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Session : 1.1

# Achieving predictive maintenance through decision support systems in the lift industry: The case of KLEEMANN

Ifigeneia N. Metaxa, Kostas Apostolou

R&D Engineer, Software Engineer

ATLANTIS Engineering S.A.

Alexandros Nizamis, Dimosthenis Ioannidis, Dimitrios Tzovaras

Research Associate, Senior Researcher, Director

CERTH/ITI

Theofilos Mastos, Angelos Papadopoulos

EU Project Management Associate, Group Health, Safety & Maintenance Manager

KLEEMANN S.A.

# Predictive Maintenance:
# Easier said than done… or not?

I.N. Metaxa

# Agenda

1. Introduction – Who we are
2. Challenge – What is the goal
3. Proposed Solution – How
4. Expected Results – What we anticipate as outcome

# 1 Introduction – Who we are

# The Team

- **ATLANTIS Engineering:** ICT SME leading maintenance in Greece+ since 1996, offering software (CMMS, DSS), consulting and training for Maintenance and Asset Management, aiming at the support of daily production activities in factories.
- **CERTH-ITI**: Specialised in the area of informatics & telecommunications. Leading research organisation in Europe.
- **KLEEMANN** operates in the manufacturing and the trading of complete lift systems. Multinational presence, Worldwide market player.

The COMPOSITION project, Ecosystem for Collaborative Manufacturing Processes – Intra- and Interfactory Integration and Automation, has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723145


# 2 Challenge – What is the goal

# The Challenge

## Scope

- Steps towards Industry 4.0, which includes Maintenance 4.0.

## What does this mean?

- Shift to predictive/prognostic strategies
- Simulate and predict faults
- Support real-time decision making with real-time data
- Easy-to-use, intuitive User Interfaces.

# 3 Proposed Solution – How

# The Process (1 of 2)

- Identify critical processes
- Identify critical machines
- Select machine(s) to monitor

→ *Machine(s)*

- Identify critical parameters
- Select parameter(s) to monitor, listen
- Install new sensors, if necessary

→ *Parameter(s)*

# The Process (2 of 2)

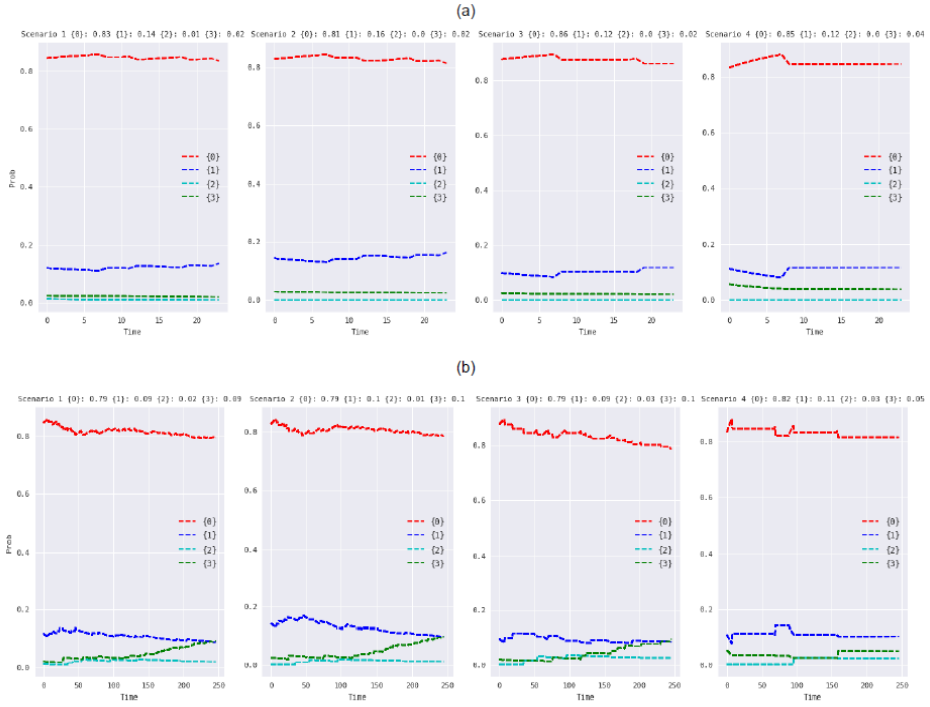
- Identify predictive/prognostic/simulation data processing techniques that may be suitable
- Select appropriate technique(s) to simulate faults, detect outliers, predict malfunctions

