

Study of the Design and Simulation Work for an Artificial Heart

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Abstract : This study discusses the concept of the artificial heart using engineering concepts, of the fluid mechanics and the characteristics of the non-Newtonian fluid. For the purpose to serve heart patients and improve aspects of their lives and since the Statistics review according to world health organization (WHO) says that heart disease and blood vessels are the first cause of death in the world. Statistics shows that 30% of the death cases in the world by the heart disease, so simply we can consider it as the number one leading cause of death in the entire world is heart failure. And since the heart implantation become a very difficult and not always available, the idea of the artificial heart become very essential. So it's important that we participate in the developing this idea by searching and finding the weakness point in the earlier designs and hoping for improving it for the best of humanity. In this study a pump was designed in order to pump blood to the human body and taking into account all the factors that allows it to replace the human heart, in order to work at the same characteristics and the efficiency of the human heart. The pump was designed on the idea of the diaphragm pump. Three models of blood obtained from the blood real characteristics and all of these models were simulated in order to study the effect of the pumping work on the fluid. After that, we study the properties of this pump by using Ansys15 software to simulate blood flow inside the pump and the amount of stress that it will go under. The 3D geometries modeling was done using SOLID WORKS and the geometries then imported to Ansys design modeler which is used during the pre-processing procedure. The solver used throughout the study is Ansys FLUENT. This is a tool used to analysis the fluid flow troubles and the general well-known term used for this branch of science is known as Computational Fluid Dynamics (CFD). Basically, Design Modeler used during the pre-processing procedure which is a crucial step before the start of the fluid flow problem. Some of the key operations are the geometry creations which specify the domain of the fluid flow problem. Next is mesh generation which means discretization of the domain to solve governing equations at each cell and later, specify the boundary zones to apply boundary conditions for the problem. Finally, the pre-processed work will be saved at the Ansys workbench for future work continuation.

Keywords : Artificial heart, computational fluid dynamic heart chamber, design, pump

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