

EASA ADDITIVE MANUFACTURING WORKSHOP

SAFRAN - MOVING FORWARD FROM DEVELOPMENT TO SERIAL PRODUCTION

Cologne, 29/09/2016

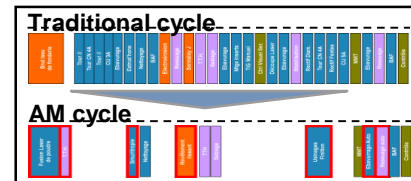


Design for additive ... and transitioning to additive

Less subassemblies
/more complex parts



Production cycle, energy &
raw material reductions



Significant weight reduction



Innovative repair solutions



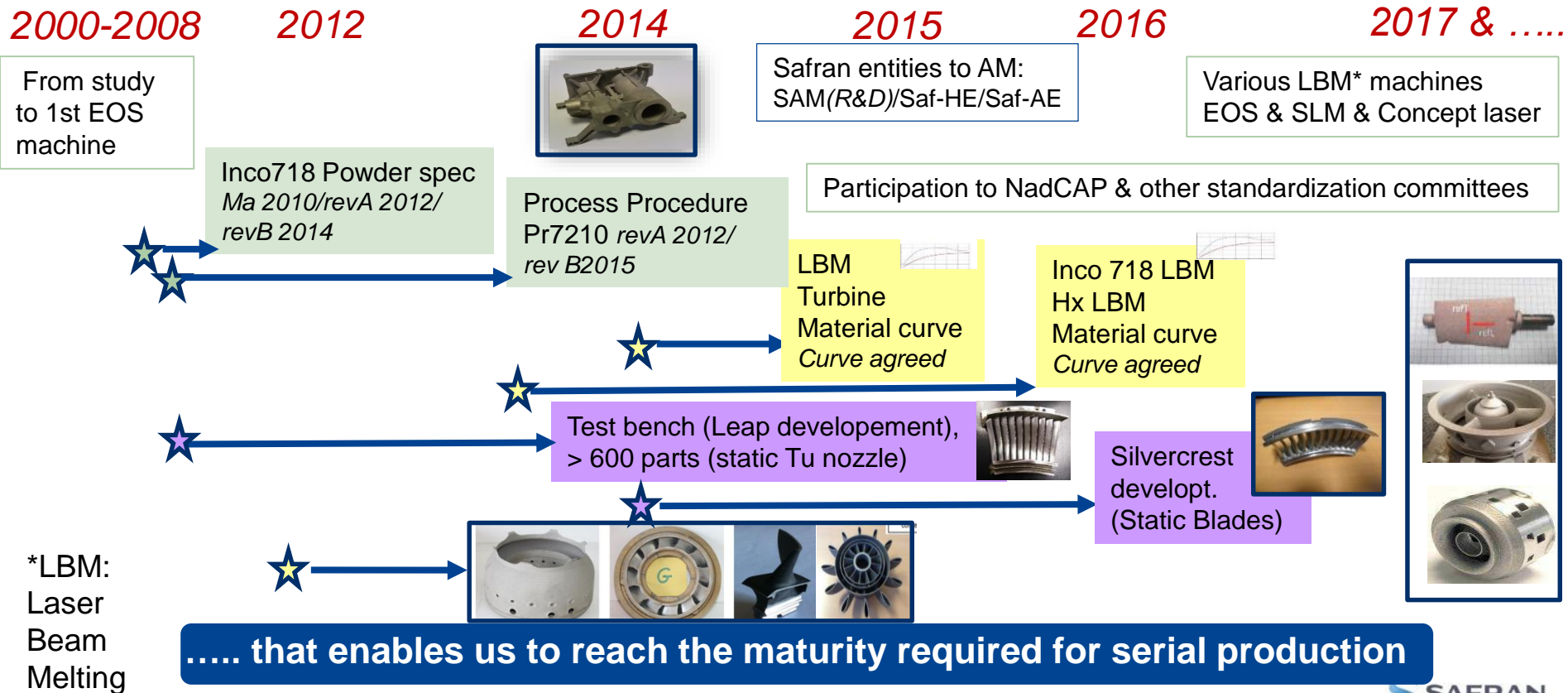
Piece & Spare parts
inventory reduction



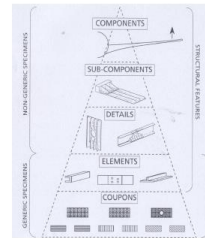
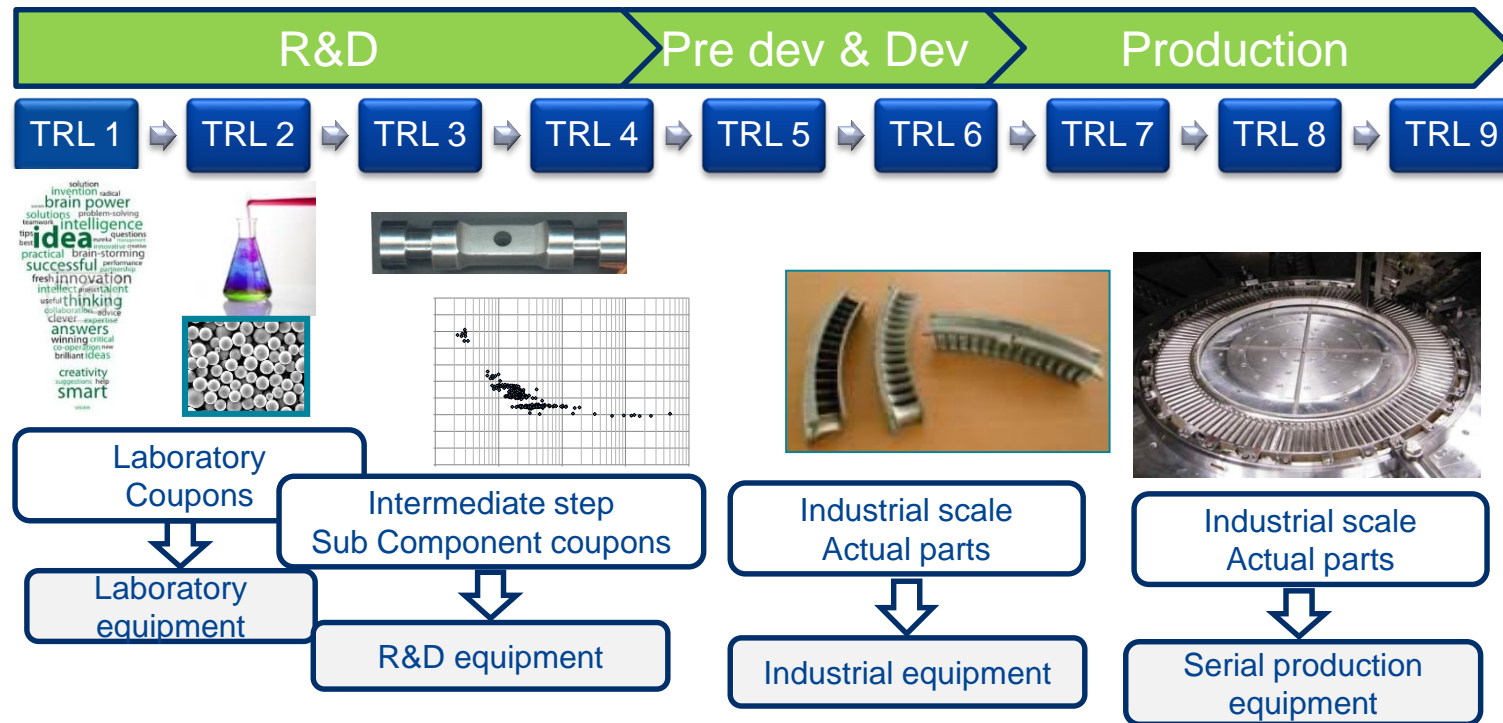
Optimized development cycle

AM will enable Safran to innovate in several areas

Safran background in Metal Additive Manufacturing : a step by step process shared within Safran companies.....



Safran standard process development scheme for AM



For targeted applications:

- Design allowables and material curves available
- Key process parameters identified
- SPC under definition

“DVI”: Safran management of Special Processes to support a Type Design

EN9100, EN9102 & EN9103 standard

DVI process from development to serial production (GRP 165: industrial validation)

Certification specification
requirements compliance

Type design (Part21J):

Dimensionnal + manufacturing req.+
Material requirement (eg Ma1210)+
manufacturing Process req (eg Pr7210) +
airworthiness limitations +...

Characteristics: Dimensional and other
measurable characteristics

Key Charac included in material spec : Cut up,
Sample, raw material, ...

Key Charac for Special Process to be controlled,
incl raw material

DVI structure (Part21G) DVI stored in Safran Quality base

Part Number

FAI (First Article Inspection)

Conformance to raw material spec

Key Process parameters list (PFMEA)

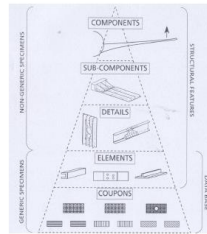
Key Charac tolerances & measures

Inspection plan

Key process parameters robustness (serial production
capability)

DVI change control

Safran Design for additive ... and transitioning to additive



Safran experience:

Safran has been working on and has been testing since 2008 additive manufacturing for a wide range of parts.

Safran has developed a full set of procedures in the frame of the current Safran Quality&Production System, to ensure the quality of the parts, from the raw material to the finished part.

Safran is currently using all this expertise to support entry in serial production of non critical parts, following a strongly documented process from coupons to product.

This will enable the development of more complex parts.

Conclusion

Additive Manufacturing is obviously a new process but a thorough application of Special Process rules in the frame of the current regulation is to our point of view, the only way to control the quality of the product.