Corporate presentation

EX ROBOTICS

YOKOGAWA

Co-innovating tomorrow™

Company

About ExRobotics

ExRobotics is the leading expert in developing rugged reliable robots for harsh environments that require Ex zone 1 certification. These IECEx and ATEX certified robots are the new benchmark for inspecting and surveying potentially explosive facilities. All are equipped with a range of sensors and cameras that use a wireless network to communicate with an operator located remotely in a safe control room.

Our Mission | “What is our purpose?”

To create value from the market for Ex certified robots.

Our Vision | “What is our future?”

Our robots will be routinely seen at major oil and gas facilities around the World.

Our Strategy

To achieve its mission ExRobotics will:

- Exploit its oil and gas knowledge to design robots that customers want. It then aims to expand into other sectors such as chemicals, mining and energy.
- Exploit and improve its ATEX and IECEx design expertise.
- Progressively establish a world-wide base of Ex-certified customer support, assembly and maintenance facilities.
- Build a strong supplier base that provides dependable parts.
- Establish global partnerships that complement ExRobotics' skills.
- Offer customers cloud-based solutions that enable them to benefit more fully from the information our robots generate.

Our Unique Strengths

- 10 years of experience of designing and certifying Ex robots
  - Possibly the most complex products ever certified
- 4 years of developing a strong team and strong links with strategic suppliers
  - e.g. Tracks, Electronics, Software
- 4 years of refining the procedures needed to certify, assemble and maintain Ex robots
- We are currently pursuing four great patents:
  - Induction charger
  - Integrated drive module
  - Infrared leak detector
  - Lidar

History

ExRobotics was founded in 2017. It founders are world-leading experts in developing robots for use in potentially explosive environments. They were also involved in the Sensabot initiative for the North Caspian Operating Company in cooperation with Shell Projects and Technology.

In 2017/2018 a new product was developed – a remotely operated robot, the ExR-1. Since then the company has supplied over 30 robots across 4 continents.

As of 2020, our robots are defined by their application First Responder, Emissions Detector, Co-Operator.

The ExR-2 Investigator is being launched in early 2021 and is equipped with a 3D LiDAR system and a supercomputer to run Artificial Intelligence/Machine Learning algorithms.

Leadership team

Proven business insight and a strong business network

Iwan de Waard
Co-Founder & Director

Ian Peerless
Co-Founder & Director

Erwin Goorden
Operations /
Supply chain manager

Stephan Anzenhofer
Financial controller

Advisors & Business Development

Samir El Awadi
Former CEO Atos MENA

David van Loo
Rotterdam Port Fund

Frans van der Harst
Rotterdam Port Fund

Partners

Design and produce our electronics

Develops our software, communications and cloud services

Ensures connectivity around the world

Provides additional assembly capacity

Funds us and provides advice

Sell and Maintain our robots in Canada

Sell our robots globally and integrate into plants and client systems

Maintenance of our robots in Australia and USA

The problems our robots solve

- Detecting gas leaks into the environment – fugitive emissions
- Defining dangerous/hazardous situations for emergency responders
- Performing monitoring/reporting activities at unmanned facilities
- Autonomous data collection and digitalization – our robots can send data directly into customers' data lakes.
- Remote availability of experts

Our solution

Platforms

ROBOTICS

Connectivity

- 5G/4G/LTE
- Wi-Fi

Function

- Sensing
- Remote Control
- 3D Mapping
- Fleet Management
- Self-docking and Self-charging
- Autonomous Missions

Application

- Normally Unmanned Facilities
- Emergency Response
- Infrastructure Digitalization
- Fugitive Emissions Detection
- Expert Telepresence

Accomplishments and Customers

- 25.000 hours of continuous operations
- 20.000 points of interests inspected on industrial sites
- 30+ robots in operations on 4 continents
- [confidential] numbers of gas leaks detected

YOKOGAWA AkerBP bp REPSOL PTTEP PHILLIPS 66 DOW equinor woodside

Full-Service Support

- All robots from ExRobotics are available with a full-service package. This starts at 35,000 euro per year for a basic ExR-1 Co-Operator.

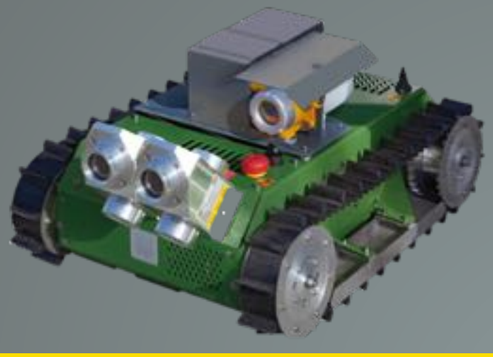
- Given that a robot can operate for 3,000 hours per year, this is equivalent to just 12 euros/hour.

- We believe that this is a great value for our customers and will help them to take the next steps in lowering their production costs and increasing the safety of their human operators.

Thank you

www.exrobotics.global

sales@exrobotics.global



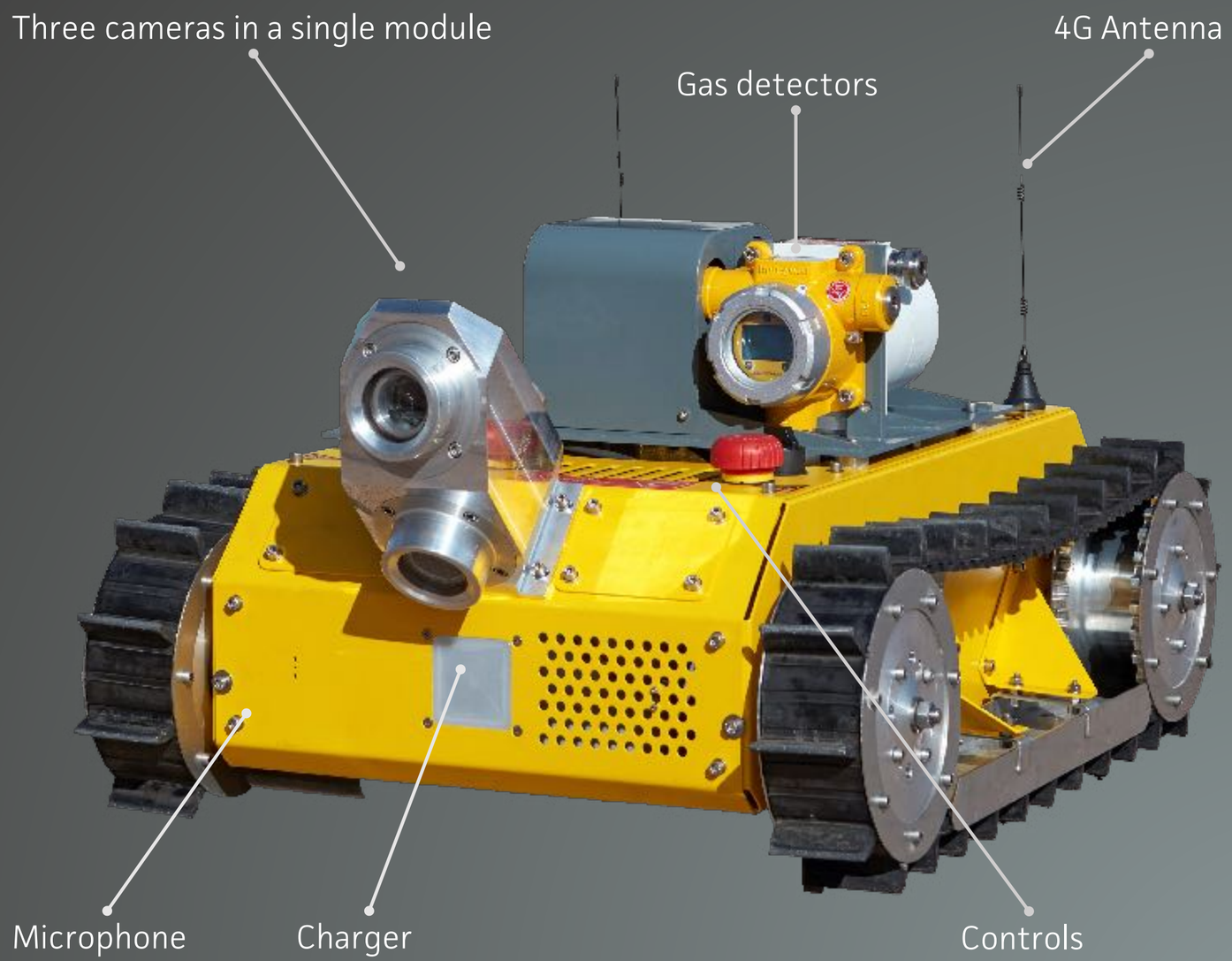
Addional information hardware

The basic robot platform is simple and cost-effective

Dimensions:
- 950mm long, 690mm wide, 560mm high
- 40mm ground clearance
- Weight 73 kilograms

