INNOVATION IN DESIGN OF METAL FILTRATION PRODUCTS BY ADDITIVE MANUFACTURING (METAL 3D PRINTING)

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The layer by layer, Additive Manufacture (AM) process allows for design freedom to produce innovation in filter media production. Our AM filter media designs have been shown to deliver a decrease in pressure drop across the filter thus reducing pumping energy requirements and decreasing end-users'costs as well as their carbon footprint over the lifespan of the filter. Following this successful innovation, we have further investigated the potential benefits of the AM process in filter media designs.

Metal foam and porous metal are formed from different manufacturing processes and are both permeable for gaseous and liquid media. As an industrial material metal foams have a high strength and low weight and have a large internal surface and good thermal conductivity and are utilized by automotive and heat industries. Metal foams can have a wide range of porosities and pore sizes. The manufacturing process of porous metal formed from the base material and salt can have a more close-range of porosity and pore sizes. AM technology provides two techniques to produce porous metal materials. Sintering where metal spheres are fused together, with the interstitial spaces forming the pores and selective laser melting where laser parameters are controlled to melt varying amounts of metal powder to form a porous structure similar to porous metal. Here we have utilized SLM to produce two types of porous metal AM filters one type with the porous metal forming the whole structure and the other with porous metal forming the walls of the metal AM filter. The solid forms of filters are inserted into a value for gas dispersion in an industrial process and have replaced a previous metal foam filter. However, defining the specifications of the pore size and overall porosity of these filters and the porous wall filters is challenging. We are currently investigating light microscopy as a means to defining the pore size and range of these filters.

Y-strainers are widely employed in many industrial processes and are traditionally formed from a hollow cylinder with woven wire mesh attached to deliver the required filtration level. We have investigated utilizing AM to increase the filtration area of Y strainer elements. We will demonstrate the effect of introducing folds into the sides of the Y-element and the resultant increase in surface area. Using AM the folded Y-element can then be utilized as a support with woven wire mesh as the filtration element. In addition, we have created AM Y strainer folded design from porous material as described above to form the filtration portion of the element with additional supports to form the overall Y-element media. The novel AM filter designs described here deliver innovation in the manufacture of metal filtration media.