DEVELOPMENT OF THE LASERMETALDEPOSITION TECHNOLOGY

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Since 1980, the development of additive production has begun. In recent years, several additive manufacturing technologies have been developed based on the creation of 3D objects using sequential layering processes [1]. In such processes, the layers form a homogeneous structure by consistently coating 3D objects with properly prepared materials that can sometimes be modified during the process. This creates opportunities for the production of new unexplored structured materials.

We present a development of laser metal deposition technology (LMD). This technology uses a process whereby a laser beam melts a small area of the metal surface and the metal powder nozzle deposits the metal particles at that point, creating new structures on the metal surface [2].

The main technological principle of our developed LMD system is illustrated in Fig. 1 and consists of 5 parts: (I) positioning of metal powder ultrasonic jet , (II) control system of laser, (III) suction systems for metal powder residues, (IV) printing platform with controller and (V) monitoring system. Ultrasonic jet system is used to separate metal partcles and point the powder flow towards the printing platform. Laser beam is focused and pointed to the metal powder on the printable object. Suction system helps to avoid defects in the printable object by collectng unmolten powder particles and agglomerates from the printing platform. Printing platform, where the 3D object is being produced, has threecontrolled moving axes (X, Y, Z).

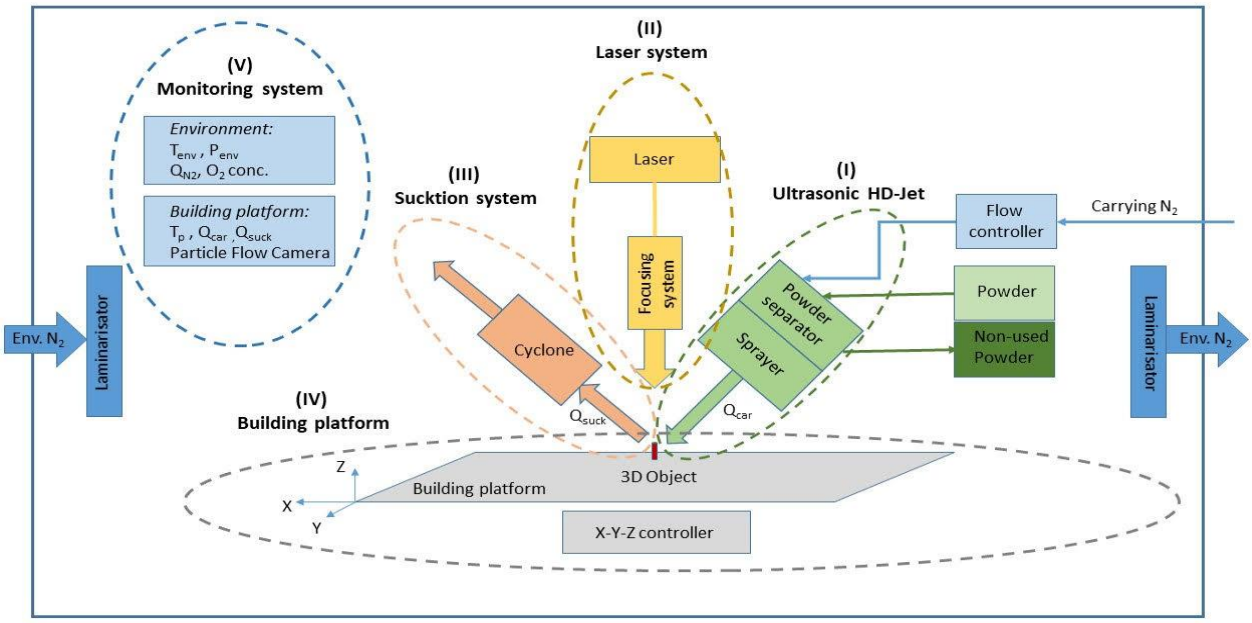

Fig. 1 Technological principle of new LMD system

The whole process of LMD system work is being observed by a monitoring system, which can determine temperature of printing platform and printable object, stability of metal particles flow density, stability of particle flow, size (diameter) of the particles, flow pressure and concentration of oxygen inside of the printing chamber.

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[2] D. Herzog, V. Seyda, E. Wycisk, C. Emmelmann, Additive manufacturing of metals, Acta Mater. 117, 371–392 (2016).