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PharmaTalk  
13th & 14th June, Berlin, Germany

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# INDUSTRY 4.0 AND TPM – HEADING TOWARDS REVOLUTION OR JUST EVOLUTIONAL IMPROVEMENT

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# AGENDA

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- What is Fraunhofer?
- Industry 4.0 – What's that all about?
- Fraunhofer TPM Model
- Use Industry 4.0 to improve your TPM process!
- Summary

# Fraunhofer-Gesellschaft



© Deutsches Museum

**Joseph von Fraunhofer** (1787 – 1826)  
Scientist, Inventor, Entrepreneur

- 67 institutes and independent research units in Germany
- More than 23,000 staff
- €2 billion annual research budget totaling



© Fraunhofer-Gesellschaft



"Fraunhofer lines"

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# THE FRAUNHOFER INSTITUTE FOR MATERIAL FLOW AND LOGISTICS IML

Dortmund, Germany

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# Topics of Fraunhofer IML

Process  
Optimization



Spare Parts  
Management



Master Data  
Management



Knowledge  
Management



Procurement and  
Warehousing  
Strategies



Cloud-Computing



Collaborative  
Inventory  
Management



Total Productive Management



Change  
Management

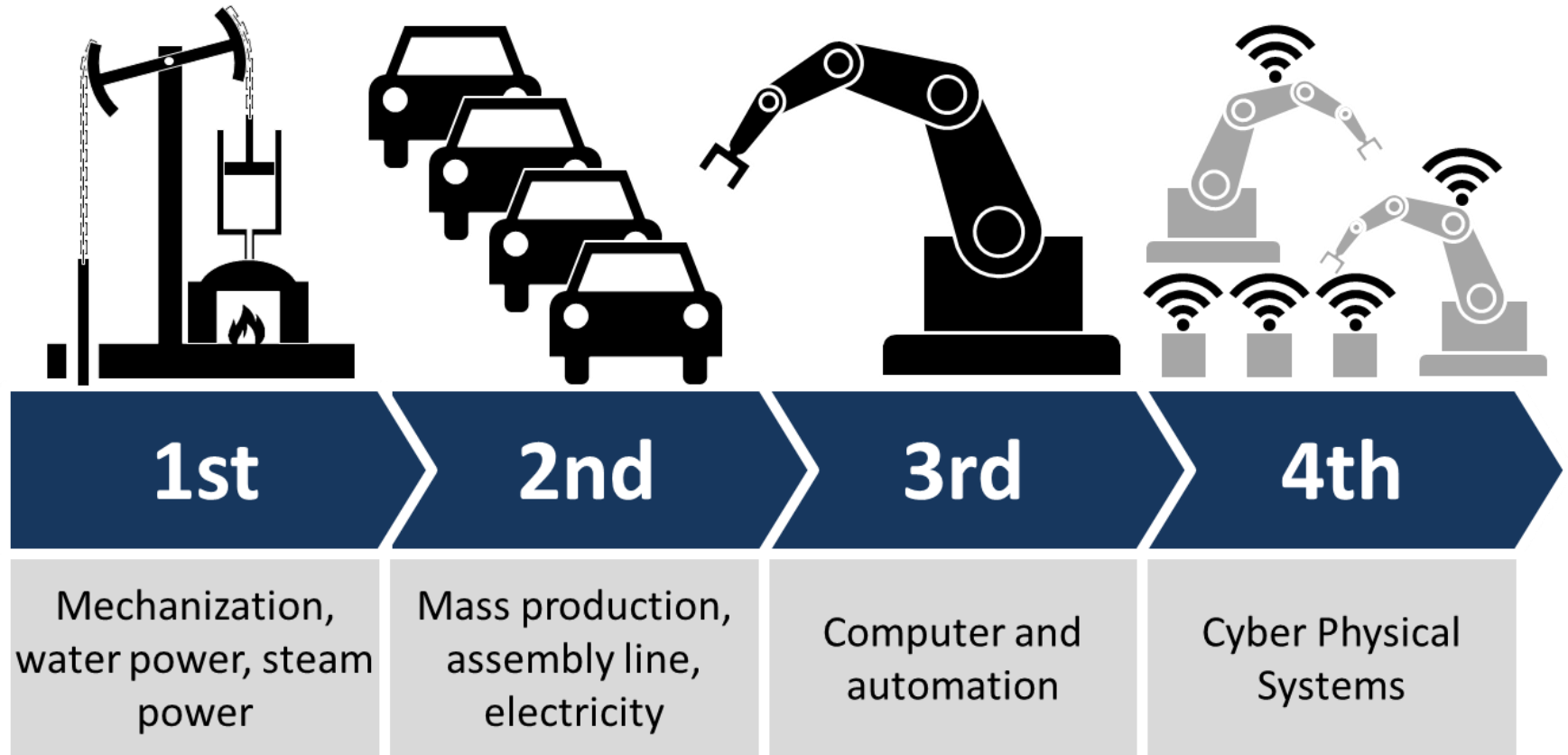
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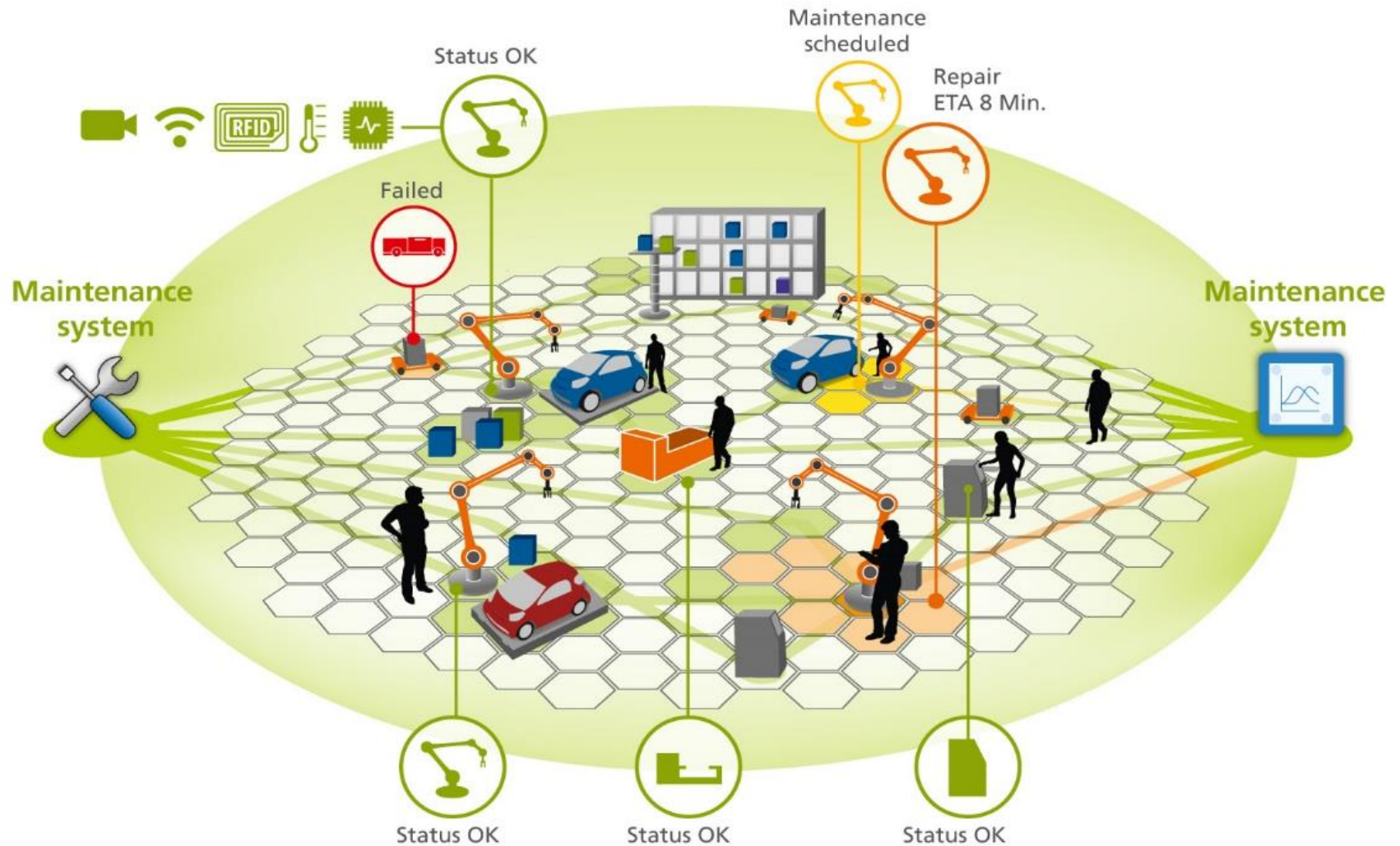
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# History of industrial revolutions





