



fuelics

IoT
sensors & solutions

November 2019



Introduction ›

Fuelics is a Research and Development company with the ability to **conceptualize, design and produce** sensors, systems and software for **massive** deployments in the **IoT** business environment.

We collectively own significant experience in industrializing sensors and in connecting assets in the cloud, with high measurement accuracy, low energy needs, low production cost, **machine learning** coding on a **microcontroller level** and intrinsic **edge computing** capabilities.

Fuelics is utilizing Low Power Wide Area Network (**LPWAN**) technologies, mainly focusing on the design and the development of **battery operated Narrow Band (NB-IoT)** sensors and systems for **Fuel Management & Smart City** applications.

Fuelics has delivered in operation or has been contracted for **IoT projects** in several countries, for more than **10K power measurement electronic boards** in PV Parks around the globe and has delivered in **10 municipalities** across Greece the first ever **real IoT projects** in fuel management on vehicle fleets and buildings.

We are continuously striving in identifying new **massive markets** for IoT sensors and produce high valuable industrial **Intellectual Property**.



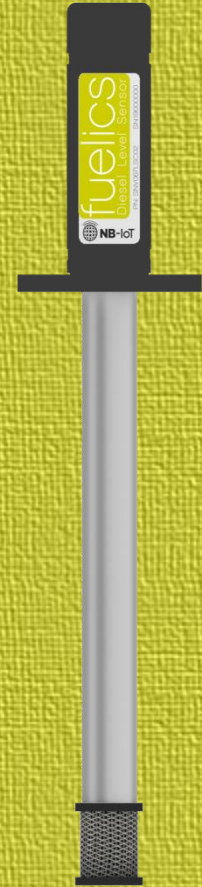
Fuelics Key technology advantages ›

- › Battery operation of 10+ years
- › Edge computing – Alerts generated on edge
- › Unified data model
- › Bootstrapping over the air – Device Initialization over the air
- › Remote management over the air – configuration of **non-OS** devices over the air
- › Firmware update over the air – FOTA on **non-OS** devices over the air
- › Install and play logic – Rapid commissioning of IoT sensors by anyone
- › Seamless integration with **third party** Smart City Platforms
- › Massive production capability



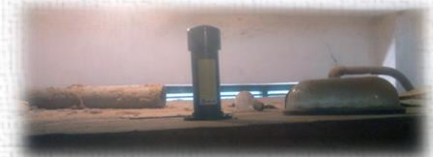
Diesel Level Management

Diesel capacitive & ultrasonic
NB-IoT sensors for all types of
stationary diesel tanks



Diesel level sensing ›

- › Diesel Tank Management utilizing NB-IoT **capacitance** & **ultrasonic** sensors
- › Monitoring of **any type** of stationary diesel tanks, while providing deep insight over operational and management needs of fuel usage
- › Utilizing **Device and Data Management services** for rapid commissioning of assets in the cloud
- › **Install & Play** sensors functionality for low CAPEX massive sensor deployments.
 - **capacitance** sensor is immersed into the diesel tank (install), while the communicating part is attached over the diesel tank (play)
 - **ultrasonic** sensor is attached over the diesel tank (install & play)



