CUSTOM

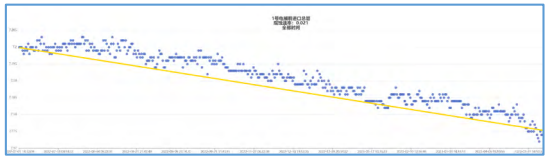
Combining Technologies
into Highly Efficient
Solutions

SKOR

KA-SKOR ELECTROMAGNETIC ULTRASONIC SOLUTION FOR CORROSION MANAGEMENT

PIPELINE CORROSION

OUR SOLUTION



PROBLEMS

- Difficult to lay a cable to a sensor
- Surface treatment needed to install a sensor
- Protective coatings of the pipe affect the measurement accuracy
- No warnings about critical pipe condition
- No online monitoring
- No historical data for predictive analytics
- No corrosion rate calculations

PIPELINE CORROSION. YOUR BENEFITS

REDUCTION OF PRODUCTION STOPS AND PRODUCT LOSSES

- Eliminated corrosion-related incidents (up to 18% of all the pipe incidents, as per Emerson)
- Convenient sensor installation, dismantlement, and relocation without stopping operations

INCREASE OF THE PERSONNEL EFFICIENCY

- Reduced time for sensor installation by 50-70%
- Simplified sensor installation - no surface treatment required
- Reduced time spent by staff on pipe monitoring and data acquisition

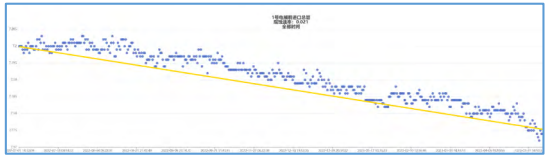
INCREASE OF YOUR SITUATIONAL AWARENESS

- On-line monitoring of the pipe conditions
- Wireless data transmission: LoRa, NB-IoT
- Improved transmission reliability and completeness of corrosion data

IMPROVEMENT OF YOUR MAINTENANCE PROCEDURES

- Precise thickness measurement, ±0,01 mm
- Up to 155 sensors in one system
- Predictive analytics on the pipe conditions
- Optimized sensor layout scheme and quick sensor relocation
- Possibility of the system rental or monitoring service