# Smart Factory and Smart Maintenance



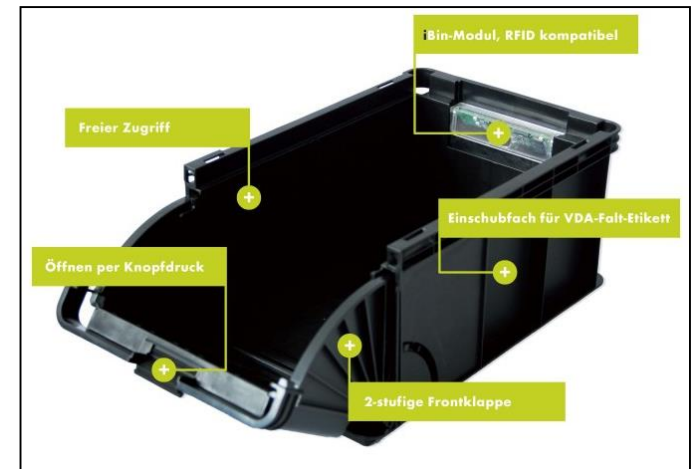
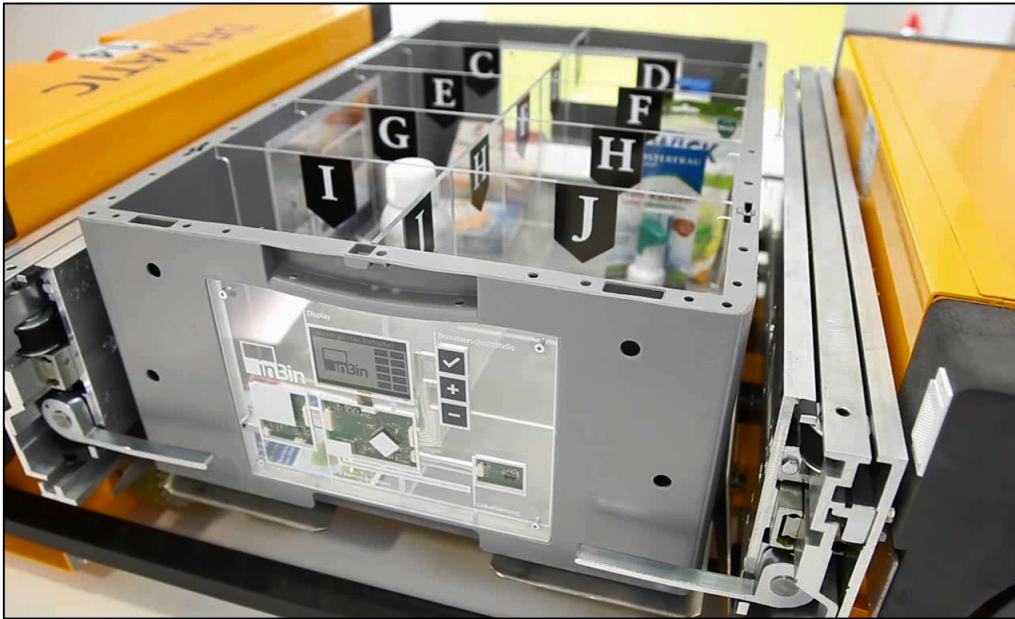


