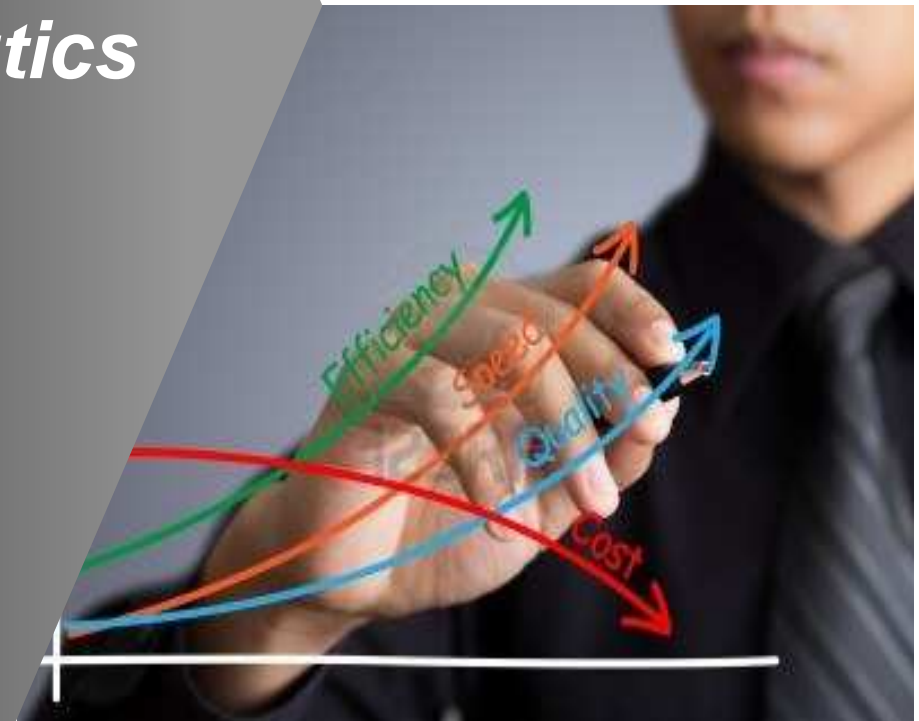


***Industry 4.0 concept for
Nano-Enabled Products
manufacturing pilot plants for
Automotive and Aeronautics***



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Introduction to SISTEPLANT



SISTEPLANT is an industrial engineering company born in 1984, whose main activities are the design and optimization of industrial processes, leaning on advanced manufacturing technologies, and with our own software development for industrial activities management:



Computerized Maintenance Management System



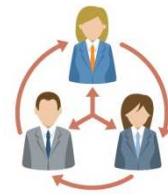
Manufacturing Execution System



Knowledge Management System



+ 2.000 customers



+ 30.000 users



Presence in 3 continents



International implementation and support



Investment of 30% Of profit in R&D



+ 150 employees

Introduction to NEP manufacturing in Pilot Plants



Last years European Commission is pushing to R&D consortiums to develop Pilot Plants, many of them oriented to Nano Enabled Products (NEP).

As a consequence, we have today many Pilot Plants that, at industrial level, can manufacture NEP, but the level of maturity is still low in general.



