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Engineering & Construction

Improving pipeline hydrotesting with IoT

JULY 2024

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Applied Innovation Manager

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We belong to a global group **of companies**

78,500

full-time **employees**

38.4 billion

USD in sales

Tenaris

8,9 million
tons of seamless and welded pipe shipments

Ternium

12,5 million
tons steel products* shipments

TECHINT
Ingeniería y Construcción

2,4 million
USD in annual sales

Tecpetrol

196.000
barrels of oil equivalent produced per day

tenova

987 million
USD in backlog

HUMANITAS

1,2 million
unique pacients

A reliable partner **for project execution**

Data as of December 2023

+75

years of global experience.

+3.500

projects completed successfully around the world.

1,9

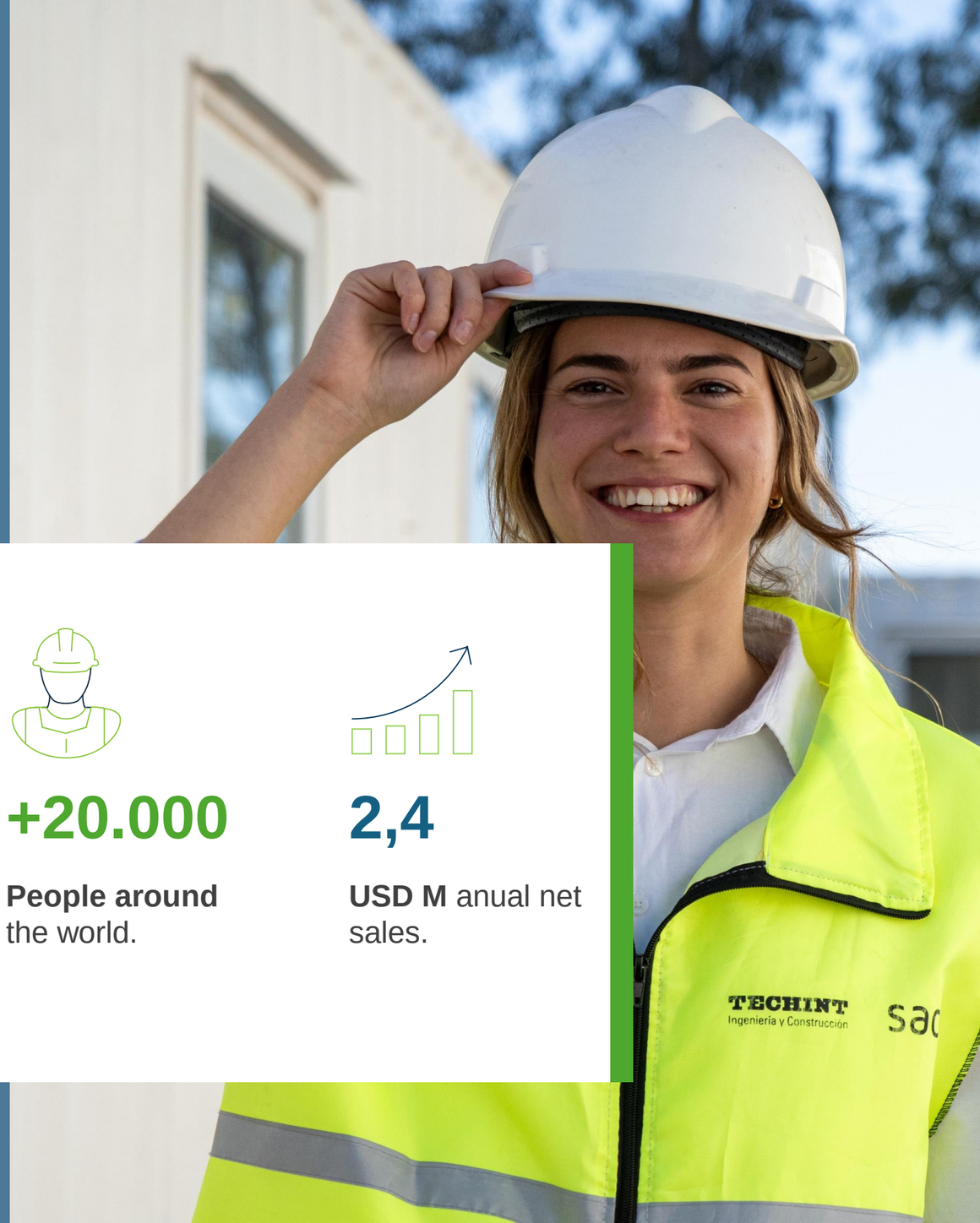
million hours per year of engineering capacity.

