



SIEMENS

Ingenuity for life

Accelerated technology development

3D metrology for large gas turbine components

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Content



- **Product**
- **Acceleration of Technology Development**
- **3D metrology for large gas turbine components**

Siemens SGT-8000H series

Reliable, flexible and proven in commercial operation

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Rotor

- Proven rotor design (Hirth serration, central tie rod, internal cooling air passages): For world class fast (cold) start and hot restart capability
- Easy rotor destacking on-site: Disc assembly with Hirth serration and central tie rod

Compressor

- Four stages of fast acting variable-pitch guide vanes (VGV) allowing for improved part load efficiency and high load transients
- Evolutionary 3D blading
- Rotating blades replaceable without rotor destack or lift

Combustion

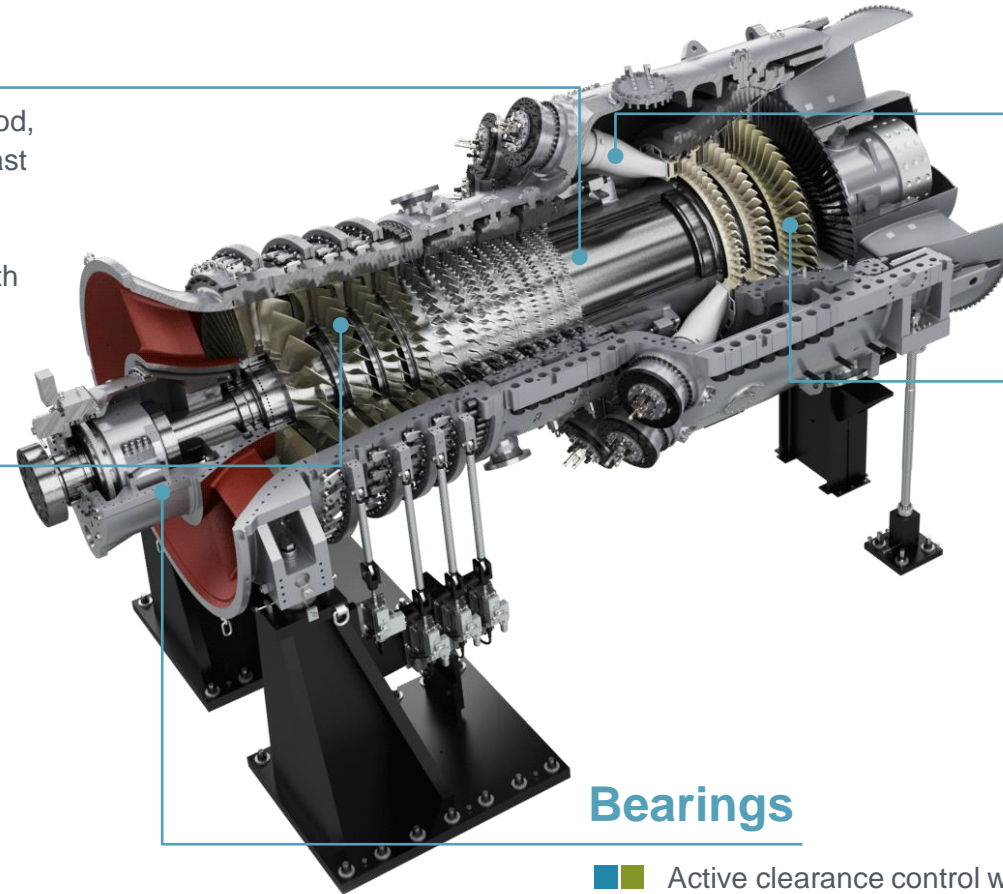
- Advanced can annular combustion system
- More than 60% combined cycle efficiency