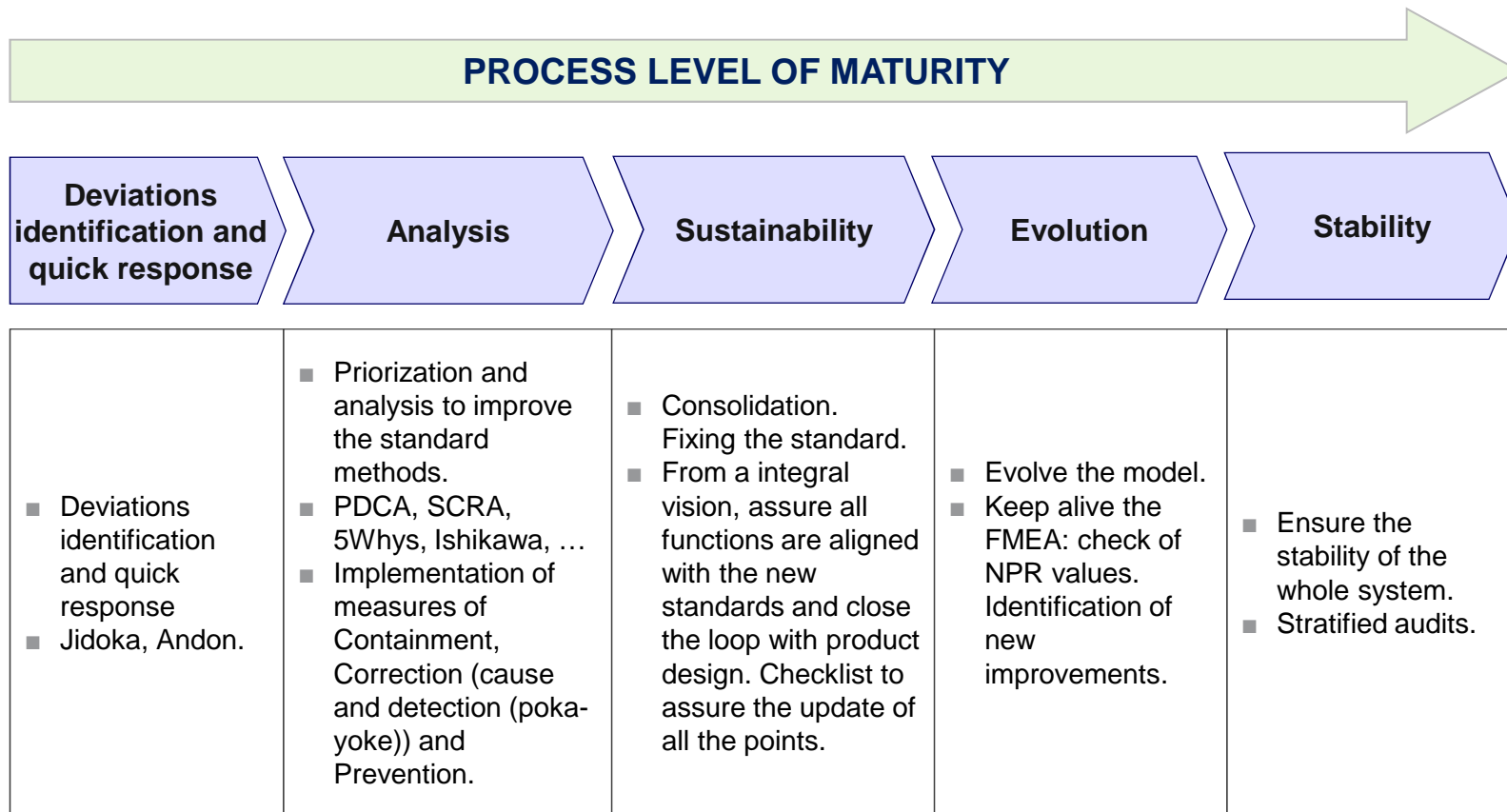
EFFRA, in its multi-annual roadmap for the contractual Public-Private Partnership under Horizon 2020, (2013, page 65), in the Domain 1 – Advanced manufacturing processes, related with the Robust micro- and nano-enabled production, said:

- *“A systems approach is needed to ensure consistent and reproducible processes able to operate within the required limits for micro- and nano-production, monitoring and controlling machine performance, component handling and transfer as well as component accuracy.”*

Introduction to NEP manufacturing in Pilot Plants



In general, every manufacturing processes follows next scheme to reach process stability / maturity:

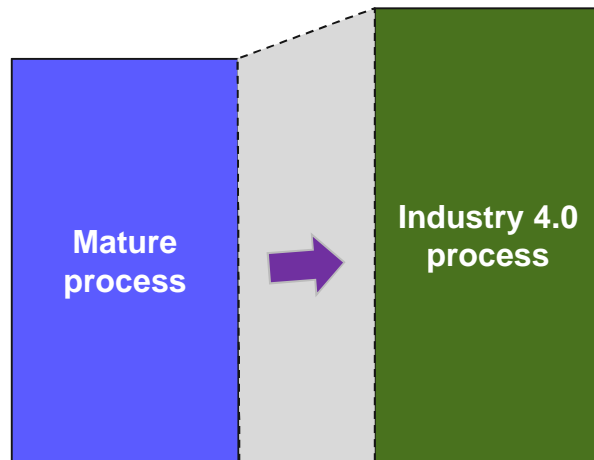


↑
PILOT PLANTS STATUS
(TRL 6~7)

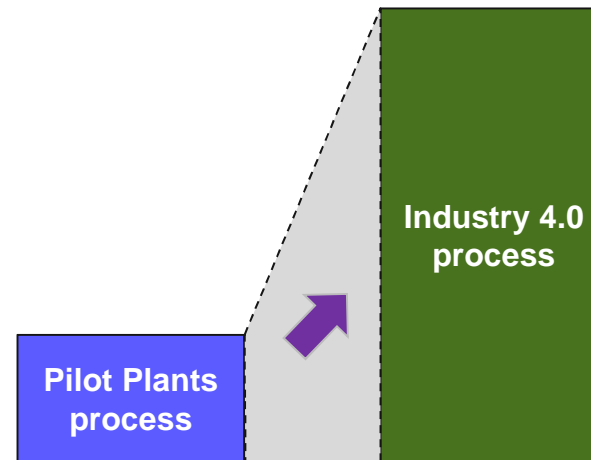
Introduction to NEP manufacturing in Pilot Plants



And the Industry 4.0 applied to a stable – mature process can give a plus of improvement, but the improvement margin is already low.