OUR SOLUTION



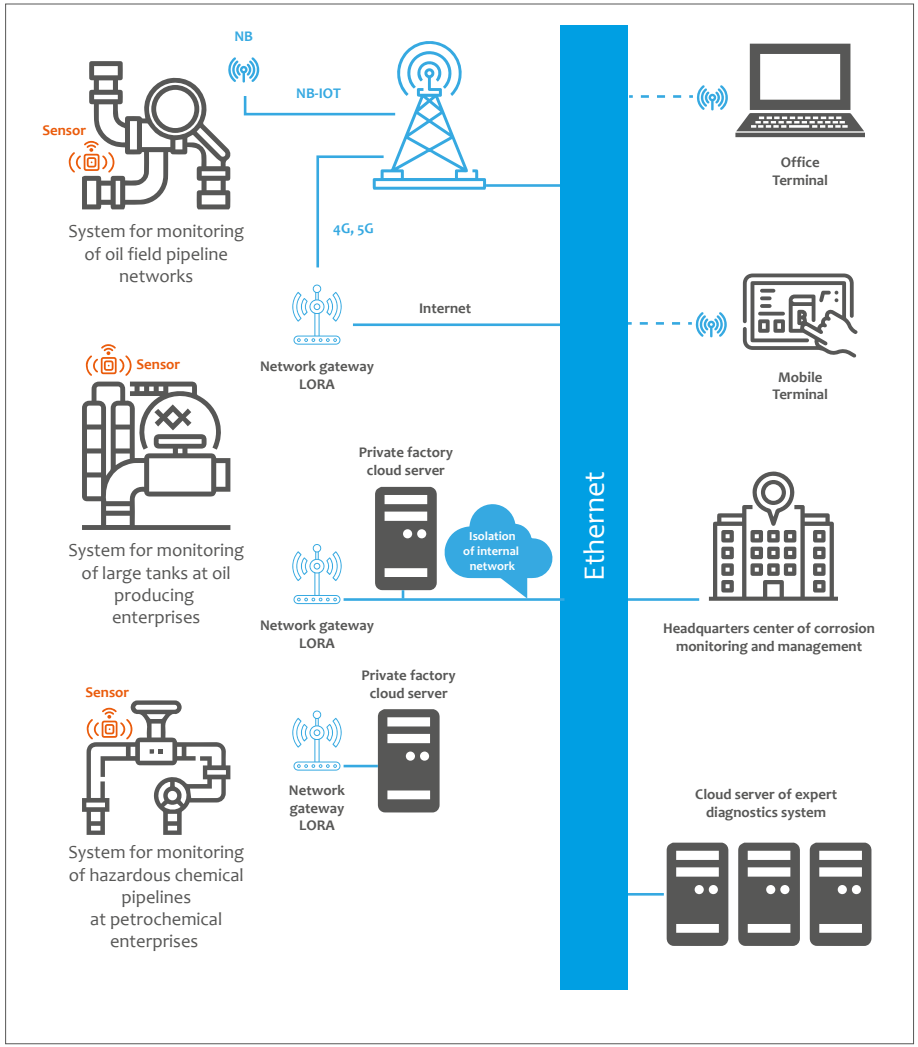
CORROSION MANAGEMENT SYSTEM

Electromagnetic Ultrasonic Corrosion Management System is designed to monitor the condition of pipelines made of steel or other plain homogeneous metals and manage corrosive and erosive processes in the real-time mode.

System continuously monitors pipeline damages using sensors installed on it.