Industry 4.0: Content and application

## Example: Cellular Transport Systems (Swarm Intelligence)



## Example: inBin – The Intelligent Bin



# Automatization and Autonomization

Industry 4.0



full automatization of all  
physical processes

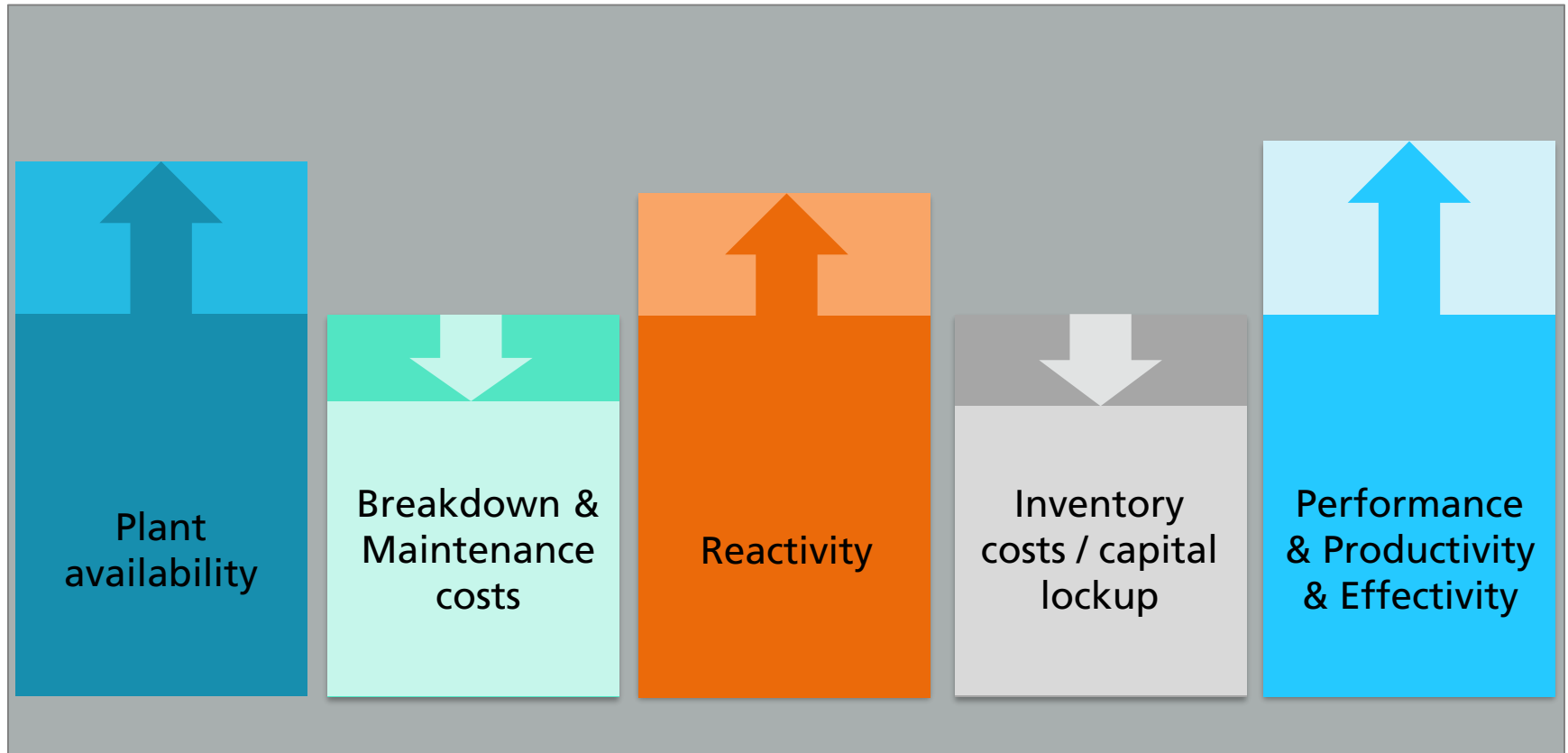
but

Industry 4.0



autonomization based on  
cyber physical systems

## Goals of Industry 4.0



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# Total Productive Management

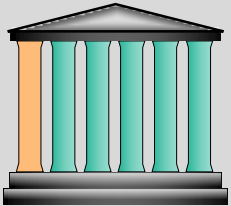
Everybody talks about it, ...  
but what exactly is TPM?

- TPM is a concept for comprehensive and continuous process optimization in the field of **production and maintenance for the entire lifecycle of a facility with direct participation of the whole staff.**

Best suitable processes  
The best plant availability  
Highly qualified employees

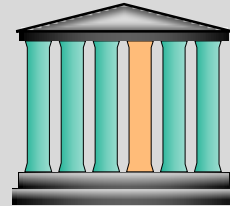


# The „TPM six pillar model“



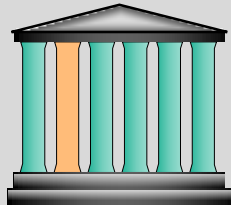
## Continuous Improvement

Together we will make it better



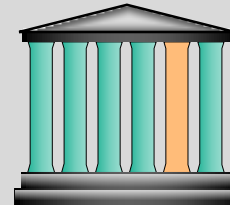
## Qualification

Build up and improve knowledge



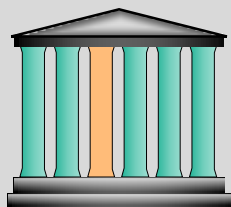
## Joint Production

Produce and maintain in a joint venture



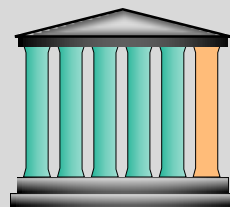
## Quality

Get an overview of your process and make it measurable



## Maintenance Strategy

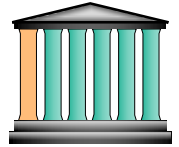
Select the most suitable strategy



## Lifecycle Management

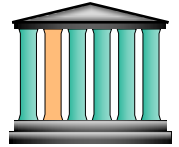
Focusing on production facilities and spare parts

