**Building high integrity parts using multiple lasers**

Marc Saunders
Renishaw Inc
West Dundee, IL 60118

## ABSTRACT

Production-orientated laser powder bed fusion (LPBF) machines increasingly feature multiple lasers to boost build rates. Overlapping fields of view enable these lasers to operate independently on separate parts, or to cooperate on single large components. Each laser can be assigned to different tasks, potentially using different processing parameters. This opens up a wide range of new processing possibilities, whilst also raising productivity and lowering part costs.

Multiple lasers processing in close proximity to one another create the potential for interaction between lasers. We will discuss the challenges that arise when running up to four lasers in the space where just one was working on previous machines. The critical relationship between the lasers and the inert gas flow will be explored, including the circumstances in which one laser can affect another. Using this knowledge, we will review strategies to exploit multi-laser flexibility without compromising the quality of high-integrity components. User-friendly software tools to manage laser assignment will also be introduced.

## MULTI-LASER MACHINE CONFIGURATIONS

The laser powder-bed fusion (LPBF) melting process produces spatter and condensate as a result of the rapid heating of the substrate. Different materials produce spatter that varies significantly in its size, shape and quantity. Multiple lasers produce correspondingly more spatter, so managing it effectively becomes increasingly important.

Where more than one laser is working in close proximity to another, this raises the concern that emissions from one laser could affect the other, dependent on their relative position within the machine's inert gas flow. If one laser is downwind of another, then the beam must pass through the emissions from the upwind laser on its passage to the powder bed. The first generation of multi-laser machines used zoning to avoid this issue, combined with either linear or divergent gas flow (see Figure 1).