

Laser Powder Bed Fusion Awareness for Engineering Students in France and Qatar

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Abstract : Additive manufacturing AM or 3D printing is one of the pillars of Industry 4.0. Compared to traditional manufacturing, AM provides a prototype before production in order to optimize the design and avoid the stock market and uses strictly necessary material which can be recyclable, for the benefit of leaning towards local production, saving money, time and resources. Different types of AM exist and it has a broad range of applications across several industries like aerospace, automotive, medicine, education and else. The Laser Powder Bed Fusion (LPBF) is a metal AM technique that uses a laser to liquefy metal powder, layer by layer, to build a three-dimensional (3D) object. In industry 4.0 and aligned with the numbers 9 (Industry, Innovation and Infrastructure) and 12 (Responsible Production and Consumption) of the Sustainable Development Goals of the UNESCO 2030 Agenda, the AM's manufacturers committed to minimizing the environmental impact by being sustainable in every production. The LPBF has several environmental advantages, like reduced waste production, lower energy consumption, and greater flexibility in creating components with lightweight and complex geometries. However, LPBF also have environmental drawbacks, like energy consumption, gas consumption and emissions. It is critical to recognize the environmental impacts of LPBF in order to mitigate them. To increase awareness and promote sustainable practices regarding LPBF, the researchers use the Elaboration Likelihood Model (ELM) theory where people from multiple universities in France and Qatar process information in two ways: peripherally and centrally. The peripheral campaigns use superficial cues to get attention, and the central campaigns provide clear and concise information. The authors created a seminar including a video showing LPBF production and a website with educational resources. The data is collected using questionnaire to test attitude about the public awareness before and after the seminar. The results reflected a great shift on the awareness toward LPBF and its impact on the environment. With no presence of similar research, to our best knowledge, this study will add to the literature on the sustainability of the LPBF production technique.

Keywords : additive manufacturing, laser powder bed fusion, elaboration likelihood model theory, sustainable development goals, education-awareness, France, Qatar, specific energy consumption, environmental impact, lightweight components

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