

Forced Convection through Helical Pipe with Constant Wall Temperature

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Abstract

This report aims to study the flow and heat transfer characteristics of flow through a helical pipe. Helical pipes are used to enhance the heat transfer between the fluid and the wall as compared to a straight pipe. The flow is characterized by the Reynolds number and the Dean Number. BuoyantSimpleFoam solver is used to study the steady state velocity and temperature profiles. An increase in nusselt number is observed as the dean number increases and the vorticity responsible for the increased heat transfer is qualitatively shown.

1 Introduction

Helically coiled tubes are used in applications involving compact heat exchangers such as food processing, nuclear reactor cooling and heat recovery systems. The reason for this prevalence is the heightened heat transfer characteristics that helical pipes provide over straight tubes. This enhancement is because of the centrifugal forces due to vorticity in the fluid leading to the development of a secondary flow transverse to the primary flow which leads to better heat transfer.

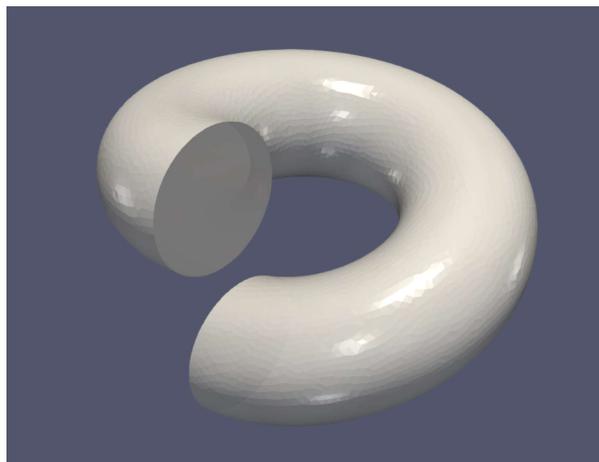


Figure 1: Helical Pipe