+20.000

People around the world.

2,4

USD M anual net sales.



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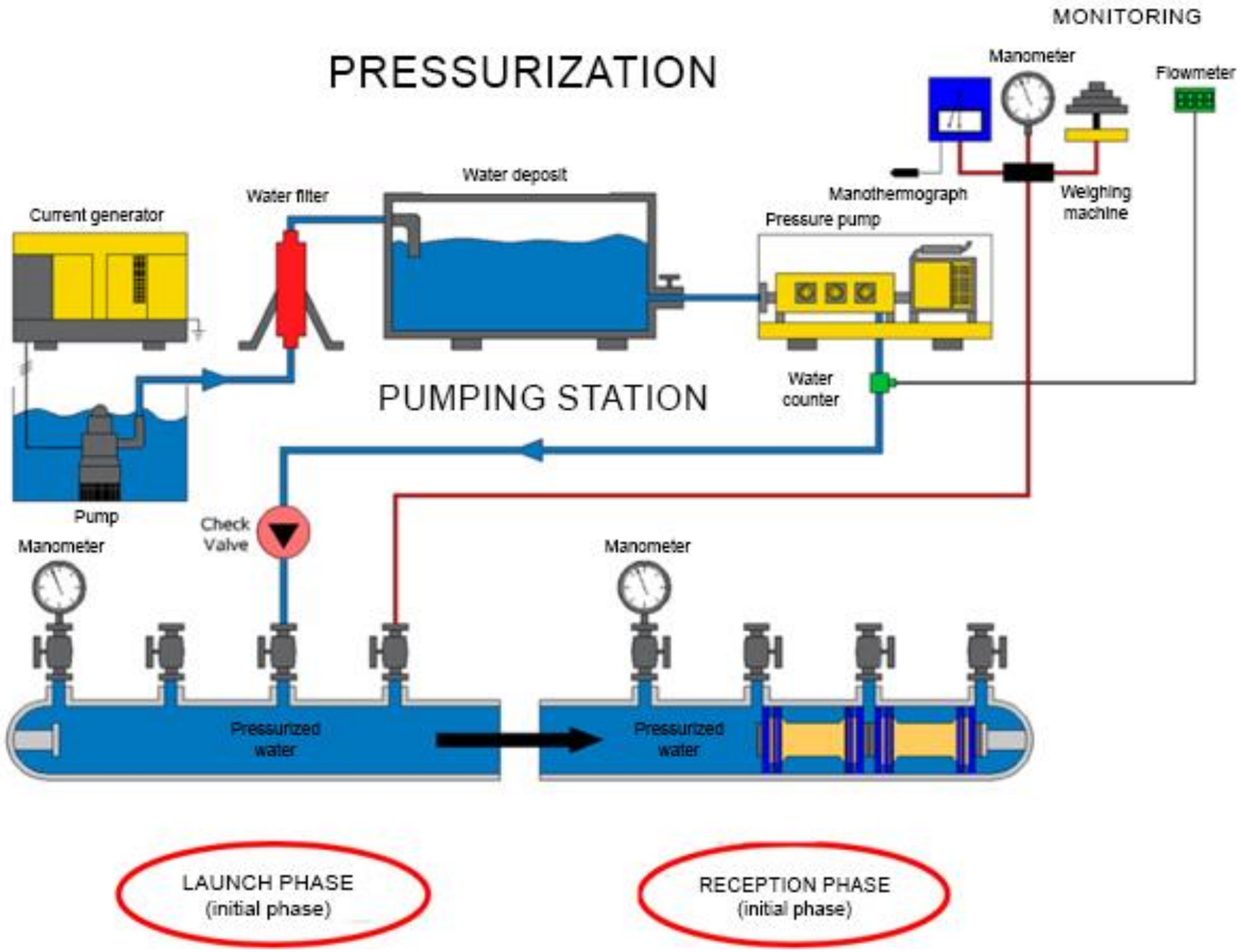
Hydrotesting concepts and equipment:

- **Hydrostatic testing** consists of pressurizing different sections along a pipeline to test it to a higher pressure than the operating one. Pressurization measurements are taken at regular time intervals.
- **Pressurization is carried out in 20-40 km sections,** according topography, material strength and pressurizing equipment. Different instruments are incorporated at each end of the section to measure pressure and temperature indicators.
- **Hydrostatic pressurization, as the word indicates, is a hydraulic method.** Water is introduced into one end, generally obtained from rivers, streams or lakes. Incorporated water volume is measured to verify applied internal pressure.
- **This test is applied on any type of pipeline, gas pipeline, oil pipeline or aqueduct.**



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IoT concepts and technology:

The Internet of Things (IoT), is a **network of objects and devices**, that are “connected” through sensors (and other technologies) that allow them to transmit and receive data. The most common way of doing this is through an application programming interface (API) which connects and exchanges data over the Internet.

Objects are connected through a communication network, such as Wifi6 or a low power wide area network (LPWAN) such as the global 0G Network, powered by Sigfox 0G technology.

0G networks, such as LoRa or Sigfox, are cellular connectivity networks, focused on Massive IoT which play a significant role in the world of smart applications.

0G or low power wide area networks (LPWAN) are low bandwidth networks, which work on a low frequency, and **use short and precise messages**. The Sigfox uplink payload is limited to 12 bytes while the downlink payload is limited to 8 Bytes. This means 6 messages per hour or 140 per day, depending on the type of antenna, with a coverage of up to 50-60 km

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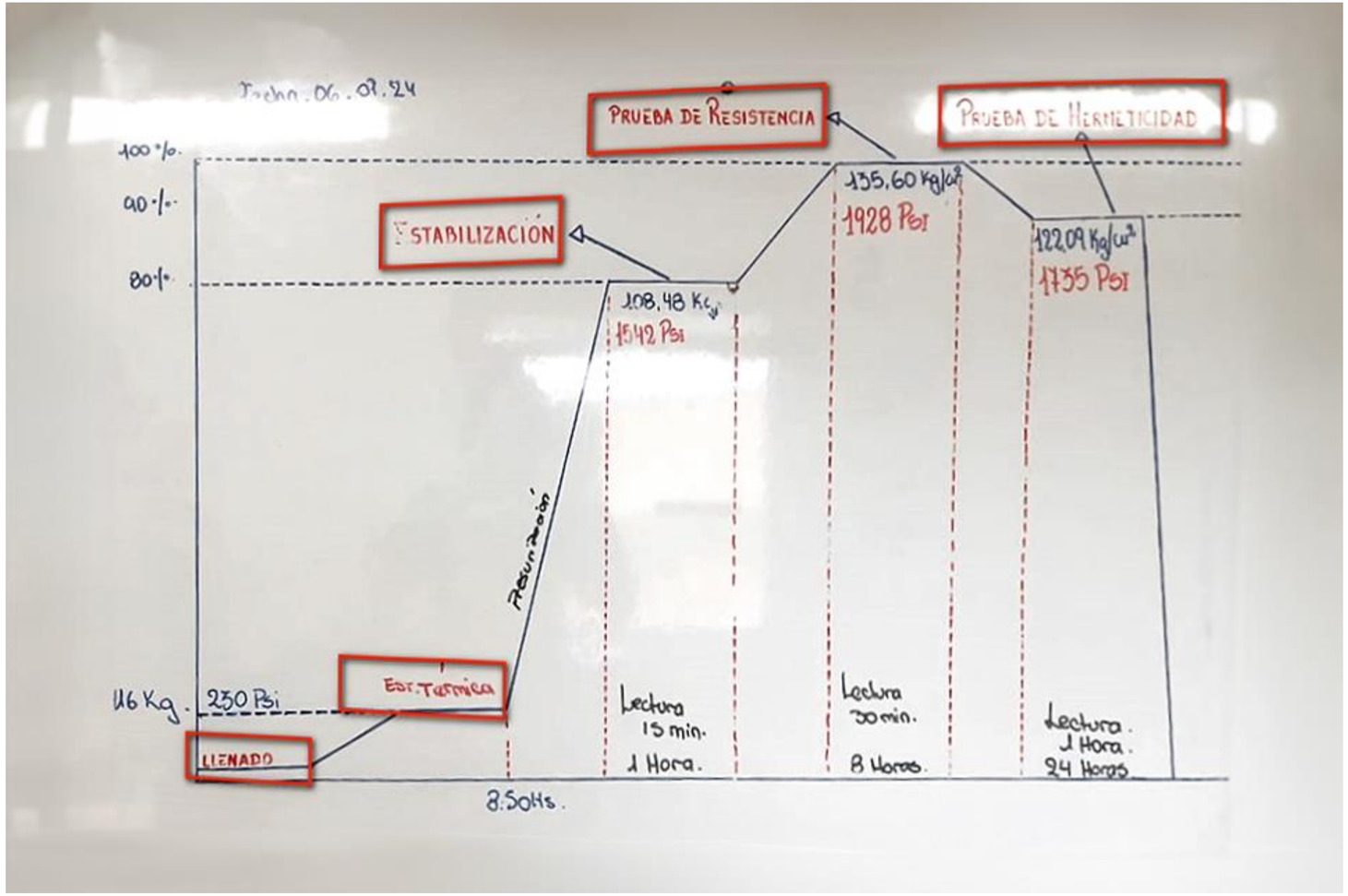
HYDROSTATIC TEST PHASES OF A SECTION