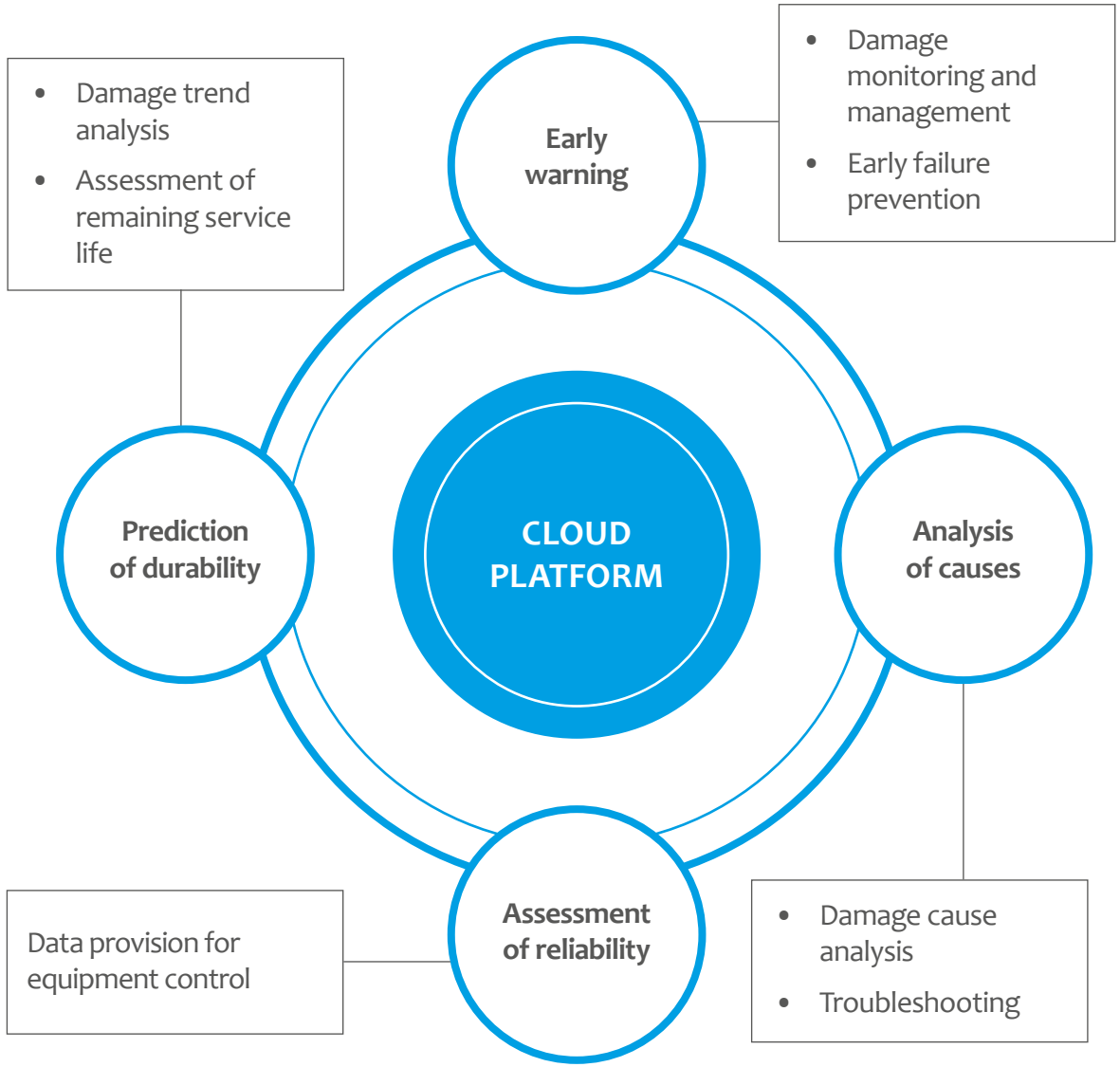
FUNCTIONAL PECULIARITIES

- **High accuracy of damage measurement** allows to improve situational awareness
- **Wide operating temperature range** allows to monitor different media
- **Low requirements to surface quality** allows fast and efficient sensor installation
- **Wireless data acquisition** allows to install sensors in hard-to-reach places
- **Long-term data storage** allows to prevent accidents and improve risk assessment through preventive analytics calculations



ONLINE MONITORING CLOUD PLATFORM

- The system follows modern trends of Internet of Things, Big Data, and Artificial Intelligence
- The system is based on a high-tech electromagnetic ultrasonic measurement of corrosion.
- The system monitors corrosion in key areas and improves safety of the pipeline operation.



ELECTROMAGNETIC ULTRASONIC CORROSION SENSOR FOR PIPELINES

The key component of the technology is an electromagnetic ultrasonic sensor; it consists of three parts: winding, a permanent magnet, and a test sample.

During operation, a high-frequency transient impulse current runs through the winding. The current induces eddy currents inside the metal sample. The eddy currents are impacted by the permanent magnet and create Lorentz force. The Lorentz force excites an ultrasonic wave. Ultrasonic waves disperse through the sample and reflected from the defects, damages or end surfaces of the sample.

Analysis of the reflected or transmitted ultrasonic signals allows to measure and assess the sample damage parameters.

SENSORS AND THEIR INSTALLATION

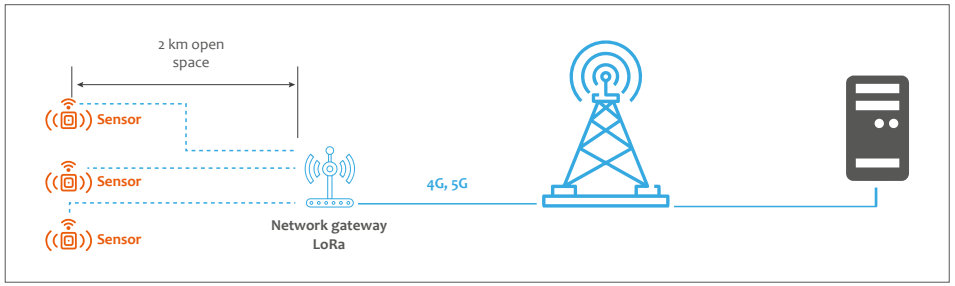
Sensors are the foundation of monitoring of industrial equipment; they monitor key parts exposed to the highest risks, as well as regular large industrial equipment.

The sensor isfixed on the pipe with clamps.

