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Design and Analysis of Fire Extinguisher Nozzle Spray Using Design of Experiment Method

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**Authors:**

Jum'azulhisham, A.S.,  
Al-Hapis, A.R.M.,  
Kauthar, A.R.,  
Azmi, H.,  
Pranesh, K.

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**Abstract:**

A fire extinguisher is the first-line defense system against fire eruption in the early stage. The conventional nozzle that has been used with the current fire extinguisher is not fully effective as the user needs to get closer to the fire sources to extinguish it. This will bring potential hazards to the user himself as the fire sources are closer. The objective of this paper, are to design, test a new fire extinguisher nozzle, and configure the diameter and length of the nozzle. Affected parameters such as velocity and pressure at the nozzle outlet also have been studied. The optimal parameter configuration of the nozzle is the final aim of this project. In this study, besides experimentation method, flow simulation and analysis in SolidWorks 2016 software were used alongside with the Taguchi method (L9) to find the optimum parameter for the nozzle design. Data shows for the Taguchi method study, in terms of pressure the best combination is level 1 with a factor of A (50 mm diameter) and level 3 factor of B (50 mm length) as it produces the lowest reading of 10.10 bar and 10.110 bar, respectively. Meanwhile, as for the velocity data, the best combination is level 1 with a factor of A (50 mm diameter) and level 1 with a factor of B (40 mm length) which obtained a reading of 54.34 m/s and 31.6 m/s, respectively, greater compared to others. Thus, this study concluded with the optimum configuration for the new nozzle outlet 2 diameter of 50 mm in diameter and a nozzle length of 50 mm in length as this configuration produces the best results.