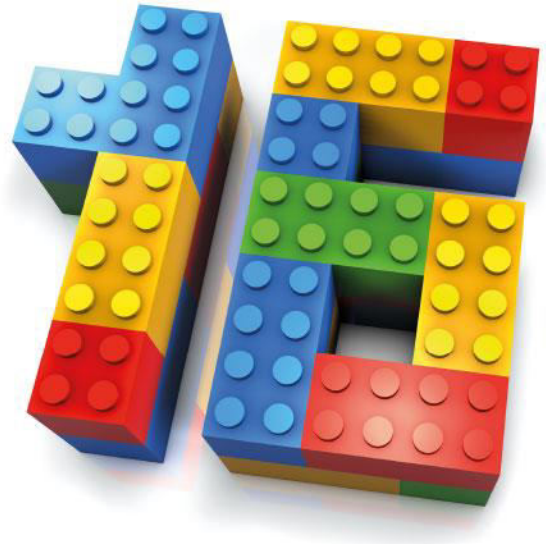
euro MAINTENANCE 2016

30 May – 1 June 2016

Athens Ledra Hotel

Athens, Greece

www.euromaintenance2016.org



Internet Plus Based Maintenance ——New Feature of the Time

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Shareford International Consulting Group Company Limited

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Organisers

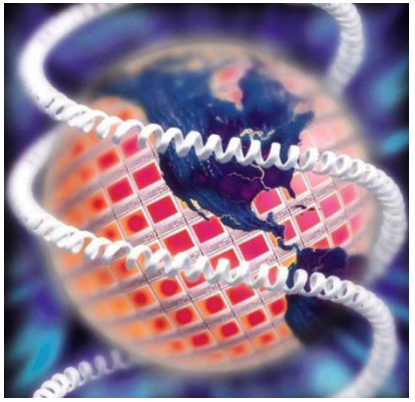
efnms European Federation of National Maintenance Societies vzw

HMS Hellenic Maintenance Society

The Challenge of the Time

- **By the end of 2008, CEO of IBM raised the concept of Smart Planet;**

- **2011, The concept of Industrial 4.0 is raised by Germany, and Platform-i4.0 is formed in 2013 then, which was also written in 《High-tech Strategy 2020》by the government.**

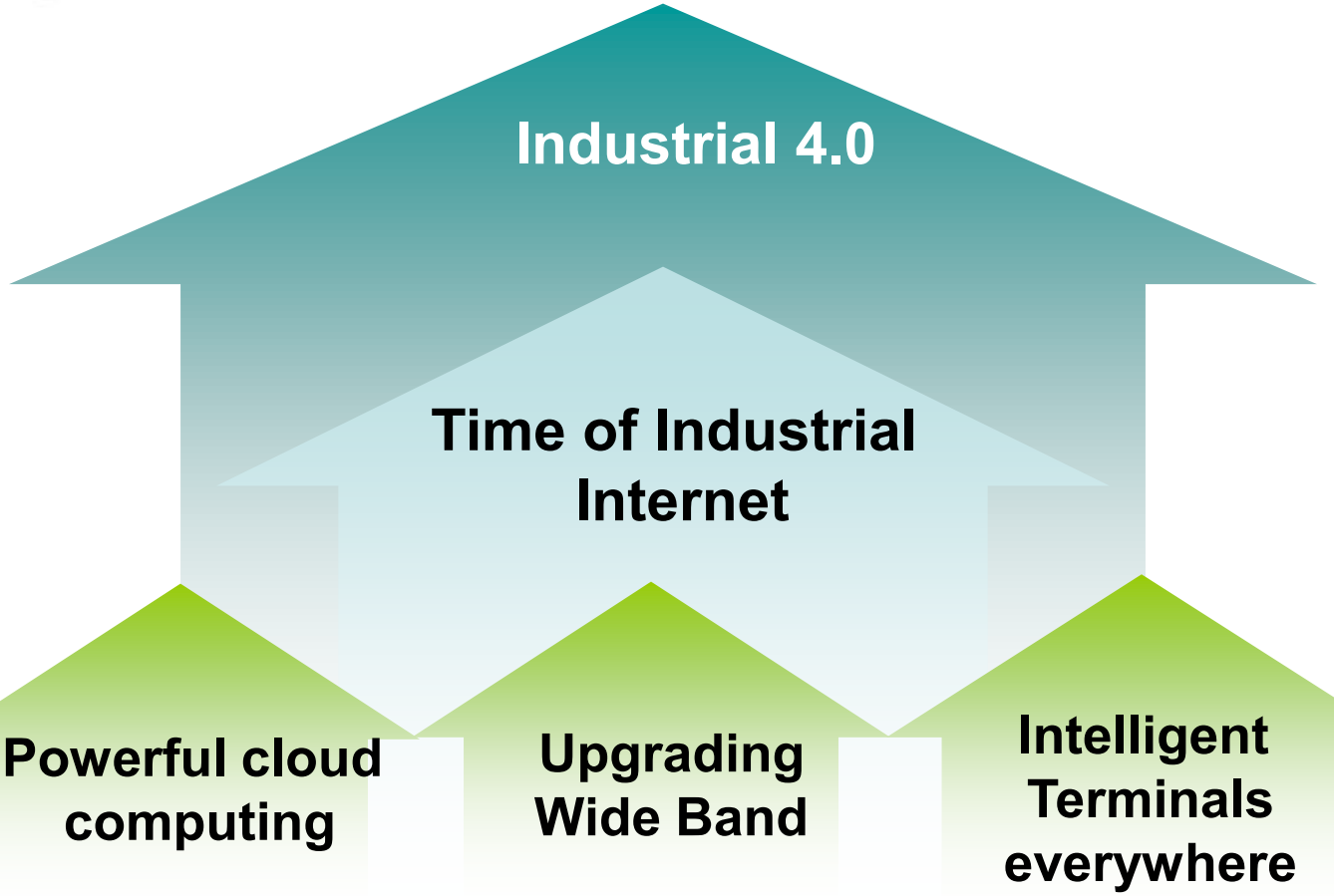


What is the Time of Internet +?

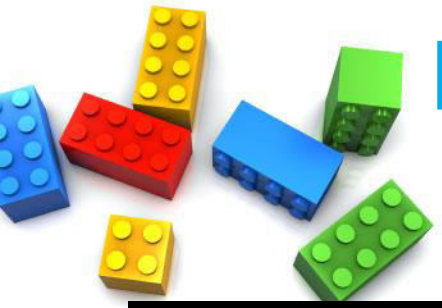
It is

- **The system upgrading of the society;**
- **Knowledge and society innovation promoted integration and evolution among internet and all industries;**
- **New economic type;**
- **Optimization and integration of internet in production resource distribution;**
- **Innovation achievement of internet is deeply integrated all fields of economy and society, in order to increase the productivity and creativity of the substantial economy;**
- **A new developing economic trend based on internet as its foundation and tools.**

Arrival of Industrial Internet



Background and Advantage of Smart Maintenance



Background

- More feasible production
- More continuous process
- Instruments are cheaper
- Labor salary is increasing
- Plant is much bigger & danger
- Breakdown time is rigorously limited
- High cost of breakdown maintenance
- Difficult to handle the maintenance tech.
- Rigorous HSE is required by the society

Advantages

- Feasible to a complicated system
- Monitoring, managing continuously
- Cost effective and controllable
- Less people employed
- Mobile terminals are used
- Condition based M.
- More preventive
- remote-education
- Less hazards

Internet+ based Maintenance

- Stockholder Satisfied
- Customer Satisfied
- Society Satisfied
- Employee Satisfied

Three Phases of Smart Maintenance

Plant+OS+Net Smart maintenance

CPS

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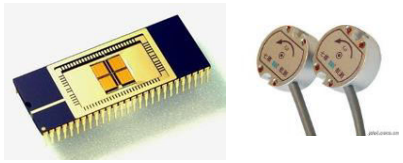


Plant life circle digitalization

Plant+Chip (MEMS)

Plant maintenance digitalization

Plant condition and operation digitalization

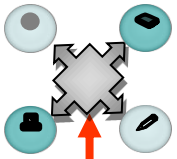
Plant+RFID

Plant position & status

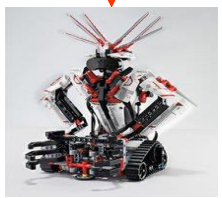
Plant Information digitalization

Brief Introduction of smart maintenance

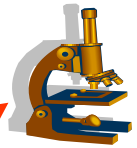
Smart maintenance strategy generation



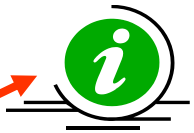
Internet + maintenance



Maintenance Robot

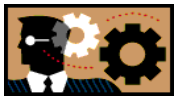


Smart inspecting



Smart information managing

Smart analyzing & diagnosing



Smart knowledge managing

Interactive maintenance manual

Smart training & learning

Smart spare parts management

Smart integrated service

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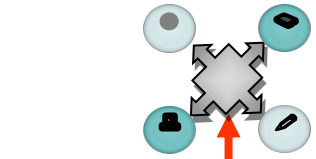

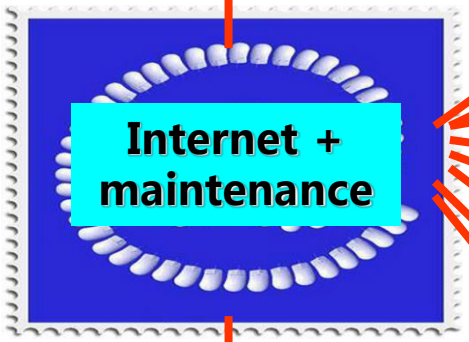

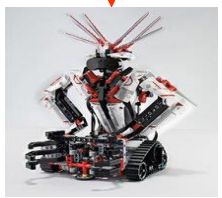

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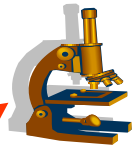
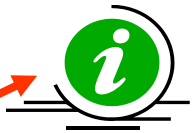


Smart inspecting



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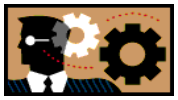

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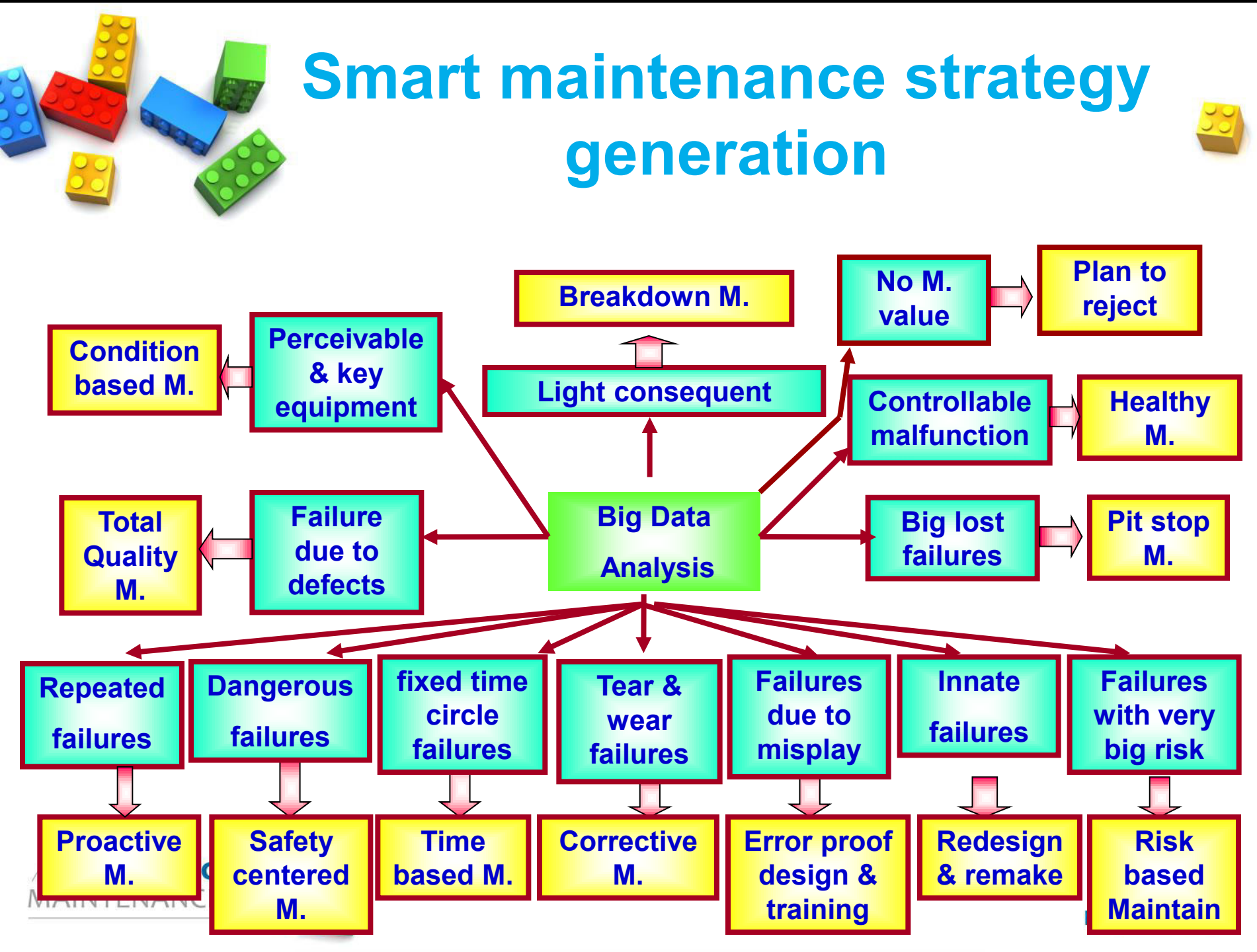

