CFD ANALYSIS OF DYNAMIC BUS BODY STRUCTURE

[a]Manavalan S, [b*]Jacob S, [a] Raguraman D

[a]*Department of Automobile Engineering, Bharath Institute of Higher education and Research, Selaiyur, Chennai, Tamil Nadu 600 073, India*

[b]*Department of Automobile Engineering, VELS Institute of Science, Technology & Advanced Studies (VISTAS), Pallavaram, Chennai, Tamil Nadu 600 117, India*

[b*]*jacobthermal@gmail.com*

Abstract

The main objective of this project is the reduction of aerodynamic drag in the moving bus, Intercity travel bus is taken for this analysis, mostly in bus body structures base drag will be created in the rear portion of the bus, this drag can be reduced by implementing new design of the vortex generator in the rear section of the bus, the entire bus model in done in CATIA 3D modelling software and the CFD analysis was done in ANSYS Fluent Software, from this analysis Lift and Drag forces of the bus calculated in Various bus speed of 80 km/hr, 100 km/hr and 120 km/hr and get the results of drag force reduced in the implementation of Vortex generators

Keywords: Bus body, CFD analysis, ANSYS Fluent, Lift and Drag forces

1. Introduction

In recent times, thanks to a better route, intercity buses cover great distances on highways at speeds above 120 km / h. The front, underbody, roof and rear of the bus must be locally tuned for better aerodynamic performance. The teardrop shape is an ideal streamlined shape that is widely used in submarine hull designs and aircraft bodies to reduce drag. With developing consciousness amongst humans approximately conservation of non-renewable electricity like fossil fuels researchers and scientists are investigating plenty on a way to lessen the intake of those fossil fuels both via way of means of the use of opportunity gasoline or via way of means of enhancing the overall performance of the devices like motors, aeroplane and different electricity changing devices. There are many papers submitted within side the beyond in discipline of aerodynamics of motors meant to optimize the geometry of those motors to lessen the gasoline intake and maximize the overall performance via way of means of lowering the aerodynamic drag. Researches on this discipline are nevertheless developing in numbers. This paper additionally intends to lessen the aerodynamic drag via way of means of reading the float discipline round the automobile. This paper compares the effects acquired from CFD evaluation of the present version and the changed version with a duct brought to the roof of a sedan version car. The evaluation is completed the use of ANSYS Fluent and the automobile 3-D version is created the use of CATIA V5.

2. CFD Methodology

CFD is a way to numerically calculate warmness switch and fluid flow. Currently, its major utility is as an engineering method, to offer records this is complementary to theoretical and experimental records. This is specifically the area of commercially to be had codes and in-residence codes at huge companies. CFD also can be used for only clinical research, e.g. into the basics of turbulence. This is greater not unusual place in educational establishments and authorities studies laboratories. Codes are commonly evolved to mainly look at a sure problem. The end result of CFD analyses is applicable engineering records utilized in Conceptual research of recent designs, distinct product development, Troubleshooting, Redesign. CFD evaluation enhances trying out and experimentation. Reduces the entire attempt required with inside the laboratory.

3. Modeling

CATIA is used to create the 3D Model of the bus body structures as shown in the figure 1 below.

