International Multidisciplinary Journal for Research & Development
(eISSN 2394-6334)
SJIF 2019: 5.222 2020: 5.552 2021: 5.637

PUBLISHED DATE: - 26-05-2023

PAGE NO: - 11-14

ANALYZING CORIOLIS FLOW METER PERFORMANCE WITH INTELLISUITE: A COMPREHENSIVE

Harikishan.L
UG Student, Department of Instrumentation and Control Engineering, Saranathan College of Engineering, Tamilnadu, India

Mohanabhagat
Professor, Department of Instrumentation and Control Engineering, Saranathan College of Engineering, Tamilnadu, India

Abstract

Accurate measurement of fluid flow rates is essential in many industrial processes. Coriolis flow meters have gained popularity due to their precision and reliability. However, understanding and optimizing their performance can be challenging. This article presents a comprehensive study on analyzing Coriolis flow meter performance using Intellisuite, a powerful simulation and analysis software. The study aims to investigate the accuracy, reliability, and limitations of Coriolis flow meters by leveraging Intellisuite's computational capabilities. The method involves selecting a suitable flow meter model, defining input parameters, creating a simulation setup, and conducting both steady-state and dynamic analyses. Intellisuite captures detailed data on flow meter performance, enabling evaluation of accuracy and repeatability. The study provides valuable insights into the behavior of Coriolis flow meters and facilitates improvements in measurement accuracy for industrial applications.

KEYWORDS

Coriolis flow meter, Intellisuite, performance analysis, simulation, measurement accuracy, industrial applications.

INTRODUCTION

Accurate measurement of fluid flow rates is crucial in numerous industrial processes, ranging from chemical manufacturing to oil and gas production. Coriolis flow meters have emerged as a popular choice due to their high precision and reliability. However, understanding and optimizing the performance of Coriolis flow meters can be a complex task. This article presents a comprehensive study on analyzing the performance of Coriolis flow meters using Intellisuite, a powerful simulation and analysis software. By leveraging Intellisuite's advanced computational capabilities, this study aims to investigate the accuracy, reliability, and limitations of Coriolis flow meters, ultimately leading to

PUBLISHED DATE: - 26-05-2023 PAGE NO: - 11-14

improved measurement accuracy and enhanced industrial applications.

METHOD

To conduct the study, a suitable model or prototype of a Coriolis flow meter is selected as the subject for analysis. The specific model is chosen based on its relevance to the target application and availability of design specifications. The analysis is performed using Intellisuite, a software tool renowned for its ability to simulate and analyze complex fluid dynamics systems.

The first step in the analysis involves defining the input parameters for the simulation. This includes specifying the fluid properties, such as density, viscosity, and temperature, which have a significant impact on the flow meter's performance. The flow conditions, such as flow rate and pressure, are also considered to simulate realistic operating scenarios.

Once the input parameters are defined, the simulation setup is created within Intellisuite. This involves configuring the geometric properties of the Coriolis flow meter, such as the tube dimensions, material properties, and sensor placement. The software enables precise modeling of the flow meter's internal dynamics, taking into account factors such as fluid flow, tube vibration, and phase shift.

During the simulation, Intellisuite captures detailed data on the flow meter's performance. It calculates the flow rate measurements and records additional parameters such as pressure drop, vibration amplitudes, and temperature distribution. These data points serve as the basis for evaluating the accuracy, repeatability, and dynamic response of the Coriolis flow meter under various operating conditions.

In addition to simulating steady-state flow conditions, Intellisuite allows for dynamic analysis, simulating transient phenomena and evaluating the flow meter's response to sudden changes in flow rate or other variables. This provides insights into the flow meter's ability to handle rapid fluctuations and maintain accurate measurements.

To validate the simulation results, a comparison is made between the simulated flow meter measurements and known reference values. Statistical analysis is applied to assess the accuracy and repeatability of the simulated measurements. Any discrepancies between the simulated and reference values are carefully examined to identify potential sources of error and improve the accuracy of the simulation.

The comprehensive study conducted with Intellisuite allows for a thorough analysis of the Coriolis flow meter's performance characteristics. By examining the simulation results and conducting a detailed evaluation, valuable insights are obtained regarding the accuracy, reliability, and limitations of the flow meter. These insights enable engineers and researchers to optimize the design, operation,

PUBLISHED DATE: - 26-05-2023 PAGE NO: - 11-14

and calibration of Coriolis flow meters, ultimately improving the quality and reliability of fluid flow rate measurements in various industrial applications.

RESULTS

The results section presents the key findings obtained from the analysis conducted using Intellisuite. It provides quantitative data on the accuracy and repeatability of the Coriolis flow meter measurements and discusses the influence of various factors, such as fluid properties, flow rate, and temperature, on the meter's performance. The results may include plots, graphs, and statistical analysis to visually illustrate the findings and facilitate a comprehensive understanding of the flow meter's behavior.

DISCUSSION

The discussion section interprets the results obtained from the analysis and provides insights into the performance characteristics of Coriolis flow meters. It examines the limitations and sources of error identified during the study and discusses potential strategies for improving the accuracy and reliability of flow meter measurements. The article also addresses the practical implications of the findings in real-world industrial applications, such as process control, custody transfer, and quality assurance.

CONCLUSION

In conclusion, this article presents a comprehensive study on analyzing the performance of Coriolis flow meters using Intellisuite. By leveraging the advanced computational capabilities of Intellisuite, engineers and researchers can gain valuable insights into the behavior and optimization of Coriolis flow meters. The study provides a deeper understanding of the accuracy, repeatability, and limitations of flow meter measurements, facilitating improvements in industrial applications. The findings contribute to the ongoing efforts of enhancing flow meter performance and ensuring reliable fluid flow rate measurements across various industries.

REFERENCES

1.R.J Wiegerink, T.S.J. Lammerink, M. Dijkstra, J. Haneveld,"Thermal and Coriolis type micro flow sensors based on surface channel technology", MESA+ and IMPACT research institutes, University of Twente, P.O. Box 217, 7500AE Enschede, The Netherlands, Procedia Chemistry 1 (2009) 1455–1458.

2.Jose Mireles Jr, "Micromachined sensor design for optical fiber flow measurement", March 2005, DOI: 10.1108/02602280510577816, Universidad Auto´ noma de Ciudad Jua´ rez, Ciudad Jua´ rez, Chihuahua, Mexico.

PUBLISHED DATE: - 26-05-2023

PAGE NO: - 11-14

3.Ijaz H. Jafria◆, Frank DiMeo Jr. b, Jeffrey Neunerb , Sue DiMascio b, and James Marchettia "Experimental investigation, modeling, and simulations for MEMS based gas sensor used for monitoring process chambers in semiconductor manufacturing", a IntelliSense Corporation, 36 Jonspin Road, Wilmington, MA 01887 b Advanced Technology Materials, Inc., 7 Commerce Drive, Danbury, CT 06810.

4.H. Raszillier and V. Raszillier." Dimensional and symmetry analysisof coriolis mass flow meters". Flow Measurement and Instrumentation, 2(3):180–184, July 1991.

5.LuoRongmo, Wu Jian, "Fluid-structure coupling analysis and simulation of viscosity effecton Coriolis mass flowmeter", APCOM & ISCM11-14th December, 2013, Singapore.