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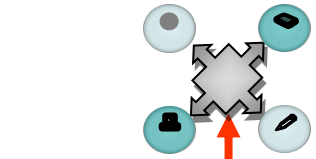
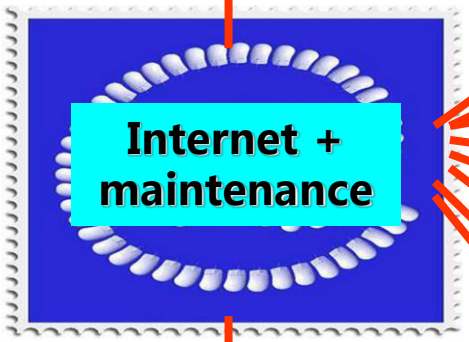
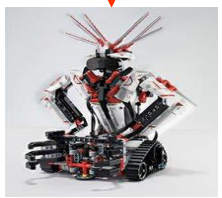
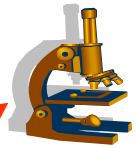


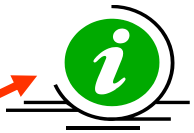




Maintenance Robot

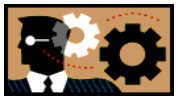
Smart inspecting





Smart information managing

Smart analyzing & diagnosing



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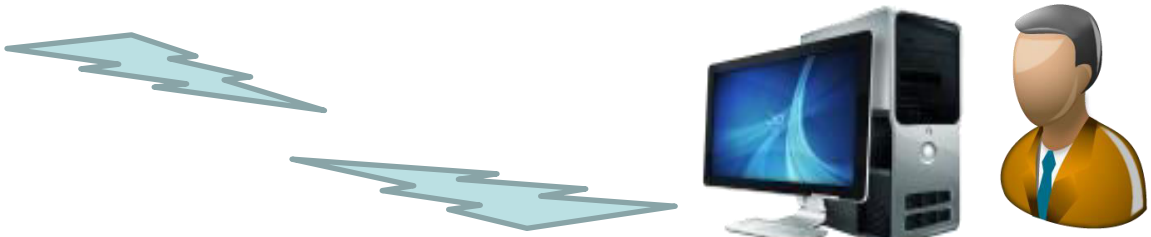
Smart inspecting

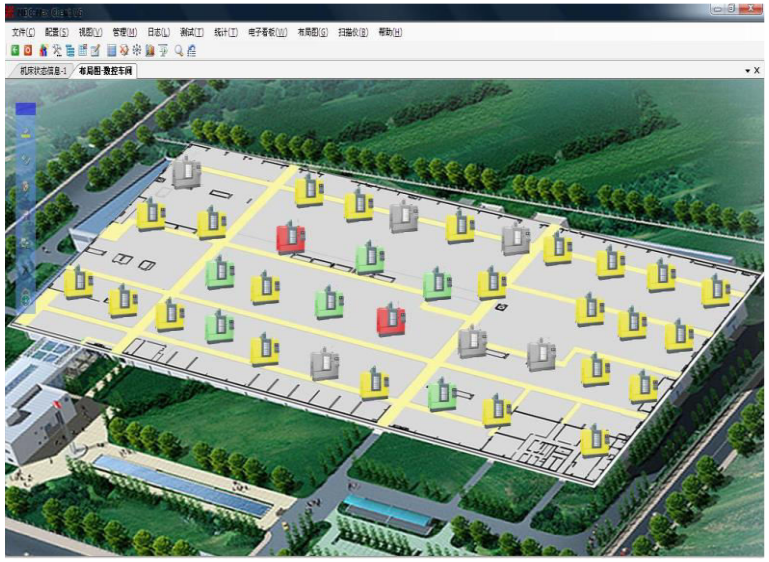
Definition and features

- **The plant or equipment are inspected or checked by operators or engineers with condition monitoring instruments or simple electronic tools such as the personal digital assistant-PDA, real time communication with the center server is carried out through internet.**



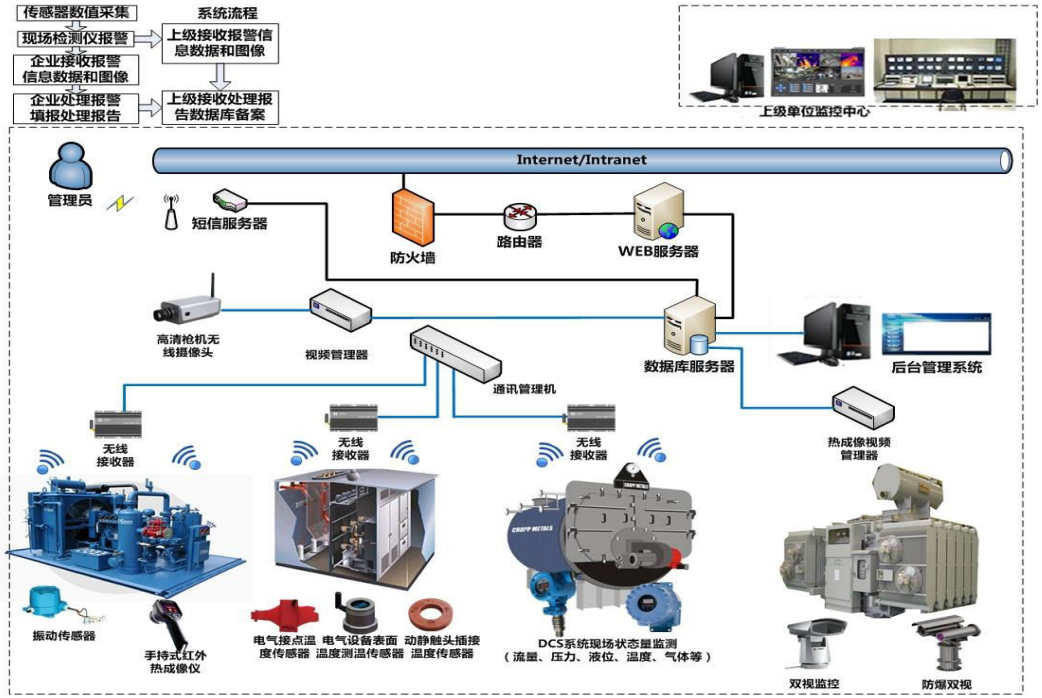
Smart inspecting

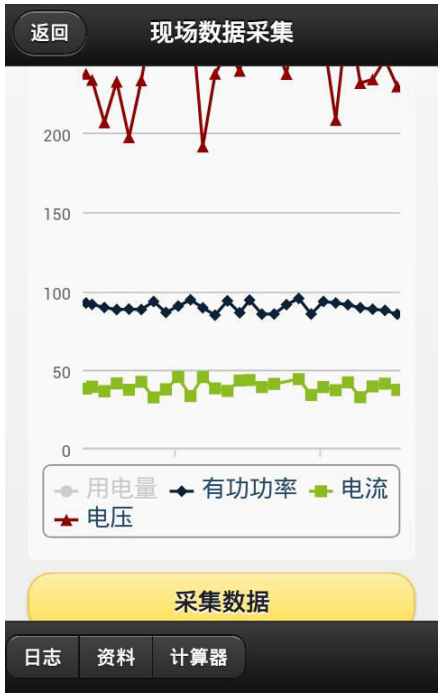
Smart data collection Real time、accurate、objective and autonomous



Smart inspecting

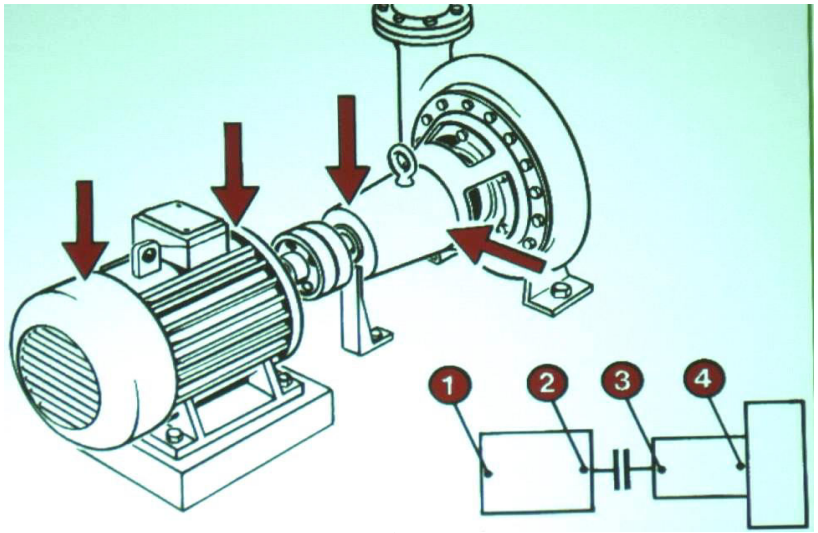
- **Applying of PDA and condition based monitoring system in enterprises**

