

2nd Energy Technology Forum, Athens, Greece, 25/11/2017

Oil & Gas Pipeline Security and Predictive Maintenance: an LRU Structural Health Monitoring approach

Προστασία αγωγών υδρογονανθράκων και προγνωστική προσέγγιση στη συντήρησή τους: Συνεχής παρακολούθηση δομικής ευστάθειας με χρήση LRU.

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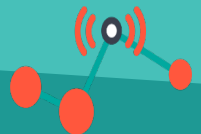


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Recent increase of importance of transmission pipelines in Europe

- Gas consumption in Europe rose by 6% last year
- Increased demand in natural gas and lower rates of production within Europe has led to high investments in the construction of pipelines
- Under Construction: Trans Adriatic, Ionian Adriatic, East Med, Poseidon
- Connectors: IGB, IBR, ITB, IBS, IRH
- German transmission system operators alone are investing over €4 billion according to grid development plans for the period 2016-2026

Costs of protection and safety cannot be spared



Need for an integrated approach to monitoring the Structural Health of the pipelines among other HSE concerns

- Growth of Pipeline Network increases demand for higher security
- Precision planning in maintenance work can reduce its associated cost
- Integration of non-destructive testing and structural integrity (SI) assessment can improve safety assurance
- Data fusion and integration of data with other Structural Integrity Methods in remote monitoring can provide a better model for detection of anomalies in the structure before they can become critical fault



Industry 4.0 and predictive maintenance

- ❑ 3rd Industrial revolution :extensive use of controls, IT and Electronics for an automated and high productivity environment

- ❑ Industry 4.0: Cyber-Physical production Systems
 - ❑ integration of virtual and physical sub-systems by incorporation of
 - Industrial Internet of Things,
 - Cloud computing,
 - Wireless Intelligence and
 - Big Data
 - in Sustainable Manufacturing and Lifecycle Assessment.