Life:
- 2km range
- Battery life 90 minutes to 7 hours, depending on use
- Spot steering
- 4,5 hours to charge batteries

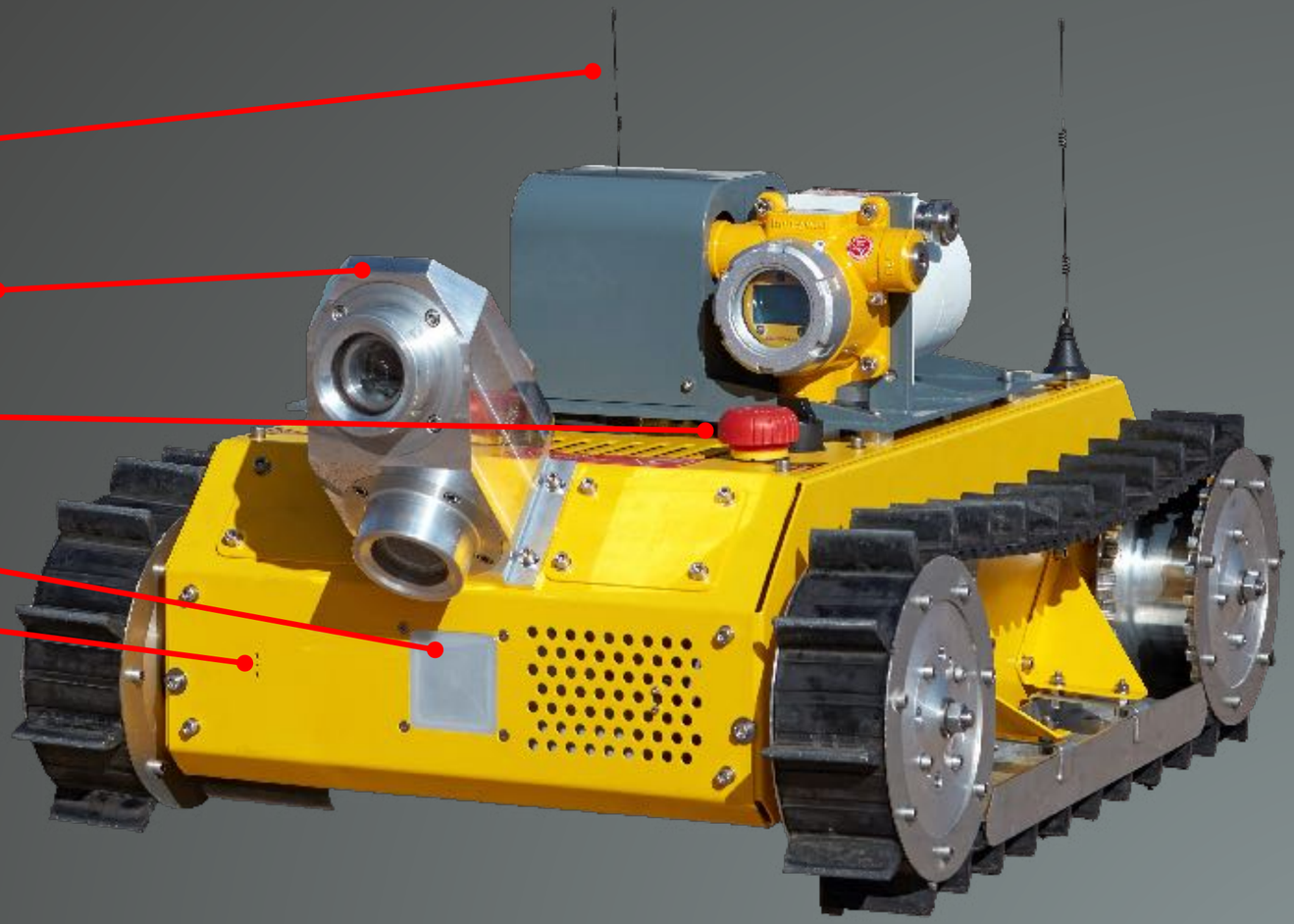
Drives:
- Over roads, slabs, pebbles, metal gratings and grass
- Up and down 20cm ledges
- Up and down 35 degree slopes
- In light snow, hail and rain



The basic robot platform is simple and cost-effective

Basic configuration:

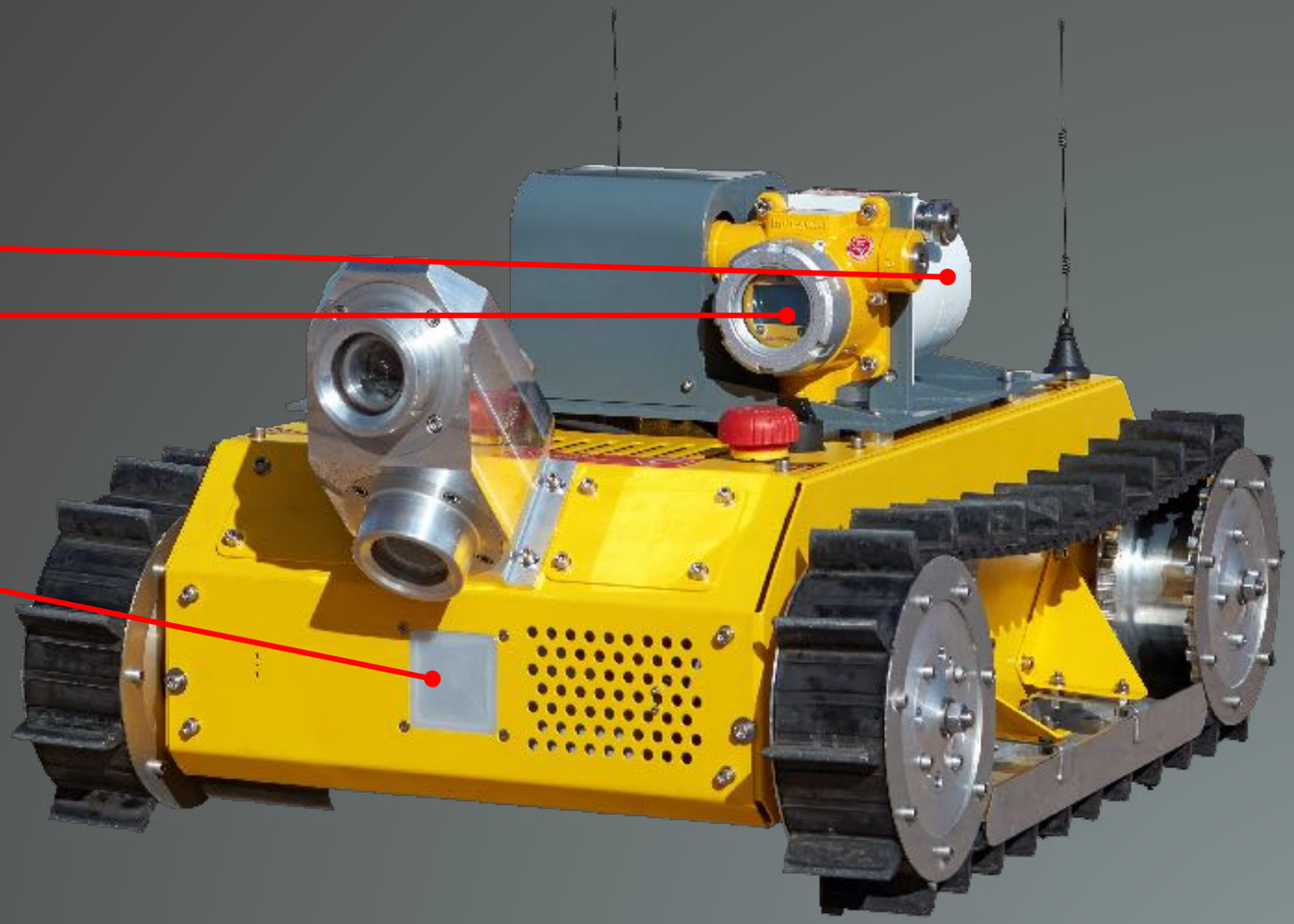
- IECEx & ATEX zone 1 areas from -20°C to +50°C
- II 2 G Ex db eb ib mb qb IIB T4 Gb
- 4G/LTE Antennas
- Three cameras in a single module. (Three lights are installed in an identical, adjacent module)
- Controls
- Induction charger
- Microphone