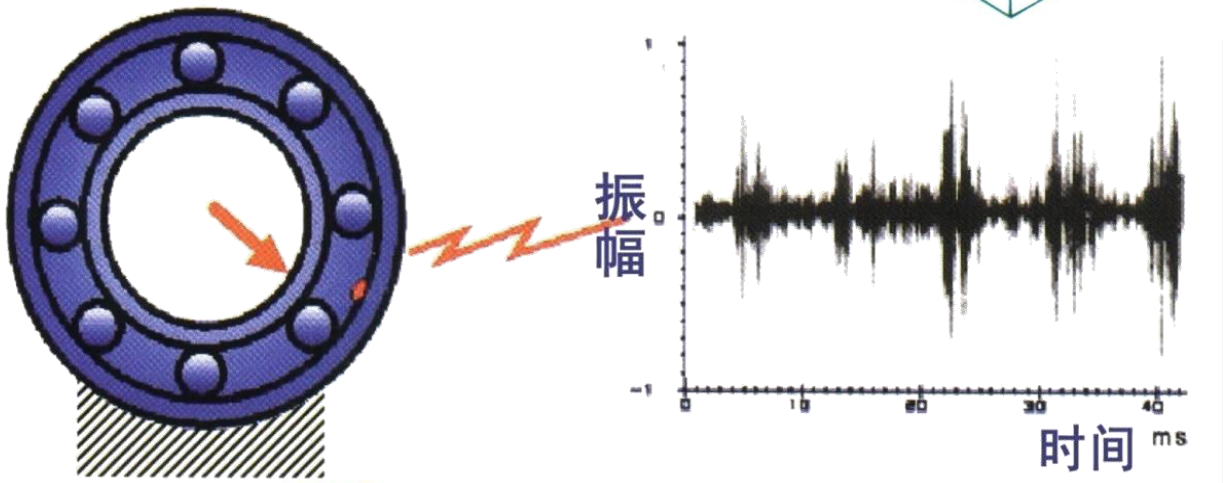


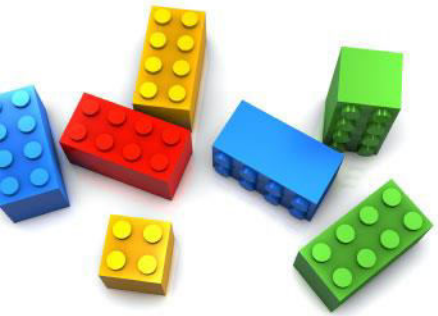


Smart inspecting

- **Vibration analysis**

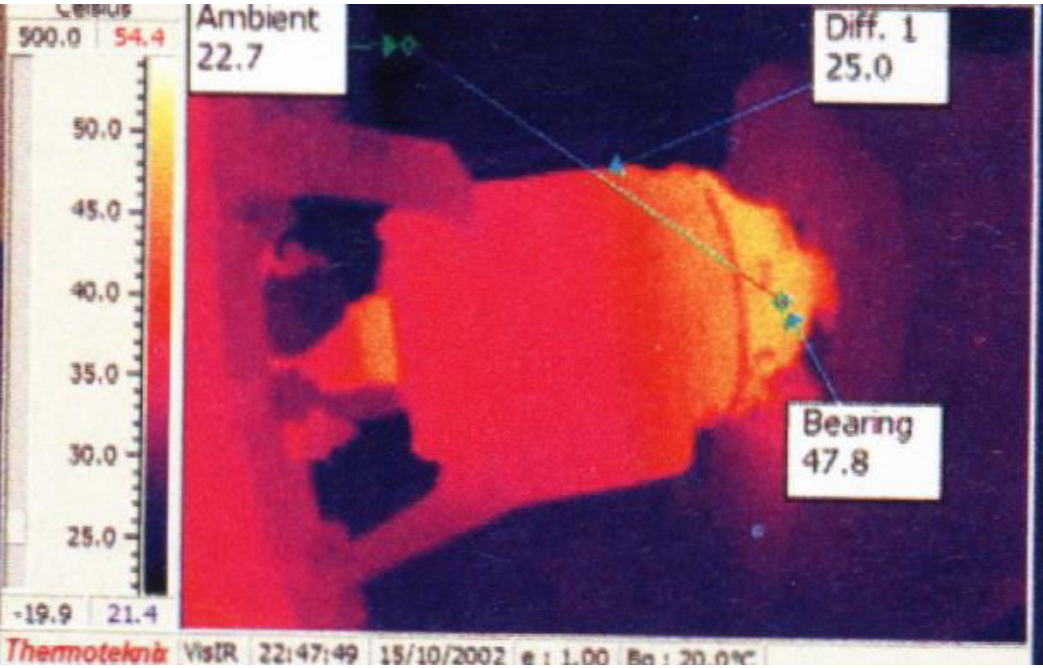






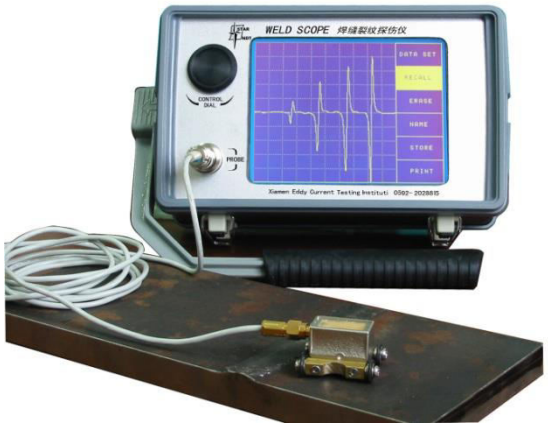
Smart inspecting

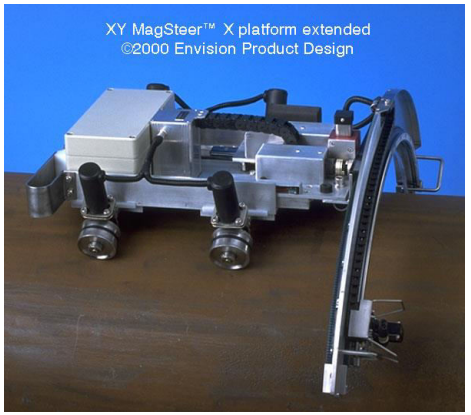
- **Infrared analysis**

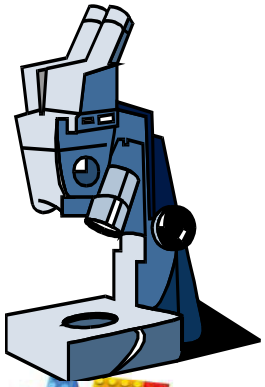


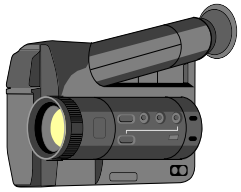
Smart inspecting

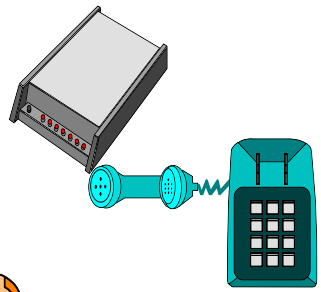
- **Other instruments for analysis**

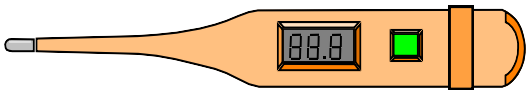






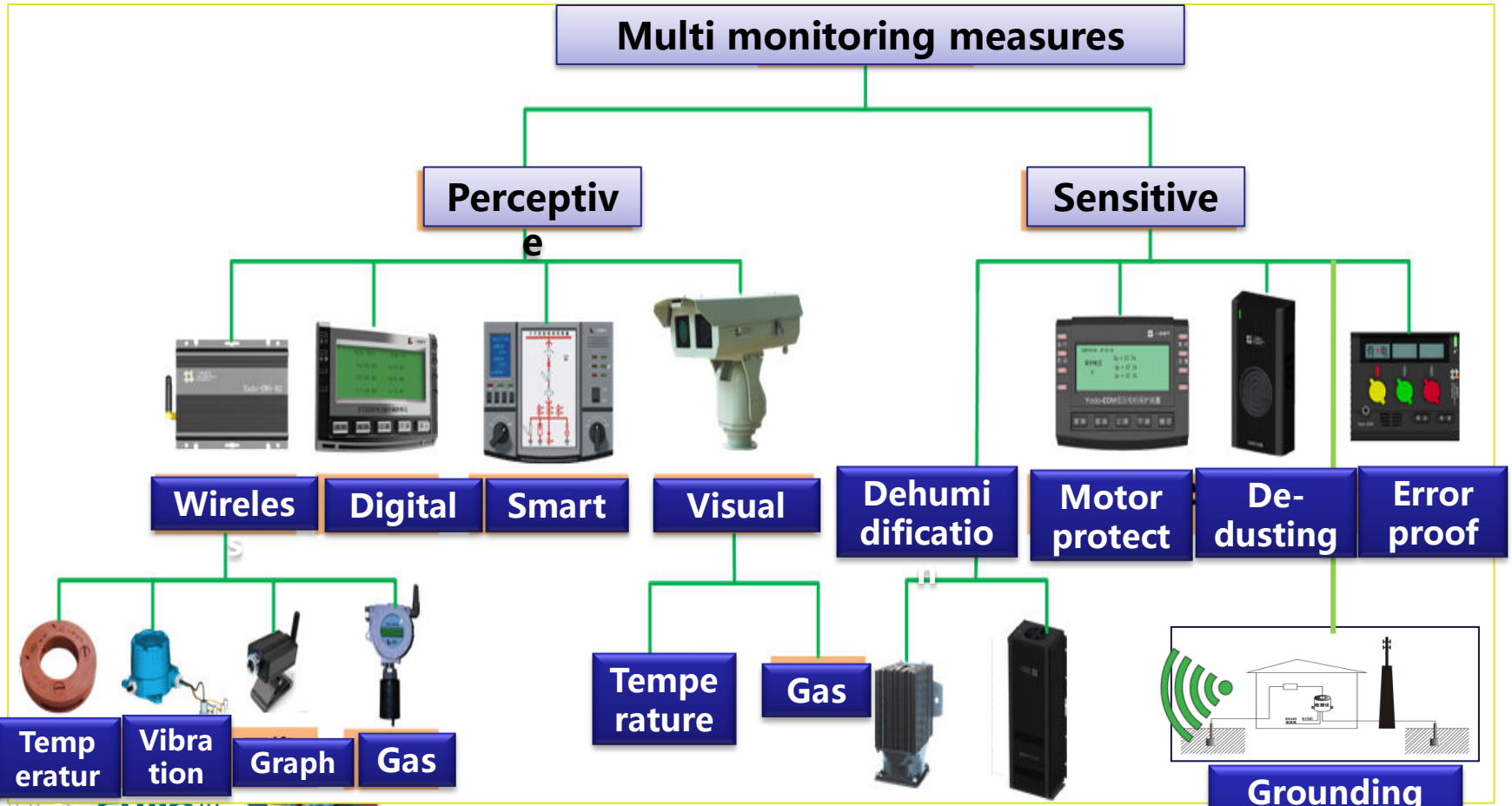






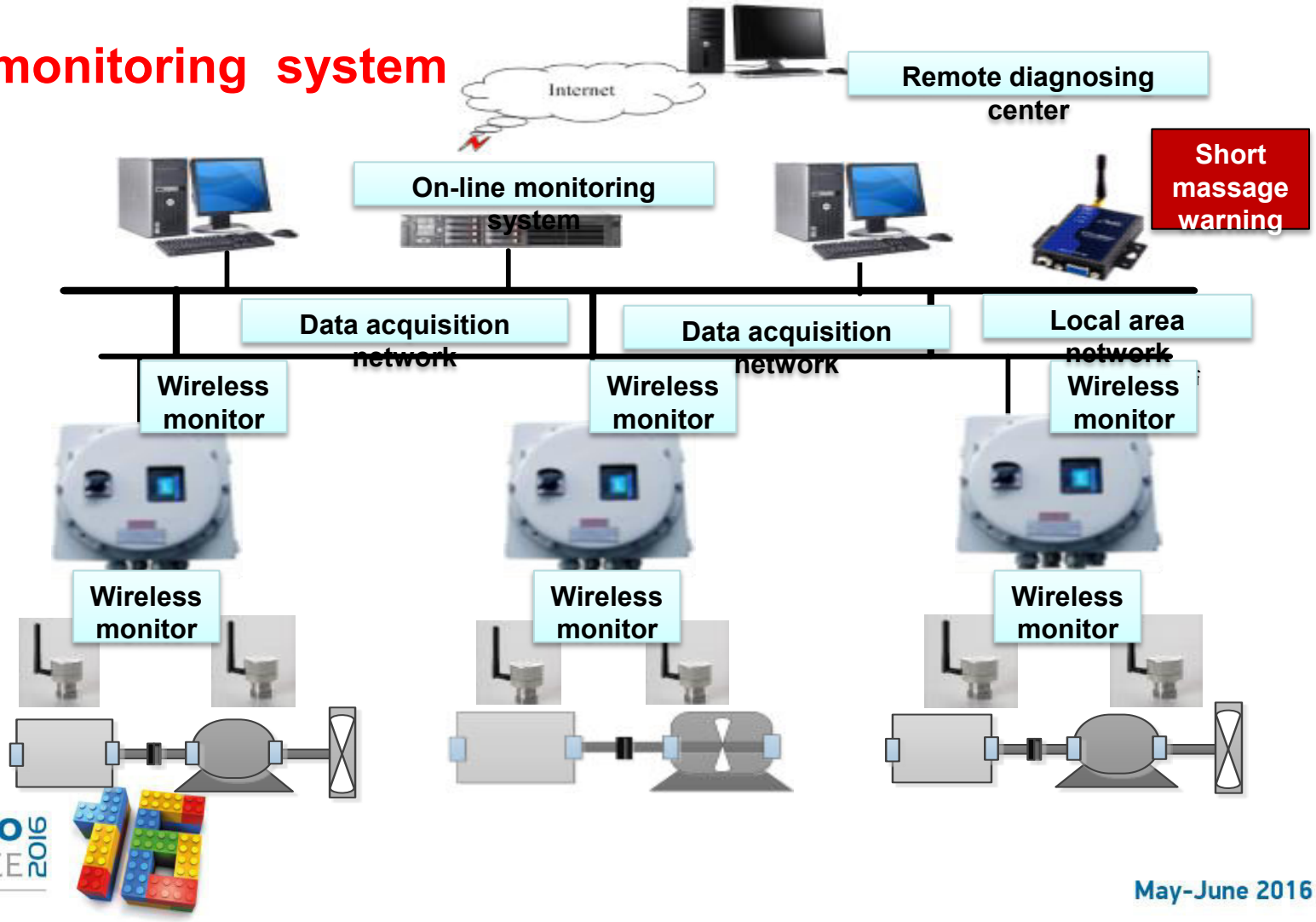
Smart inspecting

Multi-sensor system



Smart inspecting

Wireless monitoring system



Smart inspecting

Operator inspection on the shop-floor

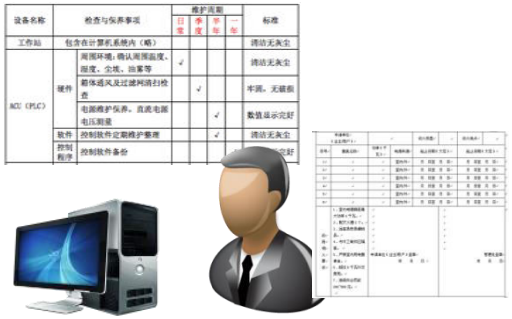
Smart inspecting

Structure design case

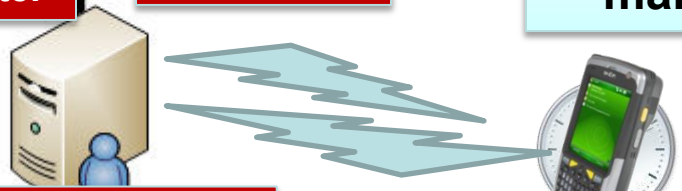
Operating plan

Operating center

Data bank



Operating plan management



Information server

Operating analysis

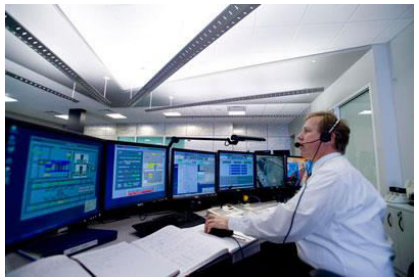
Operating audit

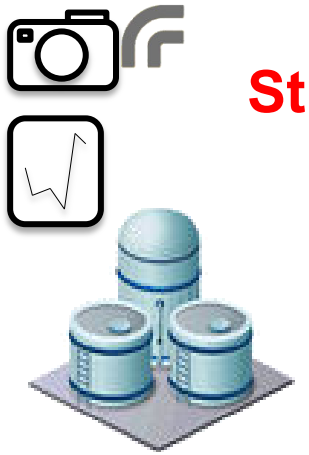
Operating execution