# 1st Pillar: Continuous Improvement



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## 2nd Pillar: Joint Production

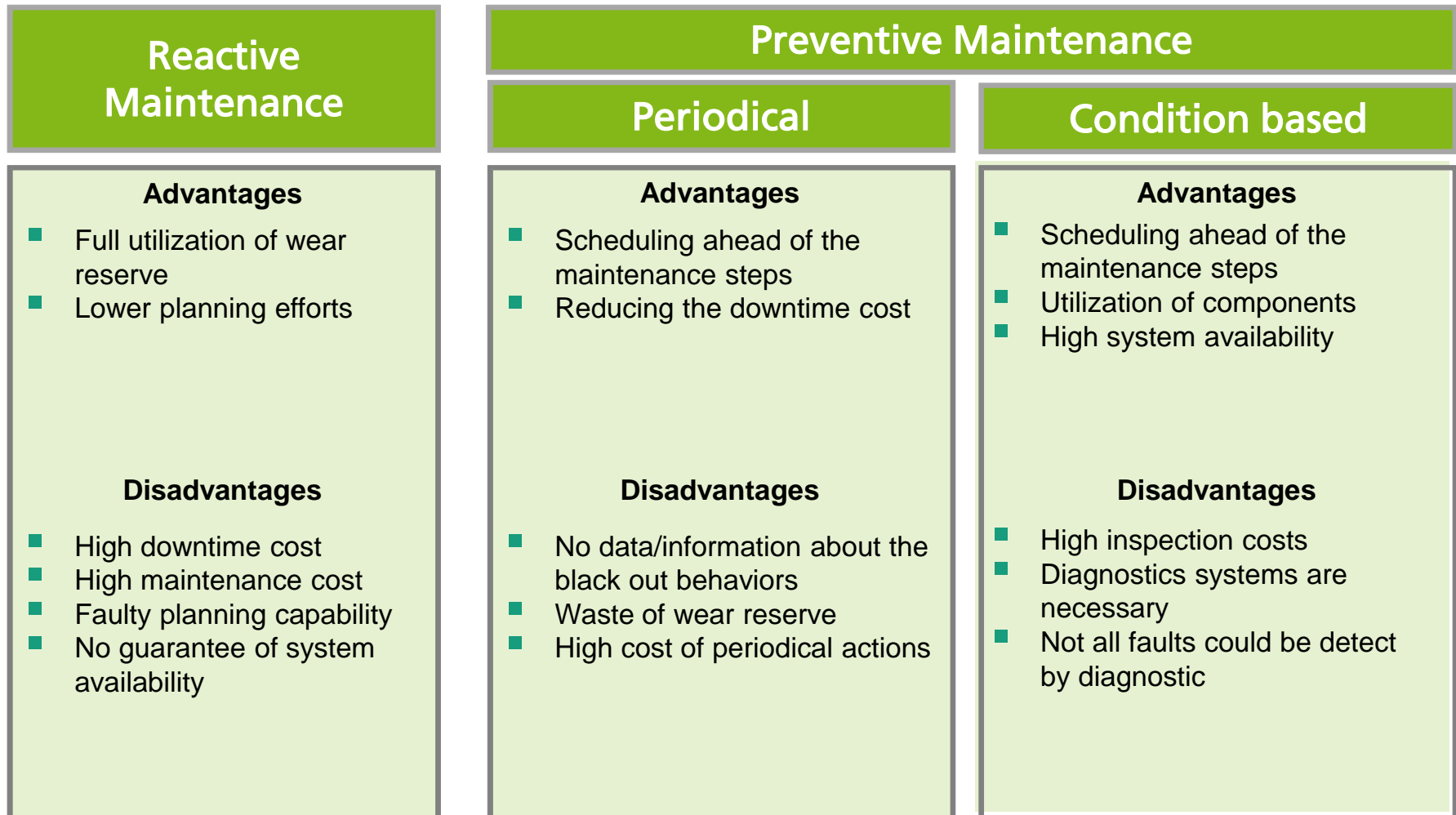
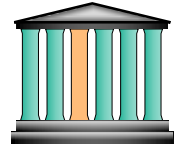


- Basic inspection
- Documentation is the first step to improvement
- Deficiency cards visualize malfunctions

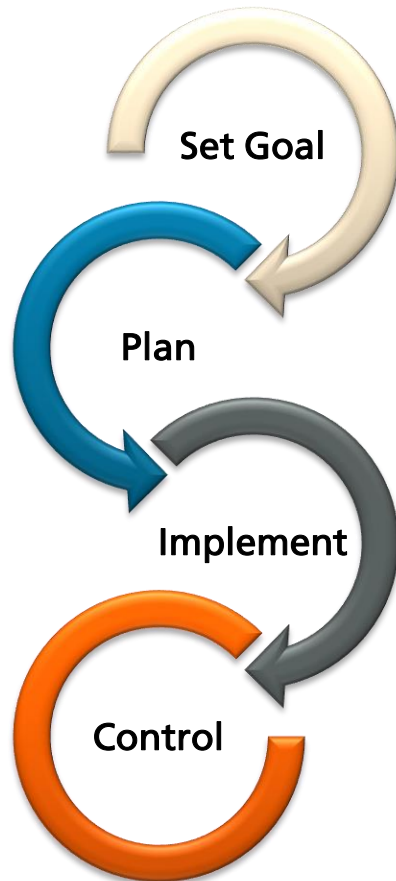
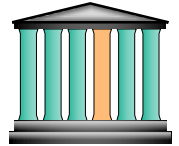
**Everybody sees  
deficiencies at first sight!**

