



METALLIC MATERIALS MANUFACTURING FORGINGS

Forging is a method used to add shape to raw material which can be close to the final shape of the parts, and to produce the required material properties of the forged material. Forging of parts is very common in the aerospace industry, and it is included in the manufacture of the most critical parts, which, if they failed, could have a catastrophic impact on the aircraft. The material structure after forging is vital to the correct inflight function of the parts. This includes grain size, forged flow lines and developed material properties.

Failure to control the forging process can lead to reduced service life, premature and in-service part failure, increased costs and/or excessive lead time and program delays.

There are very few industry specifications controlling the manufacture of forgings with most original equipment manufacturers (OEMs) using their own specifications to

BUSINESS BENEFITS

- 50% reduction in non-conformances in 5 years due to enhanced quality control as a result of compliance to Audit Criteria
- Number of Forging suppliers on extended accreditation status has doubled since 2020
- Reduced expenditure and lead-time reduction
- Reduced scrap, reduced rework with associated cost savings
- Accredited Companies appear in the Aerospace Qualified Manufacturers List (QML) in PRI EANSM (formerly eAuditNet). This is a publicly accessible database industry uses to find Nadcap accredited suppliers.
- Reduction in the OEM audits of suppliers

control forging and forged parts. General Quality System standards like AS9100 are not designed to provide the depth and breadth needed to address critical forging processes. At the request of Industry, the Nadcap[®] Management Council approved a Metallic Materials Manufacturing Task Group to address areas such as forgings, castings, and raw materials.

By working together through the Nadcap program, the aerospace industry benefits from the existing structure, policies, and systems to address this efficiently and effectively.

The forging process includes:

- Interpretation of requirements
- Forging planning and control
- Forge equipment maintenance
- Operator training and competency
- Inspection and testing of parts

INDUSTRY SUPPORT

The following Subscribers (OEMs) are active in the Nadcap Metallic Materials Manufacturing (MMM) Task Group:

- Airbus Commercial
- BAE Systems
- Collins Aerospace
- Honeywell Aerospace
- Leonardo Helicopters
- MBDA
- MTU
- Rolls-Royce
- Safran Group

AUDIT CRITERIA

The forgings audit criteria questions are grouped into sections based on the forging process timeline. These include:

1. General requirements (preventative maintenance, training, documentation, tooling and dies manufacturing and storage)
2. Purchase order review
3. Purchasing and verification of product (forging stock and consumables)
4. Forging stock preparation
5. Heating process prior to forging
6. Forging process
7. Post forging processes (flash removal, visual inspection, scale removal, conditioning, bending / straightening)
8. Test material removal and inspection
9. One long job audit, covering the entire forging process, based on a historical job asking a wide array of compliance questions
10. Eight live in-process shorter job audits covering pre-forging, forging and post-forging processes

COMMON NCRS FOUND DURING NADCAP® FORGING AUDITS

- Control of forging temperature and time
- Defined over-temperature set point
- Control of temperature sensors in forging equipment
- Furnace control and recording instrumentation required by the governing specification and/or Supplier Document
- Control, storage and protection of the forging stock
- Requalification requirements after maintenance activity

BUSINESS IMPACTS OF POOR FORGING CONTROL

- Costs associated with forging malfunctions
- Reputational damage and impact
- Lack of credibility and trust in the industry
- Customer attrition due to inability to satisfy requirements

TECHNICAL BENEFITS OF THE FORGING PROGRAM

- Working with peers to develop audit criteria and approve auditors used for the Nadcap accreditation process
- Participating in global supply chain assessment activities
- Incorporation of OEM's specific requirements into the Nadcap audit criteria
- More robust, consistent approach to audits

USA / International Headquarters

Telephone: +1 724 772 1616
Email: PRIAmericas@p-r-i.org

Europe, Middle East and Africa

Telephone: +44 (0) 870 350 5011
Email: PRIEMEA@p-r-i.org

Asia Office (China)

Telephone: +86 10 6463 6008
Email: PRIAsia@p-r-i.org

Asia Office (Japan)

Telephone: +81 80-6911-1154
Email: PRIAsia@p-r-i.org



GET INVOLVED

NadcapInfo@p-r-i.org