Projektsammanfattningen ska kunna spridas och publiceras fritt och får således inte innehålla konfidentiella eller på annat sätt känsliga uppgifter. Den ska skickas in till programkontoret för Lättvikt: info@lighterarena.se.

Projektsammanfattning

*(max 1 sida exklusive nedanstående tabell, **publik**)*

Projekttitel på svenska (max 80 tecken)

Utveckling av EBM-tillverkade titanlegering delar för högpresterande lättviktsdesign

Projekttitel på engelska (max 80 tecken)

Development of EBM-fabricated titanium alloy parts for high performance leightweighting

Akronym (max 10 tecken)

EB-TILIGHT

Erbjudande	Projektet bygger vidare på resultat från ett tidigare projekt
☐ Genomförbarhetsstudie ☒ FoI-projekt	☒ ja, med stöd från Vinnova (Projekts diarienummer: INNOKOMP 2017-0126) ☒ ja, med stöd från AoA Materials Science (SFO), Chalmers (avser offentlig finansiering). ☐ nej

Projektet är ☐ i sin helhet samma projekt som har insänts till annan finansiär, nämligen: finansiär
☐ i delar samma projekt som har insänts till annan finansiär, nämligen: finansiär

Finns uppgifter om affärs- och driftsförhållanden som skulle kunna leda till skada om de offentliggörs

☐ ja ☒ nej

Sammanfattning (max 1500 tecken) – *Denna ska skrivas så att en extern bedömare ska kunna förstå syftet och innehållet i projektet.*

Projektet fokuserar på electron beam melting (EBM) som metod för lättvikt via för flyg och biomedicinska tillämpningar. Målet är att skapa förtroende för ökad tillämpning av additiv tillverkning för högt belastade komponenter där tillämpningar för flyg har utmattningsegenskaper som kritisk faktor samt vidareutveckling av additiv tillverkning som metod för bionisk design för framtida implantat. Utmaningar kan sammanfattas som följer. Utmattningsegenskaperna för additivt tillverkade titankomponenter behöver kontrolleras ytterligare för att möta kraven för lättviktsdesign för högt påkända detaljer. Här kommer möjligheten att optimera mikrostrukturen och eliminera defekter att adresseras. För att nyttja bionisk design genom additiv tillverkning för att skapa optimerade strukturer kommer tillverkningsoptimering när det gäller lättviktsdesign för eliminering av stress-shielding att adresseras. Samverkansstrukturen som skapas genom projekt kopplat till dessa mål involverar en konstellation med två centrala industriparter (GKN, Arcam) samt tre forskningsorganisationer med kompetens inom additiv tillverkning och materialteknik.

Sammanfattning på engelska (max 1500 tecken)

The project focuses on electron beam melting (EBM) for Ti alloy in both aerospace and biomedical sectors as a means of high performance light weight design. The goal is to build confidence to use additive manufacturing (AM) for highly loaded components that would benefit significantly from the design in aerospace applications where fatigue loading is critical and to further develop AM as a main approach for bionic design demonstrated for future medical parts. The main challenges are as follows. First, the fatigue properties of the AM-fabricated Ti-parts needs to be further controlled with respect to in particular spread

Med stöd från:

to meet the strongest demands for lightweight design of highly loaded components, where the potential effect of subsequent hot isostatic pressing is explored as well. It is expected that there is further need for optimising the microstructure in this respect as well as to establish efficient approaches for assessing the fatigue properties. Of particular importance as well is the re-use of the powder as means of sustainable and cost efficient implementation in future applications. Second, to take advantage of the bionic design capacity to tailor constructs for improved stress-shielding for biomedical applications further the limits in manufacturability with respect to thin wall structures are needed. The cross-correlation between these objectives and joint efforts in realising high performance EBM-Ti parts comprises the core of the project involving constellation with key industrial partners (GKN, Arcam) and core research providers in additive manufacturing and materials science (Chalmers, GU and RISE).	
Startdatum 2019-09-01	Slutdatum 2022-08-31
Totalt sökt stöd (SEK) 3 600 000	Total medfinansiering (SEK) 7 200 000

1. Projektets idé

The project focuses on electron beam melting (EBM) for Ti alloy in both aerospace and biomedical application as a means of high performance light weight design. The goal is to build confidence to use EBM for highly loaded components that would benefit significantly from the design in aerospace applications where fatigue loading is critical and to further develop EBM as a main approach for bionic design for future medical parts. Successful implementation of project results is expected to bring the TRL-level from TRL4 towards TRL6 for specific parts. The results will open-up new commercial alternatives for aerospace and biomedical industry. The project will provide the necessary decision support for GKN to bring their development of use of EBM-Ti towards implementation for their products. The project will provide Arcam with a platform for further marketing of their EBM-technology as solution provider for improved stress shielding solutions in medical sector. The knowledge obtained ensures robust EBM manufacturing and high performance of components. Project agreement will secure IPR for future implementation of industrialization of project results. Besides presentation at LIGHTer conferences, results dissemination will include international scientific publications and conferences.

2. Projektets bidrag till programmålen

The proposed project addresses both innovation themes “Lighter through improved properties and innovative solutions” and “Lighter with reduced development time”. In aerospace, EBM constitutes a manufacturing technology for realizing light weight structures provided that thin wall designs are strong enough and surface characteristics can be controlled. By securing predictable and consistent fatigue performance, it is envisaged that more than 20% lighter products can be obtained through the project. The assessed correlation between mechanical performance and product characteristics will ensure that development time from design to print can be shortened by 50% for specific products. In the biomedical application, light weighting is realized by optimized/bionic design of future implants having tailored surfaces, thin wall structures and open networks. The resulted low modulus matches better with the human body, reducing the mismatch in stiffness and alleviating the stress-shielding. This ensure long-term safe application. High design freedom and flexibility shorten lead time to final usage.

Med stöd från:

3. Projektets aktörskonstellation

Nr	Role	Organisation	Contact	Gender
1	C, RTO	Chalmers	Yu Cao, Marie Fischer, Lars Nyborg	F, F, M
2	IND	GKN Aerospace Sweden AB	Mats Delin	M
3	RTO	Rise IVF	Ola Lyckfeldt	M
4	RTO	Göteborg University	Anders Palmquist	M
5	IND	Arcam AB	Anders Snis	M

Competences

Five partners are included, covering all the required research and technological capabilities. ***Chalmers*** provides core expertise in powder metallurgy at the international forefront that combines research excellence with industrial relevance. Characterization of surface chemistry and microstructure, knowledge of mechanical performance, fractography and powders are provided.
GKN Aerospace Sweden AB is the world's leading aerospace supplier and has strong technology positions. It serves more than 90% of the world's aircraft and engine manufacturers.
Arcam AB is the global leader for AM technology of fully dense metal parts using EBM. It provides cost-efficient EBM solution for production of components for implants and aerospace.
Gothenburg University/Sahlgrenska Academy has long experience on tissue reactions to implants, providing necessary analytical techniques and theoretical model as well as connection to end user needs in hospital sector.
RISE IVF contributes with powder characterization and surface geometry characterization.

Med stöd från: