

HARVESTREE[®]

Battery-free & Cableless
Data acquisition Node



**PRODUCT OVERVIEW:
TECHNICAL & FUNCTIONAL INTRODUCTION**

MARCH 2024

Lab-driven Deep Tech Born in Grenoble Alpes (CNRS) Incorporated in 2020

No batteries and no wires

The MOİZ start-up offers 100% autonomous sensors! Free from batteries and wires, our autonomous modules harvest the thermal energy lost in your environment by generating the electrical energy necessary for their operation.



No installation fees

Our autonomous sensors are easily mounted on a hot or cold surface. The thermal losses of this surface will feed the sensor. With MOİZ, no more kilometers of cables and overloaded cable paths !



No operating costs

Our sensors are self-powered through a thermal energy harvesting solution, they contain no batteries nor wires. and are designed to operate for 10 years without any intervention from you.



Sustainable approach

About 40% of the energy produced is lost as heat, why not recover some of it to monitor your processes ?
This approach is sustainable and guarantees ROI, so why deprive yourself ?



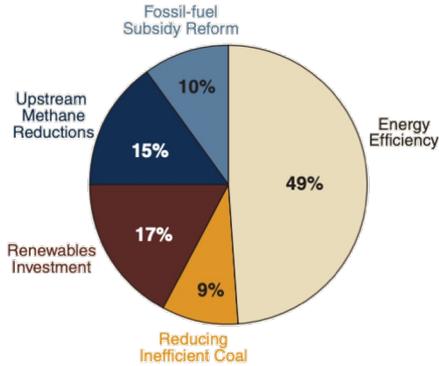
Improving energy efficiency of industrial processes, whether through AI or legacy methods, Demands to collect **more and more on-site data**.



Harvestree is a device that collects data, **without batteries nor cables**.

You save both **money and time** by avoiding cable installation and battery maintenance

Energy Efficiency levers



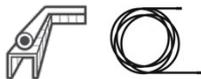
Source | World Energy Outlook Special Report: Energy and Climate Change

Energy Efficiency is the primary driver of industrial process decarbonization

“What Gets Measured, Gets Managed”

Acquiring **additional on-site data** is crucial to implement process optimization and energy-saving strategies





WIRED INSTALLATION



INSTALLATION



MAINTENANCE



Installation costs & time

Challenge in cable routing
(cable tray overfill,...)

Mobile Equipment



Corrosion



Broken wires



Short circuit

That's the reason wireless technologies have been increasingly adopted in industrial automation in recent years



Reduce installation costs & time

Enhance Flexibility and Scalability

No risk of cable damage



INSTALLATION
CAPEX



MAINTENANCE
OPEX



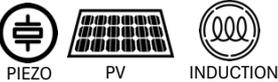
DATA REFRESH
PRECISION



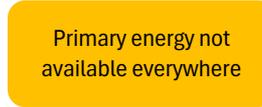
WIRED INSTALLATION



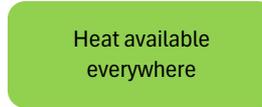
BATTERY-POWERED WIRELESS SENSOR



CONVENTIONAL ENERGY HARVESTING SENSOR

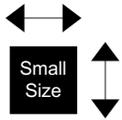
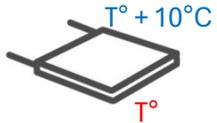


HARVESTREE THERMAL HARVESTING NODE





Originating from the Néel Institute, affiliated with CNRS in Grenoble, MOIZ represents a decade of research and multiple projects funded by Europe, ANR, CNRS, and Linksiem SATT and MOIZ Thermal Energy Harvesting technology is covered by various patents.

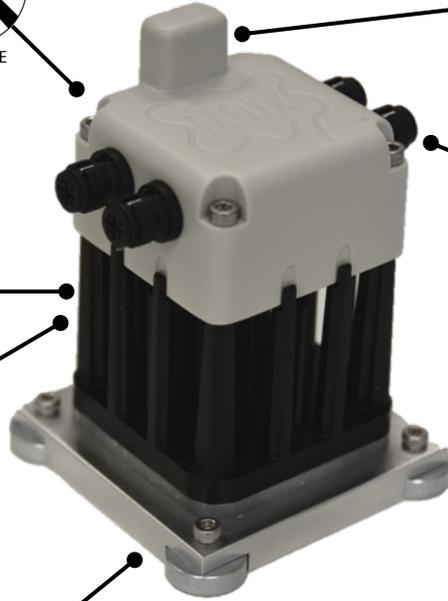


The magic lies in its ability to use small size and small temperature difference to deliver the power needed for long-distance communication without time limit. The harvest tree simply requires installation on a surface that is a few degrees (at least 10°C) warmer or cooler than the ambient air.