NETWORK ARRANGEMENT OPTION

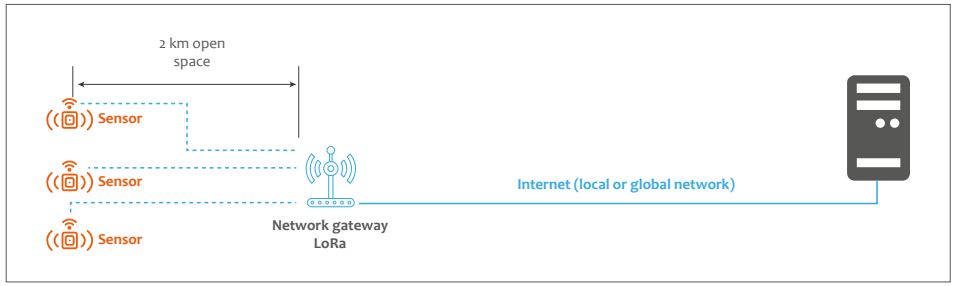
LoRa NETWORK ARRANGEMENT

Connection to the cloud-based server: the sensor is installed on the pipe and powered by a battery. The sensor transmits data to the network gateway. The gateway transmits data to the cloud-based server using a network cable or 4G. The data collected on the server can be accessed with a cell phone or a PC.



LoRa network arrangement option (cloud-based server)

Connection to the on-premise server: the sensor is installed on the pipe and powered by a battery. The sensor transmits data to the network gateway; the gateway connects to the on-premise server through a network cable. The data collected on the on-premise server can be accessed from a local PC.

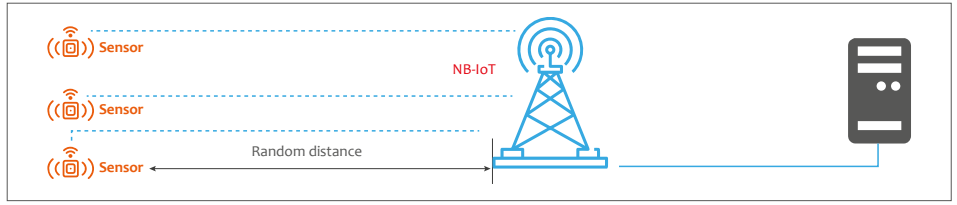


LoRa network arrangement option (on-premise server)

NB-IoT NETWORK ARRANGEMENT

The sensor is installed on the pipe and powered by a battery. The sensor transmits data to the server through NB-IoT. The data collected by the server can be accessed with a cell phone or a PC.

No network gateway required; agile roll-out; suits for rolling-out within relatively limited territories.



NB-IoT network arrangement option

SERVER SOFTWARE

Server software can be cloud-based or on-premise; communication with the sensor can be wireless. You can set flexible intervals for sampling by the sensor, flexibly control sensors, store and display data, calculate corrosion rate.

The server software is equipped with a multi-user role setting function, with users having different access rights; this aligns management practices between the headquarters and branches.

KEY BENEFITS OF ELECTROMAGNETIC ULTRASONIC CORROSION MONITORING

HIGH MEASUREMENT ACCURACY

- Precision up to ±0,01 mm
- Up to 155 sensors in one system

CONTACTLESS MEASUREMENT. NO RISK TO LOSE CONTACT WITH THE SENSOR

- Deviation in sensor inclination angle does not affect the wave distribution direction
- No obstruction from binders

NO SURFACE TREATMENT REQUIRED

- Acceptable to set up sensors on rough, oily, or rusty surfaces
- No need to polish surface from corrosion, paint, oil, etc.

CONVINIENT SENSOR DISMANTLEMENT AND RELOCATION

- No welding or other fixation methods. Only clamps
- Quick and easy relocation of monitoring points

WIDE OPERATING TEMPERATURE RANGE

- Range -200... +300 °C
- Almost every pipe of your enterprise could be measured

VARIOUS TYPES OF SOUND WAVES TO DETECT VARIOUS DEFECTS

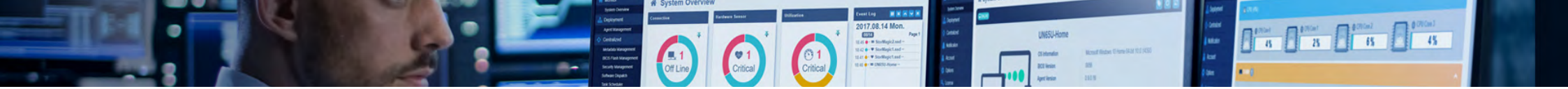
- Different sensor configurations for different sound waves
- Could be used for different measurement requirements