Benefits using NB-IoT sensor technology ›

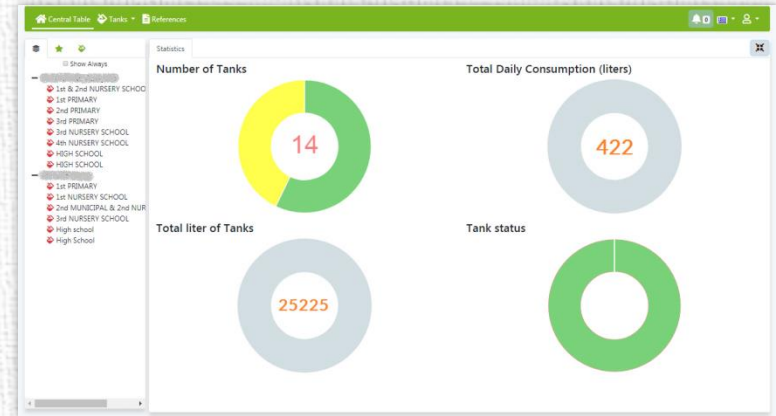
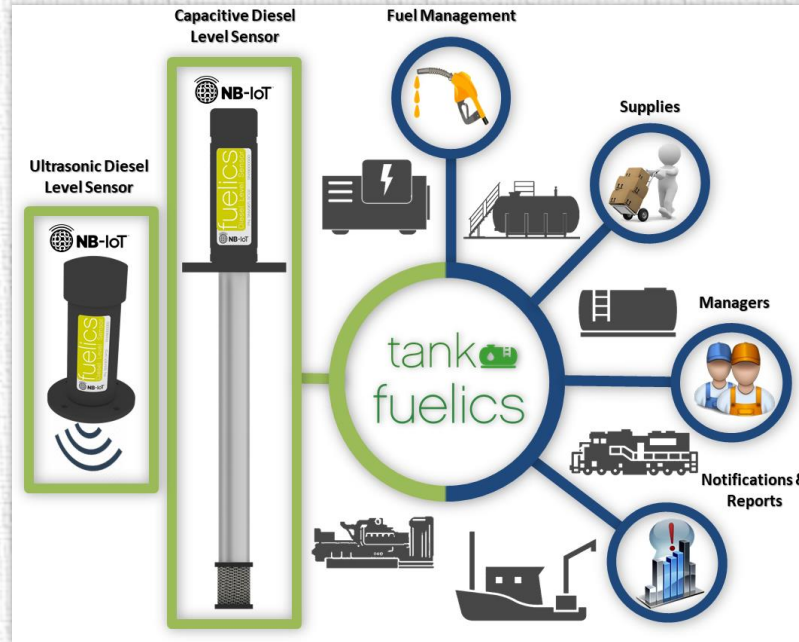
- › Minimized data throughput based on machine learning algorithms. The sensors are intrinsically intelligent when sensing linear systems like diesel fuel level
- › Battery uptime
 - capacitance sensor 10+ years when broadcasting one payload per day
 - ultrasonic sensor 5+ years when broadcasting one payload per day
- › Extremely **high sensitivity** in underground tank installations
- › Delivers **holistic** operational and management of any stationary diesel tank
- › Seamless **integration** with **Intelligent Transportation Companies** that facilitate fuel distribution and re-fueling procedures

Benefits for the end user ›

- › **Reliable and highly accurate** level measurement of any stationary diesel tank
- › Event driven notifications in real-time. Sensor **detects** rapid changes of level states (re-fueling or theft) or threshold exceeding and **notifies** accordingly
- › **Lowest possible OPEX** compared to other sensors
- › **Minimal data throughput**, based on linearization algorithms
- › Accumulating **reporting** of reserved fuel instantly
- › **Minimum installation burden**
- › **Interoperable** with any type of fuel management third party S/W platforms

IoT Platform › Diesel Level Management

- › tank@fuelics is an end-to-end fuel management platform interoperable with NB-IoT sensors for monitoring and managing of all operational requirements of diesel stationary tanks!



Water Level Management

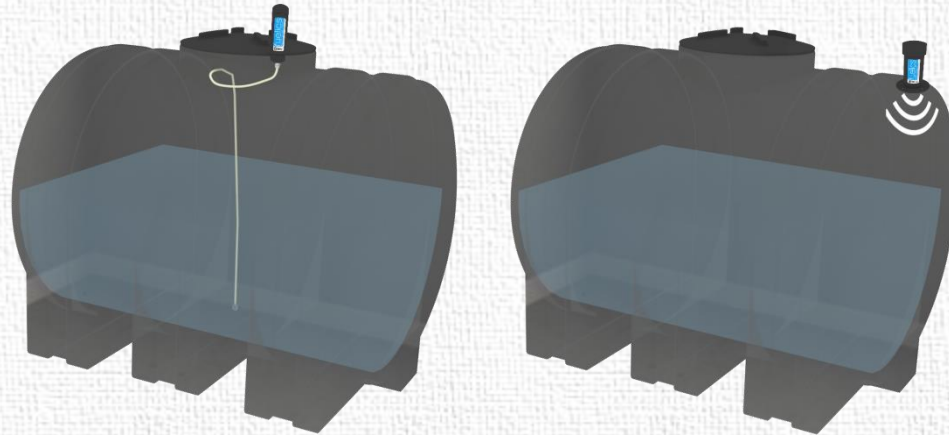


Water pressure & ultrasonic
NB-IoT sensors for any type of
industrial water reservoirs and
natural water collection points