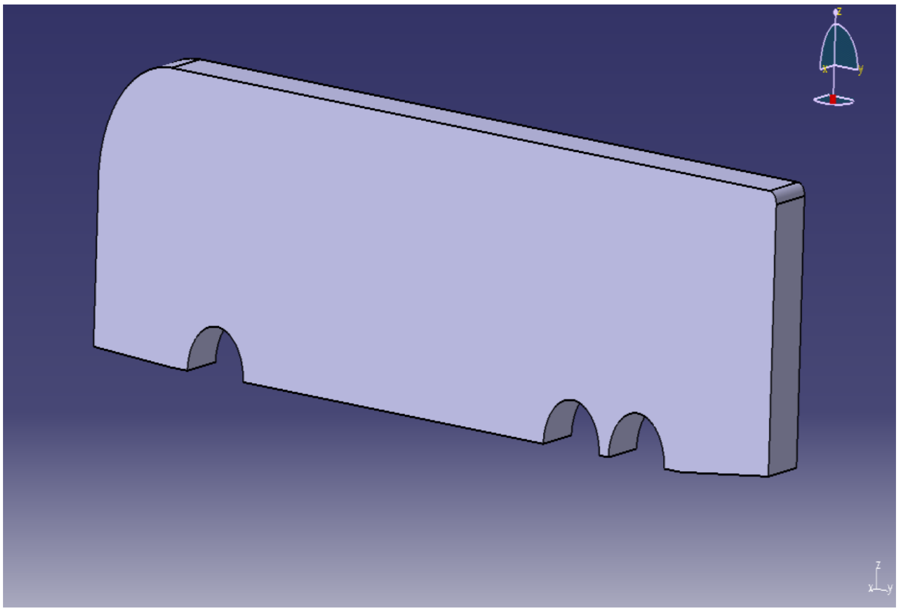

Fig 1. 3D Model of Base Dimension Bus Body Structure

3.1 Bus Body Mesh Model

The Mesh Image of the Base model is shown in the figure 2 with 76368 nodes and 401148 elements of TETRAHEDRAL type.

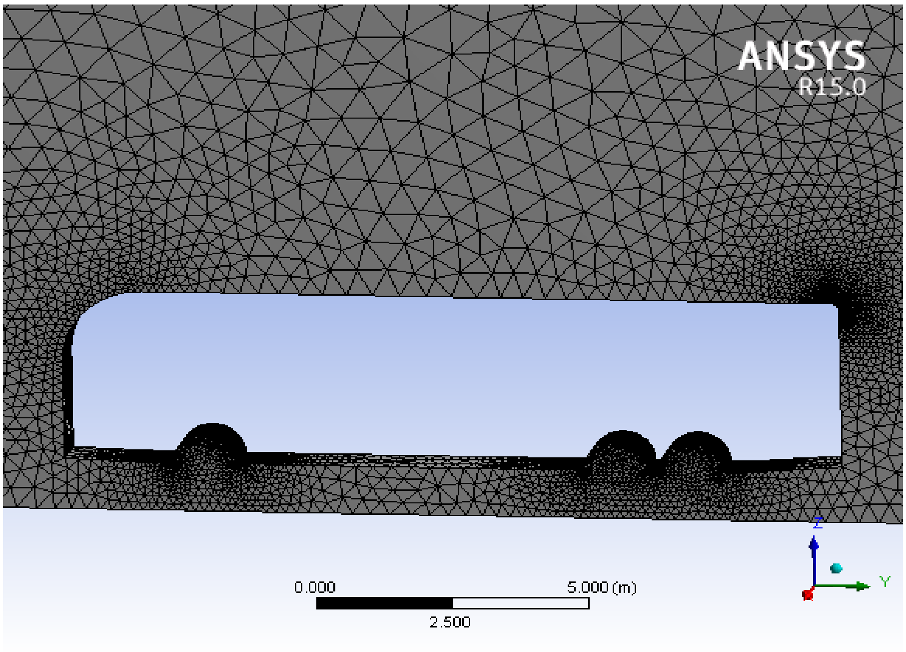

Fig 2. Mesh Image of the Base model

The Mesh Image of the modified model is shown in the figure 3 with 74446 nodes and 390047 elements of TETRAHEDRAL type.