**Deficiency cards**

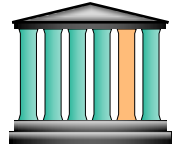
## 3rd Pillar: Maintenance Strategies



## 4th Pillar: Qualification



## 5th Pillar: Quality

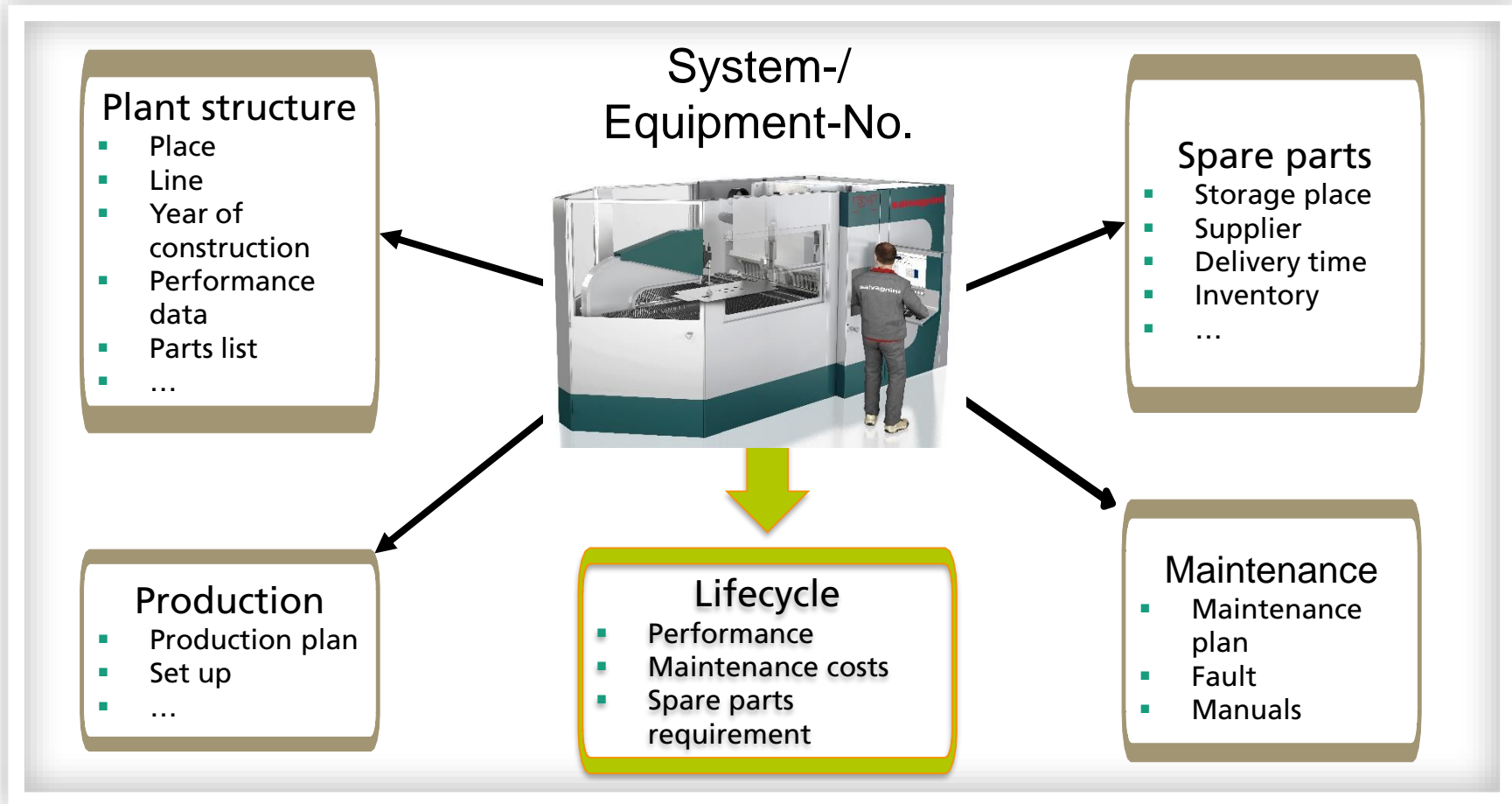
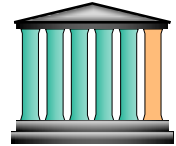