Water level sensing ›

- › Water Tank Management utilizing NB-IoT **differential pressure** & **ultrasonic** sensors
- › Monitoring of **any type** of stationary water tank and water collection points (man-made or natural), while providing deep insight over operational and management needs of water use
- › Utilizing **Device** and **Data Management services** for rapid commissioning of assets in the cloud
- › **Drop & Play** functionality that is tailored-made for massive deployments.
 - **differential pressure** sensor is immersed into the water tank (drop), while the communicating part is strapped over the water tank (play)
 - **ultrasonic** sensor is attached over the water tank or over the water collection points (drop & play)



Benefits using NB-IoT sensor technology ›

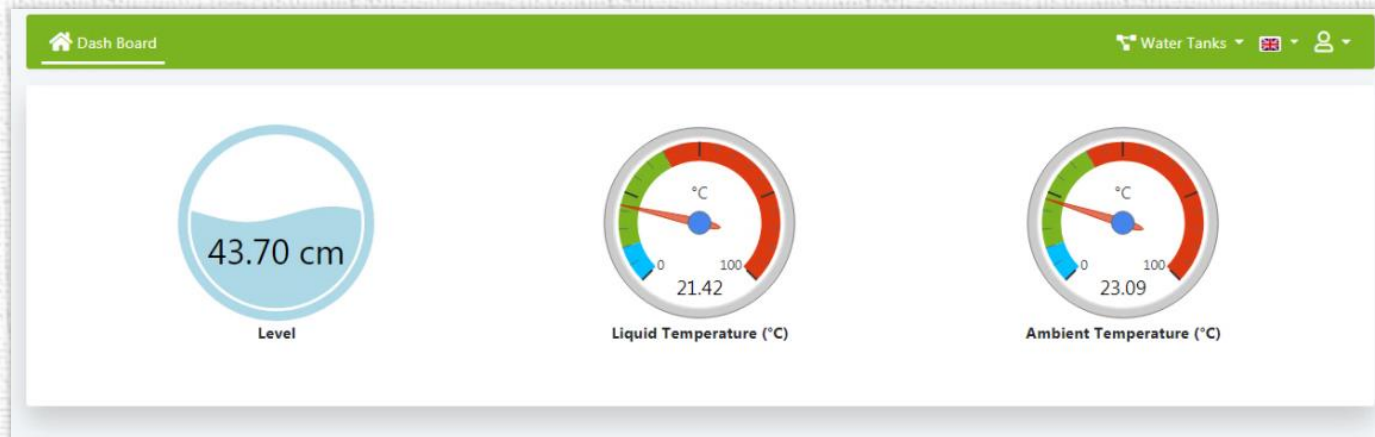
- › **Minimized** data throughput based on machine learning algorithms. The sensors are intrinsically intelligent when sensing linear systems like water level
- › **Battery uptime**
 - **pressure** sensor **10+** years when broadcasting one payload per day
 - **ultrasonic** sensor **5+** years when broadcasting one payload per day
- › **Lowest possible** OPEX compared to other sensors
- › Delivers **holistic** operational and management services
 - to water **tank owners** regarding consumption behavior, re-filling process and unauthorized water usage
 - to **authorities** responsible for reserving or carrying water in forested areas (fire fighting), for controlling floods in water basins and for regulating water level in agricultural areas

Benefits for the end user ›

- › **Accurate sensing** of the quantity or level of any type of water (drinking water, grey water, industrial water), within any type of water tank or water collection point
- › **Real-time monitoring** of the consumption and /or re-filling behavior.
- › Real time **alarming and notification** for any state of use, including unauthorized usage, low/high level thresholds and temperature control (water and ambience)
- › **Accumulative reporting** of water inventory, instantly.
- › **Zero installation** burden
- › **Interoperable** with any type of third party water management S/W platforms

