

Manufacturing large TiAl parts

Without defects and with a high homogeneity

Patent status:

EP 1568486 (AT, DE, FR, GB, IT) granted

CN 1660540 granted

RU 2306227 granted

US 7870670 granted

Challenges

Titanium aluminides (TiAl) are mainly used in jet engines as a substitute for nickel. Until now the usage of TiAl has been restricted to manufacturing blades. Manufacturing larger parts is difficult due to the intrinsic high brittleness, inhomogeneity and presence defects and chemical inhomogeneity in ingot material.

Technology

Scientists at Helmholtz-Zentrum Geesthacht developed a process, which overcomes problems that occur while manufacturing large TiAl parts. Final defect free forged parts have a high chemical and microstructural homogeneity thus offering more opportunities to introduce TiAl into other relevant areas that to date were not possible.

Areas of Application

Using TiAl for jet engines, blisks, rotors and other weight and temperature critical parts potentially offers high fuel reductions. Other applications with potential for the introduction of TiAl are power plant and vehicle engines, high-pressure compressors, etc.

Development Status

Currently the technology has an ARL of 4, meaning that the technology has been validated in lab. The process was shown to producing disks with a diameter of up to 29 cm. In principle it is possible to use the process for producing even larger parts.

Exploitation Opportunity

Helmholtz-Zentrum Geesthacht offers the described technology for in-licensing and/or for the further development and exploitation. Within the scope of cooperation, interested companies can be supported in adapting this technology to their specific requirements.

Publication

J.D.H. Paul et al.: Up-Scaling of TiAl Component size: a Novel Solution. Aeromat 2014.

J.D.H. Paul et al.: Up-Scaling the size of TiAl Components made via ingot metallurgy, Intermetallics, 32, p. 318 (2013)



Bild: HZG/WPM

Advantages:

- Large TiAl-parts
- High homogeneity over the whole part
- Fine microstructure
- Defect free parts possible
- Higher overall material usage possible??

Application:

- High strength
- Durability
- Reduced abrasion
- Low weight Ca. 50% less weight than comparable technologies (nickel)

Industrial Sector:

- Aviation and aerospace (turbines, blisks, ...)
- Energy (gas turbines, ...)
- Automotive (piston, connecting rods, ...)
- As a substitution to nickel

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