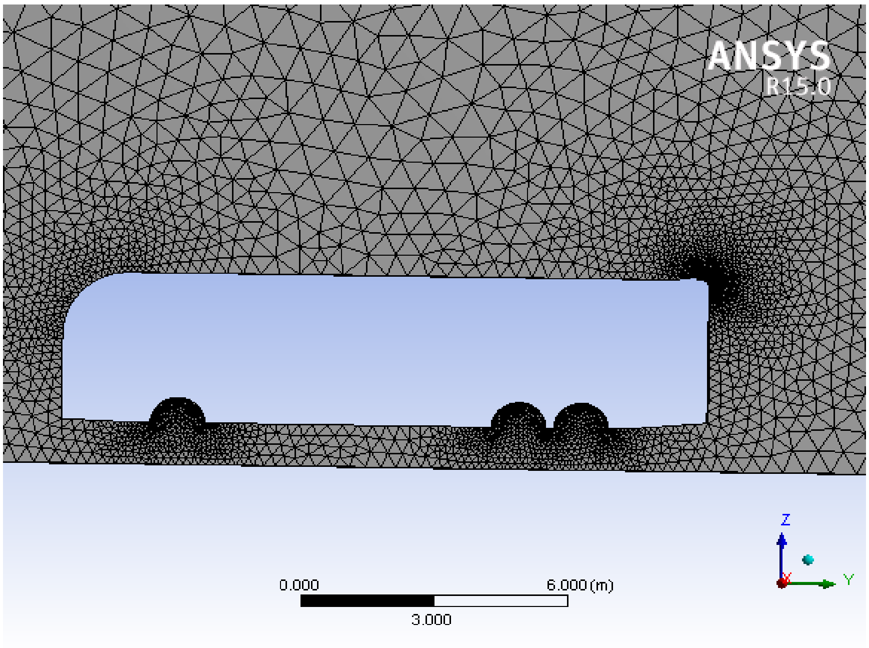

Fig 3. Mesh Image of the modified model

4. RESULTS AND DISCUSSION

4.1 Pressure Contour Results

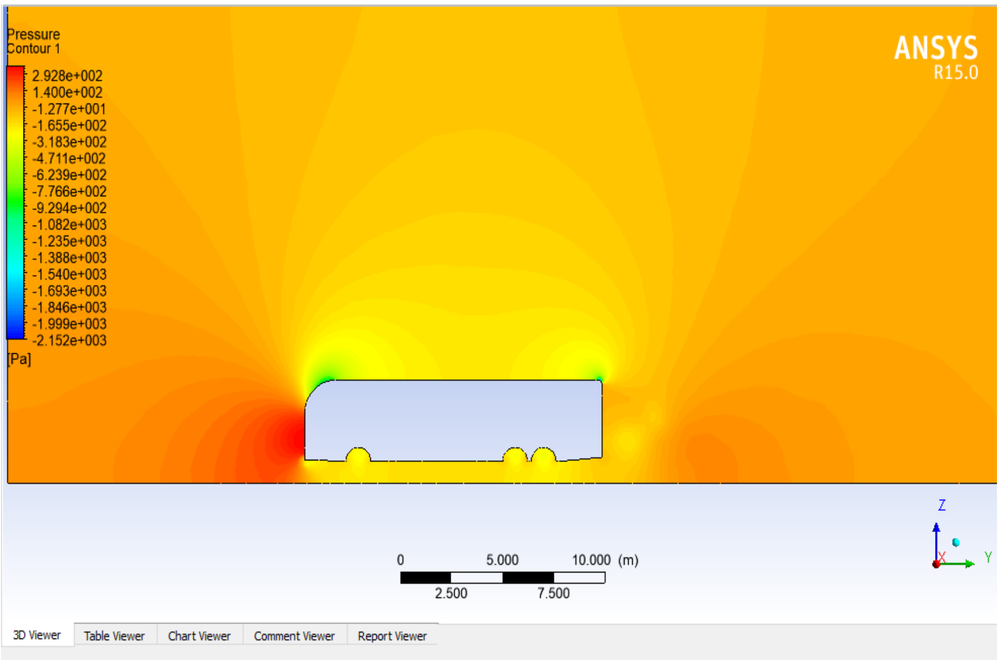

Fig 4.1 Pressure Contour results