That's all it takes to supply the necessary energy to the node indefinitely!

IP 68 & IK7 Heavy duty design
Electronics protected from high temperatures for Harsh industrial environment



LoRaWAN

2.4 GHz

WirelessHART



Additional technologies available soon



Battery-Free
Sustainable approach

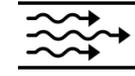


Place & forget



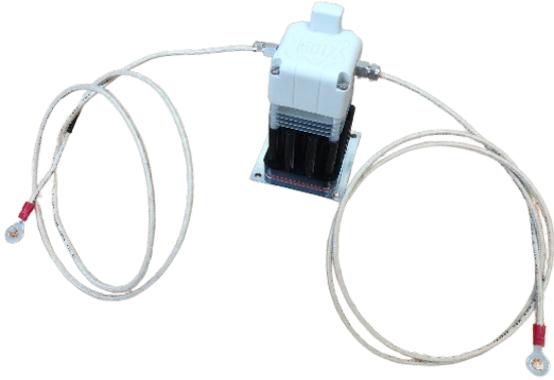
4in1

4 configurable inputs enabling connection to various types industrial sensor bringing flexibility to measurement and reducing the cost per sensor



Fast installation using bonding, magnets, screws, or pipe clamps with flanges . Can be installed on a surface at a T° of up 350°C