The basic robot platform is simple and cost-effective

Available options:

- Point gas detectors
  - Simtronics hydrocarbon GD10 P
  - Falco VOC detector
  - Honeywell Toxic gas detector 3000 MKII
- IR Boson camera
- FLIR G300A leak detection (evaluation model)
- Induction charger + docking station
- LED unit
- Warning beacon
- WiFi communication
- Autonomous line following
- Tag based inspection



Our flagship, the ExR-2

Dimensions:

- 950mm long, 696mm wide, 670mm high
- 60mm ground clearance
- Weight 100 kilograms

Life:

- 2km range
- Ops time 2 hours, standby time 6 hours
- Spot steering
- 8 hours to charge batteries

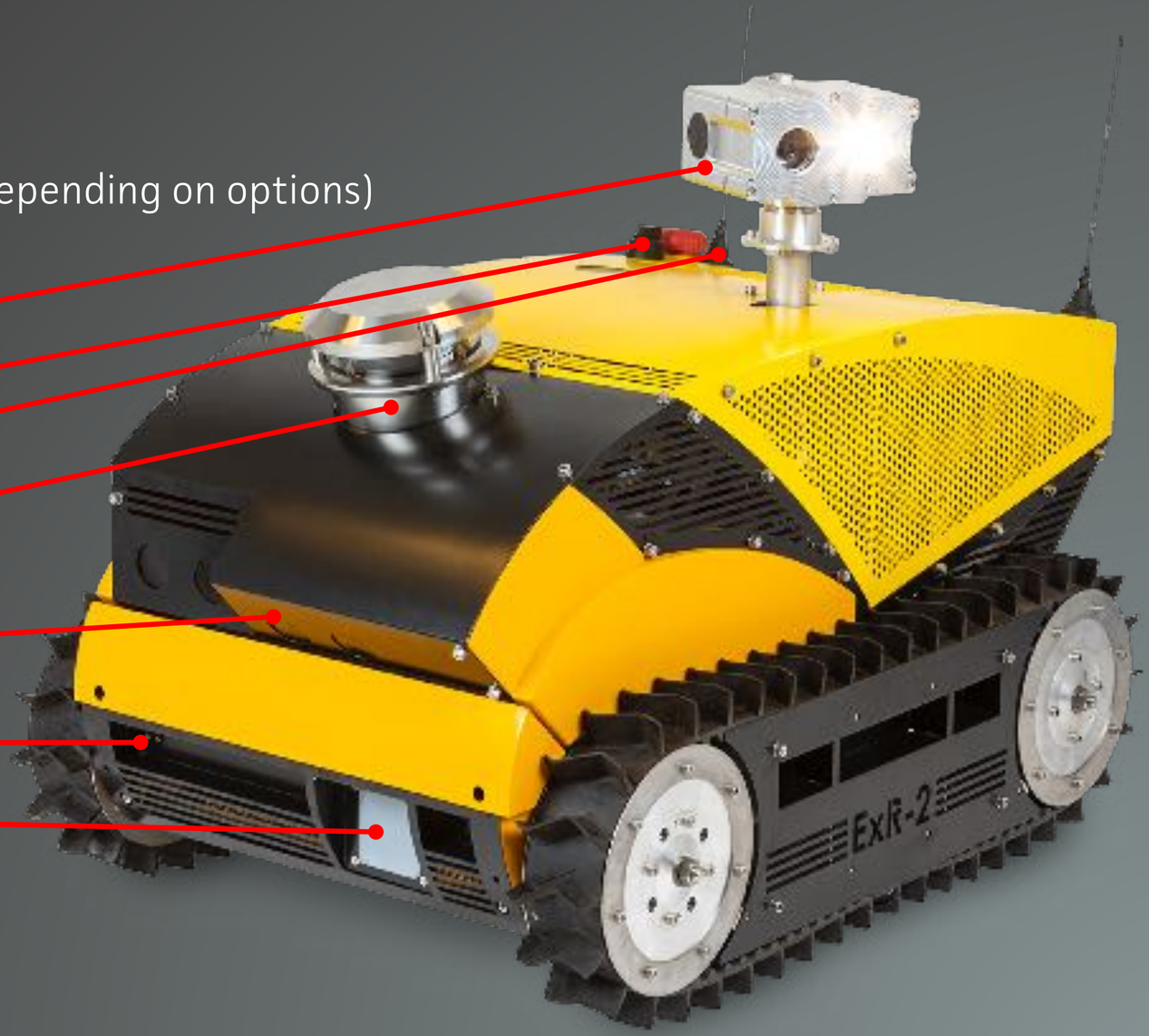
Drive:

- Over roads, slabs, pebbles, metal gratings and grass
- Up and down 10cm ledges and 35 degree slopes

Our flagship, the ExR-2

Basic configuration:

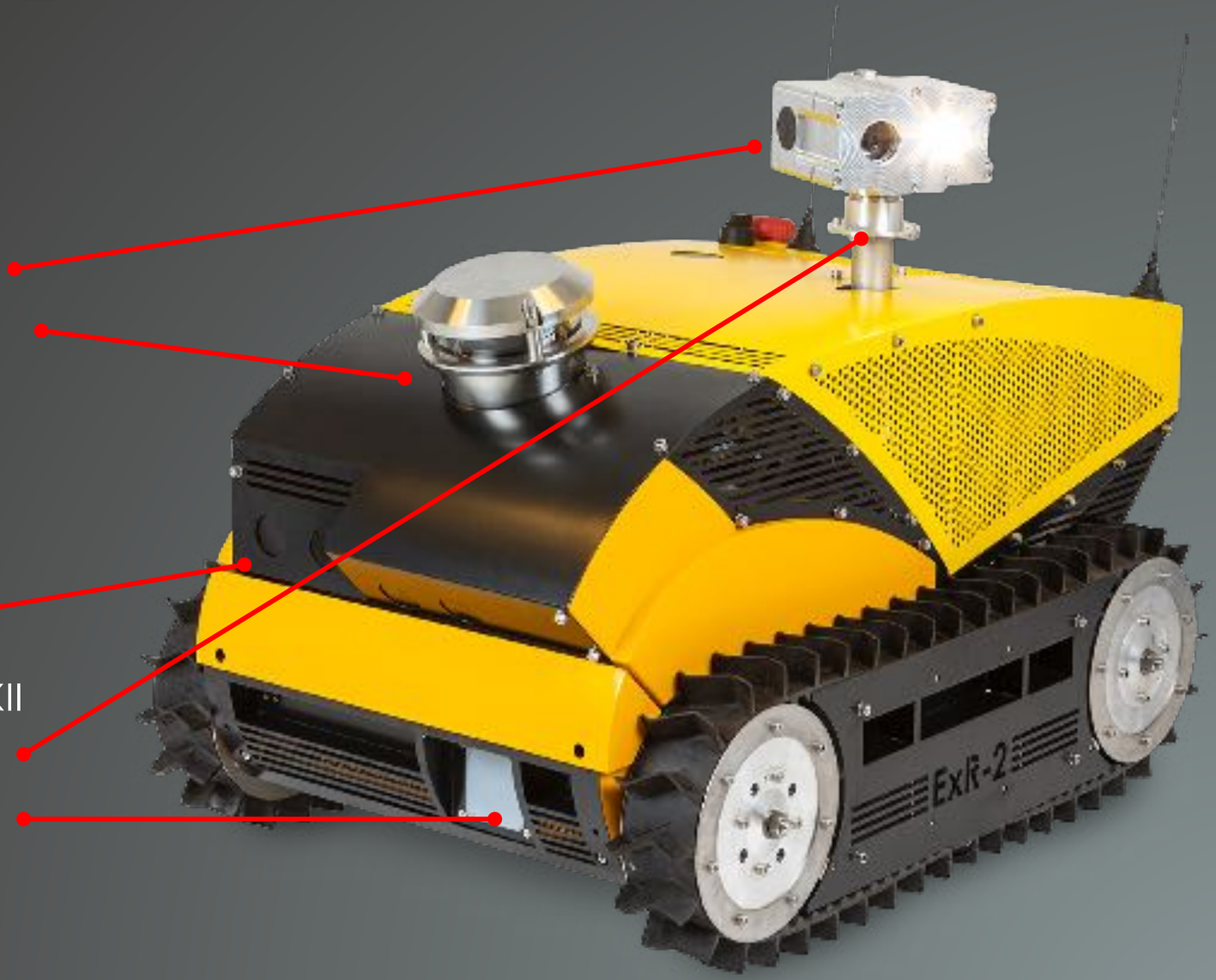
- IECEx & ATEX zone 1 areas from -40°C to +55°C (depending on options)
- II 2 G Ex 60079-46 IIB T4 Gb
- Panning, digital zoom, inspection camera
- Controls
- 4G/LTE antenna
- LiDAR localisation and collision avoidance
- AI/ML computational unit (inside hull)
- Drive camera
- Microphone
- Induction charger



Our flagship, the ExR-2

Available options:

- Communication options WiFi/GPS
- Thermal IR camera (FLIR Boson) module
- Extra front facing camera
- Extra back facing camera
- Induction charger for use in Zone 1 areas
- Point gas detectors
  - Simtronics hydrocarbon GD10 P
  - Falco VOC detector
  - Honeywell Toxic gas detector 3000 MKII
- Elevating mast (Q4 2021)
- Det-Tronics Acoustic Detector (Q4 2021)



Addional information software

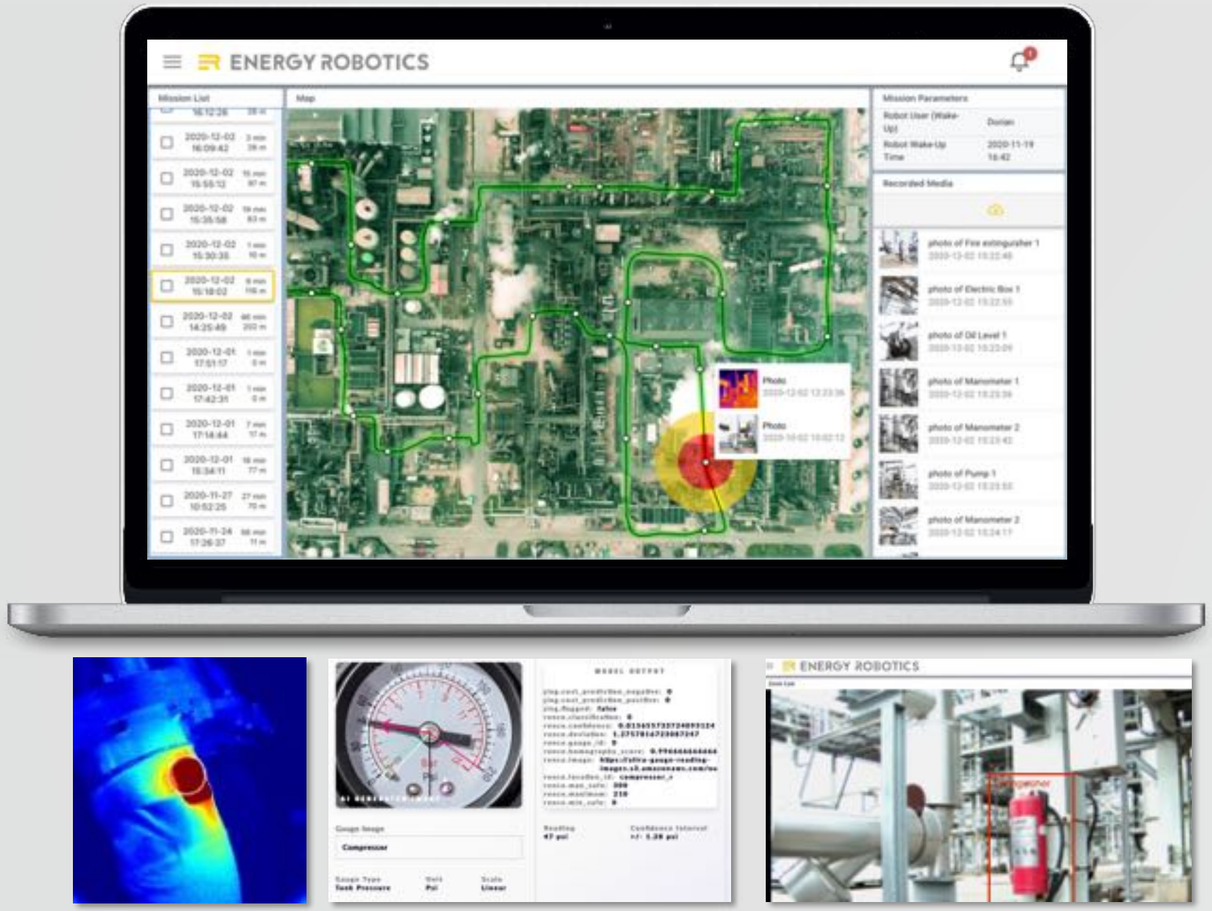
Our robot is equip with the software of Energy Robotics

ENERGY ROBOTICS SOLUTION

ER Software allows industrial robots to operate fully autonomous and to do inspections like detecting gas emissions, read out offline devices, monitor anomaly of taken images or recorded sounds & much more

ENERGY ROBOTICS

What do we delivers today!



Autonomous Navigation

Robots navigate by following a line or full 3D navigation, do tag-based inspections & perform autonomous route repetition

Visual Inspections

Different visual inspections can be performed by using several cameras (optical & thermal). Recordings will be analyzed & evaluated by AI-technology running in the background.