for Original Bus Dimension in 80 km/hr

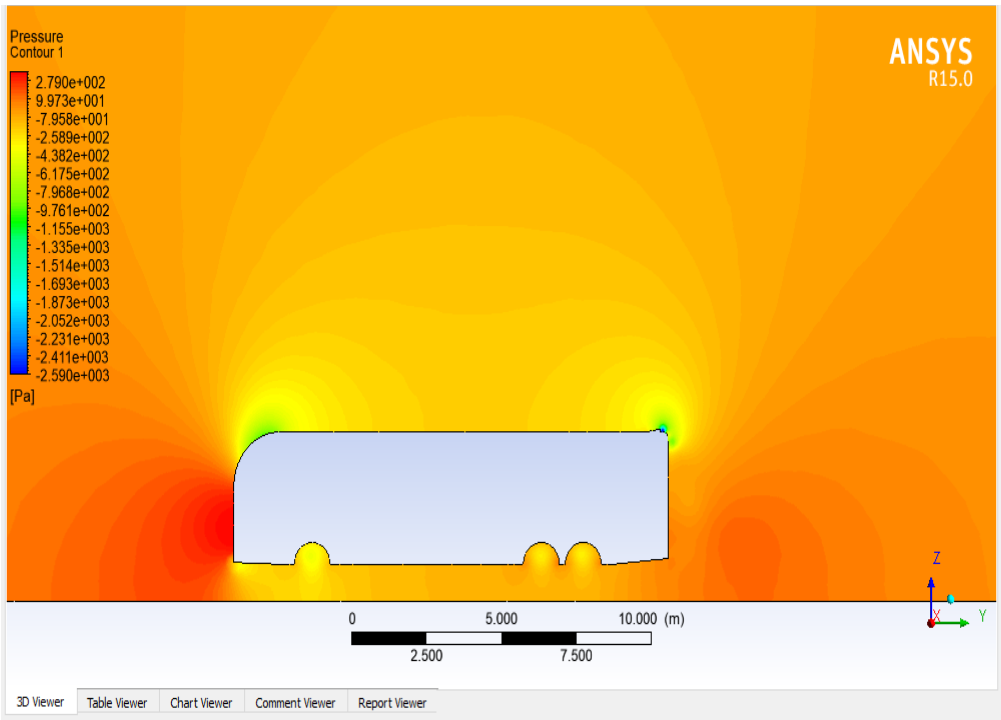

Fig 4.2 Pressure Contour results for Modified Bus Dimension in 80 km/hr

Fig 4.3 Pressure Contour results for Original Bus Dimension in 100 km/hr