„You can only improve things that you can measure“

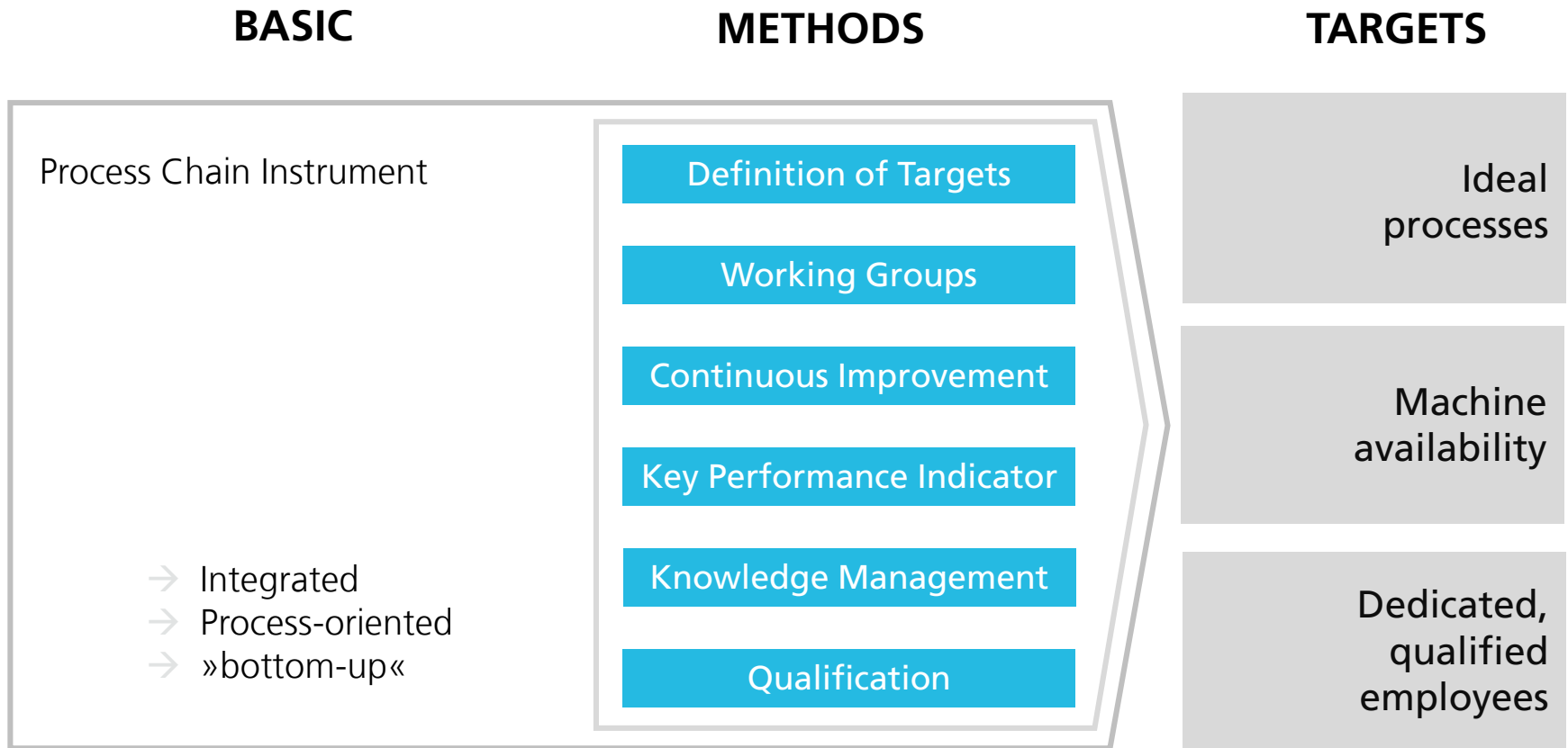
The base of Shopfloor-Management is visualization of the current situation