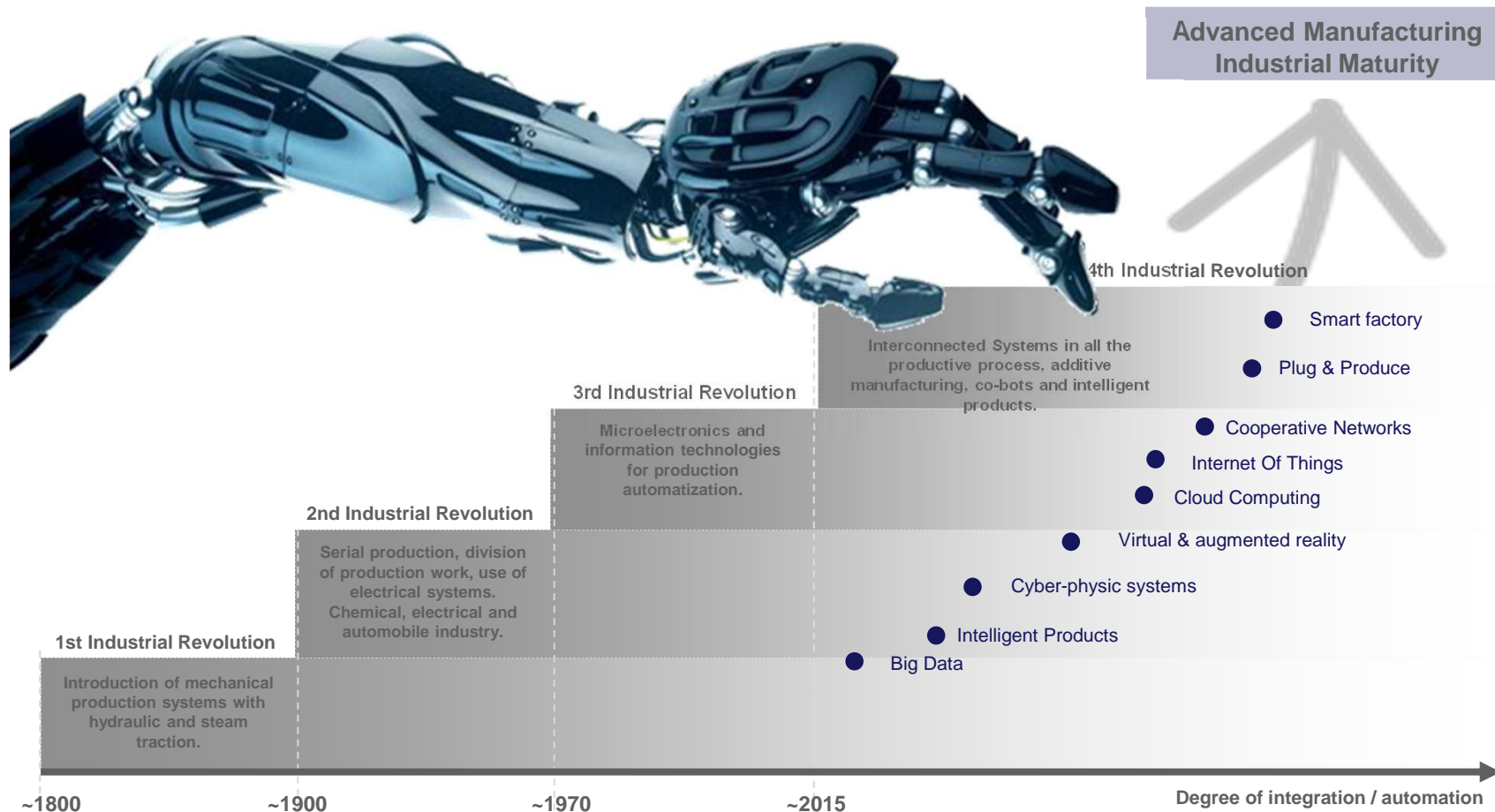
But for a non mature process (like Pilot Plants), the improvement margin to gain with Industry 4.0 is much bigger.



Roll of Industry 4.0 in Pilot Plants



There are a lot of tools and technologies available in Industry 4.0 “portfolio” → which one to use ???