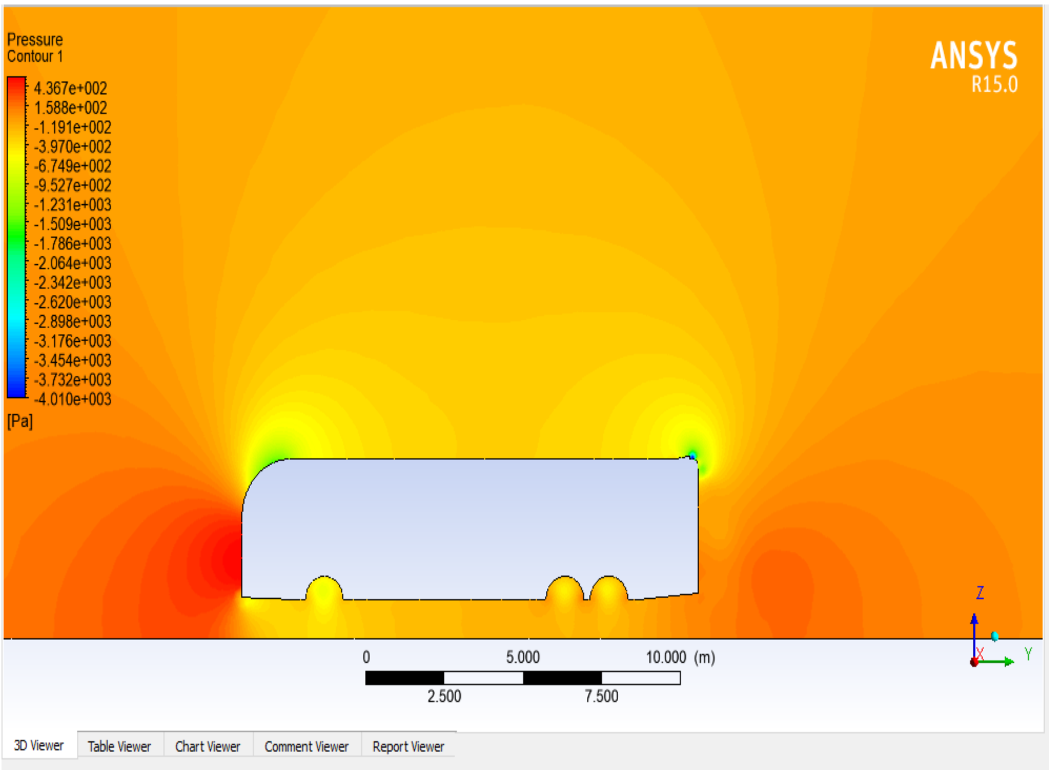

Fig 4.4 Pressure Contour results for Modified Bus Dimension in 100 km/hr

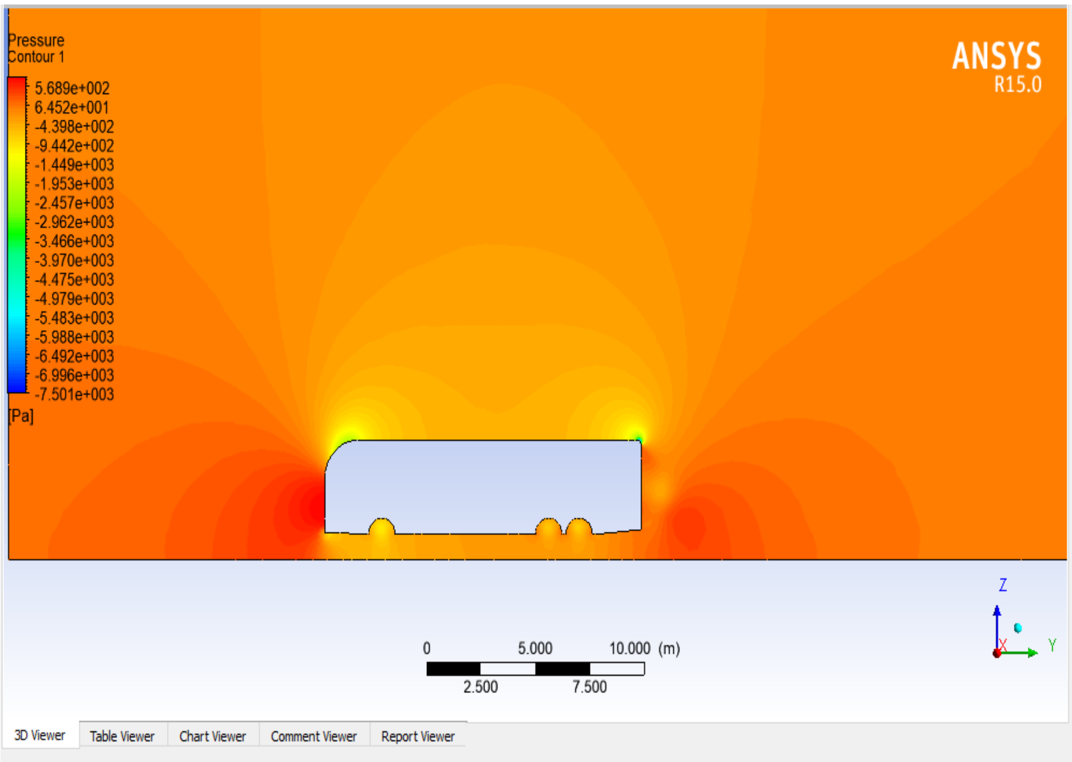

Fig 4.5 Pressure Contour results for