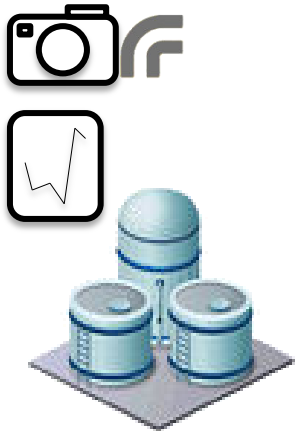
Smart inspecting

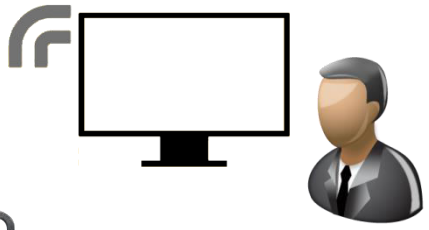
- Whole talkback
- Cooperative work
- Data interaction
- Multi media
- Historic data
- Location-based service
- One key in rescue

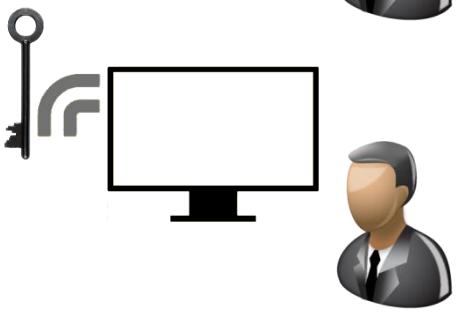
Structure design case











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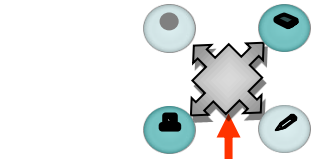
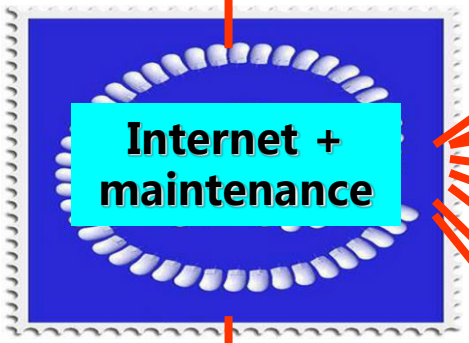
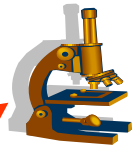




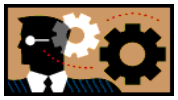
Maintenance Robot



Smart inspecting

Smart information managing

Smart analyzing & diagnosing



Smart knowledge managing

Interactive maintenance manual

Smart training & learning

Smart spare parts management

Smart integrated service

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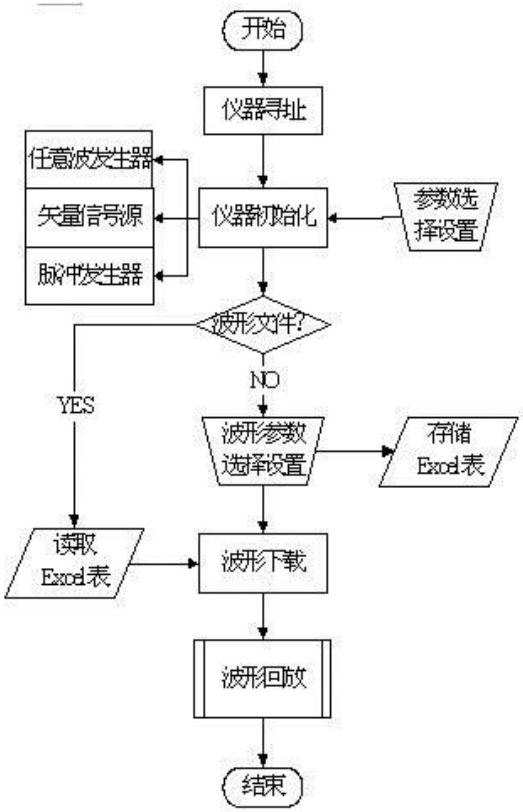
Smart information managing

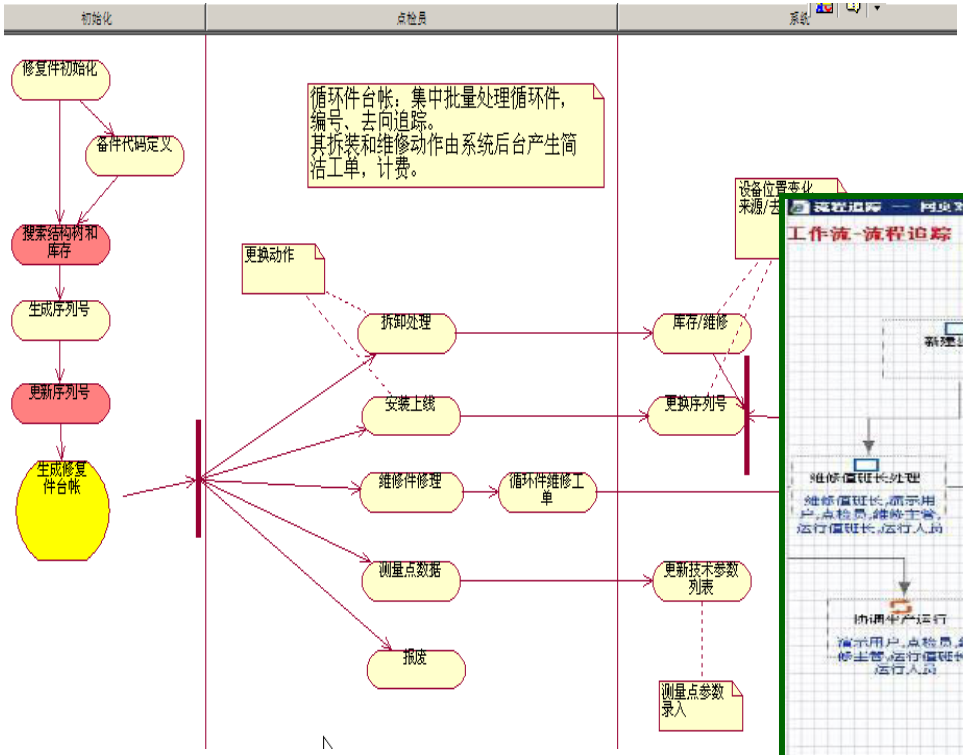
Definition

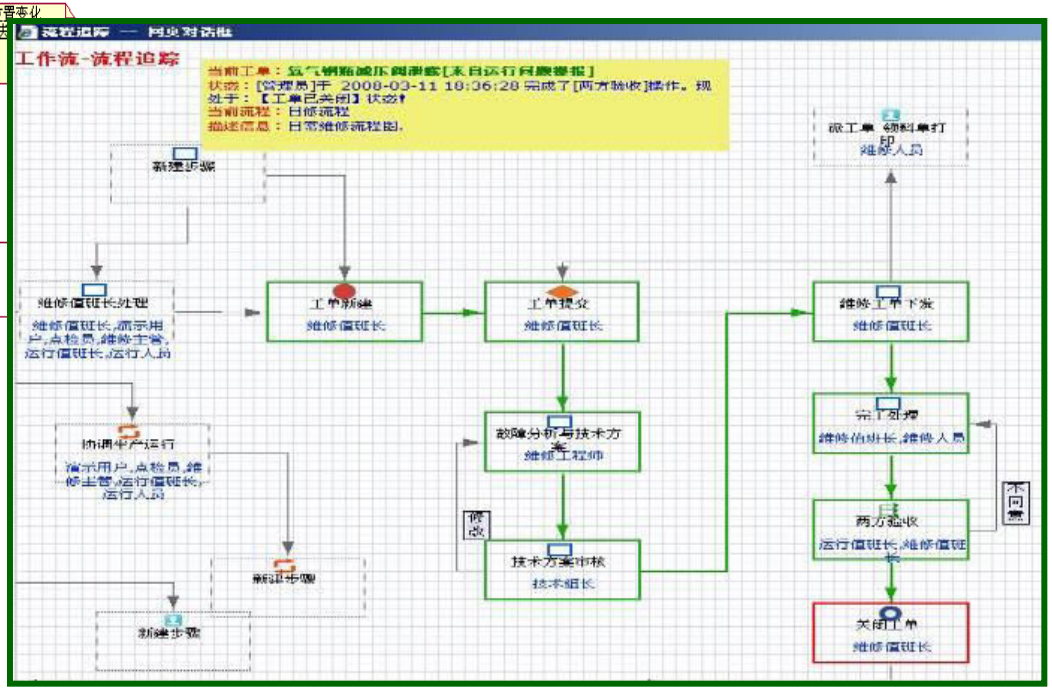
Material flow, value flow, capital flow as well as the working flow are all carried out by the assistant of internet.