“Which one” shouldn’t be the question, but, “**what for**” ???

Roll of Industry 4.0 in Pilot Plants



Two of the main tractor sectors in the industrial development are Aeronautical and Automotive. Both are leaders in aspects like quality and productivity, and to do so, they are at the forefront of the technology.



At the same time, the two main aspects to improve in Pilot Plants usually are:

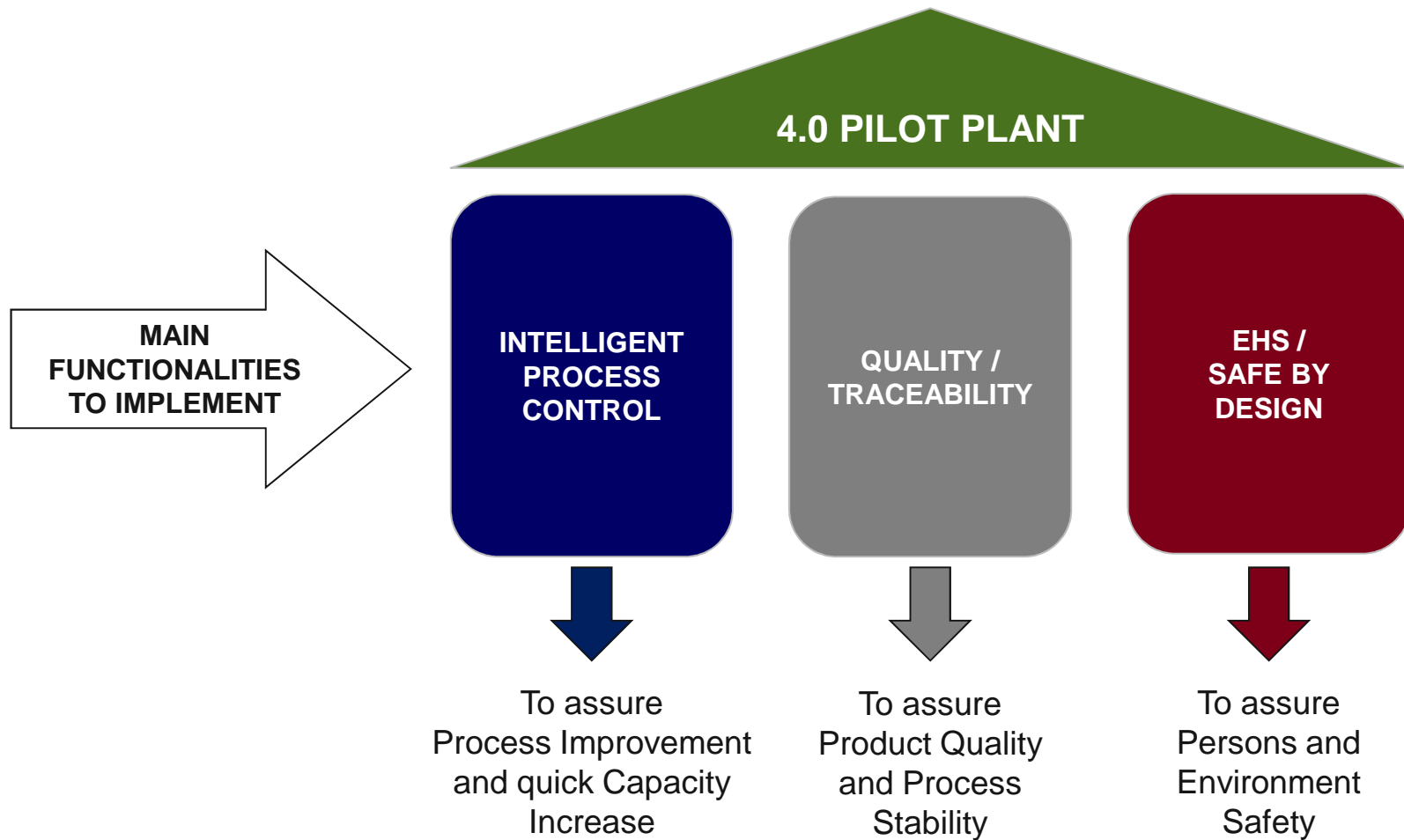
1. Constant quality – stability

- Mainly because the dynamic of the process is not well known yet.
- Many times the quality is only assured by internal quality inspections, but not incorporated in a robust and stable way in the process.

2. Increase capacity / productivity

- Usually the production capacity (volume / speed) is the last target in a Pilot Plant, after having assured the desired product achievement.
- The productivity increase is achieved as the process is known and improved, and it becomes more mature.

