S1.3.2 FILTER DESIGN AND MANUFACTURE TO SUIT AVAILABLE MATERIALS

Neil Burns[1], Louise Geekie[1], Mark Burns[1], Darren Travis[2]
[1]Croft Filters Ltd, [2]Croft Additive Manufacturing Limited

Many filter media are available in standard sizes, with specified filter ranges and are mass produced production. For unique end user filtration specifications industrial end users turn to custom filter manufacturers. Within this filtration supply sector production is low volume, with many orders being single filtration units. Here the filter is designed to suit one set of operational pressures and conditions, one physical placement site, one shape and one filtration level. Customer specifications vary widely from detailed including: drawings, filtration level, material, operational and welding specifications, to general expressions of requirements of size available and unknown filtration level. Both types of specification can present different challenges for the manufacture of the final custom filter.

Custom filters are often manufactured to suit conventional sized piped work in both imperial and metric. Here materials such as conventional flanges and fixings may be readily available for filter attachment but the filter element may be required to be customised. For an unknown filtration level we devised a filter housing consisting of commercially available clamps and O rings. However we were unable to source a flat filter support with retaining ring for mesh. We utilised additive manufacturing (AM) to create this part. The end user then changed the filter mesh until the correct filtration level was found.

Conventional filter housings such as Y strainers have the benefit of having suitable flange and inlet and outlet sizes however they may not fit the customer specification of available space. Customisation here involved altering the length of the filter housing and manufacture of a custom element. In the above examples materials were available commercially that were then used together with customisation too deliver the specified filter media. However, some customer specifications demand that their filter be made from a certain material that is not readily available, ie a lead-time of 3-4 month in formats usual to manufacture the filter. Here the requested material was Incoloy and required date less than lead-time. Therefore we considered what materials were available: Incoloy bar and plate. A novel filter housing was designed to be manufactured from bar and conventional fittings to suit specifications. Design considerations included inlet and outlet, position and size of the filter element and removal of element for cleaning. The filter element support prototype was manufactured by AM in order to evaluate the design, attachment points for mesh and its subsequent subtractive manufacture from Incoloy plate. The filter housing design and the filter element designed were then evaluated for fluid flow through the filter housing and element using computational fluid dynamics. The results determined that the overall fluid flow pattern through the filter does deliver the required flow pattern. However the flow path has been affected by the design being led by the available materials.