Original Bus Dimension in 120 km/hr

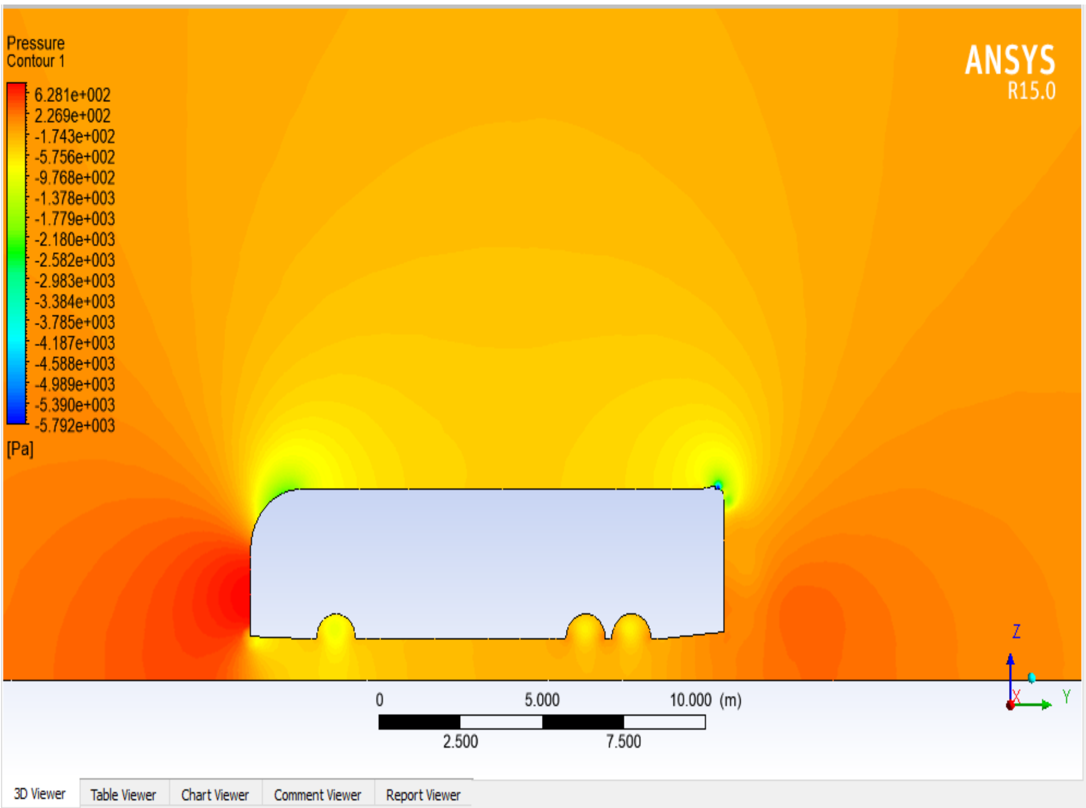

Fig 4.6 Pressure Contour results for Modified Bus Dimension in 120 km/hr

4.2 Velocity Contour Results

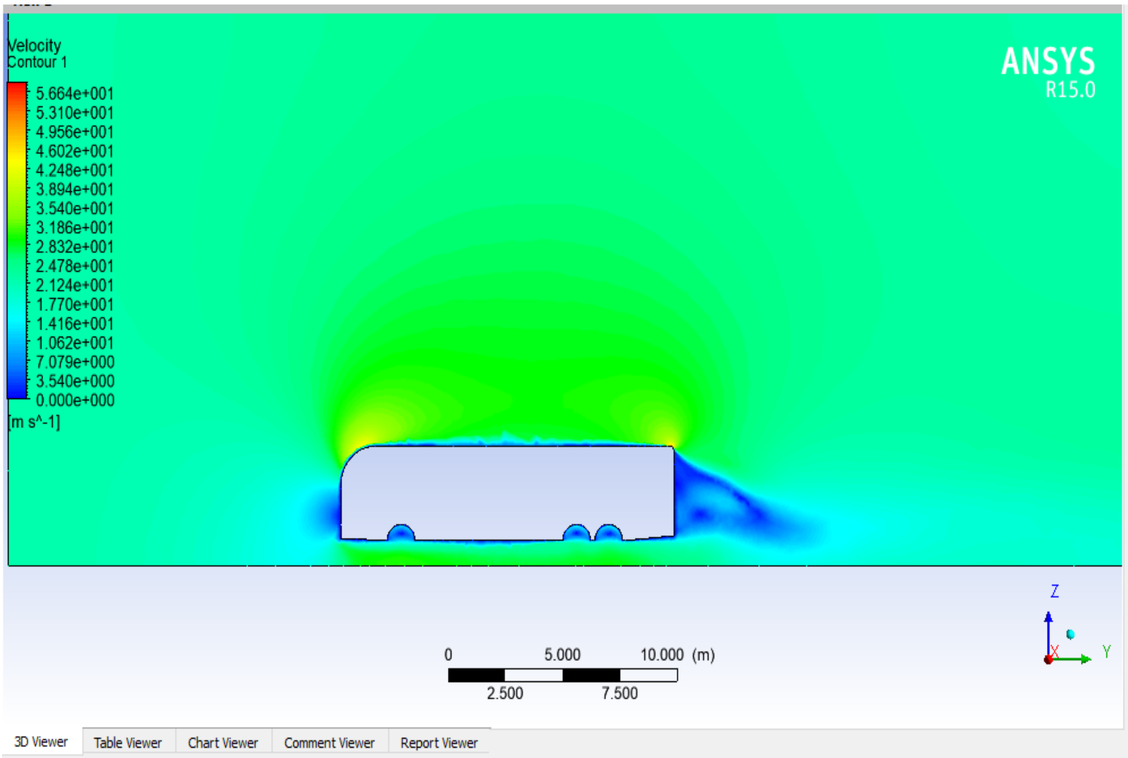