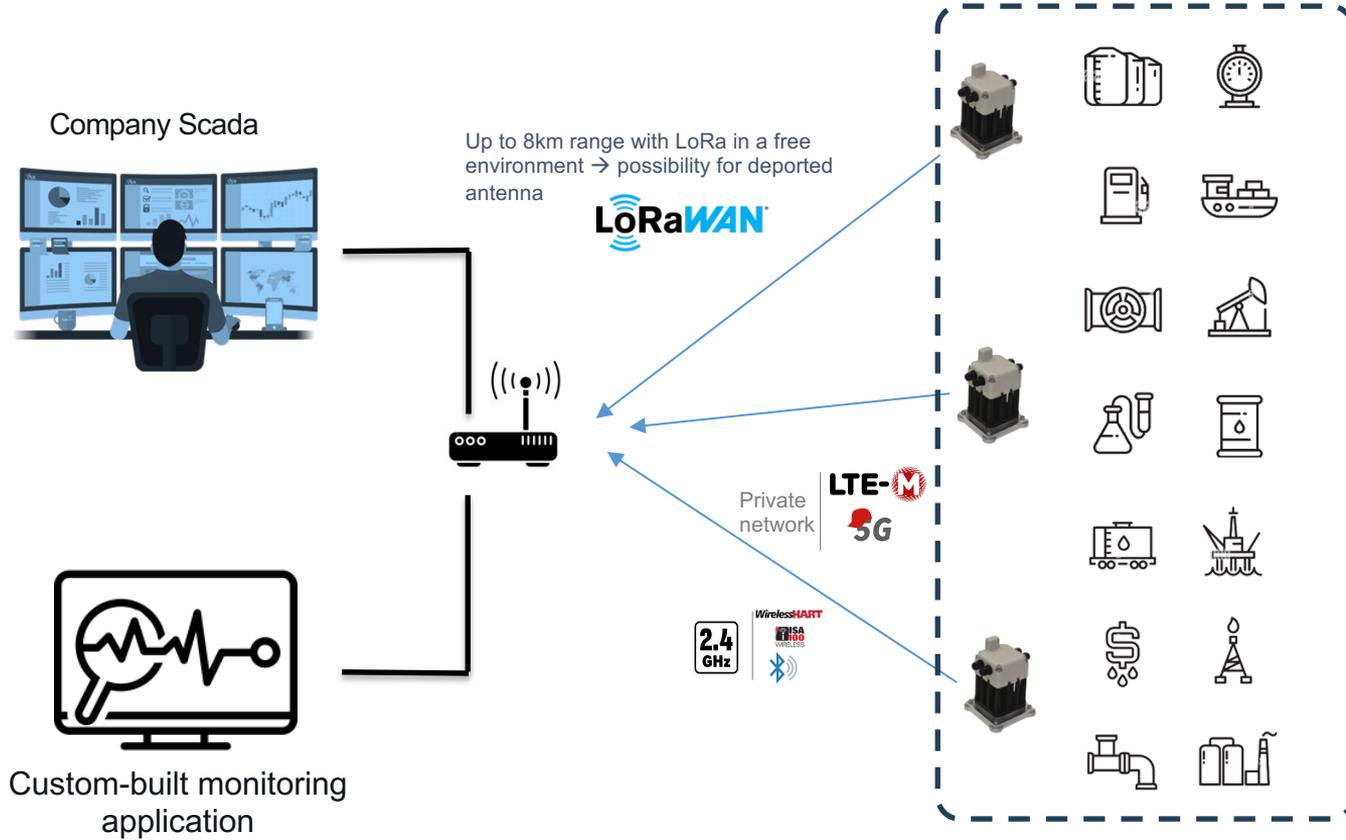


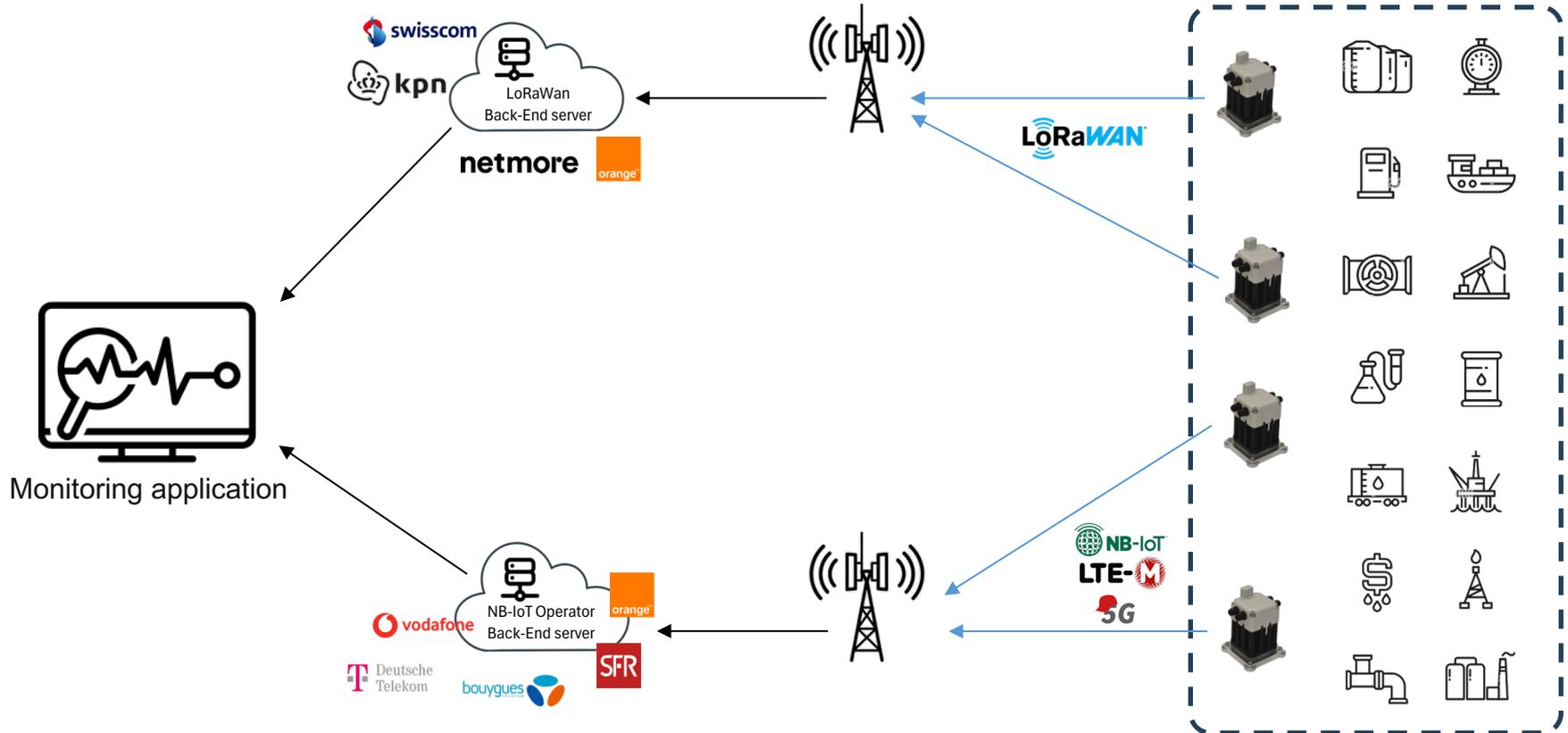
- Link up sensors from the following options:
- the selection available in the MOÏZ catalog
 - those already validated and used by you
 - those available in the market



MOÏZ offers its expertise in sensor design and adaptation, including CAD design and rapid prototyping, to ensure that the sensor perfectly fits the client's use case environment.