→ *Data processing technique(s)*

- Feed decision support system
- Fuse results from different techniques
- Apply rules, following also business objectives

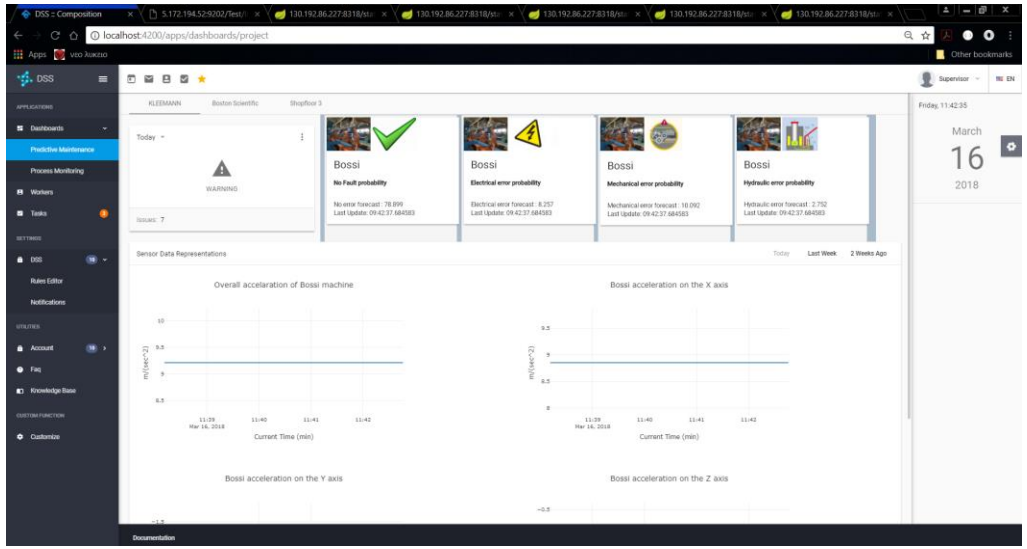
→ *Support decision making*

# The Specifics (1 of 2)




- *Machine*: Polishing pistons used in lifts
- *Parameter*: Vibration
- *Data processing techniques*:
  - Probabilities of Future Faults (PoFF), Local Outlier Factor etc.
  - Consideration of Digital Factory Model

# The Specifics (2 of 2)

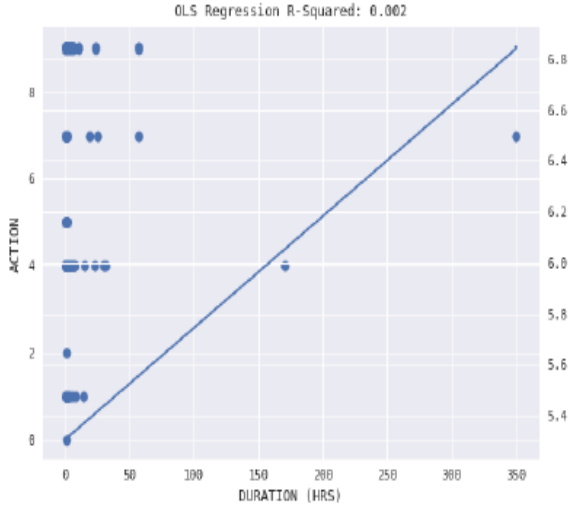


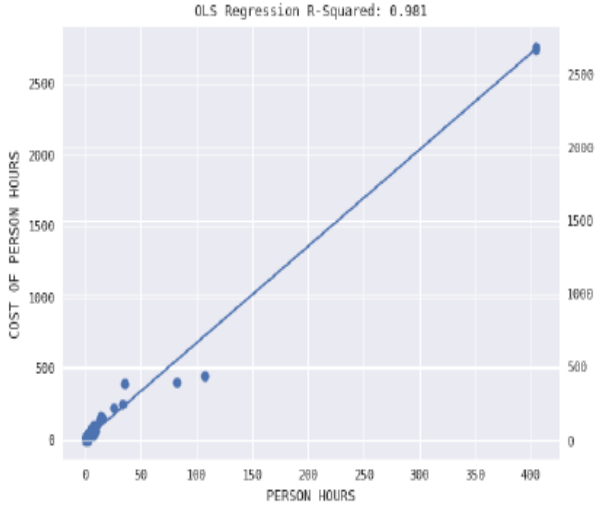

- ***Fusion***:

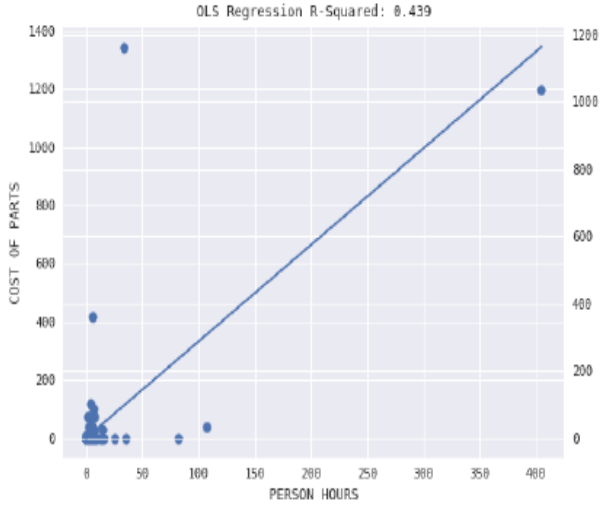
- Comparison of results of techniques to eliminate false positives and negatives,

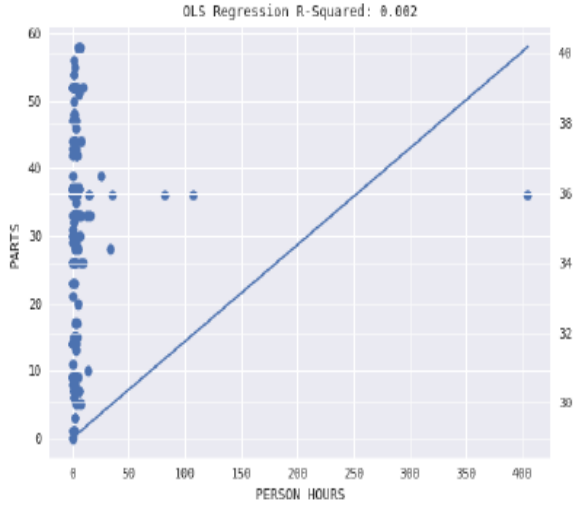
- Combination of real-time data from sensors and historical data from CMMS

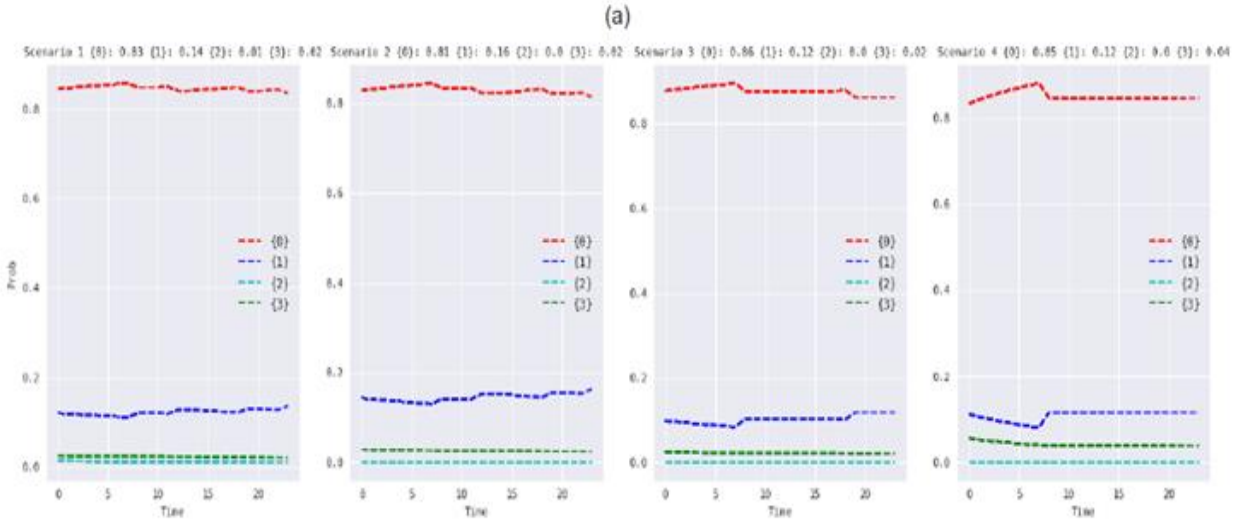
- ***Rule Engine***: State Machine method for DSS, Definition of states and transitions
- ***Real-time Decision Support***: Rise alerts, Notify appropriate personnel, Transfer actionable knowledge at shopfloor level