- Filling
- Thermal stabilization
- Pressure stabilization
- Strength testing
- Titghtness testing

Pressure readings every 15, 30 and 60 min



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DEVELOPMENT:

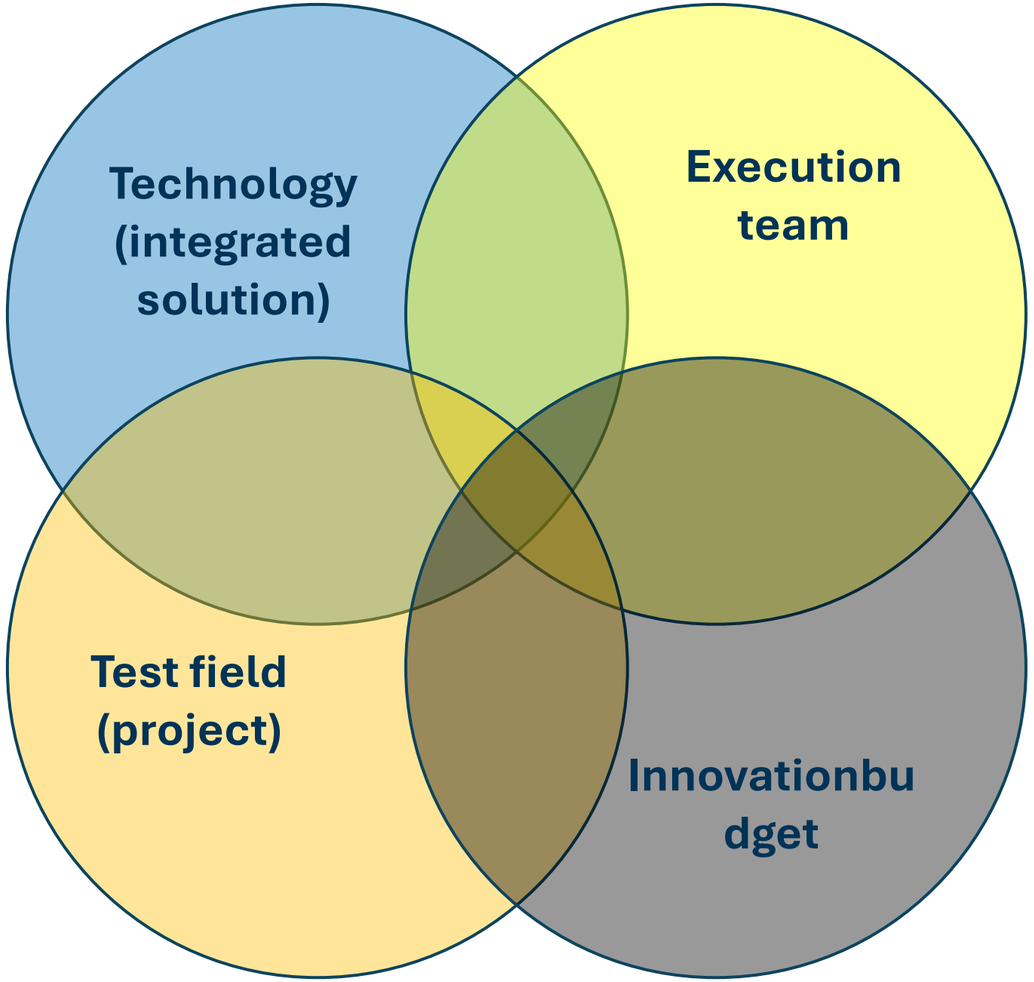
The Innovation area requested the IT and Support & Development areas to assist the Hydrostatic Testing team working at the RGN project.

