Cyber Physical System based Proactive Collaborative Maintenance
ECSEL-2014-1 Project – MANTIS
Project number: 662189
“Maintenance is no longer a necessary evil that costs what it costs, but an important function that creates additional value in the business process”

“New business models with a stronger service orientation are seen as an instrument to react to the upcoming competition and future challenges”
Consortium

12 countries

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What is the life expectancy of an asset’s component or part?

How can I perform in depth root cause failure analysis on my process and equipment?

How can I optimize my maintenance plan?

How do I achieve optimal equipment efficiency and availability?

How can I predict an impending equipment failure and the cause?

How can I reduce unscheduled maintenance and its high costs?

How can I detect warranty issues sooner?
Objective

The main objective of MANTIS is to develop a Cyber Physical System-based Pro-active Maintenance Service Platform Architecture enabling Collaborative Maintenance Ecosystems
Objective

- Reduce the adverse impact of maintenance on productivity and costs
- Increase the availability of assets
- Reduce time required for maintenance tasks
- Improve the quality of the maintenance service and products
- Improve labor working conditions and maintenance performance
- Increase sustainability by preventing material loss (due to out-of-tolerance production)
Embedded solutions

- New sensing CPS to capture maintenance relevant/critical information
- Virtual Plug & Play
  - Easy to configure and deploy complex maintenance services
- Secure wireless solutions
  - Increasing the possibility to reach inaccessible places for a wired network
- Remote access that facilitate access to new geographic markets
- Distributed (local) decision making
- Connection to the Cloud enabling new capabilities for data aggregation and complex computing
- Distributed Big Data analysis with focus on critical data sources
Knowledge management

- For an enhanced advanced analytics methodology
  - Proactive asset maintenance
  - Root cause failure analysis
  - Remaining useful life identification
  - Simulation, prediction and scenario tools

- Information sources
  - Asset maintenance history
  - Condition monitoring
  - Inventory and purchasing transactions
  - Labor, craft, skills, certifications and calendars
  - Safety and regulatory requirements
  - ERP, sensors, CMMs, SCADA,…
  - New CPS will provide relevant/critical data/information
  - Simulations
Smart sensors and data acquisition technologies

Data sources (On-premises & Cloud)

Open Data | CRM | CMMS
MES | Geo Information | ERP

Communications in challenging environments

Analysis and decision making (Distributed & Cloud)

Analysis and decision making (Local)

Smart sensors

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Use cases

• Production asset maintenance will be validated in:
  – Shaver production plant
  – Pultrusion line
  – Press machine maintenance
  – Sheet metal working machinery
  – Compressor maintenance

• Vehicle maintenance management will be validated in:
  – Off-road and Special Purpose Vehicles
  – Railway systems

• Energy production asset management will be validated in:
  – Wind mills
  – Photovoltaic plants
  – Conventional energy production

• Health equipment maintenance will be validated in:
  – Health imaging systems

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Impact

• Competitiveness (C)
  – Reduction of unscheduled maintenance and its high costs
  – Optimised maintenance windows to reduce operating expense
  – Avoid unnecessary investments in redundancy
  – Minimise parts inventory
  – Increased equipment lifetime

• Assets Availability (A)
  – Unexpected failures reduction
  – Repair and overhaul time reduced
  – Improved reliability and uptime of assets
Impact

• Sustainability (S)
  – Lower energy and raw materials need
  – Lower CO2 footprint through full life cycle use and components re-use
  – Reduction in spare part consumption thus, smaller stock of spares
  – Increased plant safety
  – Work orders down
  – Efficient assignment of labour resources
  – More friendly and attractive working environments
  – Preparing the next generation of knowledge-workers
  – Improved competitiveness
  – Employment sustainability and new job creation based on new business models and opportunities
  – Stimulating societal cohesion by value added production instead of price competition
  – Increased life expectancy of ageing factories
  – Internationalisation opportunities
  – Key components re-use (rental or second-hand asset market)
Implementation

WP9 - Project management

WP2 - Service platform architecture development

WP3 - Smart sensing and data acquisition technologies

WP4 - Analysis and decision making functionalities

WP5 - HMI design and development

WP6 - Business impact and models

WP8 - Dissemination of knowledge and exploitation

WP7 - Validation of MANTIS solutions in relevant scenarios

WP1 - Service platform architecture requirement definition. Scenarios and use cases descriptions

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Thank you