Industry 4.0 and predictive maintenance

Industry 4.0 Disrupting NDT

Key Technological Pillars of Industry 4.0



Cloud Computing



Industrial Internet of Things



Robotics

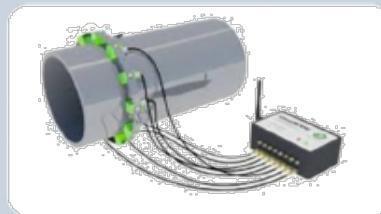


Big Data Analytics

Transformational Implications



Smart Inspection



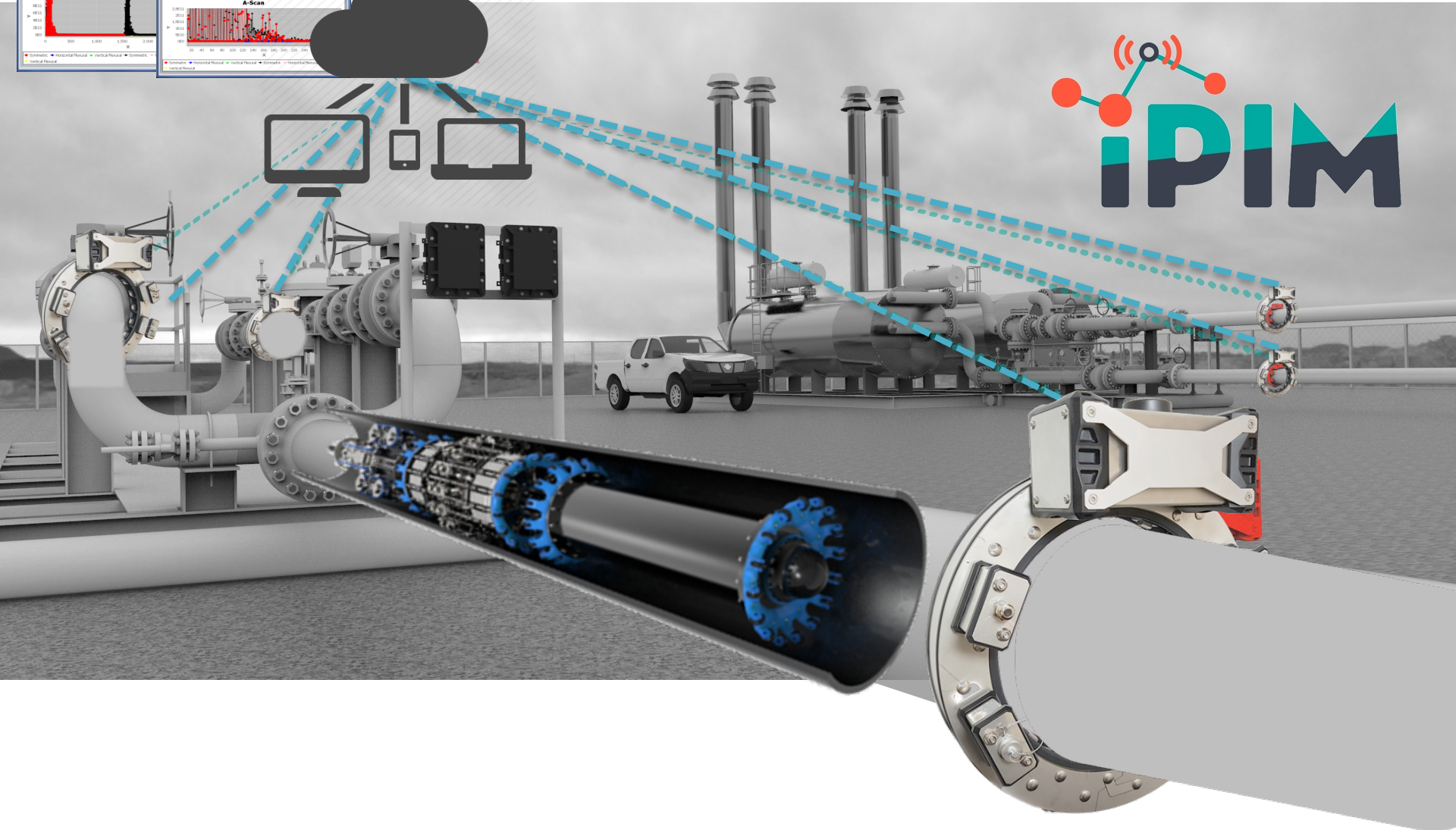
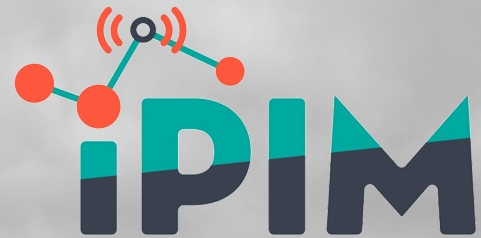
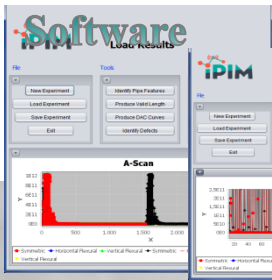
Permanent Monitoring