WIRELESS DATA TRANSMISSION

- LoRa or NB-IoT are possible
- Monitoring points are established in hard-to-reach places quickly and easily

LONG-TERM DATA STORAGE

- Predictive analytics of pipe conditions
- Corrosion rate calculation



KEY TECHNICAL PARAMETERS

Tested materials	Carbon steel, stainless steel, alloyed steel, copper, aluminium, and other conductive materials (note: parameters for different materials may vary significantly; readings for carbon steel are used as reference)
Sensor excitement	Electromagnetic ultrasound or waveguide rod
Measurement range	1.5–75.0 mm (note: customizable for larger range upon request; depends on properties of the tested materials, sound attenuation factor, surface properties and other aspects)
Channels	Unilateral channel
Precision	0.01 mm
Minimum visible resolution	0.001 mm
Surface treatment	Electromagnetic ultrasound does not require cleaning, rust removal, paint removal, contact inspection.
Installation without operation interruption	Clamp fixture allows to install the sensor without interrupting the operation
Minimum diameter (curve) of the treated part	DN20
Excitation of electromagnetic ultrasonic sensor	Permanent magnet
Type of sound waves	Electromagnetic ultrasonic distortion (transverse) wave.
High temperature compensation	Automatic compensation of sound speed at high temperature
Communication	NB-IOT, no intermediary gateway relay, wide coverage (note: if there is no NB-IoT coverage in the area, opt for LoRa)
Network gateway	No need
Communication range	Coverage areas of NB-IoT operators' basic stations
Sensor operating temperature range	-200... 300 °C or -200... 600 °C (waveguide rod)
Housing protection degree	IP68 (water depth 1.5 m, duration 1.5 h)
Explosion protection certification degree	Ex d mb nA IIB T4 Gc or Ex ia IIC T4 Gc
Ambient air temperature	-40...+50 °C. (-60 °C with thermal shields)
Battery service life	3-5 years (depends on sampling frequency, ambient air temperature, etc.), replaceable battery; 5-10 years at ambient air temperature above 0 °C
Server	On-premise or cloud-based server
Server software	Monitoring point management, data collection, corrosion rate calculation, other functions; connection to cloud-based server, remote access with a PC or a cell phone.

LIST OF MAJOR COMPLETED PROJECTS

Dec 2024

Country	CUSTOMER NAME	PROJECT NAME	TOTAL ORDER VALUE (US$)	YEAR
Russia	Rosneft, Yuganskneftegaz	Electromagnetic Ultrasonic Corrosion Monitoring System	118 500	2024
China	PetroChina Company Limited, Changqing Oilfield Branch, First Gas Production Plant	Ultrasonic online corrosion monitoring services for the first and second purification plants	127 200	2023
China	Xinjiang East Hope New Energy Company Ltd.	The second phase of the high-temperature online thickness measurement instrument for the hydrogenation workshop at Zhuneng	74 300	2023
China	Shandong Taiyang Special Equipment Inspection Technology Co., Ltd.	Corrosion Online Monitoring Equipment	68 600	2023
China	Shanghai Yuanke Mechanical & Electrical Technology Co., Ltd.	Electromagnetic Ultrasonic Corrosion Monitoring System	28 600	2023
China	PetroChina Company Limited, Jilin Oilfield Branch, Xinmu Oil Production Plant	Steel Pipeline Integrity and Corrosion Monitoring Technical Services	106 600	2022
China	PetroChina Company Limited, Dagang Petrochemical Branch	Online Corrosion Monitoring Technical Services for 10 Pressure Vessels and Their Associated Pipelines	64 600	2022
China	Xinjiang Yuehang Shuzhi Technology Co., Ltd.	Electromagnetic Ultrasonic Corrosion Monitoring System	19 300	2022

We offer you mutually beneficial cooperation and customized approach

CUSTOM

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