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PREHEATED AIR INLETS FOR ADDITIVE MANUFACTURING

HP INC

Preheated Air Inlets for Additive Manufacturing

Abstract: Cooling air in an additive manufacturing system is supplied at a set temperature higher than the operating temperature range of the system in order to ensure proper cooling of parts fabricated in the print bed.

This disclosure relates to the field of additive manufacturing.

A technique is disclosed that controls the temperature of cooling air in an additive manufacturing system in order to avoid or mitigate part quality issues.

Some additive manufacturing systems have part quality issues such as variability in mechanical properties such as strength, dimensionals, and cosmetic defects. These can be related to the homogeneity and stability of the temperature in the printing surface (the print bed) while the printer is printing.

In systems where the print chamber and printhead are refrigerated, a significant amount of air is injected into the print chamber. In some systems this air is room air, at room temperature. If the printer is specified to be operable in an environment having a temperature range between 15 and 35 degrees C, the air injected in the print chamber will have a temperature within this range. As the cooling capability of the air depends on its temperature, the room temperature affects how the print bed cools and, as a consequence, affects the part properties.

According to the present disclosure, heaters are added to an additive manufacturing system to control the temperature of part of the air that is injected into the print chamber to keep the temperature of the air going into the print chamber constant and thus reduce the adverse effects of variable room air temperature on part quality.

The target temperature of cooling air is set to a temperature higher than the maximum operating temperature (e.g. 35 degrees C), in order that the room air will always be heated. Choosing a higher temperature avoids the more complex condition in which the air has to be cooled.

In one example, the additive manufacturing system includes four air ports to the print chamber. Two of these are air inlets, which are heated. The other 2 are blowing stations used to cool down the print head; the air in these ports is not heated but remains at room temperature.

The two air inlets supplying the heated air are each placed on opposite sides of the print bed, isolating the bed from the other air flows. They are placed close to the print bed, but maintain a sufficient distance to prevent local effects in the temperature due to the air flow. The blowing stations that blow cold air to the print head are positioned further away from the print bed.

In one example, the air for each heated air inlet is taken from a printer air reservoir, passed through a heater, and then driven to an air inlet plenum through a duct by means of a fan. The air is distributed homogeneously within the plenum by an internal grid, and released to the print chamber through an upper exit grid (the air is supplied from below) on the side of the print bed.

The disclosed technique advantageously reduces the variability of the part properties (dimensional, resistance, and cosmetics).

Disclosed by Emilio Carlos Cano, Hector Vega, Nicola Cofelice, Juan Manuel Valero Navazo, and Xavier Tamarit Gaja, HP Inc.