IoT Platform › Water Level Management

- › `water-level@fuelics` is a complete, flexible and intelligent platform for monitoring and managing of all parameters and operational requirements of **any type of water reservoir!**



Water Flow Management

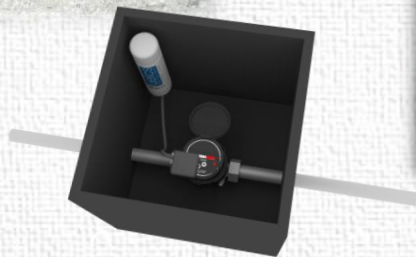
Water pulse NB-IoT sensor for
water flow sensing



Water Flow

Water flow sensing ›

- › **Water Flow Management** utilizing NB-IoT technology for **pulse** metering registration of any type of water meter with **pulse output** (SOHO or industrial-grade), regardless of pulse output characteristics
- › Utilizing **Device** and **Data Management services** for rapid commissioning of water meters in the cloud
- › **Install & Play** functionality that is tailored-made for massive deployments. The sensor is connected by wire with the pulse output of the water meter (Install), while the communicating part is rigidly strapped within the pit (play)



Benefits using NB-IoT sensor technology ›

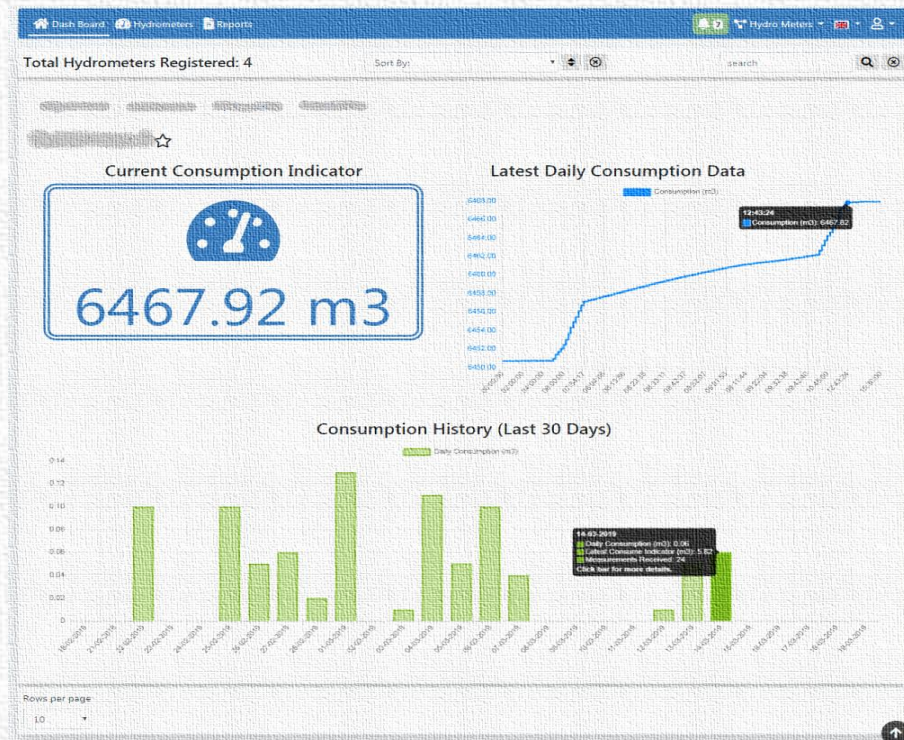
- › 10+ years of battery uptime when broadcasting one payload per day
- › **Minimized OPEX** for water utility companies in comparison with any other type of LPWA Networks
- › **Extremely high** sensitivity in underground installations. Usually, water meters are installed in underground pits