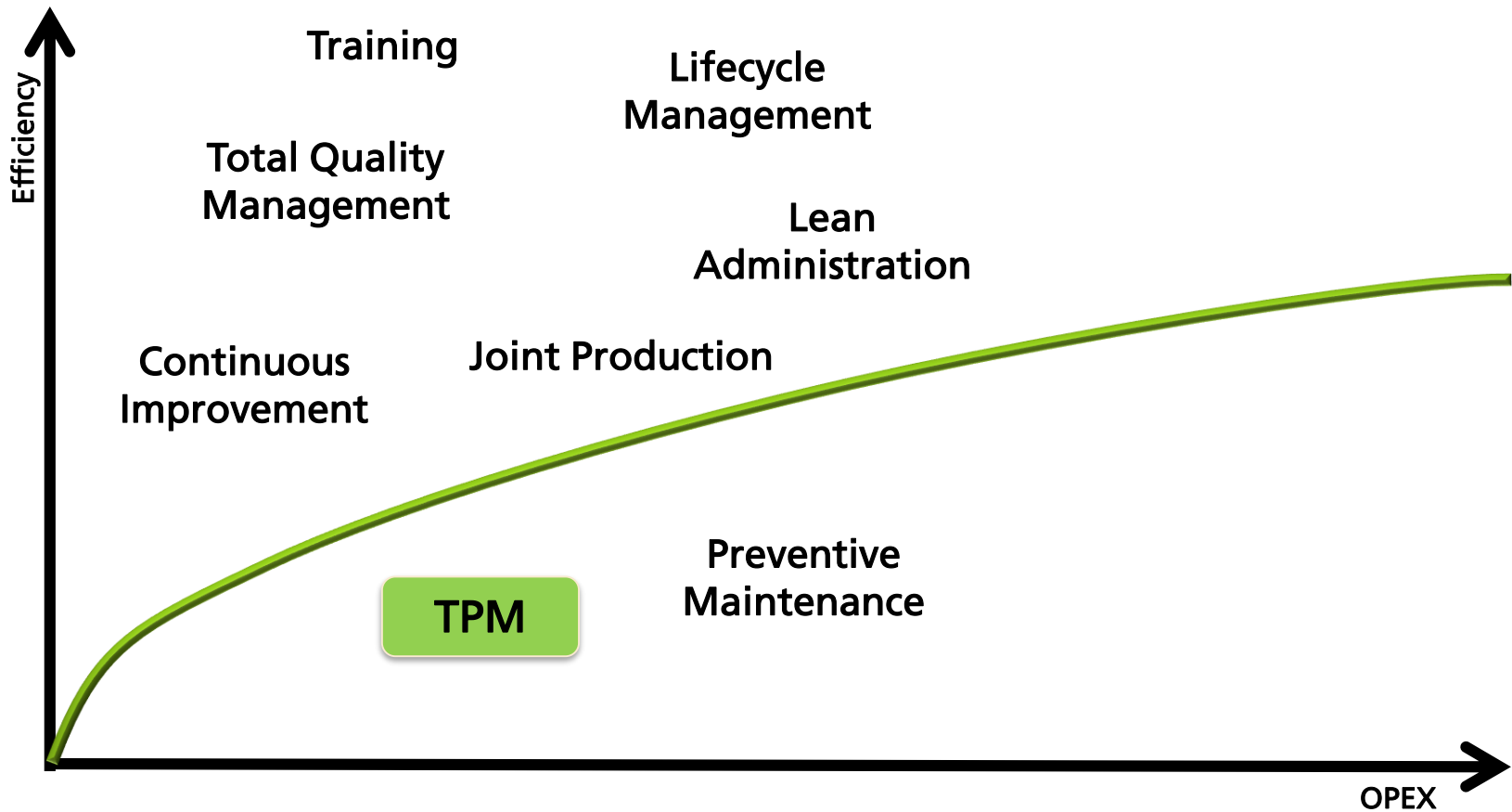
## 6th Pillar: Lifecycle Management



# TPM Summary



# Benefits of TPM



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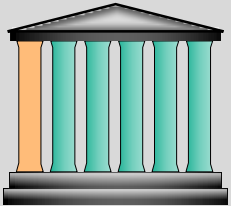
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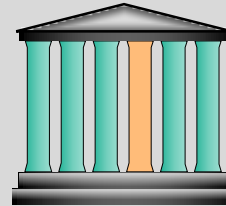
Use Industry 4.0 to improve your TPM process!

## These 6 pillars will improve your performance



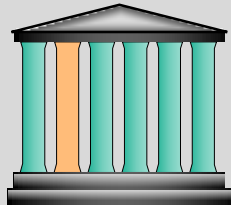
### **Continuous Improvement**

Together we will make it better



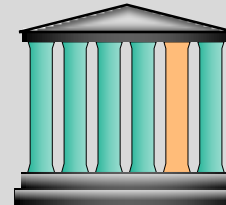
### **Qualification**

Build up and improve knowledge



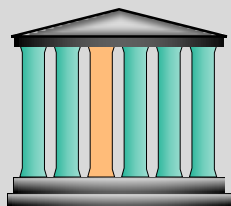
### **Joint Production**

Produce and maintain in a joint venture



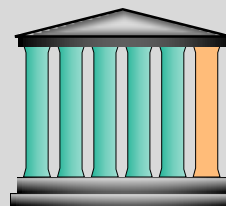
### **Quality**

Get an overview of your process and make it measurable



### **Maintenance Strategy**

Select the most suitable strategy

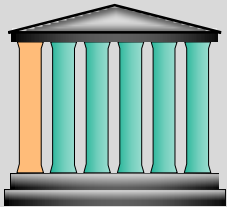


### **Lifecycle Management**

Focusing on production facilities and spare parts

# Use Industry 4.0 to improve your TPM process!

## Self organization of staff

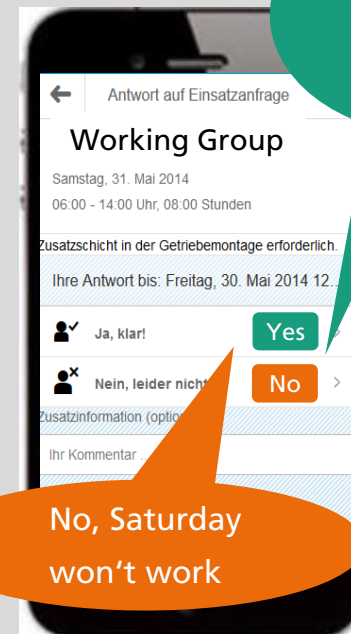


### Continuous Improvement

Together we will make it better



- Self-organized working groups are perfect for the Industry 4.0 concept of independence and autonomy



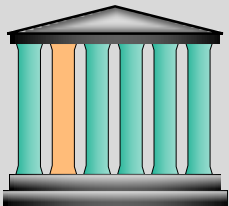
Coming to work!  
Saturday is ok for me

No, Saturday won't work

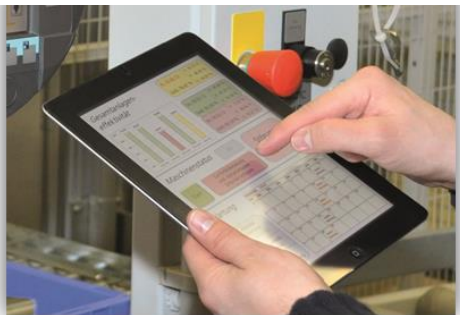


Use Industry 4.0 to improve your TPM process!

# Breaking down the walls between production and maintenance



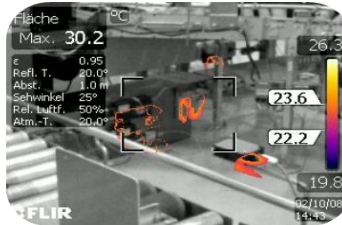
**Joint Production**  
Produce and maintain in  
a joint venture



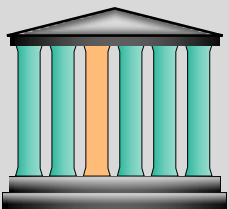
- Efficient work can only be achieved if production and maintenance staff work together
- Industry 4.0 technology can help to provide the necessary information for set up, repair and other activities
- Besides technology you also need a change process

Use Industry 4.0 to improve your TPM process!

## Find the right maintenance strategy with data integration



- Make use of Big Data to build up a useful information structure
- Integrate data from
  - Production planning
  - Operational data recording
  - Condition monitoring
  - History (e. g. standstills, faults etc.)
- Only data integration guarantees the choice of the optimal maintenance strategy



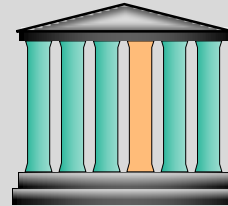
**Maintenance Strategy**  
Select the most suitable strategy



Use Industry 4.0 to improve your TPM process!

