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Numerical Analysis of a Strainer Using Porous Media Technique

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Abstract : Strainer filter serves to block the inflow of impurities while mixed fluid is entering or exiting the piping. The filter of the strainer has a perforated structure, so that the pressure drop and the velocity change necessarily occur when the mixed fluid passes through the filter. It is possible to predict the pressure drop and velocity change of the strainer by numerical analysis by implementing all the perforated plates. However, if the size of the perforated plate exceeds a certain size, it is difficult to perform the numerical analysis, and sometimes we cannot guarantee its accuracy. In this study, we tried to predict the pressure drop and velocity change by using the porous media technique to obtain the equivalent resistance without actual implementation of the perforation shape of the strainer. Ansys-CFX, a commercial software, is used to perform the numerical analysis. The analysis procedure is as follows. Firstly, the unit pattern of the perforated plate is modeled, and the pressure drop is analyzed by varying the velocity by symmetry of the wall surface. Secondly, since the equation for obtaining resistance is a quadratic equation of pressure having unknown velocity, the viscous resistance and the inertia resistance of the perforated plate are obtained from the relationship between pressure and speed. Thirdly, by using the calculated resistance values, the values are substituted into the flat plate implemented as a two-dimensional porous media, and the accuracy is verified by comparing the pressure drop and the velocity change. Fourthly, the pressure drop and velocity change in the whole strainer are analyzed by using the resistance values obtained on the perforated plate in the actual whole strainer model. Using the porous media technique, it is found that pressure drop and velocity change can be predicted in relatively short time without modeling the overall shape of the filter. Acknowledgements: This work was supported by the Valve Center from the Regional Innovation Center(RIC) Program of Ministry of Trade, Industry & Energy (MOTIE).

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