Smart information managing

Information flowing graphs





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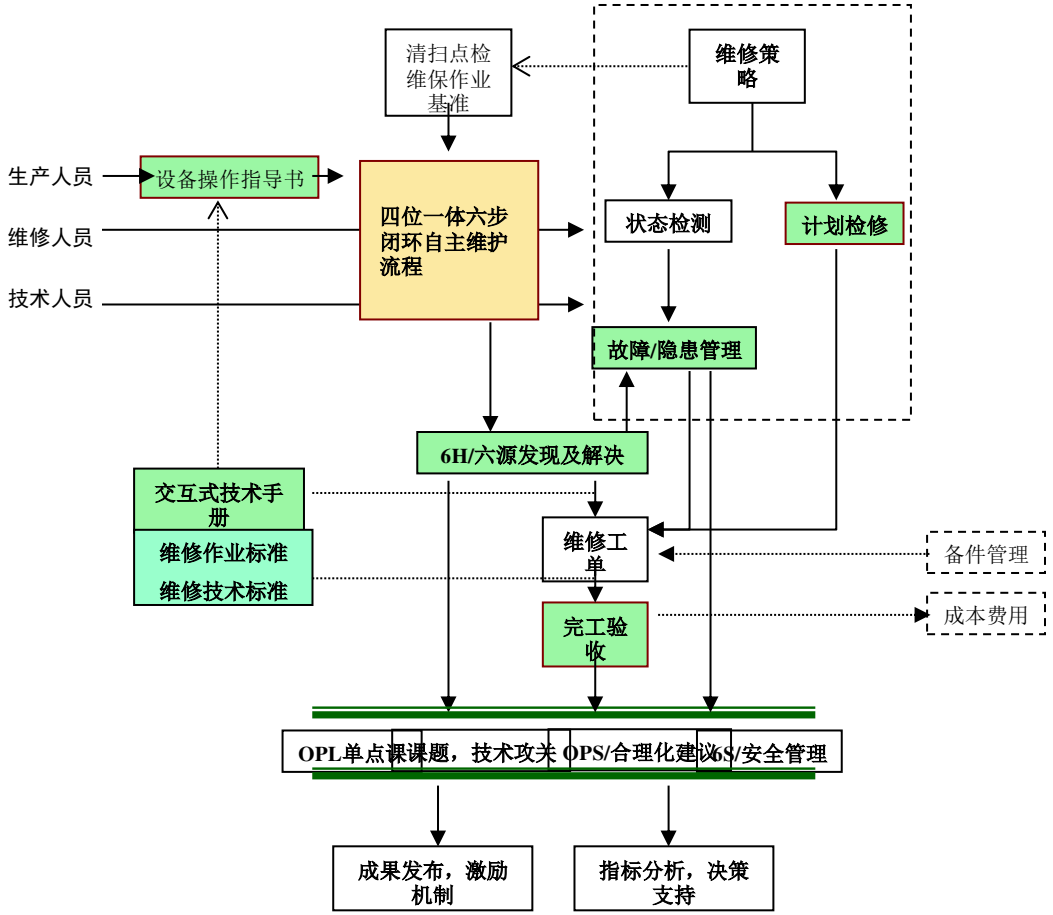
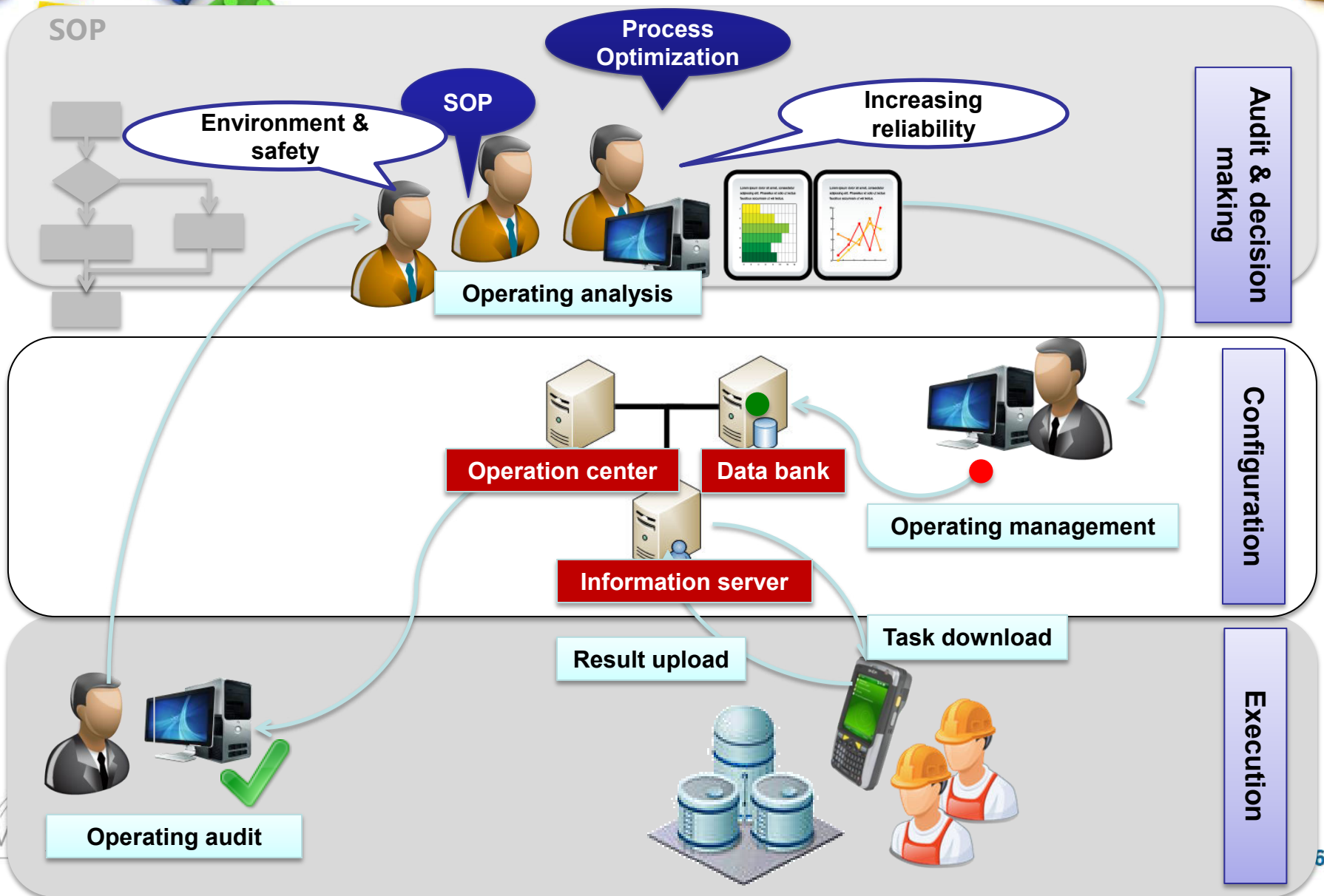
Information flowing structure

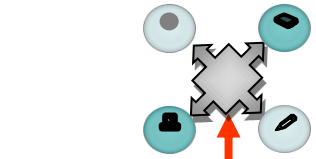


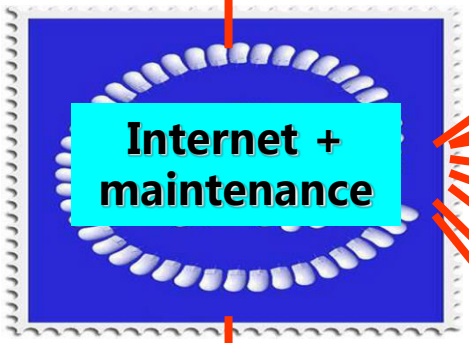
Smart information managing



Brief Introduction of smart maintenance

Smart maintenance strategy generation



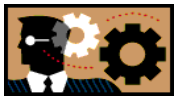


Maintenance Robot

Smart inspecting

Smart information managing

Smart analyzing & diagnosing



Smart knowledge managing

Interactive maintenance manual

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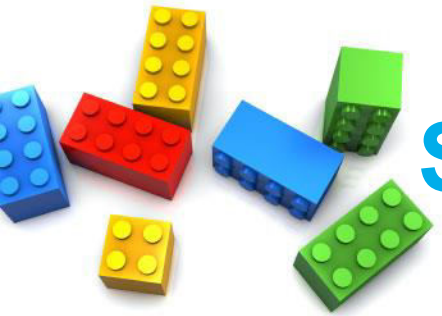


Smart analyzing & diagnosing

Definition

- **Plant related big data analysis is carried out by internet so as to get the running status, maintenance condition, working efficiency, maintenance requirement, spare part requirement, lubrication requirement as well the maintenance technology requirement.**

- **Fault tree analysis, fault cause and effect analysis, cost analysis, fish-bone analysis and diagnosis will be generated automatically by the internet through big data analysis.**

Smart analyzing & diagnosing

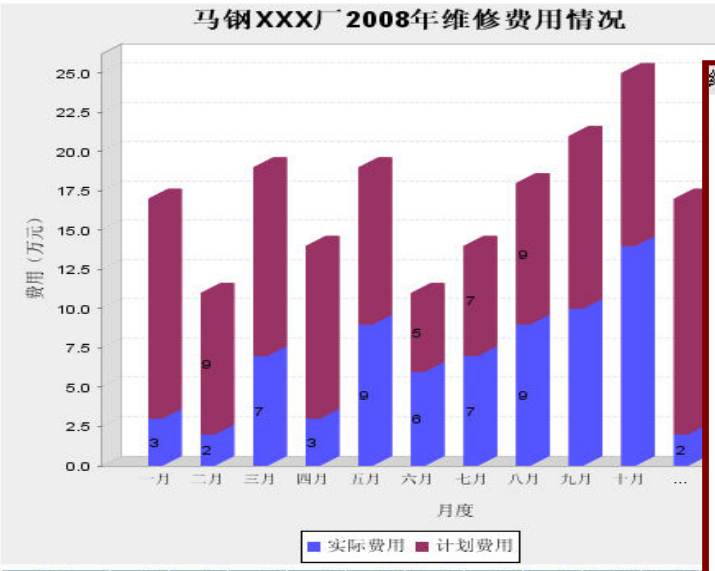
Fault Tree is built autonomously

Smart analyzing & diagnosing

- **Analysis with statistics data**

维修费用图表

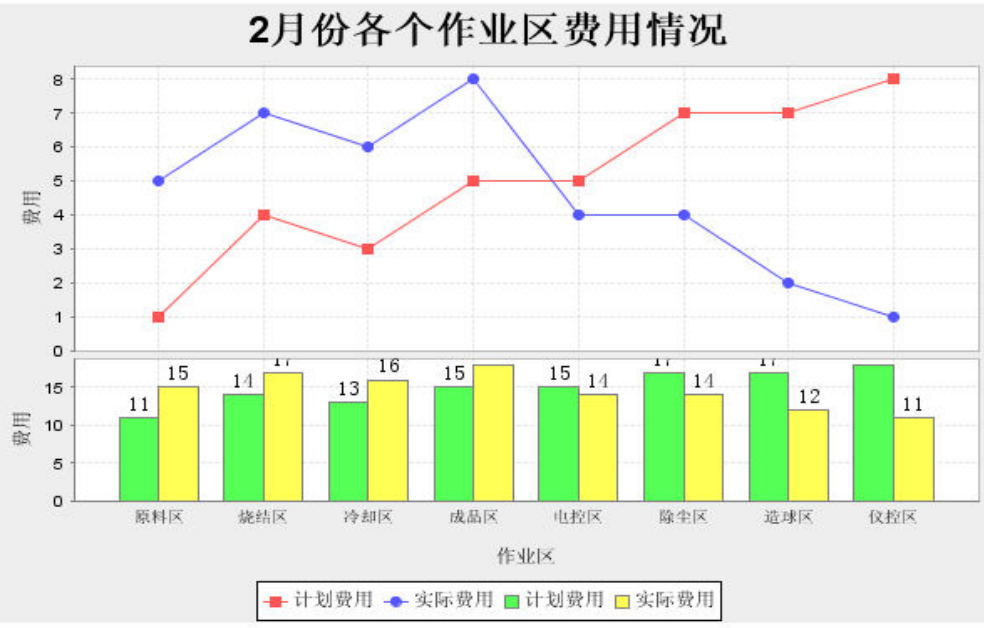
马钢XXX厂2008年维修费用情况



月度	一月	二月	三月	四月	五月	六月	七月	八月	九月	十月
计划费用	14	9	12	11	10	5	7	9	11	11
实际费用	3	2	7	3	9	6	7	9	10	14