## New learning and training methods

- Knowledge on paper can not be shared or extended easily
- The employees' brains is not the correct location for data storage
- New technologies such as augmented or virtual reality are examples for new ways of sharing knowledge
- Make sure that knowledge is accessible to everybody in your company at any time
- Apply the right medium for the individual employee



### Qualification

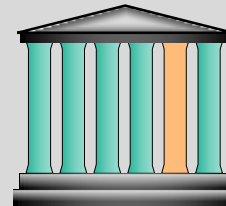
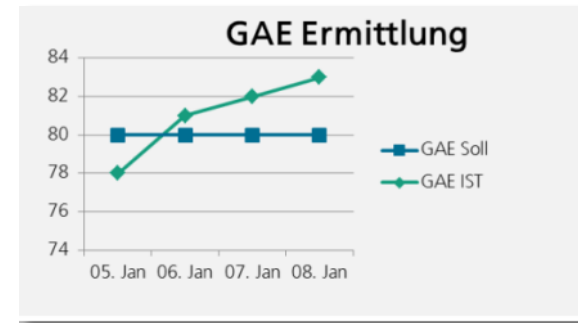
Build up and improve knowledge



Use Industry 4.0 to improve your TPM process!

## Improve your processes with new technologies

- New technologies give you an overview of the condition of your processes (product and machinery)
- A clear overview enables qualified decision making



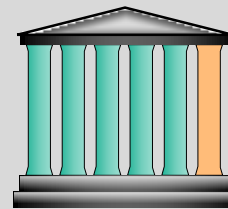
### Quality

Get an overview of your process and make it measurable

Use Industry 4.0 to improve your TPM process!

## Efficient Lifecycle Management with integrated information

- Decide about new machinery, retrofits or a higher stock of spare parts basing on profound information
- The key factor will be the interchange of relevant information and correct algorithms (Big Data)



**Lifecycle Management**  
Focusing on production  
facilities and spare parts

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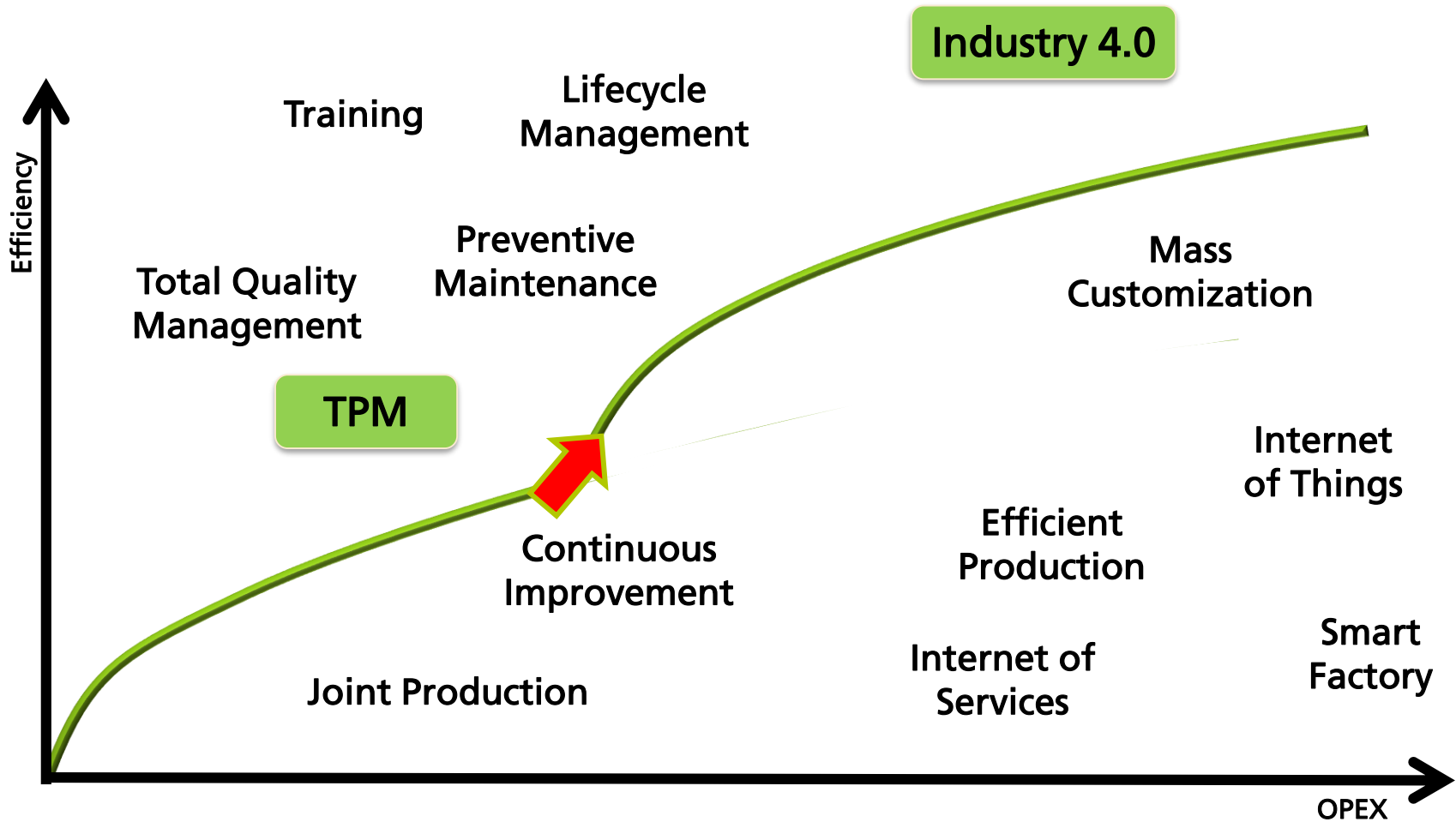
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## Reaching the next OPEX level



Summary

## Evolution or Revolution?

**It is not necessary  
to change.  
Survival is not  
mandatory.**

[W. Edwards Deming]

Think of Industry 4.0  
as a cake:  
Don't try to eat it  
with one bit.  
One piece at a time is  
way more delightful.



 **Fraunhofer**  
IML

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