Fig 4.7 Velocity Contour results for Original Bus Dimension in 80 km/hr

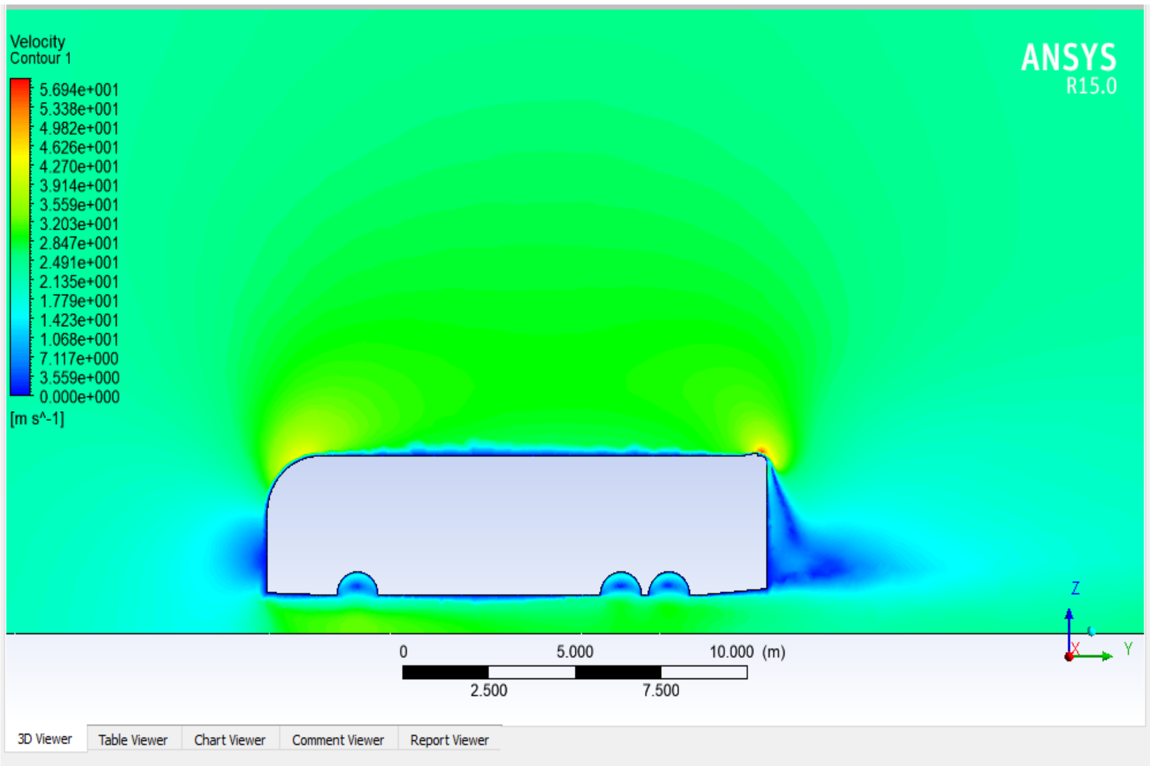

Fig 4.8 Velocity Contour results for Modified Bus Dimension in 80 km/hr