The purpose was to identify new technological tools able to facilitate tasks and record measurements throughout the stages of a hydraulic test carried out on a pipeline.

A **Proof of Concept (PoC)** was possible given the fact that all the neccessary aspects could be put together.

The PoC involved recording a series of variable (pressurization and temperature readings) **through the use of smart devices transmitting data** to a web based portal. Previously tha process was carried out using analog and digital instruments.

The proposal was to incorporate the use of IoT devices and integrate everything into a single platform that enables **event tracking** powered by **0G communication** using Sigfox**.**



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SCOPE OF THE POC:

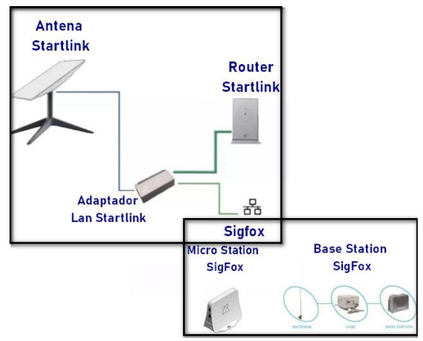
- Use of high-quality precision sensors
- Class 1, explosion-proof transmission devices
- Online communication at both points
- Periodic reading at set intervals of all devices
- One single platform, with integrated devices
- Generation of alerts regarding critical loss of device readings and/or communication
- Identification of new use cases or devices to incorporate into a PH

Pressure transmitter

Pressure sensor

Temperature transmitter

Communications



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ADVANTAGES OF THE IoT MODEL:

1. Unified event logs stored on one single platform vs. independent logs per device
2. Accurate measurements vs. manual recording errors & illegible data
3. Automated readings reduce problems associated with not being able to physically access sites to take the readings, whether due to weather conditions, high temperatures, nighttime conditions, permits, available personnel and transportation, etc.
4. Tracking and history of measurement events vs. manual records in spreadsheets
5. No need to perform daily transfers to each end to take the readings - Measurements can be read in both mobile offices and at both sections
6. Improved safety for workers within risky areas, as there is no need to carry out periodic manual readings, which expose workers to hazards such as high-pressure pipelines, hoses, valves, and coupling joints at risk of rupturing, etc.

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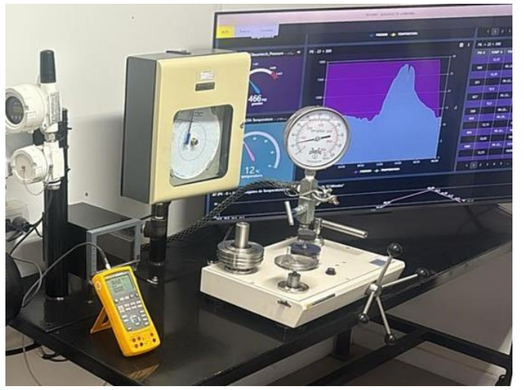
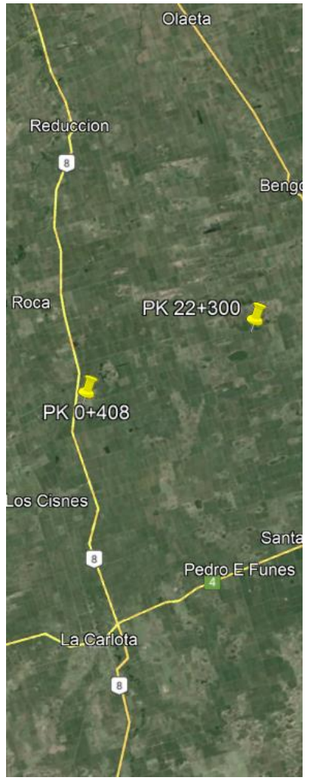
PK 0 408
reception head