Turbine

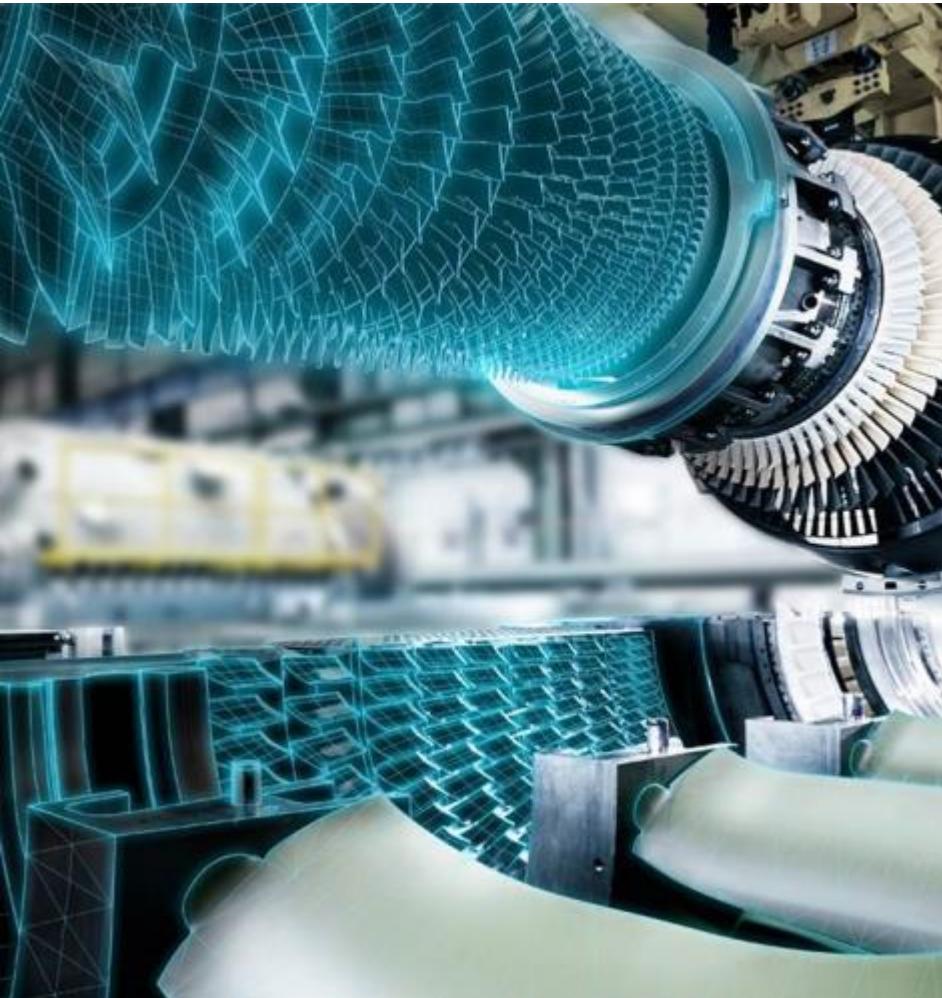
- High cycling capability due to fully internally air cooled turbine section
- 3D four stage turbine with advanced materials and thermal barrier coating
- Shorter outages: All turbine vanes and blades replaceable without rotor lift; vane 1, blade 1 and 4 replaceable without cover lift

Bearings

- Active clearance control with Hydraulic Clearance Optimization (HCO) for reduced degradation



■ Flexibility ■ Performance ■ Serviceability



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Shorter Development Cycles

New and advanced manufacturing technologies drive faster product development – Supported by 3D Metrology

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Current manufacturing development steps for turbine blades