Gas Detection

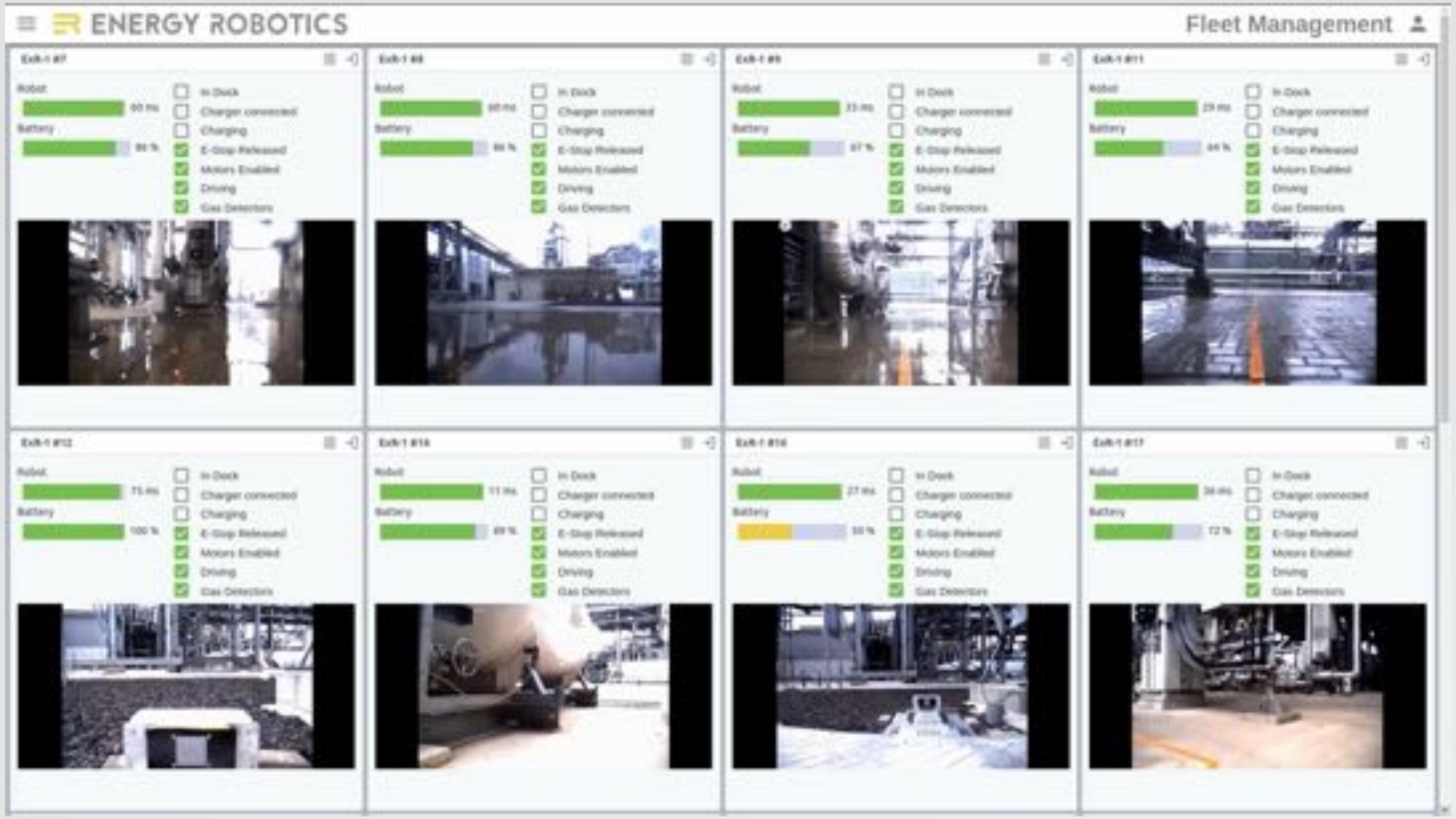
Gas leaks can be detected by gas sensors installed on the robot.

Fleet management

Cloud-based fleet management enables the supervision of large robot fleets

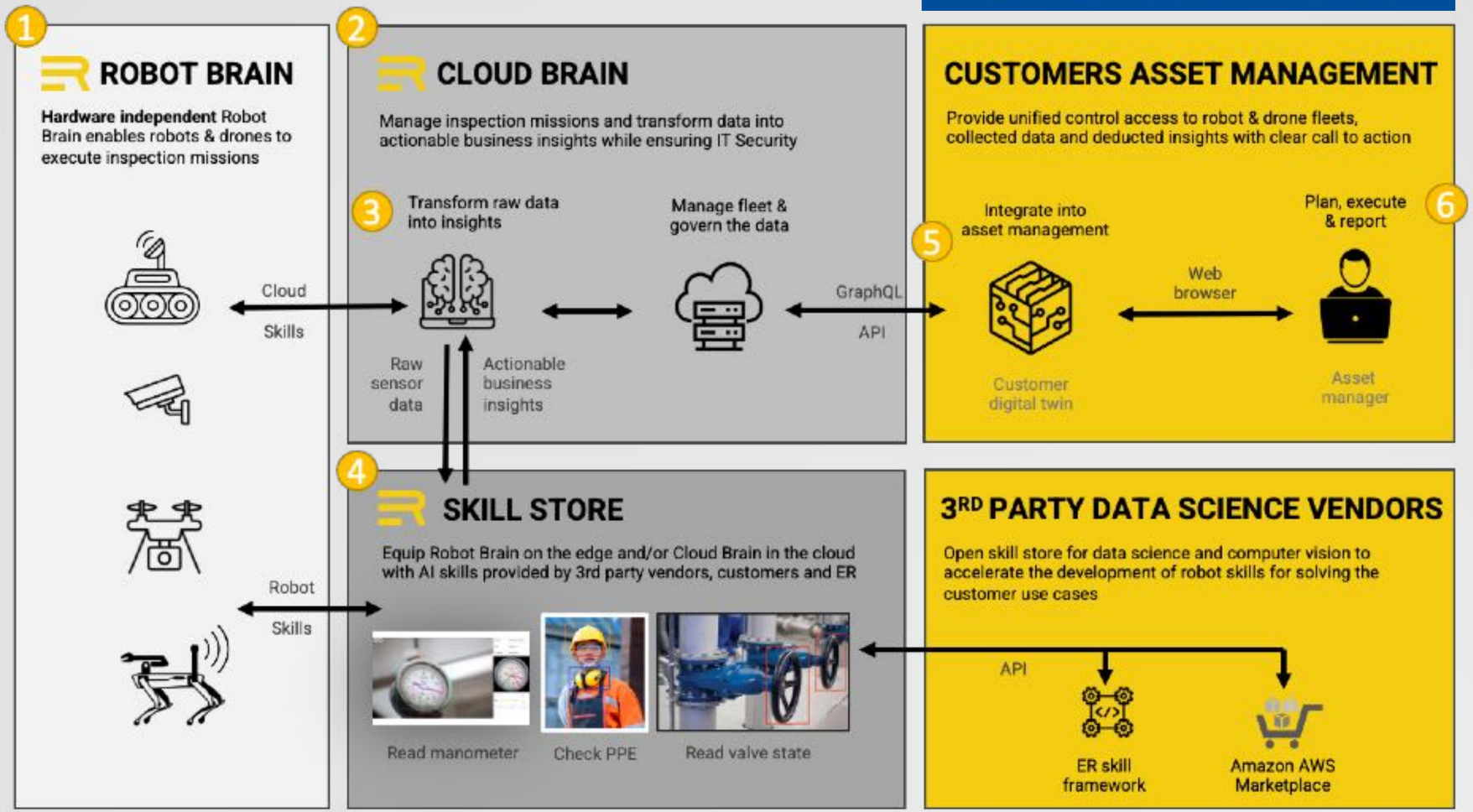
Large Scale Robot Deployment needs a Fleet Management

- ERs cloud-based fleet management enables the supervision of large robot fleets
- Robots report back their high-quality sensor data into the ER cloud
- Browser based technology and can be used without any software installations from desktop, tablet or even mobile



Skills and data integration

1. Robot Brain can be adapted to control any robot or drone on the lowest system levels to autonomously perform inspections
2. Pre-process raw inspection data on the edge and securely upload it into the cloud
3. Transform uploaded inspection data into actionable business insights
4. Open Skill Store provides AI and computer vision apps on the edge and in the cloud – provided by 3rd party vendors, customers and ER
5. Integrate information into existing customer IT and/or digital twin
6. Merge all information in central customer cockpit



Skills! What?