Despite its compact form factor, it provides significantly higher power output compared to a standard lithium battery.

This extra power output has a high value to:



- Boost **communication frequency** compared to battery-powered devices.
- Use more powerfull connectivity (like 5G)
- Incorporate internal data processing capabilities for **edge and Tiny ML** applications

Harvestree take profit of a power equivalent of:



10 lithium batteries when using a temperature difference of 10°C*



20 lithium batteries when using a temperature difference of 30°C*

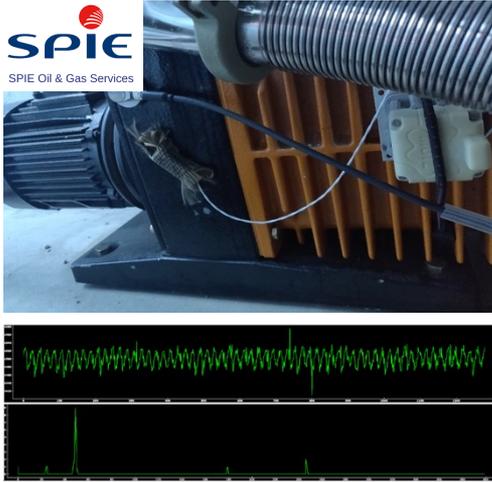
** Power delivered in comparison with a standard 3.6 Ah Li SOCl₂ battery over a lifespan of 5 years (i.e 0,3 mW average power)*

Harvestree data acquisition node works with minimal temperature differentials, commonly found in industrial environments, and allows unprecedented data transmission frequencies.

Harvestree Operating Range (with the indication of required temperature differentials)

Sensor transmission period →		24h	12h	1h	30mn	10mn	5mn	3mn	1mn	30 s
↑ Range + ↑ Transmission rate + ↓ LoRaWan Baudrate	DR5-SF7	6	6	6	6	6	7	8	10	20
	DR4-SF8	6	6	6	6	6	7	8	12	25
	DR3-SF9	6	6	6	6	6	7	8	13	30
	DR2-SF10	7	7	7	7	8	9	14	17	
	DR0-SF12	9	9	9	9	12	18	22	Off Duty cycle (Europe)	

Operating boundaries of battery-powered sensors with a lifespan of 5 years

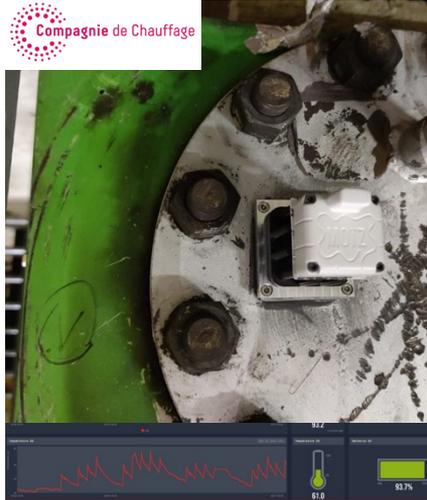


Monitoring of pump health

Heat source : pump

Cold source : ambient air

Sensor : vibration + edge computing for analysis



Monitoring of process

Heat source : boiler surface

Cold source : ambient air

Sensor : temperature



Monitoring of aluminum electrolysis

Heat source : Electrolysis potshell

Cold source : ambient air

Sensor : two temperature sensors

But also:



Air Liquide



Monitoring of hot boxes temperature

Heat source : hot box
Cold source : ambient air
Sensor : temperature



Monitoring of rail temperature

Heat source : rail
Cold source : ambient air
Sensor : temperature sensor



Codevelopment with



Temperature measurement of the catenary under voltage

Hot source : black part that absorb solar heat
Cold source : ambient air
Sensors : temperature + weather



Monitoring HV bus bar temperature

Hot source : casing of HV bus bar

Cold source : ambient air

Sensor : IR temperature



Monitoring of electrical transformer

Heat source : transformer surface

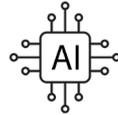
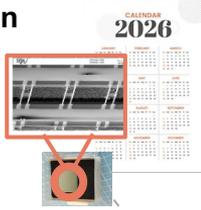
Cold source : ambient air

Sensor : temperature + trespassing + ...

Miniaturization

High

Low



On-device AI

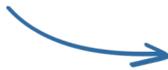


Power-hungry sensors

Few mW

Few hundred mW

Power (mW)



MOÏZ

Powering Autonomy



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