Casting

Machining

Coating

Drilling



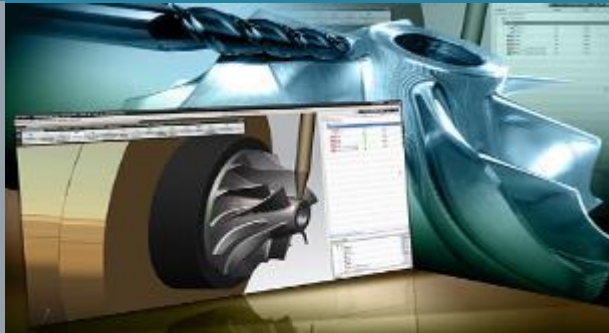
Current development process

Future development process

Faster by

**3D
metrology**

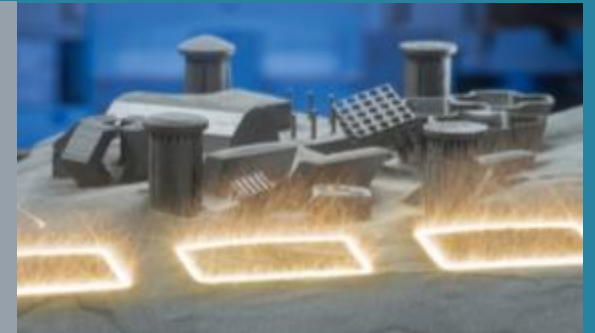
Digitalization