Skill – Small containerized ”App”
Deployed on the cloud, edge or on robot to process sensor data and influence robot behavior

Extract information out of data
Using AI-based machine vision and sensing algorithms to create business information

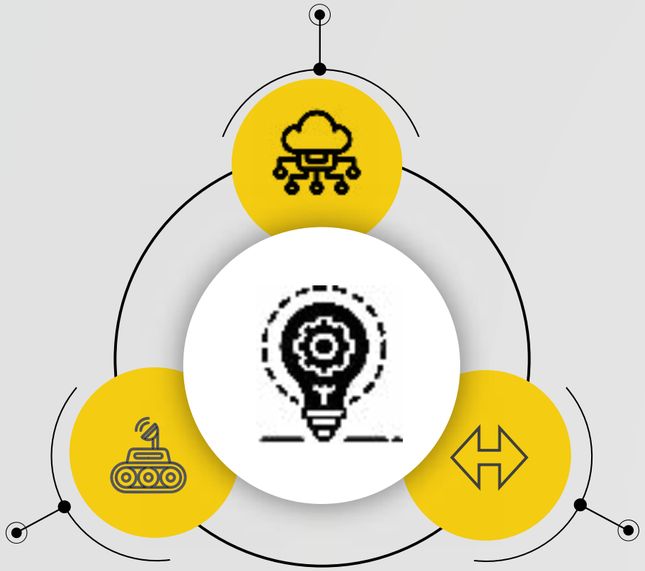
Ease of Use
Simple to install, independent from robot hardware and sensor payload

Influence robot behavior
Alerts can be raised based on min/max limits, or the inspection mission is changed

Skill Types

Cloud Skill

Always runs in the cloud brain only due to compute and memory needs

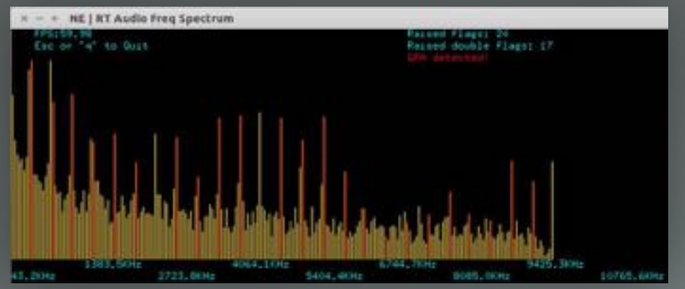


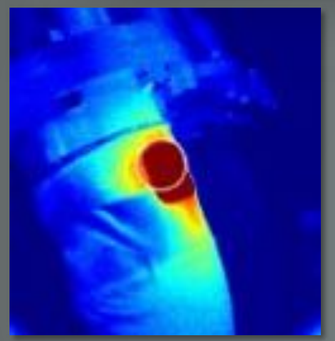
Robot Skill

Atomic, low latency and full autonomy skills that only run on robots

Flexible Skill

Float between robot brain and cloud brain depending on connectivity and resource availability





Skill store under development

Essential Skills by Energy Robotics

We provide essential skills for the robot and cloud, so that customers can start inspection

Custom Skills by Customers

Every customer can deploy skills on the robot, on the cloud or both

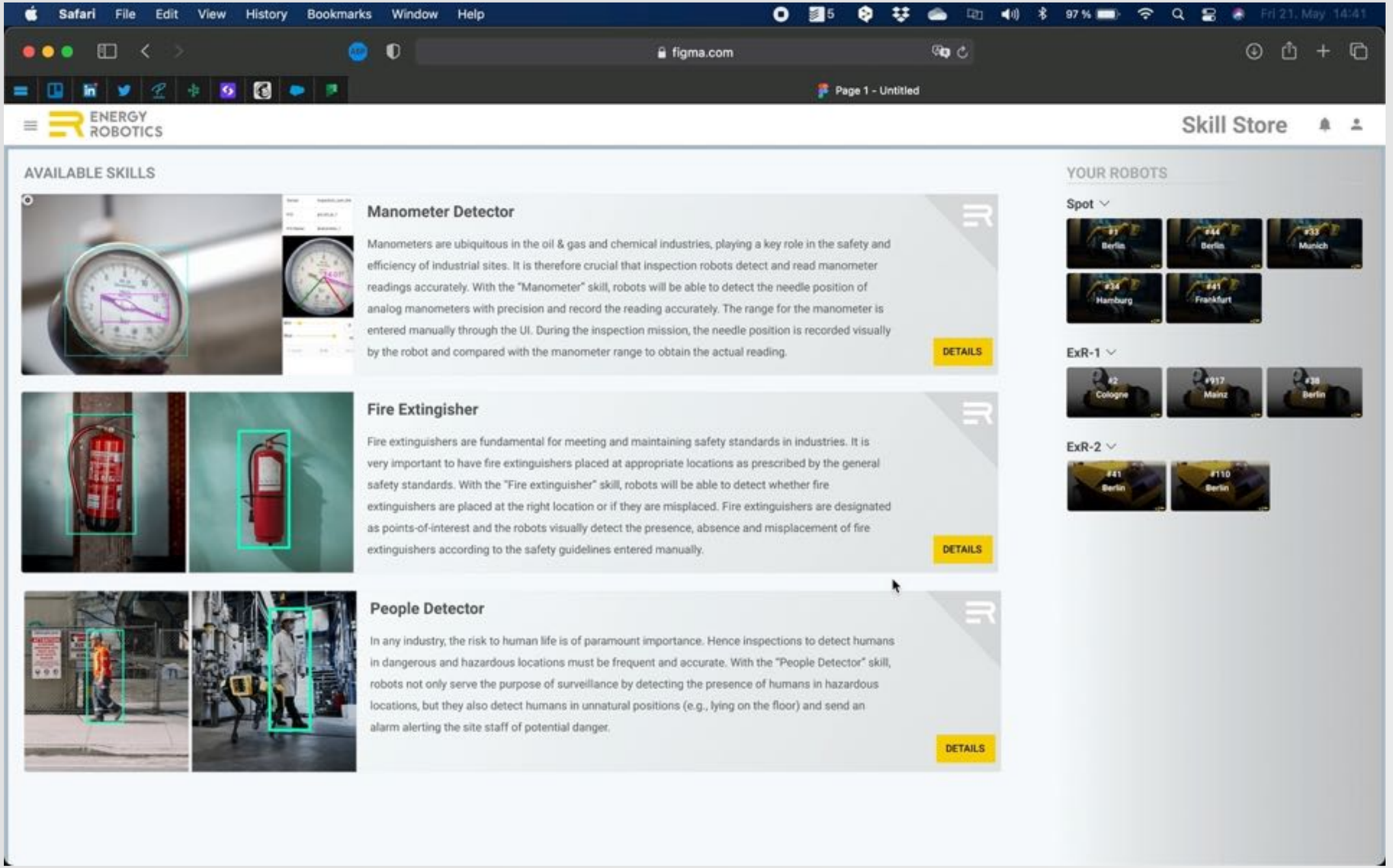
3rd Party Vendors

We work with external vendors to make existing industry AI solutions into the skill store

Closed Beta in Q3/2021

We are calling for partners and customers to join our closed beta in Q3 to develop the relevant industry skills