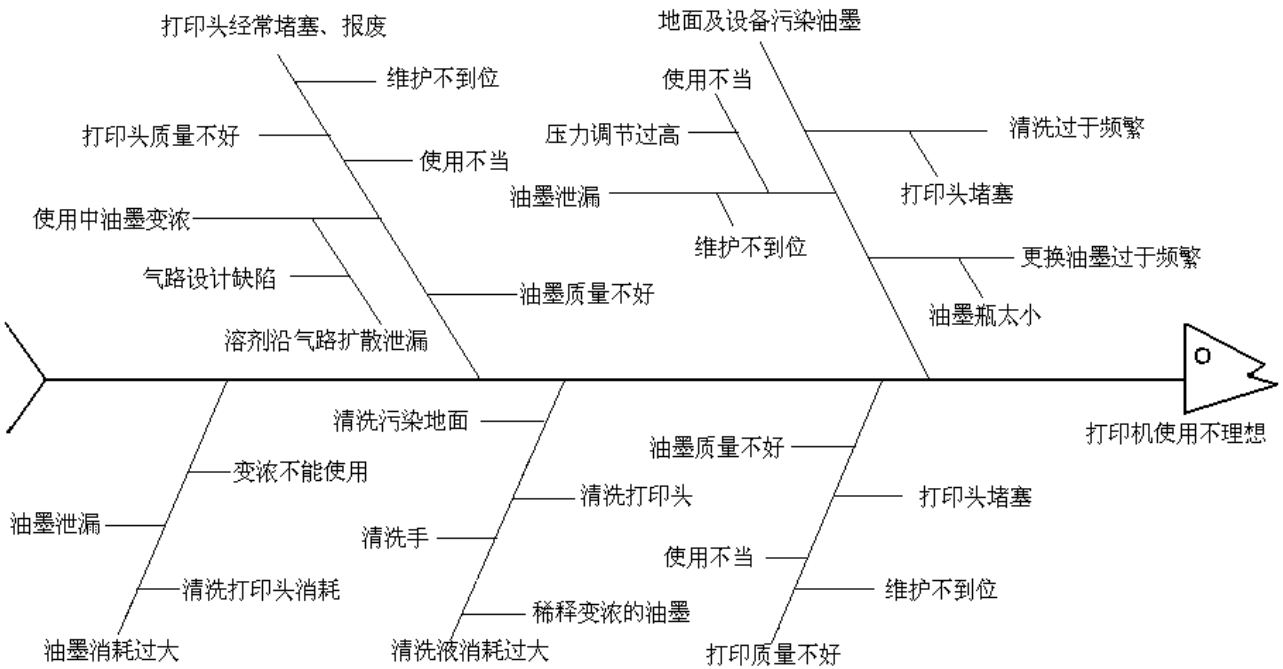
维修费用图表

2月份各个作业区费用情况



Smart analyzing & diagnosing

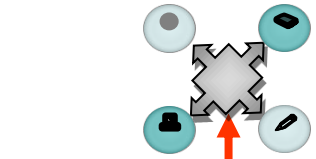
Analysis with a generated fish bone

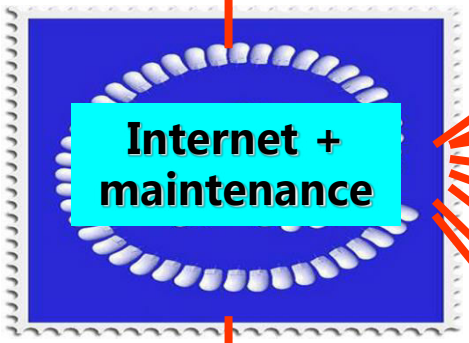


油墨打印系统使用不理想的原因分析鱼骨图

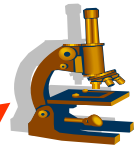
Brief Introduction of smart maintenance

Smart maintenance strategy generation





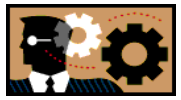
Maintenance Robot



Smart inspecting

Smart information managing

Smart analyzing & diagnosing



Smart knowledge managing

Interactive maintenance manual

Smart training & learning

Smart spare parts management

Smart integrated service

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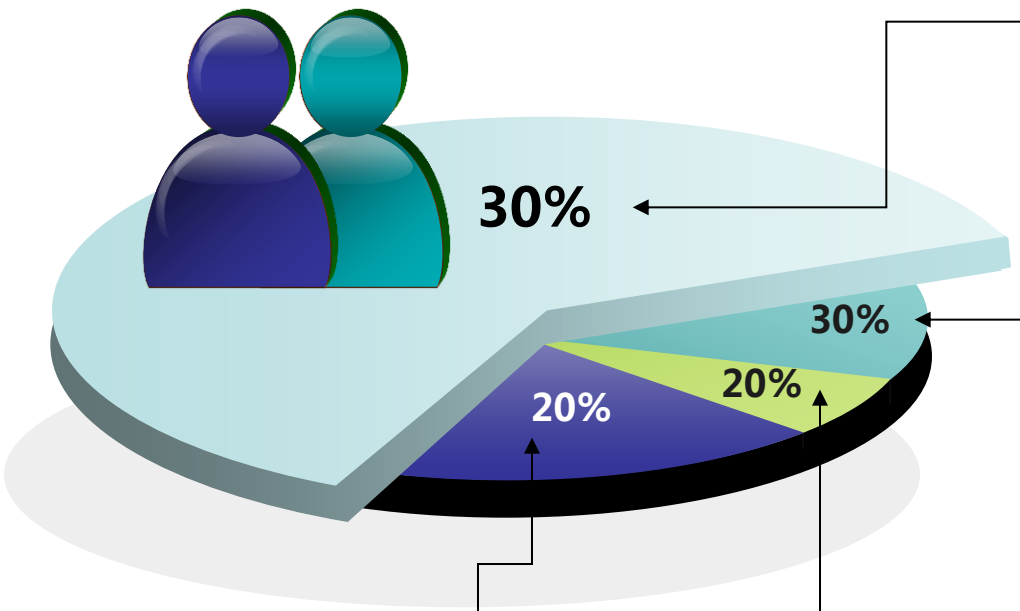
Smart knowledge managing

Four fields of knowledge management



From operators

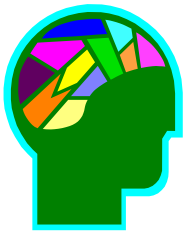
From engineers

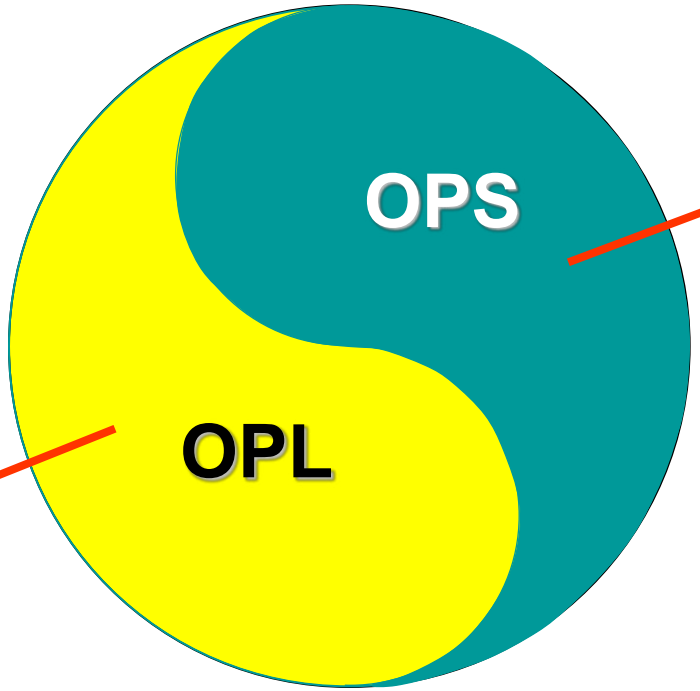
From internal departments

From cloud platform

Smart knowledge managing

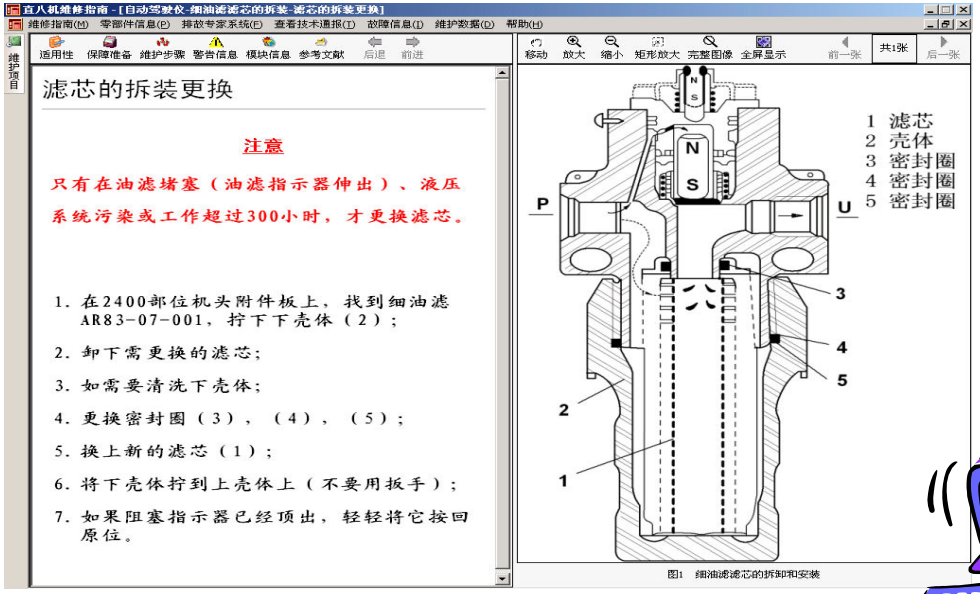
- **Knowledge comes from the root employees**





