Patent Search

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Inventor

Name	Address	Country
Kethupalli Swapna, Assistant Professor of Mathematics / Department of H&S, Malla Reddy Institute of Technology (MRIT).	Malla Reddy Institute of Technology (MRIT), Maisammaguda, Dhullapally, Hyderabad, Telangana-500100.	India
Harisha Chintamaneni, Assistant Professor of Mathematics / Department of H&S, Malla Reddy Institute of Technology and Science.	Malla Reddy Institute of Technology and Science, Maisammaguda, Dhullapally, Hyderabad, Telangana-500100.	India
Vasanthi Devi Thota, Assistant Professor of Mathematics / Department of H&S, Malla Reddy Institute of Technology and Science	Malla Reddy Institute of Technology and Science, Maisammaguda, Dhullapally, Hyderabad, Telangana-500100.	India
Dr.MD Nizam, Assistant Professor of Mathematics / Department of M&PS, Nalla Malla Reddy Engineering College.	Nalla Malla Reddy Engineering College, Ghatkesar, Medchal, Hyderabad, Telangana-500088.	India
Aruna, Assistant Professor of Mathematics / Department of H&S, ACE Engineering College.	ACE Engineering College, Ankushpur, Ghatkesar, Medchal, Hyderabad, Telangana-501301.	India
G.Srinvas, Assistant Professor / Department of Civil Engineering, Mahatma Gandhi Institute of Technology.	Mahatma Gandhi Institute of Technology, Gandipet, Hyderabad,Telangana-500075	India
Dr.J Suresh Goud, Associate professor / Department of Mathematics, Institute of Aeronautical Engineering.	Institute of Aeronautical Engineering, Dundigal Road, Hyderabad, Telangana-500043.	India

Applicant

Name	Address	Country
Kethupalli Swapna, Assistant Professor of Mathematics / Department of H&S, Malla Reddy Institute of Technology (MRIT).	Malla Reddy Institute of Technology (MRIT), Maisammaguda, Dhullapally, Hyderabad, Telangana-500100.	India
Harisha Chintamaneni, Assistant Professor of Mathematics / Department of H&S, Malla Reddy Institute of Technology and Science.	Malla Reddy Institute of Technology and Science, Maisammaguda, Dhullapally, Hyderabad, Telangana-500100.	India
Vasanthi Devi Thota, Assistant Professor of Mathematics / Department of H&S, Malla Reddy Institute of Technology and Science	Malla Reddy Institute of Technology and Science, Maisammaguda, Dhullapally, Hyderabad, Telangana-500100.	India
Dr.MD Nizam, Assistant Professor of Mathematics / Department of M&PS, Nalla Malla Reddy Engineering College.	Nalla Malla Reddy Engineering College, Ghatkesar, Medchal, Hyderabad, Telangana-500088.	India
Aruna, Assistant Professor of Mathematics / Department of H&S, ACE Engineering College.	ACE Engineering College, Ankushpur, Ghatkesar, Medchal, Hyderabad, Telangana-501301.	India
G.Srinvas, Assistant Professor / Department of Civil Engineering, Mahatma Gandhi Institute of Technology.	Mahatma Gandhi Institute of Technology, Gandipet, Hyderabad,Telangana-500075	India
Dr.J Suresh Goud, Associate professor / Department of Mathematics, Institute of Aeronautical Engineering.	Institute of Aeronautical Engineering, Dundigal Road, Hyderabad, Telangana-500043.	India

Abstract:

Abstract In aerospace hydraulics, additive manufacturing has substantially expanded engineers' flexibility in creating efficient flow channels within hydraulic valves. T
forecast of pressure drop is conducive to fluid flow design, a crucial consideration when designing a hydraulic valve's internal flow channels. However, most current r
looks at how much a decrease in pressure drop can be achieved when using an AM hydraulic channel instead of a conventional hydraulic channel, despite the absenc
mathematical model measuring rapid depressurization in an AM circular pipe. In this study, we first investigate the drop of pressure in a bowed flow channel and the
primary factors that contribute to this drop by employing a dimensionless analysis approach. CFD simulation was used to examine the correlations between the flow
dimension, length, curving radius, fluid velocity, and pressure drops. The mathematical prototype of rapid depressurization in aeronautical hydraulic channels built u
combination of multiple regression analyses, and the model subsequently solved using orthogonal unproven results. By testing the pressure drop in fluid flow model
discerning laser melting, researchers found that the experimental outcomes deviated from the mathematical model calculations by an average of 7.72%. This model
speedy pressure drop predictions in curving flow channels when applied to aircraft hydraulics.

Complete Specification

Description:A Mathematical Modelling Approach to Quantifying Pressure
Drop in Aviation Hydraulic Valve Fluid Channels

Field and Background of the Invention
One type of hydraulic element is a hydraulic valve, which is activated by pressurized hydraulic oil. It is used to switch oil directions and reverse flow in a hydraulic sy
and is operated by pressurized oil. The interior flow channels of conventional hydraulic valves are processed via drilling and milling, resulting in numerous right-ang
twists. As a result, 90-degree curves in a flow channel are the number one culprit for pressure drop. Because of AM's advent, conventional flowchart design principl
been rethought. For example, AM technology is capable of creating hydraulic valve blocks that are lighter and smaller in volume, with more flexible flow channel de
and smaller footprints. Additive manufacturing (AM) is a technique that builds up objects by adding layers of material. Several goods in the aerospace, national secu
robotics, and medical industries are now made using AM technology instead of the more conventional methods. Hydraulic actuators, injectors, valves, actuators, m
with conventional cooling channels, and heating systems are just some of the many applications for AM in parts having operational fluid flow channels. A few resea
have recently conducted experimental investigations on pressure drop at the elbows in conventional pipes. Barbara et al. conducted a CFD investigation of pressure
at a 90° Elbow-Joint and as well as V-joint in conventional hydraulic part. They found that while CFD model be able to forecast the correct enlargement of pressure c
overestimates the experimental results. After implementing a seamless conversion model for just a 90° acute elbow-joint in a conventional hydraulic valve, Zhang e
pressure drop in half. The pressure control method of a 900 elbow joint using the dimensionless analytical technique, although it is not yet applicable in practice. Pr

View Application Status