Skill store under development



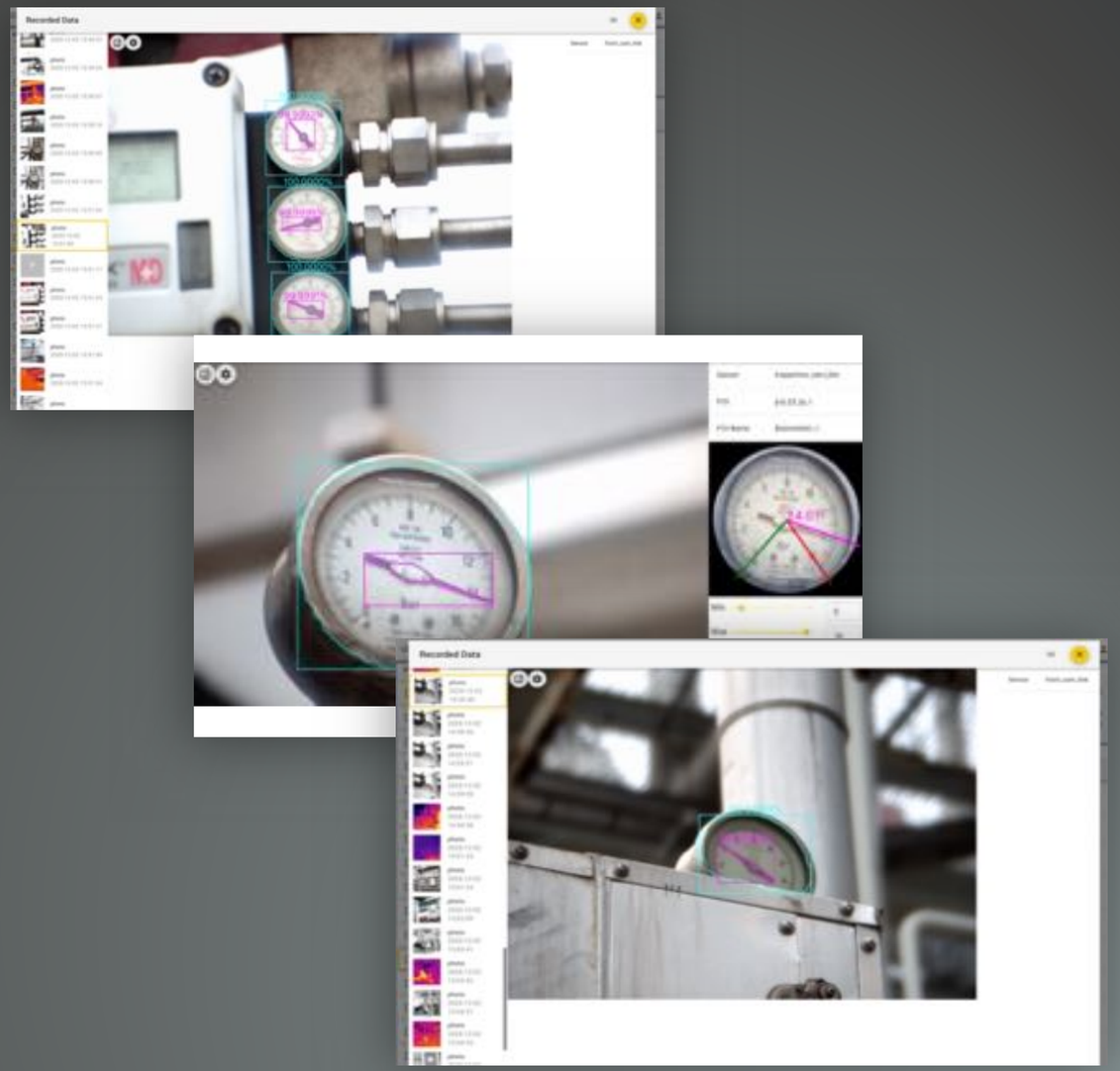
Skill : Read Gauges

Skill – What we can do?
Read out offline measurement devices

Solution – How we do it?
Using AI-based machine vision algorithms

Ease of Use
Comes pre-trained and covers most of the linear dials

Customer Value
Create actionable information out of the data.
Alerts can be raised based on min/max limits



Skill: Object detection & classification

Skill – What we can do?
Detect several objects for inspection or safety obstruction

Solution – How we do it?
Using AI-based machine vision algorithms

Ease of Use
Various vendors offer fire extinguisher, blinds, valves, fluid levels and other obstacles

Customer Value
Status of the plant and alerts on safety issues

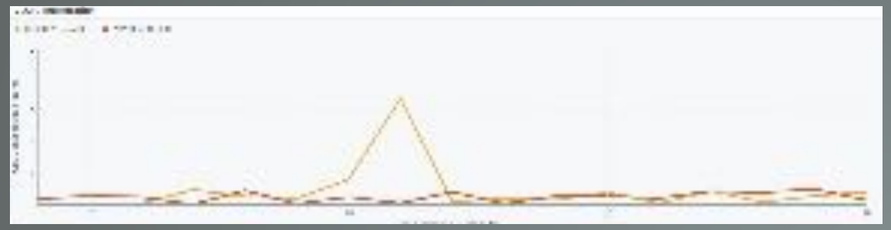
Skill: Emission detection

Task – What do we do?
Detect & measure different gases

Solution – How we do it?
Using onboard gas sensor and mapping the area

Ease of Use
Operator can enter threshold value

Customer Value
Have a historical map of emission exposure and locate small holes at a very early state



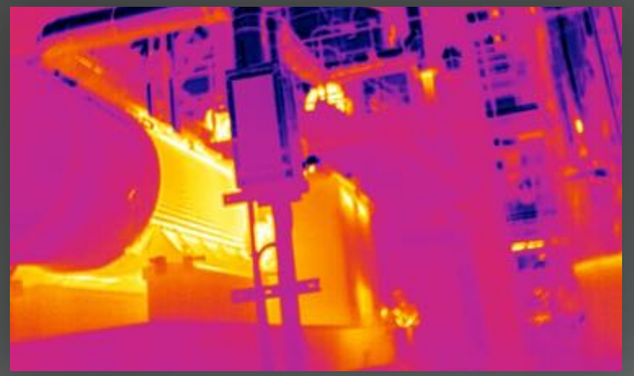
Skill: Detect thermal anomalies

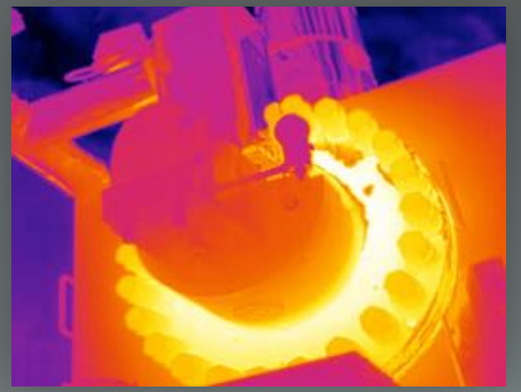
Skill – What we can do?
Detect & measure temperature changes over time

Solution – How we do it?
Using thermal camera and AI driven analysis

Ease of Use
See historical changes in the ER reporting

Customer Value
Understand the wear and tear of pumps and motors, inspect power-boxes





Skill: People Detection

Skill – What we can do?
Detect humans and equipment in image and videos

Solution – How we do it?
Using AI based machine vision algorithms

Ease of Use
Decide between various AI vendors or use the ER standard one

Customer Value
Presence of workers and their protective equipment. Act GDPR safe by design. Alert if man is down.

People Detection

Face Blurring

Personal Protective Equipment

Man Down

Addional information use cases

Use cases / Customers

Investigator

Permanently on location. Regularly performs investigative missions and collects all kind of data. Uses AI and ML to digitalize any analogue instruments at the plant. This information allows for improvements in the operational performance and maintenance, and also lowers costs.

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Emissions Detector

Permanently on location. Autonomously follows an orange line(s) daily. Includes gas detectors that send an alarm to the control room if gas is detected at a ppm level. Helps companies to reduce “fugitive emissions”.