Roll of Industry 4.0 in Pilot Plants



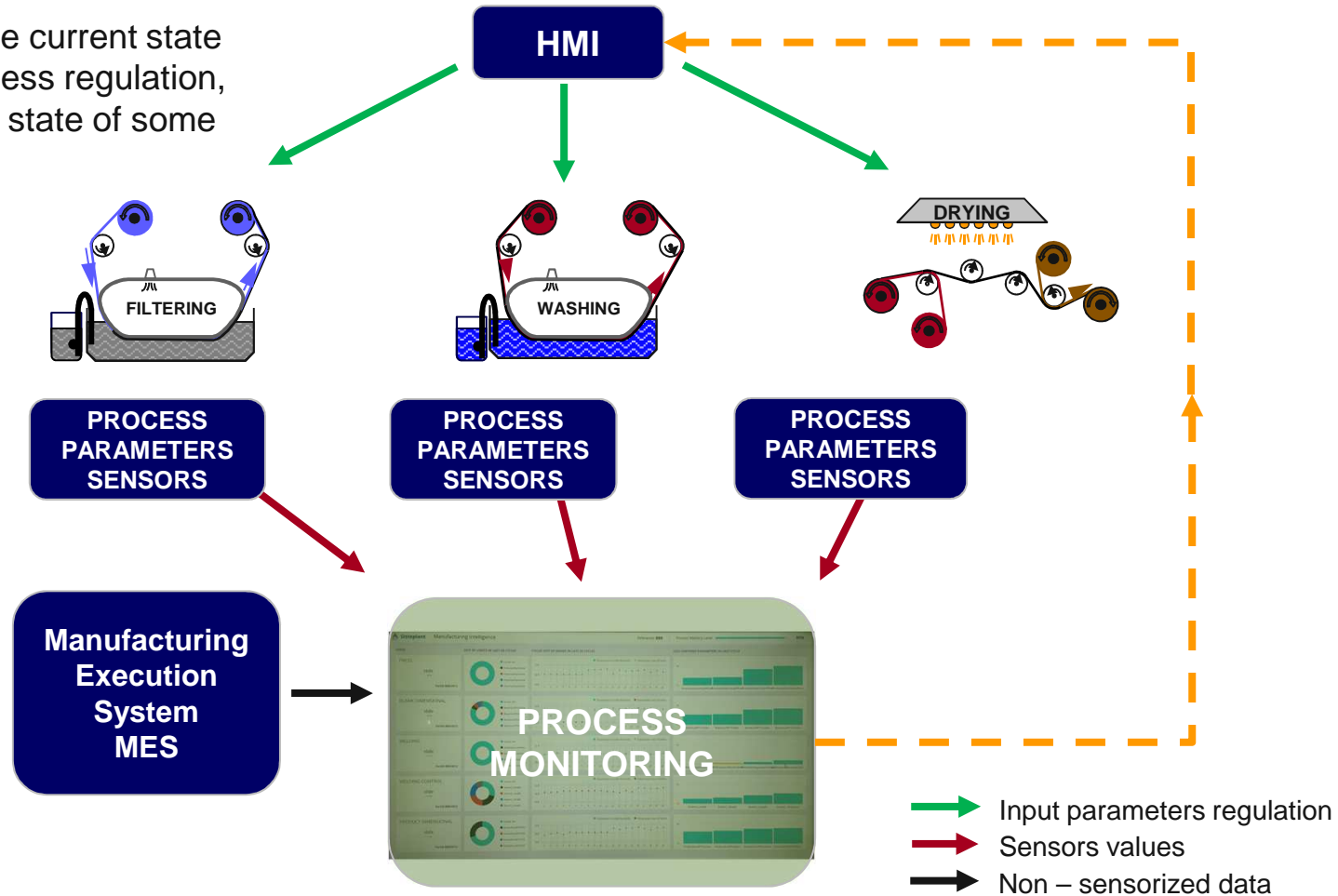
Roll of Industry 4.0 in Pilot Plants



INTELLIGENT PROCESS CONTROL



To go from the current state (manual process regulation, based on the state of some parameters)



