



SURFACE ENHANCEMENT

Surface Enhancement (SE) is a metal treatment process that uses repetitive high impacts to induce a compressive layer in the surface of Aerospace parts. This compressive layer can overcome the tensile stresses caused by machining, by inhibiting cracks from growing. This will increase the lifespan of parts by many millions of cycles in comparison to untreated parts. Another term used for Surface Enhancement is shot peening. Shot peening is the process of using shot (media) as the objects to impact the part. SE covers processes such as Computer Controlled Peening, Automated Peening, Peen Forming, Flapper Peening, Manual Peening, and Needle Peening. If SE is not performed correctly in accordance with the engineering

requirements, it can lead to premature part failure, which is why oversight of this process is critical in the Aerospace Industry.

The SE Task Group's first audits occurred in 2002 to control this process in Aerospace applications. In the late 2000s, because the Nonconventional Machining (NM) and SE Task Groups were of a comparable size, the groups were combined into the NMSE Task Group and oversight was provided by the same group of Subscribers. Today, the SE Task Group performs approximately 215 audits annually and holds 279 supplier accreditations.

INDUSTRY SUPPORT

Participating Stakeholders:

- Airbus*
- Airbus Defense and Space*
- Bell Helicopter*
- Boeing*
- Bombardier*
- Collins*
- GE Aerospace*
- GE Avio*
- GKN Aerospace
- Heroux Devtek*
- Honeywell*
- Leonardo Helicopters*
- Leonardo
- Devisione Velivoli*
- Liebherr Aerospace
- MTU
- Parker*
- Pratt & Whitney*
- Rolls Royce*
- Sonaca
- Safran*
- Spirit Aerosystems*
- Textron Aviation* (* mandates)

BUSINESS BENEFITS

- Reduced costs associated with product malfunction, returns, complaints and equipment failure
- Improved reputation and credibility in the industry
- Customer attrition due to inability to satisfy requirements
- Improved on-time delivery
- Improved control of supply chain
- Mitigated in-service risk of product failure
- Reduced scrap and rework
- Improved product quality

AUDIT CRITERIA

1. AC7117 – SE Accreditation
2. AC7117/1 – Computer Controlled Peening
3. AC7117/2 – Automated Peening
4. AC7117/3 – Peen Forming
5. AC7117/4 – Flapper Peening
6. AC7117/5 – Manual Peening
7. AC7117/6 – Needle Peening

TECHNICAL BENEFITS

Reduction in nonconforming product by ensuring a more in-depth review of . . .

- The equipment calibration processes and requirements
- Operator qualification and training
- The process of hardware inspection, including part set-up and fixturing
- Part programming and software use
- Saturation curves and intensity verifications
- Part verification tool and test block use
- Equipment maintenance in supporting fixture and asset care to prevent use of dirty/damaged/unfit for purpose equipment
- Equipment operational environment
- Flapper peening arc height conversions
- Coverage Inspection
- Media size and shape inspection
- Operator proficiency in Flapper and Needle peening

COMMON INDUSTRY ISSUES

- Improper documentation of the process
- Failure of program and software controls
- Improper process to build a saturation curve
- Failure of verification of intensity
- Improper media shape and size inspection
- No reverification of equipment after measurement of calibration setup.
- Calibration of equipment – lack of calibration, out of tolerance, lack of flow down of requirements to calibration house, lack of recurring calibration
- Operator qualification – no evidence or documentation of training/ qualifications, or process of training/qualification
- Failure to verify part programs
- Use of unapproved chemicals

COMMON NONCONFORMANCES FOUND DURING AN AUDIT

- NCR 1** - The Supplier shall complete a self-audit to AC7117 and all associated process checklists in the scope of the audit. All internally identified nonconformances should be corrected prior to the actual audit. All NA answers must be explained. Non-conformances identified as part of the Nadcap audit with potential product impact may, at the Task Group's discretion, require a follow-up audit at the Supplier's expense. This self-audit shall be maintained by the Supplier for review by the Auditor.
- NCR 2** - Is media shape inspected in accordance with the specified method and recorded at the required intervals of run time? Compliance Assessment Guidance: NA substantiation (For flapper peening)?
- NCR 3** - Are all process monitoring equipment and/or gauges identified as to their calibration status and current status?
- NCR 4** - Are the test sieves verified a minimum of every 12 months or in accordance to the Customer's requirements? Compliance Assessment Guidance: Test sieves shall be verified in accordance with ASTM E11 or equivalent recognized standard. NA substantiation (for flapper peening)?
- NCR 5** - Do all gauges used to measure parameters in the technique sheet have current calibration identification?

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GET INVOLVED

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