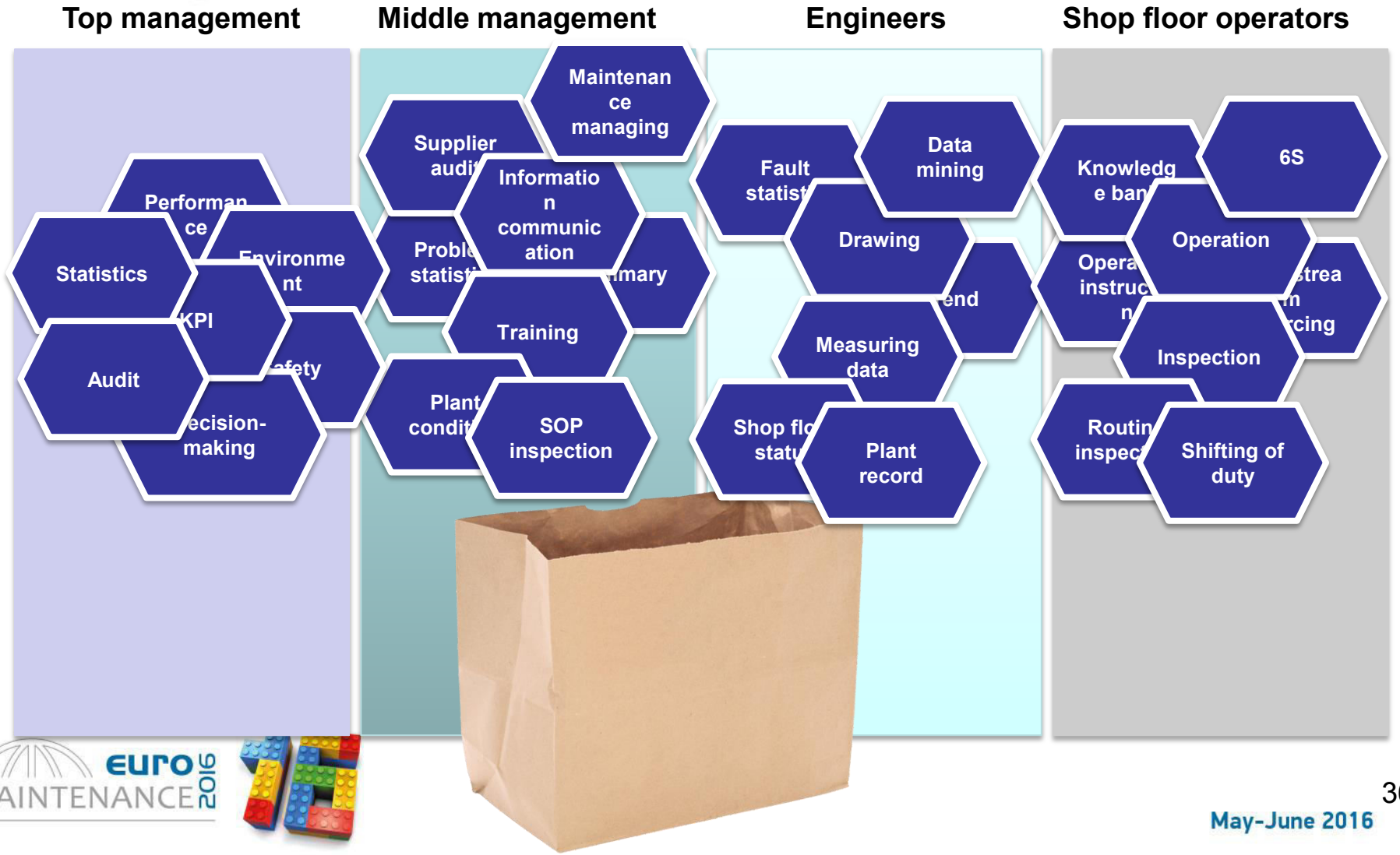
Smart knowledge managing

- **Knowledge comes from the engineers**



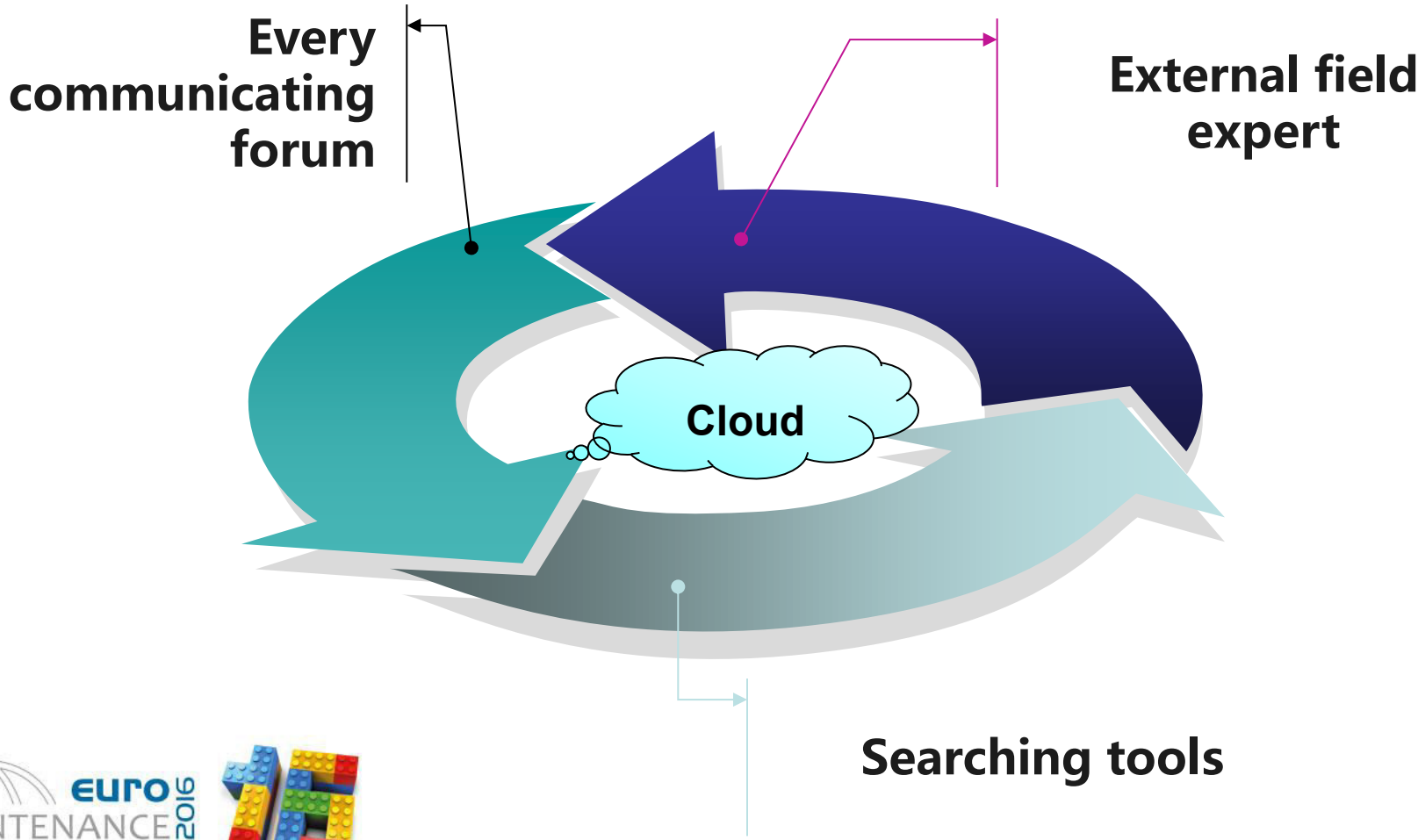
Smart knowledge managing

Knowledge from internal departments



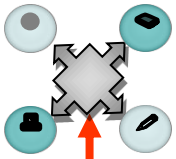
Smart knowledge managing

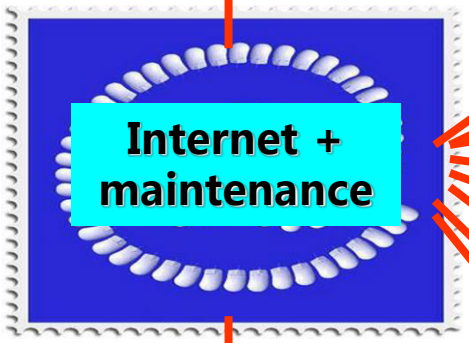
- **Knowledge from cloud platform**



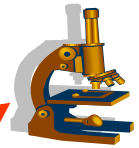
Brief Introduction of smart maintenance

Smart maintenance strategy generation





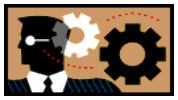
Maintenance Robot



Smart inspecting

Smart information managing

Smart analyzing & diagnosing



Smart knowledge managing

Interactive maintenance manual

Smart training & learning

Smart spare parts management

Smart integrated service

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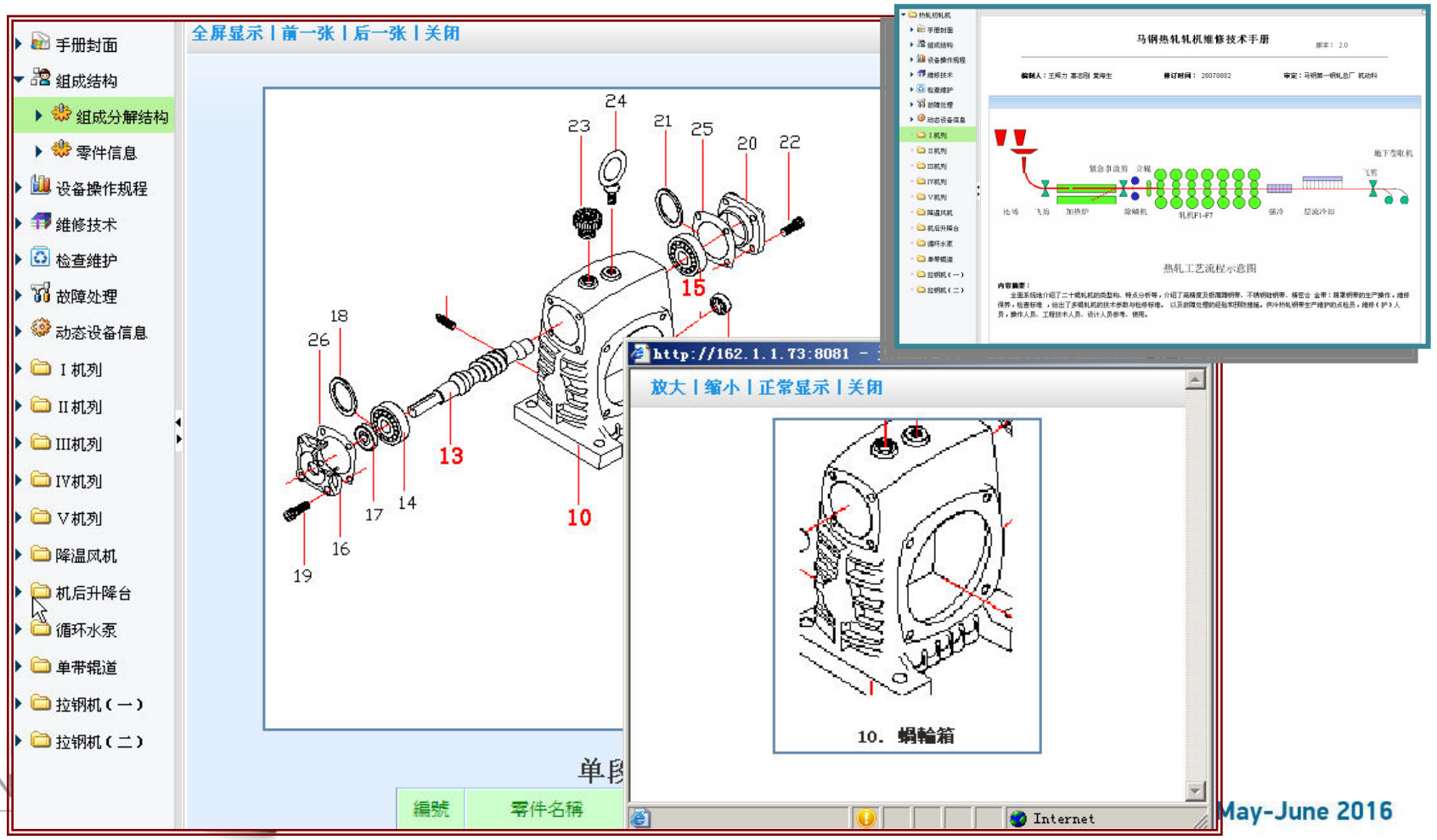
smart maintenance manual

Drawing could be enlarged or downsized

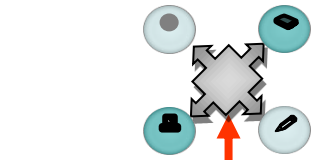


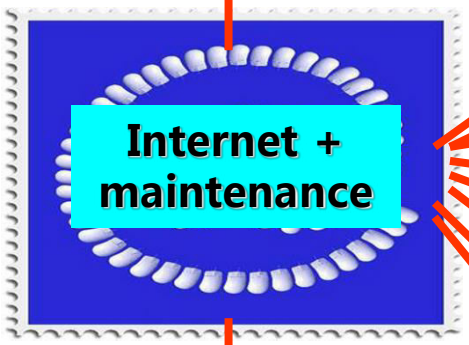
smart maintenance manual

Video aided maintenance process

Brief Introduction of smart maintenance

Smart maintenance strategy generation





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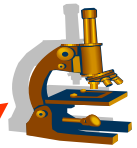

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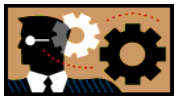

Smart knowledge managing

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Smart training & learning

Definition

- smart learning is also called digital learning, network learning, or electronic learning come from different knowledge sources.