Roll of Industry 4.0 in Pilot Plants



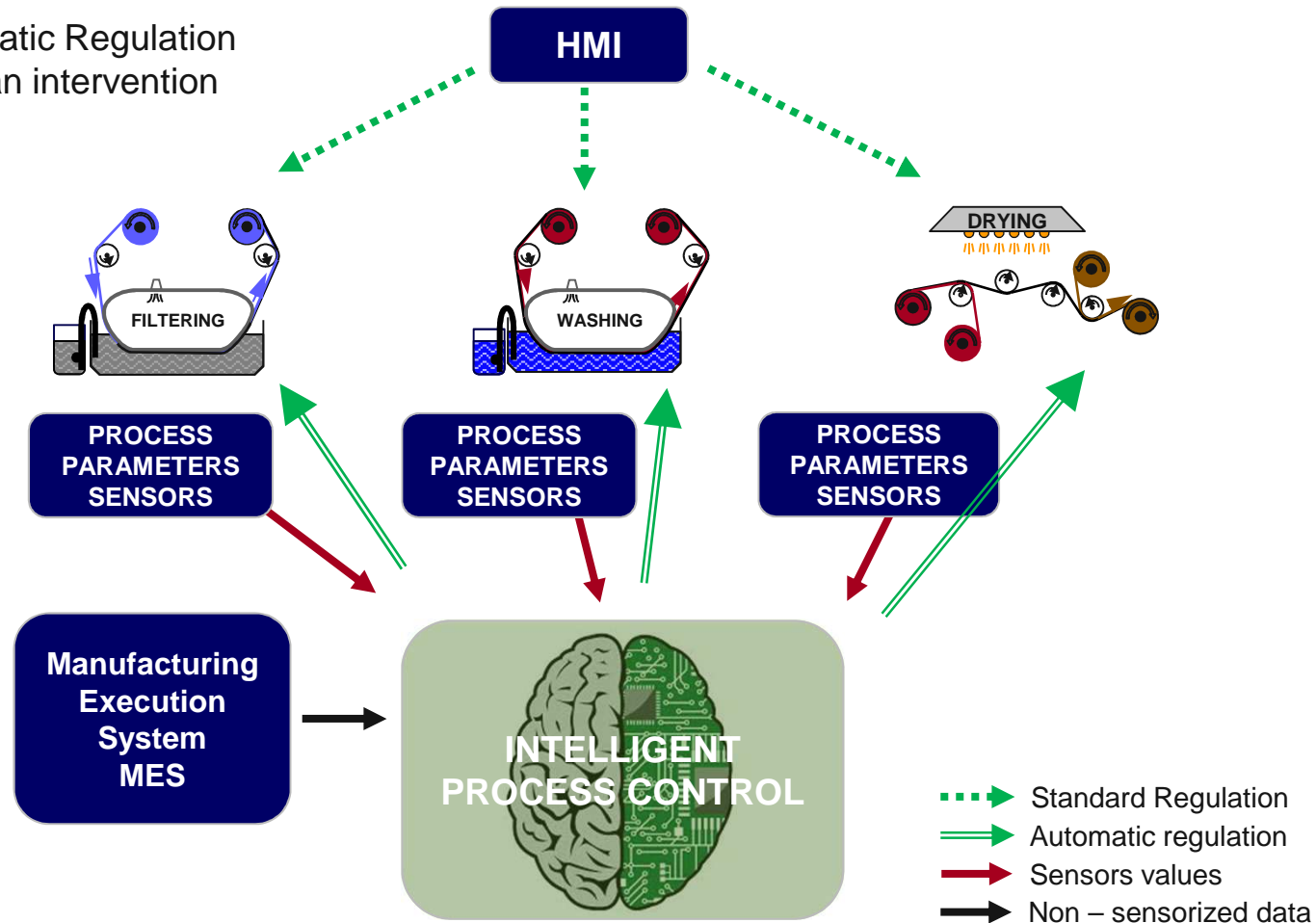
INTELLIGENT PROCESS CONTROL

To the Automatic Regulation without human intervention

I.NANO



HAZITEK 2017



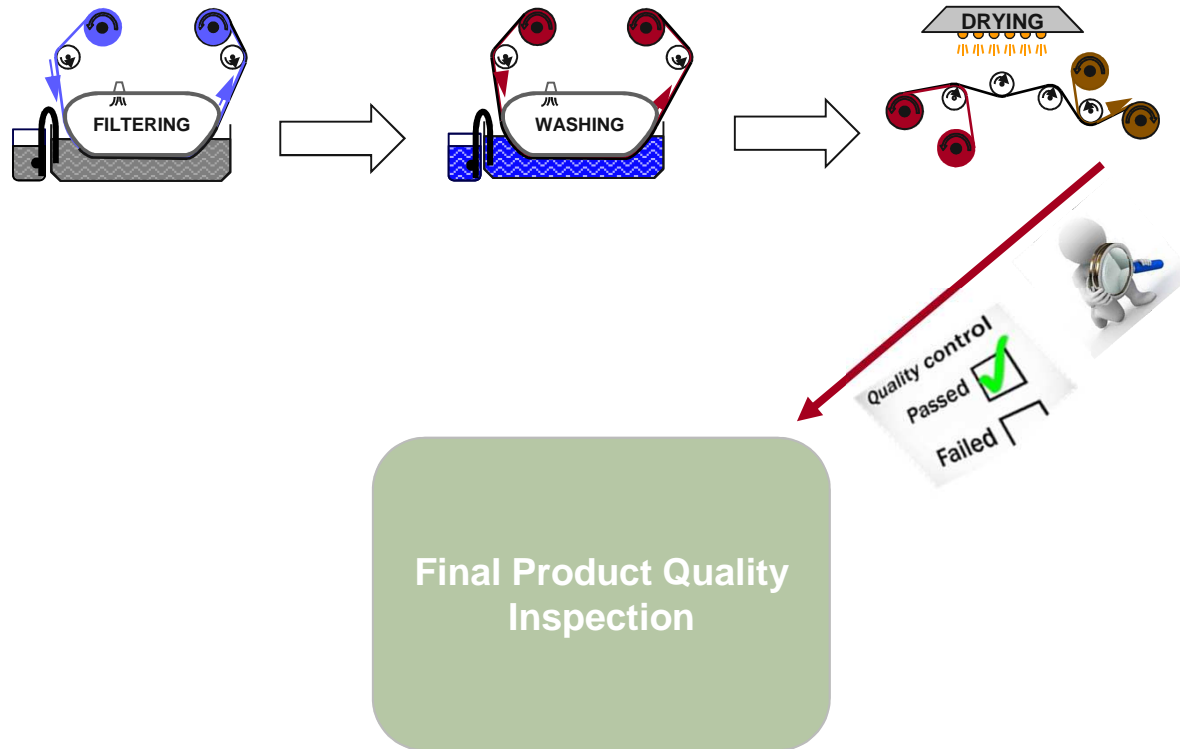