Automation

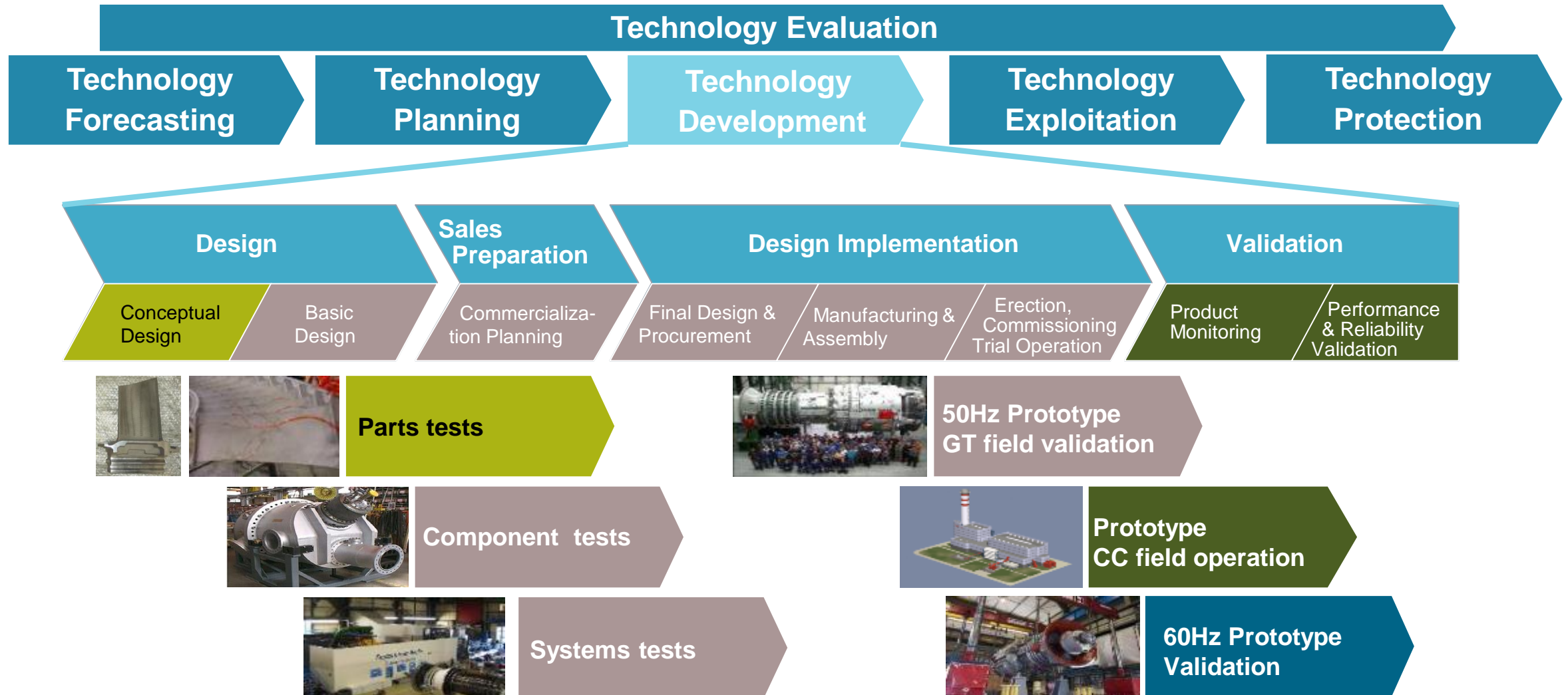


3D Printing



Technology Management Framework

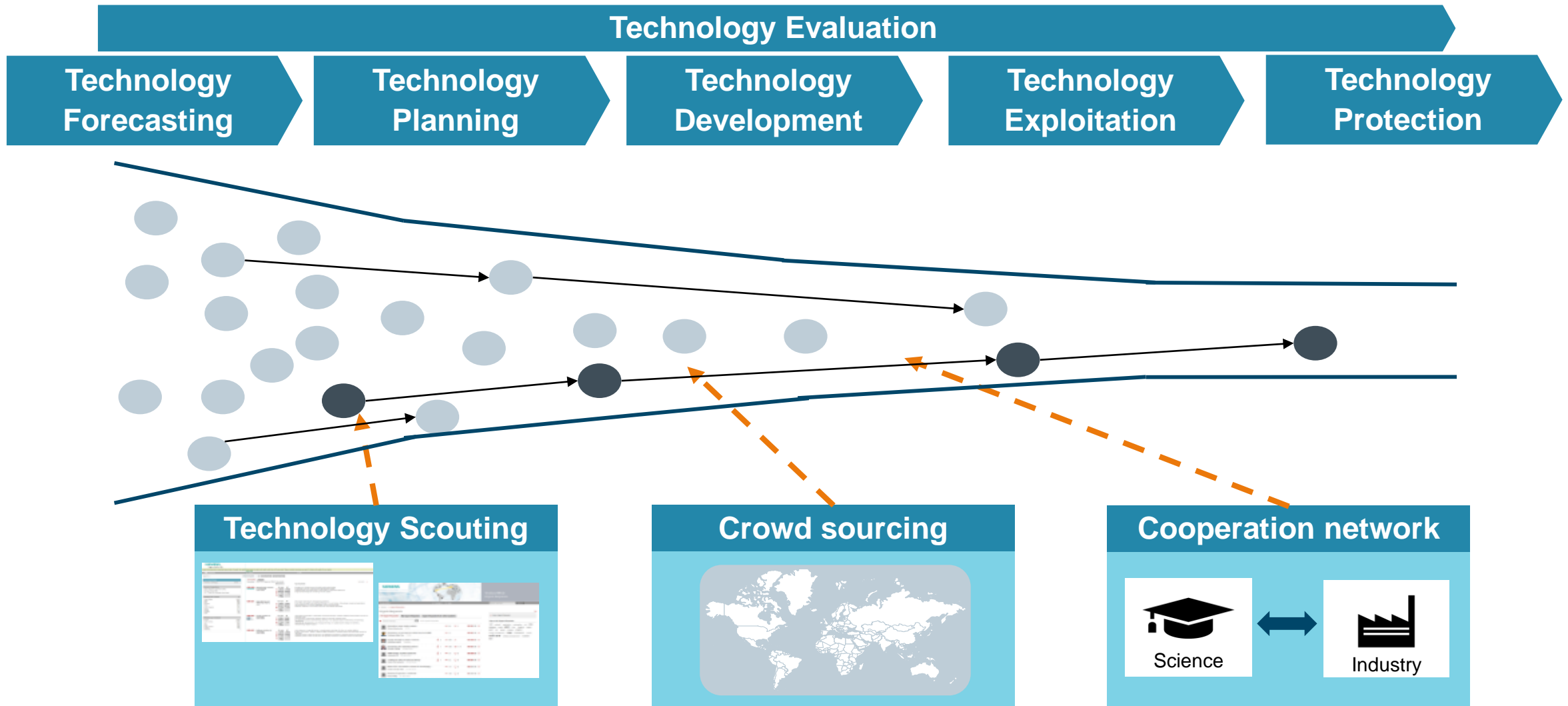
Product development process is part of the technology management process