Benefits for the end user ›

- › Cheap and robust communication in underground installations
- › Possibility of **simultaneous broadcasting** of **two (2)** or **four (4)** water sensors with one NB-IoT sensor
- › **Random connection-per-day** algorithm for balanced data control on massive installations
- › Provision of **value added services** apart from billing. **Leakage** detection, **breakage** pipe detection, **reverse flow** identification and **cable cut** detection
- › Various **alarms and notifications** based on a custom-designed firmware
- › **Almost zero** installation burden
- › **Interoperable** with any type of third party water management S/W platforms

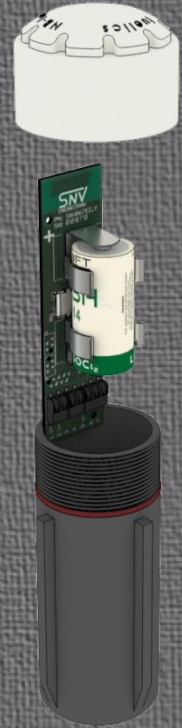
IoT Platform › Water Flow Management

- › water-flow@fuelics is a complete, flexible and intelligent platform for acquiring water flow billing data from hydrometers with pulse output



Parking Space Management

Magnetic parking on-street NB-IoT
sensor for Smart Cities & Private
Parking Enterprises



Parking Space Management ›

- › NB-IoT **parking** sensor utilizes a **3-axis magnetometer** to measure earth's magnetic flux change, when a ferromagnetic-made asset (vehicle) occupies the space above installation
- › Intrinsic **auto-calibration** intelligence to cover the ever changing magnetic pole
- › Utilizing **Device** and **Data Management services** for rapid commissioning of parking assets in the cloud
- › **Install and play** rationale. You install it into the ground (install) and the sensor is immediately broadcasting on-street parking occupancy data (play)
- › **Tailored-made** for Smart City applications & on-street Parking entities
- › Various custom-made designs for **extended battery operation**

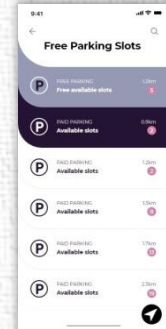
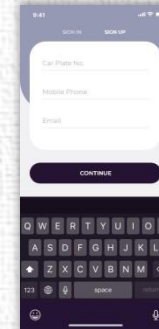
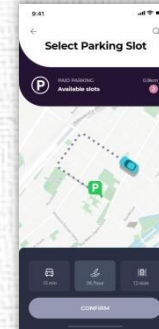
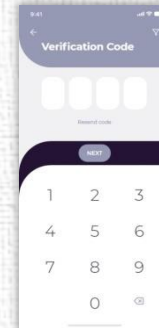
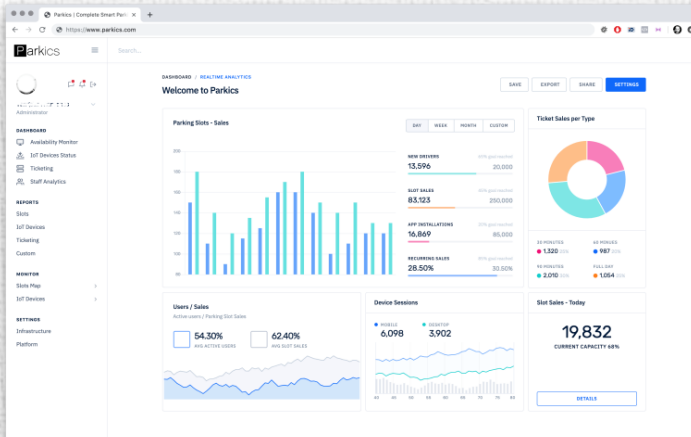
Benefits using NB-IoT sensor technology ›

- › **Battery uptime**
 - **5+ Years** (up to 12 connections per day for the transmission of the status change between Occupied [Sensor is detecting] and Free [Sensor is not detecting]) with one SAFT LSH20 3.6v (Li-SOCl₂) replaceable battery
- › **Minimized OPEX** for parking management in comparison with any other type LPWA Networks



IoT Platform › Parking Space Management

- › parkics@fuelics is an end-to-end parking management platform interoperable with NB-IoT sensors for monitoring, managing and revenue control of municipal on-street parking!



Fuelics, the art of IoT sensors creation!



www.fuelics.com