

Research theme	Design, Production and Management (DPM)
Research title	Optimisation of Inert Gas Flow in SLM machine
Researcher	Glenn Roozing
Research period	From 20-04-2015 to 01-04-2016
Company	Netherlands Aerospace Centre
Supervisor	Dr. Ir. W.W. Wits

Background

The Aerospace Vehicles Structures Department (AVST) of the Netherlands Aerospace Centrum (NLR) aims to support the aerospace sector by identifying, developing and applying high-tech manufacturing methods and design concepts for lightweight applications. Within AVST; the Metal Additive Manufacturing Technology Centre (MAMTeC) conducts Research and Development (R&D) on advanced metal-based Additive Manufacturing (AM) technologies. MAMTeC has an 'in-house' laser based powder bed fusion facility whereby a SLM machine and associated peripherals are used to produce components.

Assignment

The content of this thesis is set out to investigate the variation of process parameters caused by the closed inert gas flow circulation system of the SLM machine. The goal is to optimize the (closed) inert gas flow circulation system of the SLM machine using CFD to avoid disturbance of the laser both locally and non-locally, and, avert the balling phenomenon.

Results

Single vector scanning experiments indicated substantially improvements; no quality degradation, in the form of the balling phenomena, was observed with the improved situation of the SLM machine (Figure 1). In addition, pictures of the single vector scanning experiments indicated strong evidence of smoke being carried by the inert gas flow circulation towards the outlet of the SLM machine.

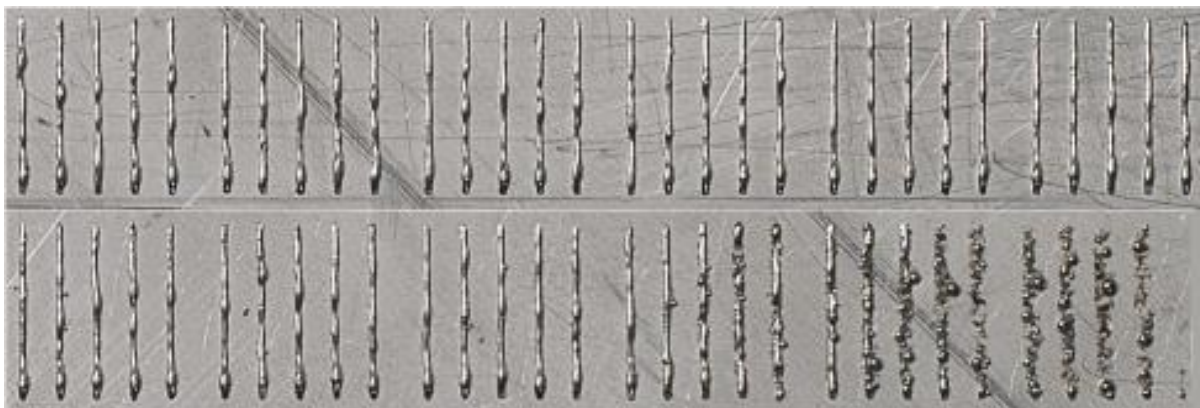


Figure 1 Single vector scanning experiments of current situation (lower platform) and improved situation (upper platform). Whereby, the quality degradation, in the form of the balling phenomenon, is (clearly) visible from vector 18 to vector 30 in case of the current situation.

Personal experience

I (especially) enjoyed the diversity and the practical aspects of the master thesis.