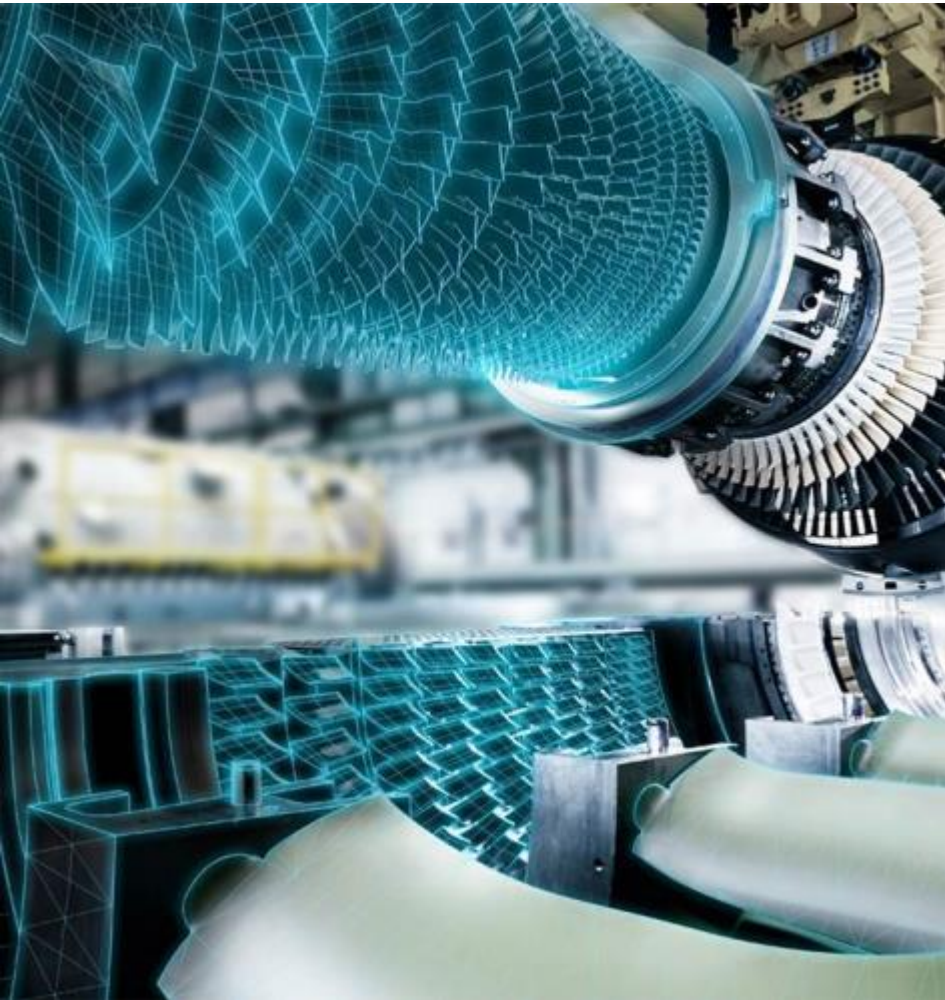


Acceleration – Time-to-Market of Technologies

New sources and open processes to accelerate the TTM

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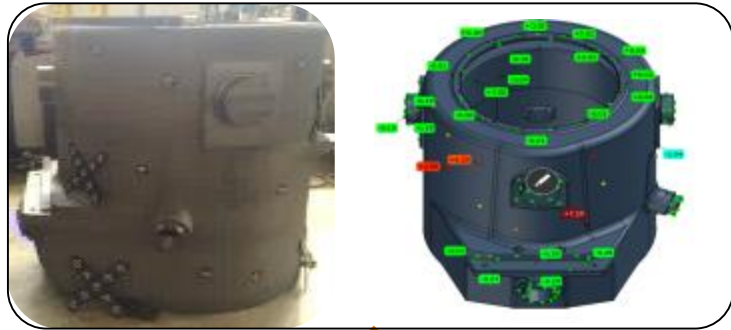


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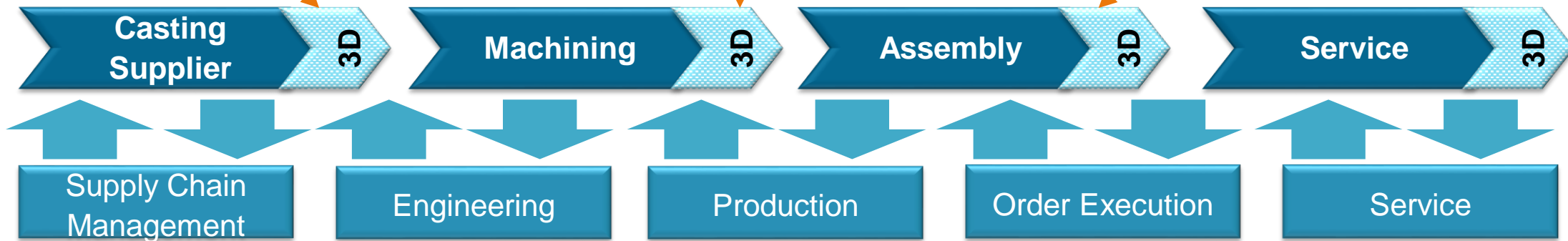
Example case: 3D metrology

3D metrology as enabler of the digital twin –
new technology with complex interfaces and disciplines