NDT Inspection Services 2.0



PIANSO™



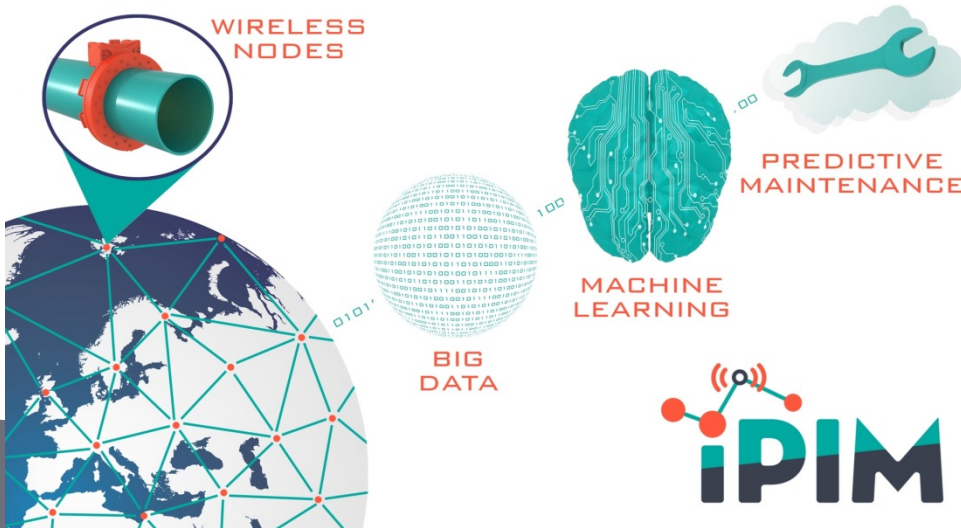
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How will the iPIM system achieve predictive maintenance

- Permanent monitoring
- Detecting fault change over time
- Rate of corrosion progress
- Mapping of fault position and expansion

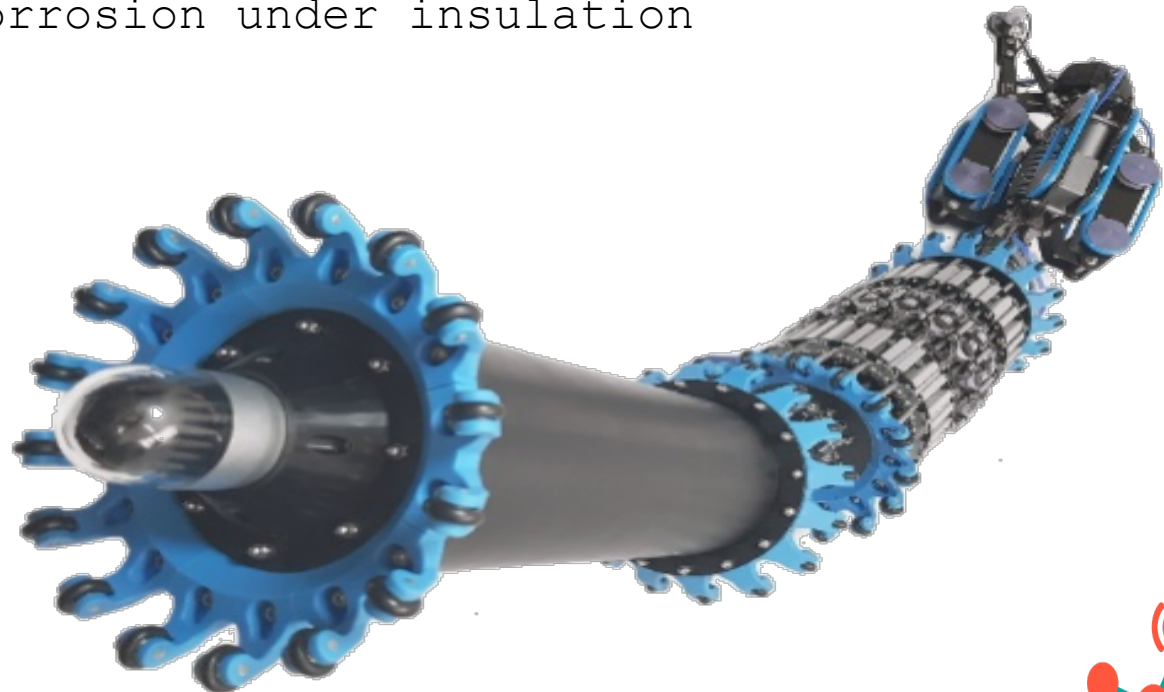
BENEFITS

- Increased accuracy in the detection and evaluation of defects in pipelines.
- Accurate maintenance planning: reducing cost
- Decrease in the probability of pipeline failure.
- Reduced excavation and other related cost .