Features

- Cost saving, Time saving, Flexible. (5A:anybody, any time, any place, any start point, any course)

中国E-Learning促进中心
面向行业 加强交流 推动合作 促进发展

Smart training & learning

E-Learning in Baosteel

1 Introduction

2 Registration

3 On line learning

4 On line homework and examination

5 Personnel information

6 Questions and answers

Smart training & learning

smart training & learning in Baosteel

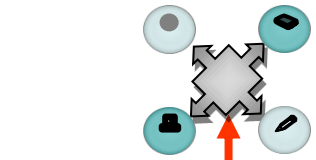
Smart training & learning

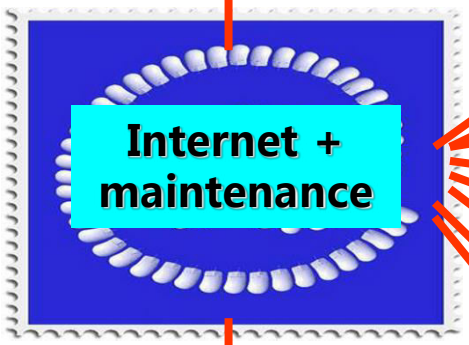
American army on line learning system

American Army On-line Courses

Brief Introduction of smart maintenance

Smart maintenance strategy generation





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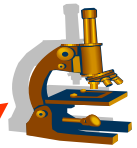

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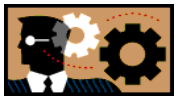

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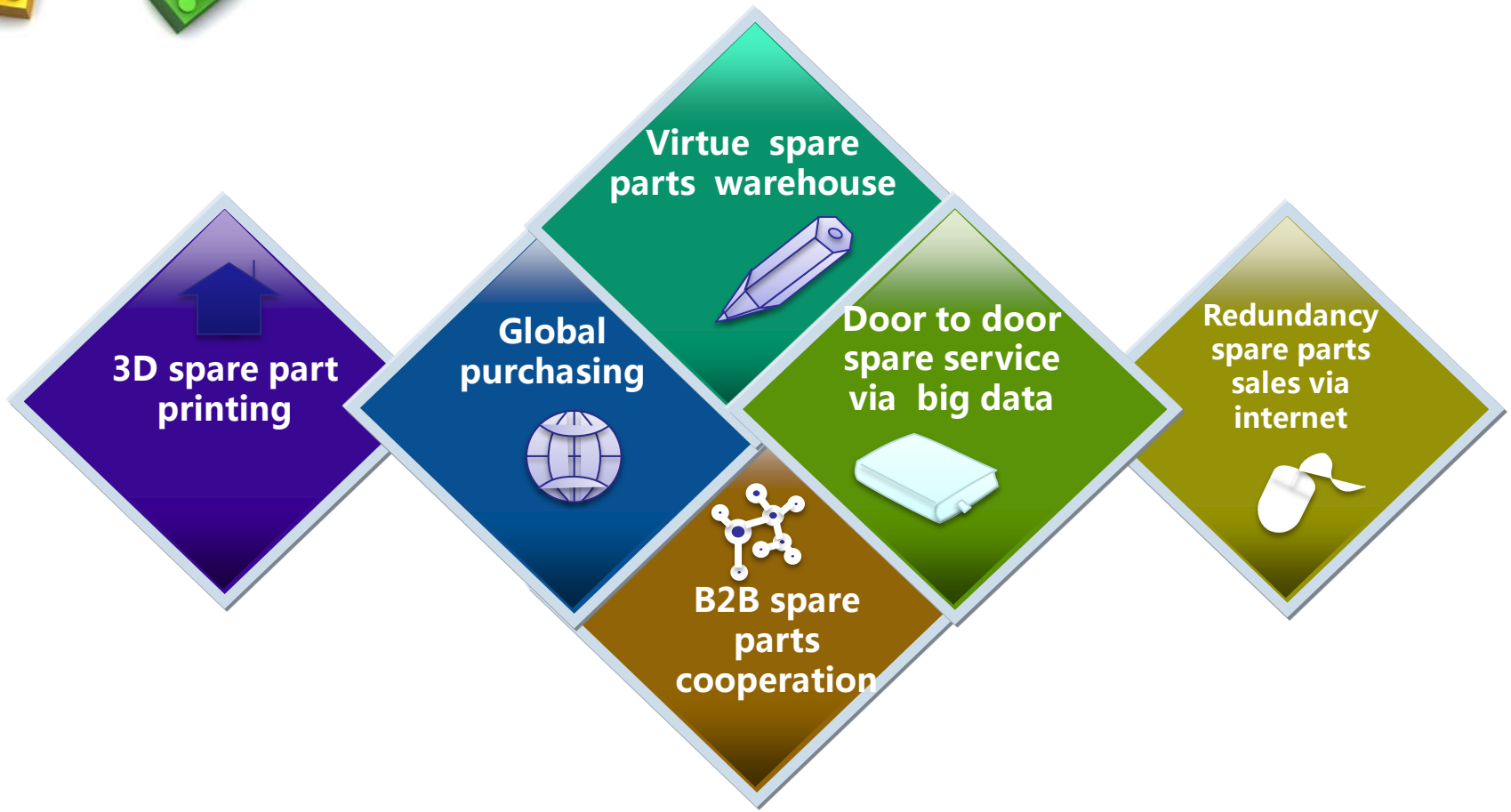
Smart spare parts management



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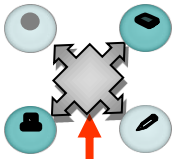

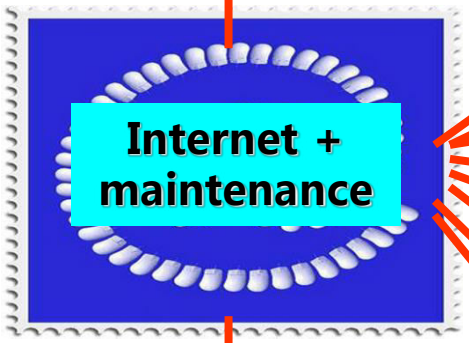

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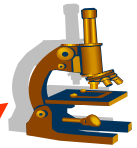

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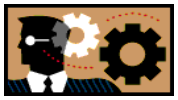

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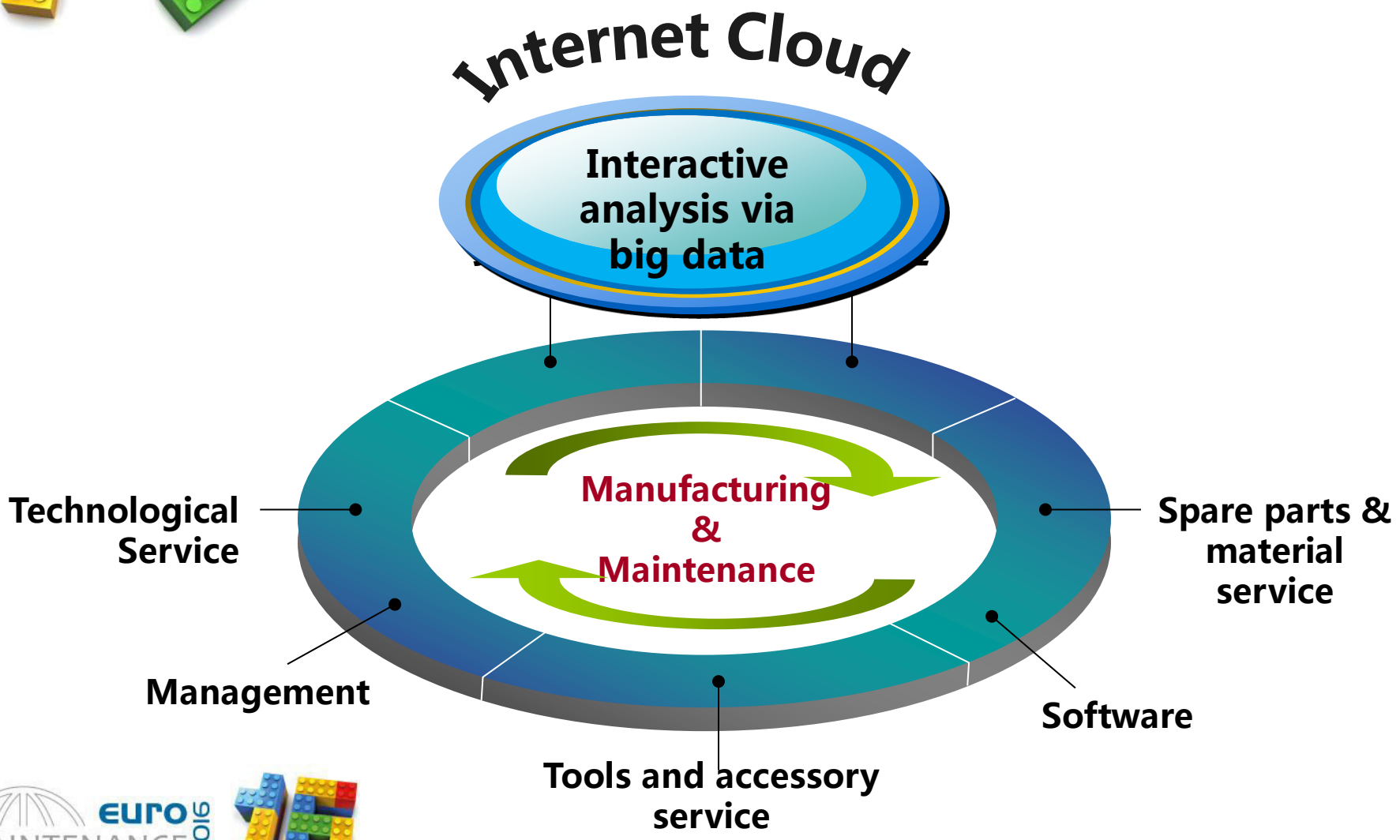

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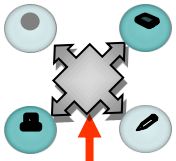

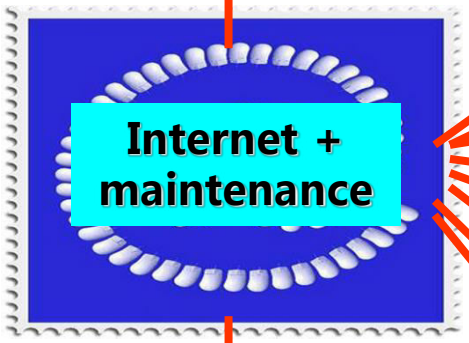

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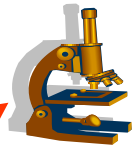

Smart inspecting

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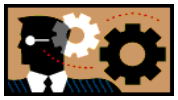

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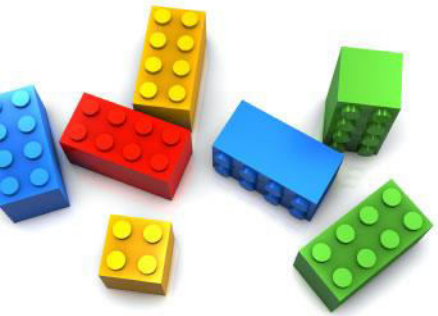


Background

- **Deficiency of industrial workers !**
- **Much more deficiency of maintainers!**
- **Increasing of labor cost !**
- **Dangerous, miserable maintenance circumstances!**
- **Decreasing cost of Robots!**

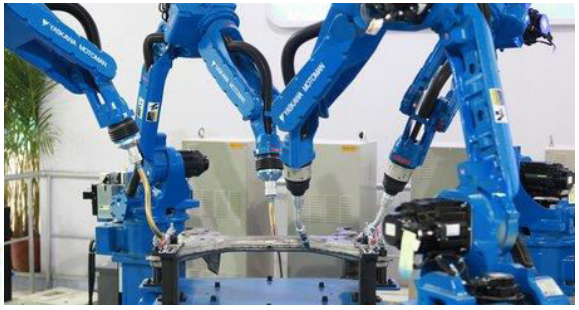
Main Domains of Robot Maintenance

Main domains of Robot Maintenance

Smart inspecting

Smart fitting and calibrating

Smart maintaining



Main fields of Robot Maintenance

Aviation
Space flight
High speed trains

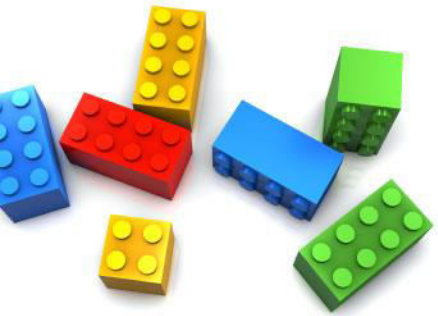
Self diagnosis calibrating maintaining

Nuclear facility
Military weapon

Radioactive Weapon inspecting and repair

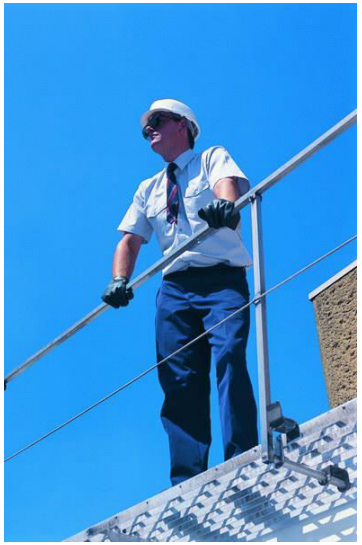
Other high Dangerous task

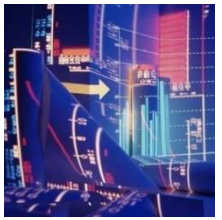
High polluting noising altitude operating



Concluding Remarks

- **smart maintenance will never be break away from human maintenance activities;**
- **Both smart maintenance and human maintenance will be growing together;**
- **smart maintenance is the inevitable trend of maintenance development in the future;**
- **Are you ready to the coming of smart maintenance era?**





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