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Value chain



Internal customers

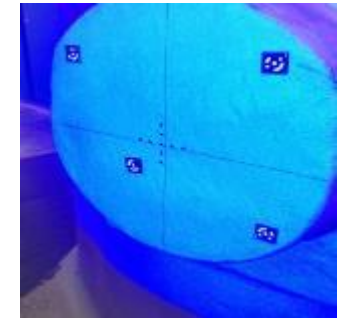
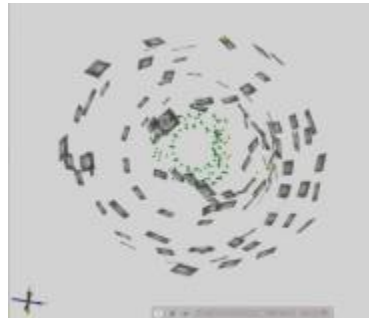
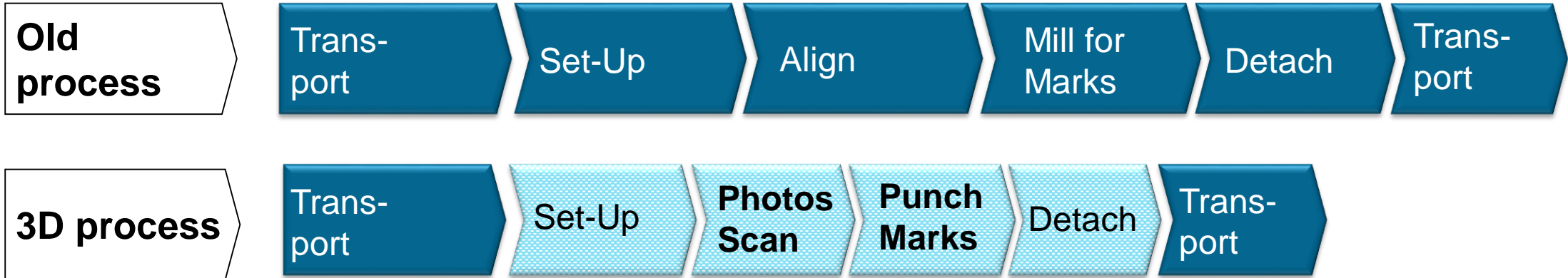
 less quality issues

 faster lead times

 better maintenance

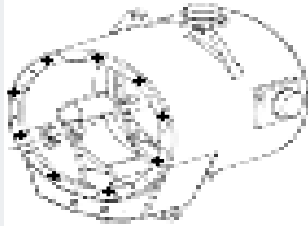
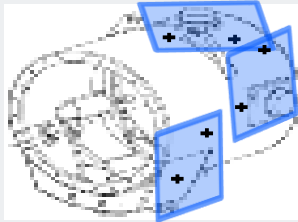
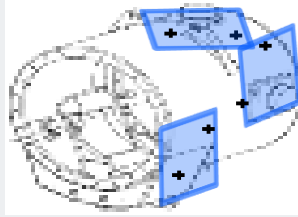
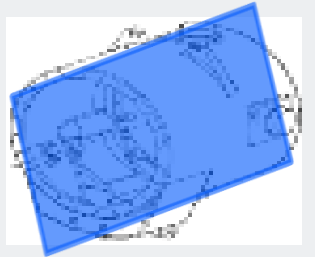
Example case: 3D metrology

Marking process of a gas turbine casing component



 40 % time reduction

Selection of 3D metrology techniques

	Single points	Partial scans	Partial scans	Full scan
Technique	Photogrammetry	Structured light scans	3D laser scanner	Photogrammetry & structured light scans
Area	10.000 x 10.000 mm ²	700 x 700 mm ²	275 x 250 mm ²	2500 x 2000 mm ²
Accuracy	0,007 mm/m	0,01 mm/m	0,02 mm/m	0,5 - 1 mm/m
Illustration <i>(blue = net = scan)</i>				

Key Takeaways

Siemens Gas Turbine Development Process ensures highest Functionality and Quality ...

... while New Manufacturing Technologies with 3D metrology enable shorter development cycles,

... dedicated Technology Management further accelerates the development process and

**... 3D metrology, as technology example for an internal process improvement,
... enables higher Productivity thus lower Cost.**



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