PK 22 300
launch head





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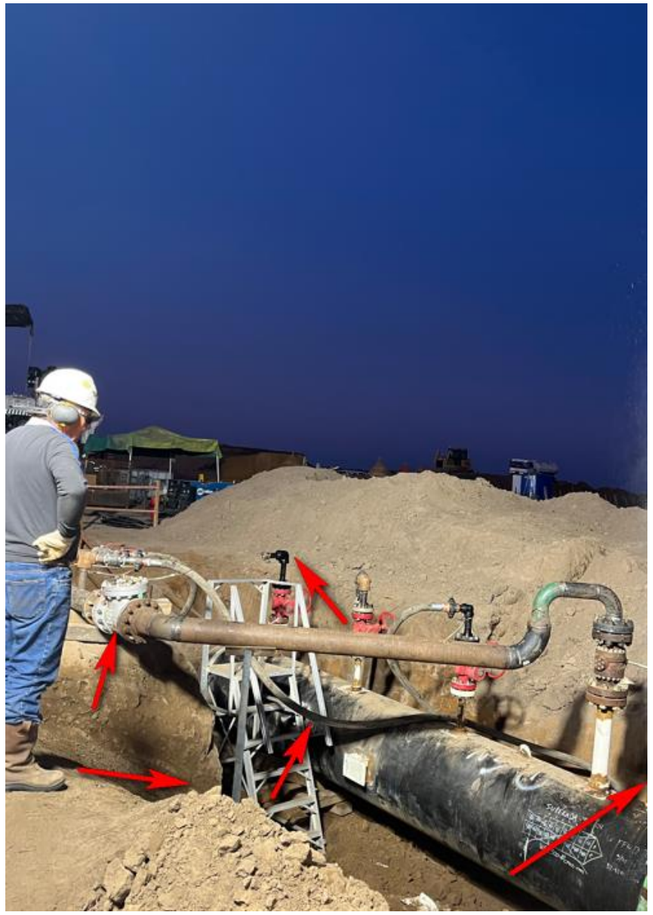

Support & Development – PH Innovation |RGN

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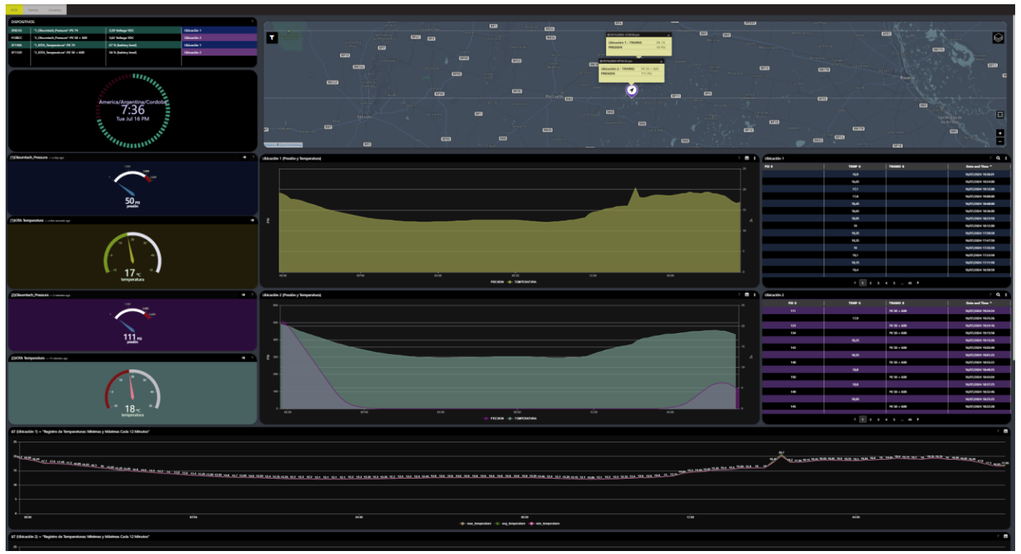

