



# Energy-SmartOps

Integrated Control and Operation of Process, Rotating Machinery and Electrical Equipment

## Towards optimal maintenance scheduling in process plants

Matteo Biondi, Dr. Guido Sand - ABB Corporate Research Center

Email: matteo.biondi@de.abb.com

### My project in SmartOps

Why is maintenance important:

- Performing maintenance jobs on processing plants traditionally requires shutting down parts of a plant for a period of time
  - Maintenance planning has an impact on the availability of a plant and on its overall efficiency
  - Start-up and shut-down of a unit for maintenance is usually a waste of energy and raw materials
- In processes where availability of the equipment is of key importance maintenance plans are optimized to minimize plant down times



### Methodology 1/2

Strategies under investigation

- Combination of preventive maintenance and corrective maintenance on a dynamic basis
- Integration of maintenance planning within production planning
- Dynamic maintenance planning under uncertainties
- Consideration of real time asset monitoring data in a dynamic maintenance planning framework

### Conclusions

- Maintenance scheduling is a well established research field in literature
  - Several researches (in particular the ones involving condition monitoring information) are looking towards a single asset maintenance
  - Optimization and mathematical programming technologies are rarely used in this field
- Target of the project is a technology prototype that can help maintenance engineers to take the right decision about maintenance planning in a relatively short time



### Problem statement

A range of strategies can be applied to perform maintenances:

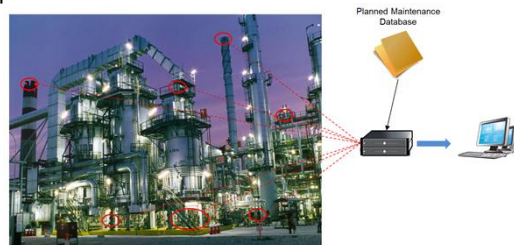
- On one hand, they can be executed on a predefined time interval base (Preventive maintenance – PM)
  - On the other hand, a system could be maintained only after a failure occurs (Corrective maintenance – CM)
- Between these two extremes, different strategies have been proposed to optimize the maintenance process
- ABB has high interest and is putting a lot of effort in this research area



### Methodology 2/2

System level

- An "optimal" maintenance strategy for a single asset may not give the best result at system level. An holistic approach (i.e. looking at the complete system, a functional area, ...) is needed to increase the performance



### Future Work

Use case definition:

- The selection of the best methodology for an optimal maintenance scheduling approach will be defined on the basis of the use case that will be identified and described

Concept demonstrator:

- A simple *demonstrator* will be developed to ease the explanation of the concept and identify strengths and weaknesses of the approach