REPSOL

woodside

Co-Operator

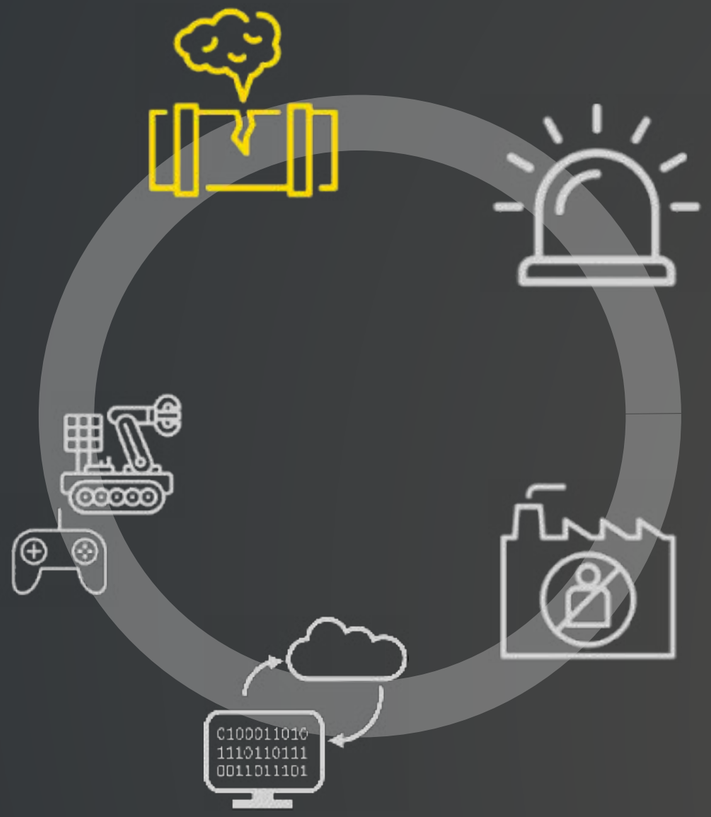
Permanently on location. Driven from the facility operator’s base. Acts as the eyes, ears and nose of the operator, especially in harsh, hazardous, or remote locations (e.g. unmanned in the Caspian islands in winter or in desert facilities).

PTTEP

DOW

AkerBP

Fugitive emissions



Use case / Problem to solve

Every year $30 billion of gas leaks into the environment!

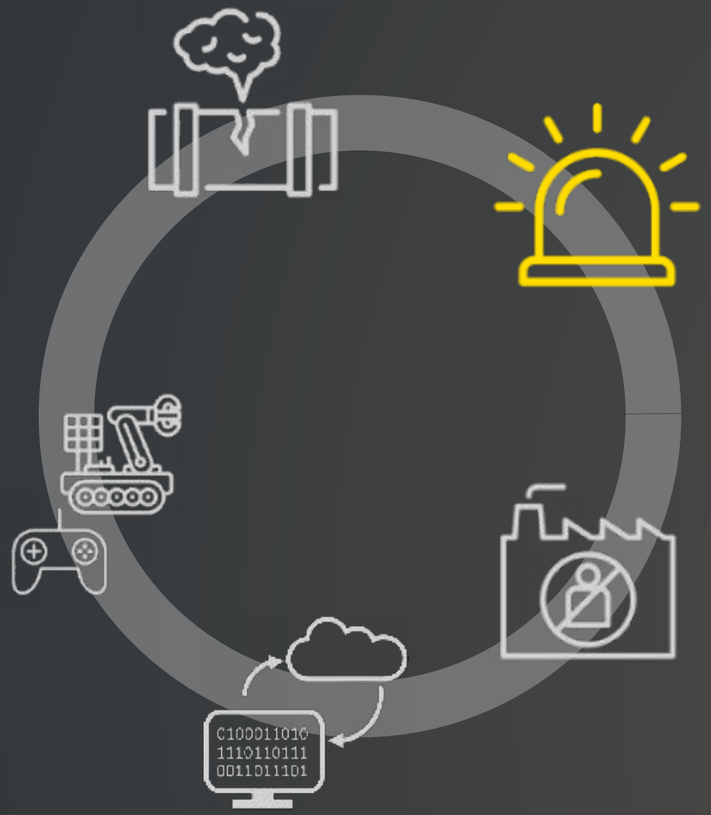
About 25% of methane emissions come from the oil & gas industry. In the United States, fugitive emissions from the oil and gas industry total an estimated 13 million metric tons per year, amounting to $2 billion in lost revenue. Globally, the value of leaking gas is $30 billion.

Asset owners are legally required to search for emissions. Furthermore, emissions could be an early warning of more serious leaks.

Our solution

The Emission detector is permanently on location and autonomously follows an daily inspection round. Includes gas detectors that send an alarm to the control room if gas is detected at a ppm level. Helps companies to reduce “fugitive emissions”.

Emergency responder



Use case / Problem to solve

Traditionally emergency response teams wearing breathing apparatus and protective clothing are required to inspect events such as gas leaks on well-heads.

Our first responder robot can be deployed from an emergency response truck and driven at short range using a pad controller.

It acts as the eyes, ears and nose of the emergency response team keeping them away from the hazard during the early phases of an investigation.

Our solution

Deployed from an emergency response truck & driven at short range. Acts as the eyes, ears & nose of the responders keeping them away from the hazard during the early phases of an investigation without triggering an explosion.

Normally unmanned facilities

Use case / Problem to solve

Customers are increasingly moving towards normally or minimally unmanned facilities to cut development and operating costs.

Sometimes these facilities are very remote, harsh, or hazardous and fixed instruments cannot be installed to cover all eventualities.

In these situations, a robot can act as the eyes, ears and nose of a human driver that is located in a comfortable control room many (sometimes thousands of) kilometres away.

Our solution

Permanently on location. Driven from the facility operator's base. Acts as the eyes, ears and nose of the operator, especially in harsh, hazardous, or remote locations (e.g. unmanned in the Caspian islands in winter or in desert facilities).

Digitalization

Use case / Problem to solve

How to connect you brown field plant?

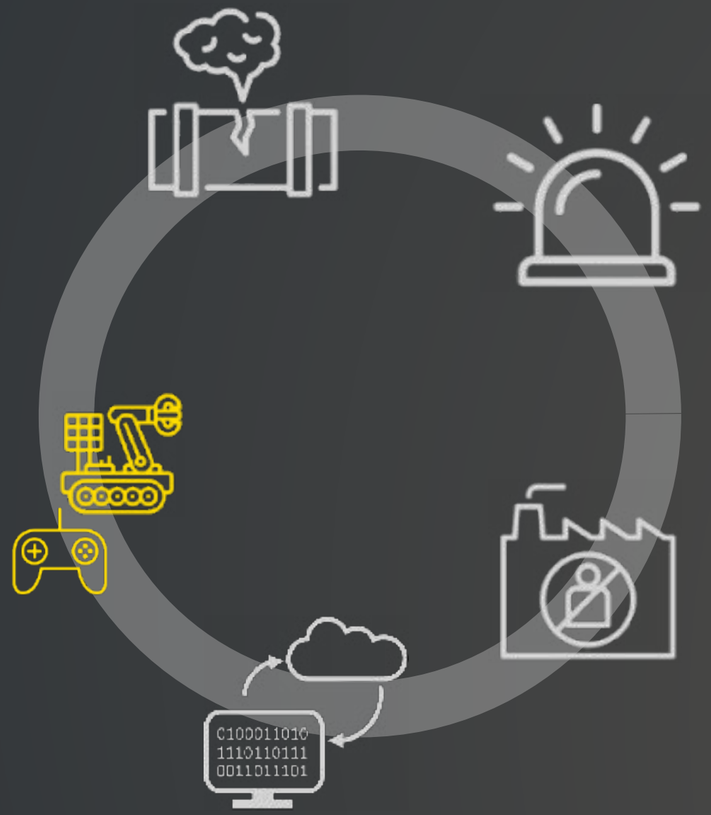
Brown field plants with a lot of analogue meters can be digitalized very simply.

It is actually cheaper to install a robot that can read and convert analogue information in a plant than to replace all the analogue meters/gauges.

Our solution

Permanently on location. Regularly performs investigative missions and collects all kind of data. Uses AI and ML to digitalize any analogue instruments at the plant. This information allows for improvements in the operational performance and maintenance, and also lowers costs.

Remote availability of experts



Use case / Problem to solve

During Covid some customer realized that it’s not always possible to ask a export to come to site. Travel restriction makes make it sometime hard to get to correct expertise on site.

Our solution

Permanently on location. Driven from any place on the World and share with any body on the world. Operators are able to show and hear possible issue.