HEXAG MEETING JUNE 20TH 2016

Progress in the use of Additive Powder Layer Manufacture

of Compact Heat Exchangers:

An update.

Drummond Hislop,

Technology Director

HiETA Technologies Ltd.

Introduction

- Additive Manufacturing (AM) is a new manufacturing technology that "grows" products by adding and processing material layer by layer. AM allows previously unattainable design complexity, compactness and functionality.

- HiETA uses Selective Laser Melting (SLM), a form of AM that processes high performance metal alloys in the design, development and manufacture of thermal management products, particularly compact heat exchangers.

- Main markets: aerospace, defence, automotive and clean energy, where there is an increasing need for more compact, lighter and efficient components

- AM products have the potential to meet these requirements. An additional advantage is the ability to integrate 2 or more components into a single, multi-function SLM unit.

Why SLM for Compact Heat Exchangers?

•Micro-turbine recuperators: existing components too large, heavy, expensive and unreliable for new demands in automotive and aerospace applications.

•Thermal management in defence and aerospace – increasing demands for heat removal, particularly in UAVs, but weight limitations getting stricter.

•Motorsport: new regulations encouraging thermal management lead to need for more heat exchangers.

SLM – The Process

- A thin layer of the powder is spread on a metal platen.
- A CAD-driven laser scans and melts each layer where it is to be solid.
- The molten powder cools quickly to a fine-grained solid structure
- Each layer is a very thin horizontal slice of the part being built
- Each new layer is melted into the previous layer.
- The part is “grown” layer by layer until it is complete
- The finished part is cut away from its platen and excess powder removed

The Advantages of SLM

- Very high degree of 3-D design freedom.
- Elimination of welded, brazed and other joints.
- Can build very complex parts with internal voids.
- Parts can be packaged with much greater design flexibility.
- Different functions can be combined in single builds (eg heat exchange/structural/fluid flow control).

Progress

General Electric: fuel nozzle for LEAP aero engine

HiETA recuperator: for micro-turbined range extender for electric vehicle; and ground generation for mobile phone towers

HiETA: heat exchanger for motorsport.

HiETA heat transfer surfaces: triply periodic minimum surface, lattices with hollow struts.