Roll of Industry 4.0 in Pilot Plants



QUALITY / TRACEABILITY



To go from the current state
(check the Product Quality
after manufacturing)



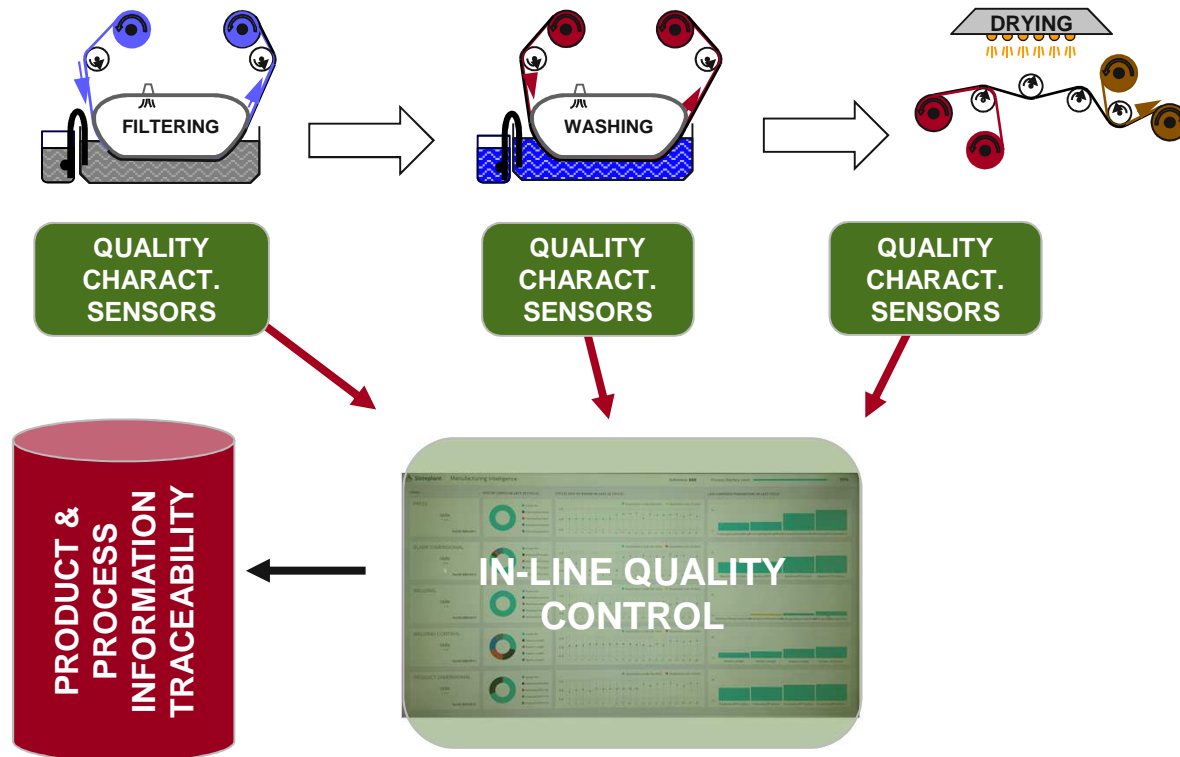
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QUALITY / TRACEABILITY