Additional advantages of LRU Guided Waves

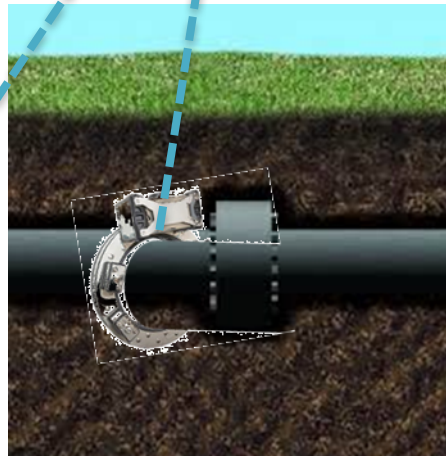
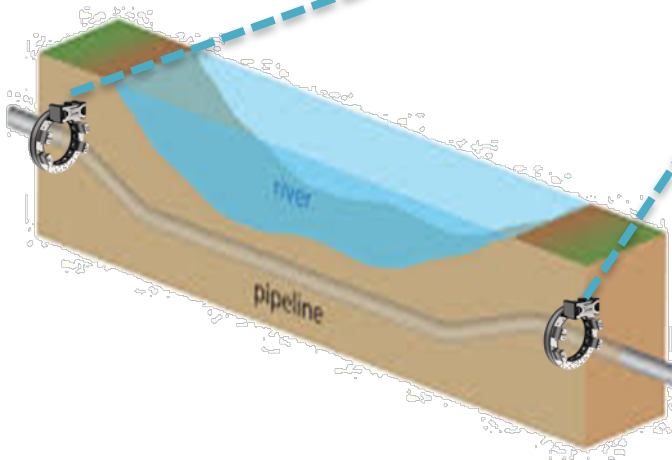
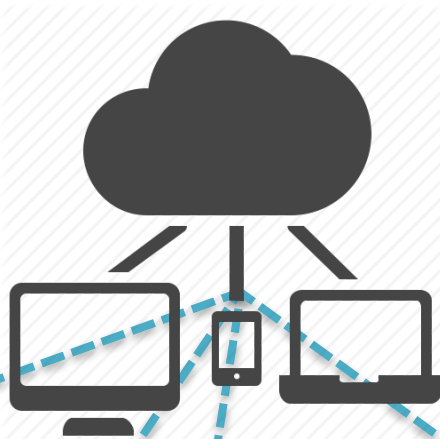
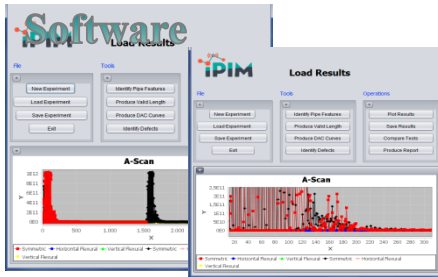
- Discriminate between flaws and pipe features; welds bends, supports
- Corrosion detection in-service pipes and pipelines
- Geometry
- Detection of anomalies at welds, supports and pipe racks.
- Detection of corrosion under insulation



Use Cases

- Road , rail, river crossing etc.
- Buried feature
- Unpiggable buried pipeline

PIANSO™



Way forward

- ❑ Development of solutions that were never before possible: enabled by ICT evolution
- ❑ Applications are available in many sectors of the Energy Industry, one of which is safety assurance and protection of the communities and the environment
- ❑ Making the most of these developments in technology requires the interdisciplinary cooperation
- ❑ Greece has many capable companies in the sector of ICT that can contribute to this transition to the Industry 4.0 thereby taking part in the country's economic development and reversing the brain-drain process that has been taking place in the last decade.





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