RESUMEN TRABAJO DE GRADO

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FACULTAD: INGENIERÍA

PLAN DE ESTUDIOS: INGENIERÍA MECÁNICA

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TÍTULO DEL TRABAJO: "THE EXTERNAL AERODYNAMICS OF THE AHMED BODY REFERENCE GEOMETRY: A NUMERICAL ANALYSIS USING CFD"

RESUMEN

In the present study, numerical CFD simulations were developed on the Ahmed body reference geometry in order to understand and analyze its external aerodynamics, such as: generation of vortices; fields of velocity around the geometry, mainly in the wake part; generation of drag by pressure and drag by friction; and sustentation generation. On the other hand, in the validation process of results, fundamental parameters were considered, such as: mesh independence study, computational domain independence study and mesh quality analysis. In addition, different turbulence models were used to determine which best predicted the airflow around the geometry. The results obtained through the numerical simulations were verified exhaustively to guarantee the veracity of the simulations, additionally a comparison was made with experimental investigations, showing high concordance between the results.

PALABRAS CLAVE: Ahmed's body reference geometry, Computational fluid dynamics, Road vehicle aerodynamics, Drag and lift forces, Turbulence models.
CARACTERÍSTICAS:
PÁGINAS: 84 PLANOS: _ _ ILUSTRACIONES: CD ROOM: __

THE EXTERNAL AERODYNAMICS OF THE AHMED BODY REFERENCE GEOMETRY: A NUMERICAL ANALYSIS USING CFD

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UNIVERSITY FRANCISCO DE PAULA SANTANDER

FACULTY OF ENGINEERING

MECHANICAL ENGINEERING

SAN JOSÉ DE CÚCUTA

2020

THE EXTERNAL AERODYNAMICS OF THE AHMED BODY REFERENCE GEOMETRY: A NUMERICAL ANALYSIS USING CFD

Submitted to the Faculty of Engineering in partial fulfillment of the requirements for the degree of Mechanical Engineer

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2020

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Título de la Tesis: "THE EXTERNAL AERODYNAMICS OF THE AHMED BODY REFERENCE GEOMETRY: A NUMERICAL ANALYSIS USING CFD"

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Dedication

I dedicate the realization of this project to that wonderful being, who has always supported me, to the only true King, God. Who, with His infinite love, has always been by my side, to guide me and give me the capacities to always go in search of the realization of my dreams, with much love, I dedicate this victory to you, my lord.

My family has always been an invaluable support; from them I have always learned important lessons. My sister Diana has always taught me to fight and to make an effort for my dreams; my sister Maria Camila has taught me the value of tenderness and love; my father Jorge Chavez, has always shown me the value of constancy and discipline, to go in search of the proposed goals; my beloved mother, although today you are not with us, this triumph is without any doubt all yours, your effort and motherly love have brought me to this point of the road, thank you very much for everything, I will always love you.

Thanks to my friend Yeltsin Perez, for always supporting me and being a faithful and sincere friend, this victory is also for you, a hug.

I dedicate with great affection, this project to the Engineer Leonel Cancino, his wife and son. In them I found unconditional support, besides learning the value of family and perseverance for always wanting to be better. Thank you very much for everything.

I thank God for allowing me to be surrounded by such wonderful people.

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Thank you so much.

Abstract

In the present study, numerical CFD simulations were developed on the Ahmed body reference geometry in order to understand and analyze its external aerodynamics, such as: generation of vortices; fields of velocity around the geometry, mainly in the wake part; generation of drag by pressure and drag by friction; and sustentation generation. On the other hand, in the validation process of results, fundamental parameters were considered, such as: mesh independence study, computational domain independence study and mesh quality analysis. In addition, different turbulence models were used to determine which best predicted the airflow around the geometry. The results obtained through the numerical simulations were verified exhaustively to guarantee the veracity of the simulations, additionally a comparison was made with experimental investigations, showing high concordance between the results.

Summary