To the automatic in-line Quality Control, and product information traceability

TQMNANO



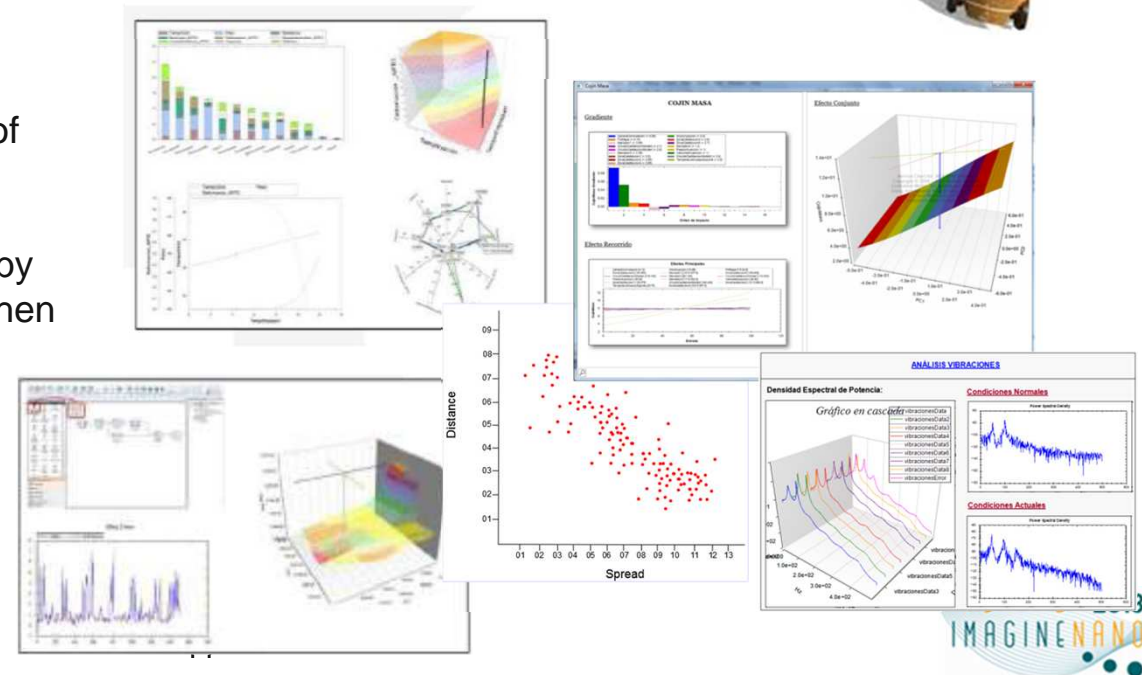
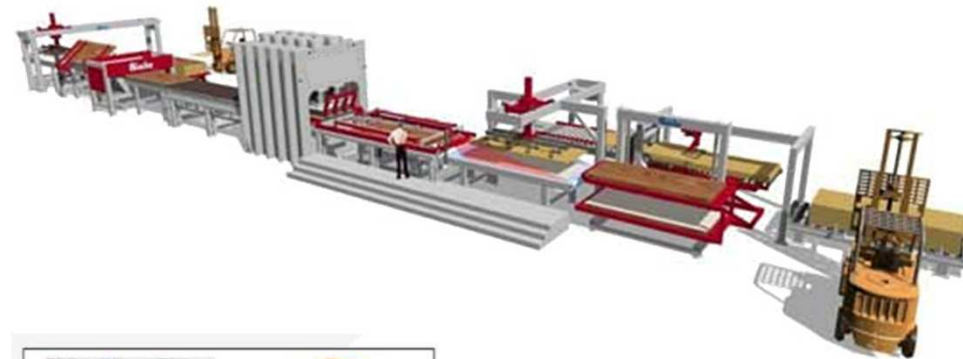
Roll of Industry 4.0 in Pilot Plants



EHS / SAFE BY DESIGN

As a complement to the Safe By Design approach, the Digital Twin can help to simulate what – if situations in two different :

- Training for new Pilot Plant users in a virtual 3D scenario
- Mathematic models:
 - To gain technological knowledge of the process (how is the process behaviour in different situations).
 - To improve process performance by off-line simulation of the model, when some parameters are changed (multiple interaction between parameters)



**THANK YOU
FOR YOUR
ATTENTION**