYSTEM

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## INTRODUCTION

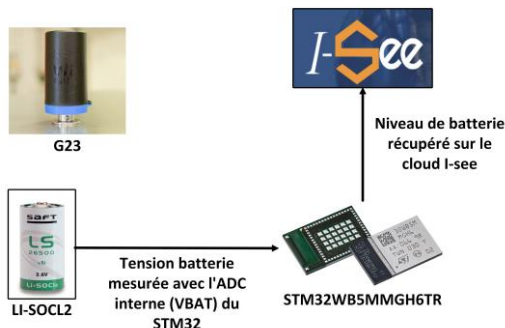
As part of Industry 4.0, the company I-care, which specializes in predictive maintenance, uses Wi-care sensors to carry out vibration analyses and monitor the condition of industrial equipment, with the aim of reducing unplanned downtime.

This end-of-studies project (PFE) aims to improve two sensors in this range to optimize the monitoring and reliability of industrial machines.

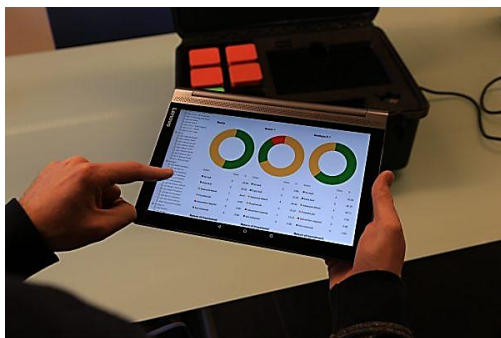
## EXISTING PROBLEMS

At present, the sensor in the Wi-care G23 range measures the voltage of its Li-SOCL<sub>2</sub> battery via the microcontroller's (STM32) internal analog-to-digital converter (ADC).

But this battery has a flat discharge curve, making voltage measurement unreliable for estimating range.



The second sensor, Wi-care PURE, requires RPM input, which is currently performed manually on the analysis tablet, which can lead to a risk of errors.



Unlike the G23, which is installed continuously, the PURE is used occasionally in the field. Automatic measurement of RPMs would simplify the capture of this value and improve the reliability of analyses.

## SOLUTIONS PROVIDED



The first extension uses a LTC3337 fuel gauge to address the problem of reliable Li-SOCL<sub>2</sub> battery measurement.

This chip incorporates a coulomb counter that accumulates the charge consumed (in mAh) over time. The SoC (State of Charge) is estimated by dividing this value by the total battery capacity to get the percentage of charge remaining.

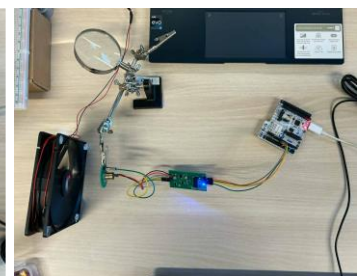
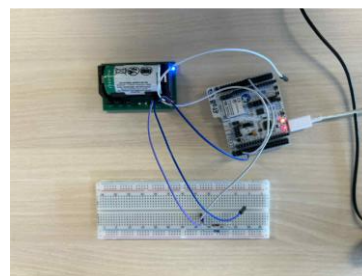
The second extension uses a 650 nm laser optical sensor that detects pulses reflected by a band on the rotating axis. Their frequency is used to calculate the speed in revolutions per minute (RPM).



## RESULTS

Overall, the results are conclusive, both for the battery management system and for the tachometer. The fuel gauge LTC3337 offers a more reliable SoC estimate than the initial ADC-based solution of the STM32.

In addition, the optical tachometer correctly picks up the frequency of the light pulses and converts it well into revolutions per minute (RPM).



## CONCLUSION

This end-of-studies project, carried out as part of the engineering degree, aimed to design two extensions to improve sensors in the Wi-care range. Despite the challenge posed by the gap between my computer science background and the electronic aspects of the subject, this project allowed me to strengthen my skills and interest in electronics, while achieving conclusive results.