EASA/FAA Additive Manufacturing Workshop 2019

Cologne, November 6, 2019

Opening Presentation of Working Group 1

Co-chairs

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Background

- A review of the EASA 2018 Knowledge Transfer Workshop presentations uncovered a common theme of challenges relating to Machine and material qualification.
  - This included comments from both the TCH and Machine OEM Groups
- Rather than continue to document challenges, John a I selected developed several topics related to the Problem Statement (shown on next slide) that could be discussed in today's workshop.

Problem Statement

Standardization of the qualification of AM machine and material would benefit both the machine OEM and part producers (type certificate and service bureau). Qualification tasks including machine initial calibration and builds used for site acceptance testing and generic material qualification tasks for statistically consistent material performance (metallurgical, mechanical, and physical properties) will be identified. Discussion will focus on these aspects of machine and material qualification.

Working with the WG1 core team, we down-selected 2 topics to be discussed in todays workshop .

Recognition of Companies in the Core WG1 Team

- General Electric Aviation
- SAFRAN
- Norsk Titanium
- Sciaky
- EOS
- Trumpf
- UK CAA
- EASA

Who is participating in Working Group 1

AM Machine or Powder Producers

Type Certificate Holders

Other Design Approval Holders

PAH / Part Producers (i.e., supply chain)

Airline Operators

MRO

Academia

Regulators or other government agencies?

Did we miss anyone?

Working Group 1 Topics

Topic 1 Key Process Variables

Topic 2 Qualification of Identical Machines

Fabrication Methods Regulation

§25.605 Fabrication methods.

(a) The methods of fabrication used must produce a consistently sound structure. If a fabrication process (such as gluing, spot welding, or heat treating) requires close control to reach this objective, the process must be performed under an approved process specification.

(b) Each new aircraft fabrication method must be substantiated by a test program.

WG1 Goals

- **Have a robust discussion on these specific topics related to machine qualification.**
- **Develop a common understanding and position on the WG1 topics.**
- **To provide a summary of WG1 session notes to the Workshop attendees.**

Topic 1 Key Process Variables

Will address the following questions:

- What makes a Process Variable a Key Process Variable?
- How are Key Process Variables determined?
- How are Key Process Variable values and tolerances determined?

Questions or Comments before we get started with Topic 1?

Topic 2 Qualification of Identical Machines

FAA Workshop August 2018

GROUP 2 – TYPE CERTIFICATE HOLDERS

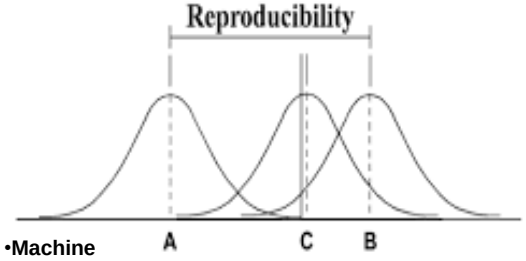
Airbus presentation on experience in qualification of AM products

Meeting Notes

GROUP 2 – TYPE CERTIFICATE HOLDERS

EASA AM Machine Knowledge Transfer and Training Meeting

- **Machine to machine variability**:
  - Variability can appear between



Machine producers should undertake "variability studies" that highlight machine to machine variation for the machines they produce and implement process improvement efforts to reduce variation … goal should be to ensure that frozen parameters established to fabricate a specific part can be used on all "identical" machines from the same machine producer

Covered in the Airbus qualification approach by :

-> Systematic machine qualification applied

Topic 2 Qualification of Identical Machines

Will address the following questions:

- Can we determine an equivalence resulting in a limited qualification exercise, a subset of the initial qualification exercise to meet a certain specification?

- How can we maintain good configuration management of the machine, BOM?

- Can we define a track record of variability of different machines produced to visualize the trends?