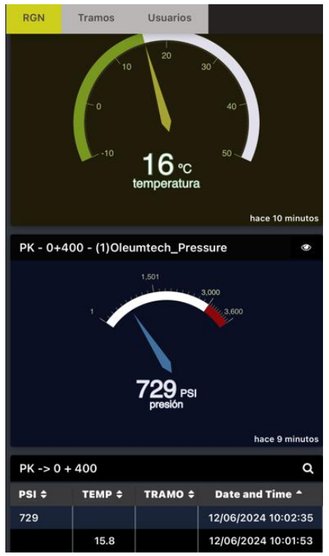

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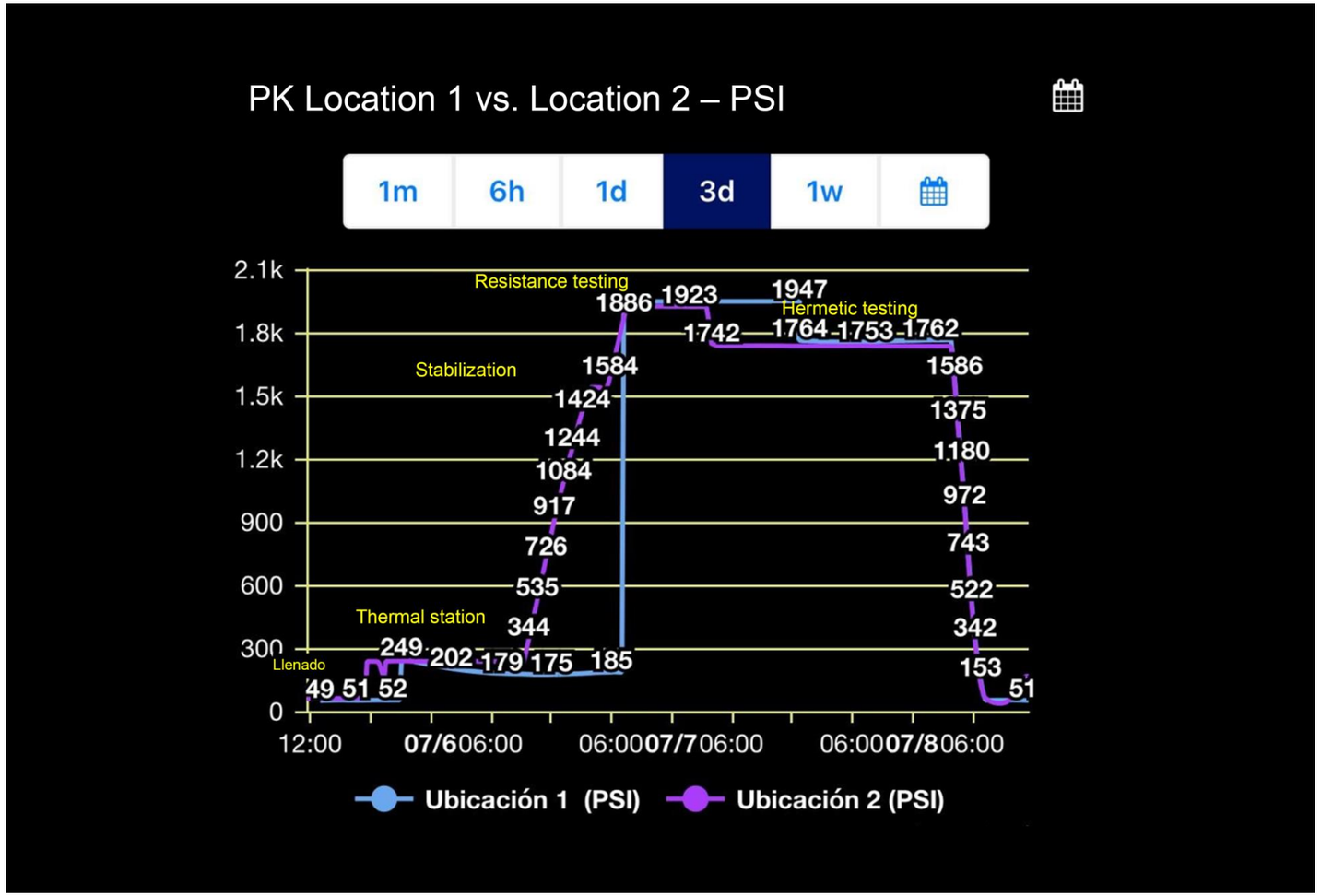
HYDROSTATIC TESTING PHASES ON IOT PLATFORM

Results of the 1st PH –
Section PK 0 408 / PK 22 300



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Identification of new use cases or devices to incorporate into a PH