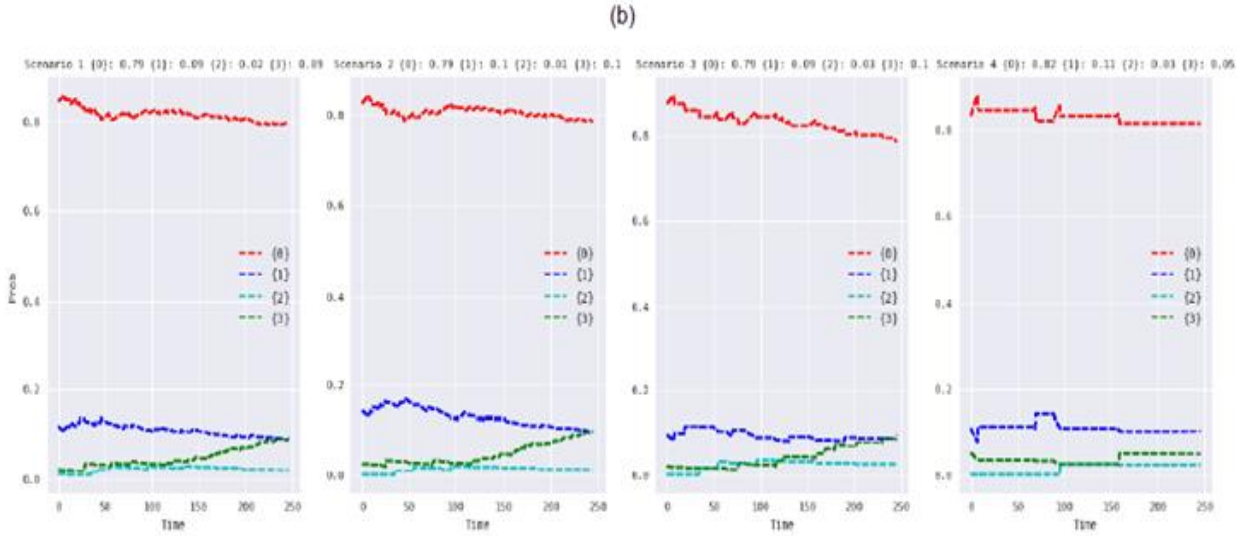



# 4 Expected Results – What we anticipate as outcome

# The Results

- *Already observed*
- 15% reduction in downtime
- Increase of MTBF

- *Anticipated*
- Reduction of MTTR
- 5% improvement in manufacturing quality
- Reduction in scrap and repair costs

# Maintenance 4.0  Predictive Maintenance

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## CONTACT


### Ifigeneia N. Metaxa

R&D Engineer

ATLANTIS Engineering S.A.

+30 2310 233 266

metaxa@abe.gr

### Dimosthenis Ioannidis, Alexandros Nizamis

Senior Researcher, Research Associate

CERTH/ITI

+30 2311 257 701

djoannid@iti.gr, alnizami@iti.gr

### Angelos Papadopoulos, Theofilos Mastos

Group Health, Safety & Maintenance Manager, EU Project Management Associate
KLEEMANN S.A.

+30 2341 038 100

ag.papadopoulos@kleemannlifts.com, t.mastos@kleemannlifts.com