Electromechanical flowmeter

Electromagnetic flowmeter with IoT

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IoT Electromagnetic Flowmeter. Implemented 07/27/2024

POC - First Instantaneous Flow and Volume Measurements in M3

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Identification of new use cases or devices to incorporate into a PH

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Current Dew Point Measurement

DRYCAP DM70 Portable
Dew Point Meter

Dew Point transmitters

Examples of devices to test

RO120-DIS High Accuracy Temperature, Humidity and Dewpoint Transmitter with Remote Display

$1,395.00

RO120-W-B-DIS High Accuracy Wall Mount Temperature, Barometric Pressure and Humidity Transmitter with Display

$1,540.00

CM10 Chilled Mirror Dew Point Transmitter

$1,600.00

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Identification of new use cases or devices to incorporate into a PH

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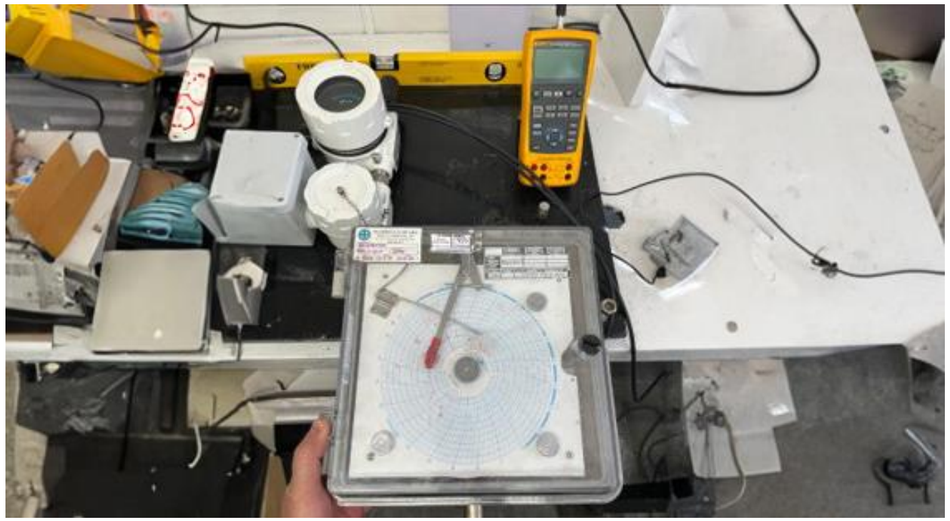
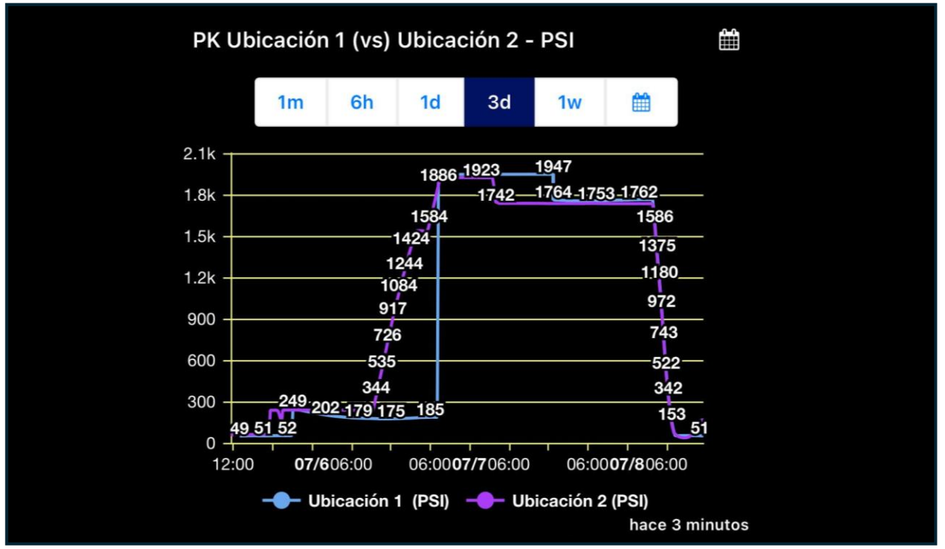
Certification

Pressure manothermograph
PH Certification Letter - ENARGAS



IoT Platform

Plataforma TagoRun



| QUESTIONS? |

THANK

YOU!

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