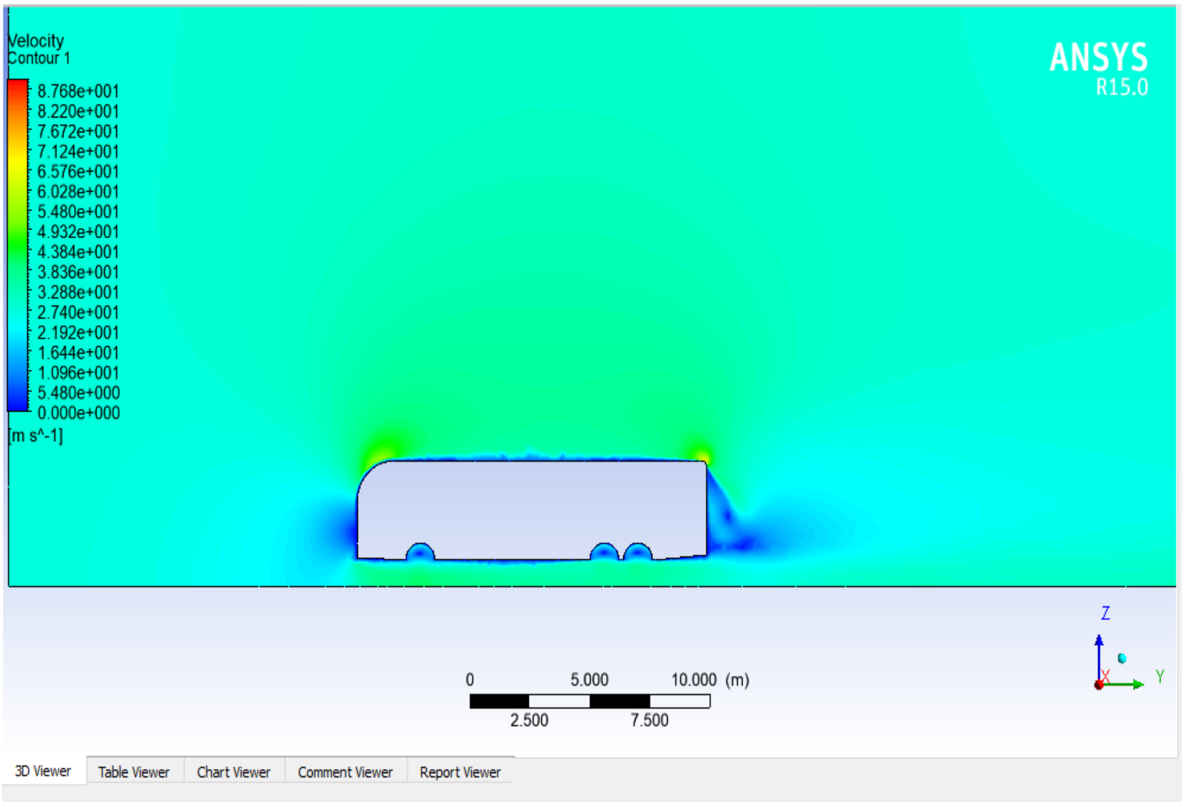

Fig 4.9 Velocity Contour results for Original Bus Dimension in 100 km/hr

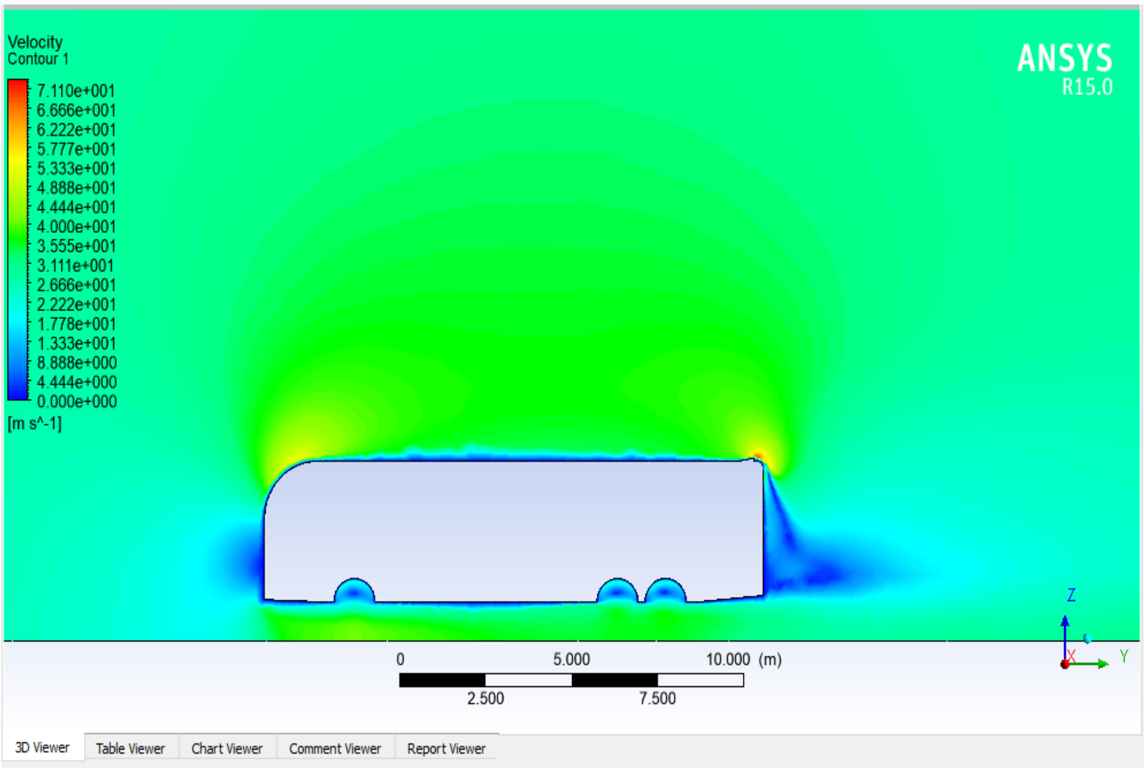

Fig 4.10 Velocity Contour results for Modified Bus Dimension in 100 km/hr

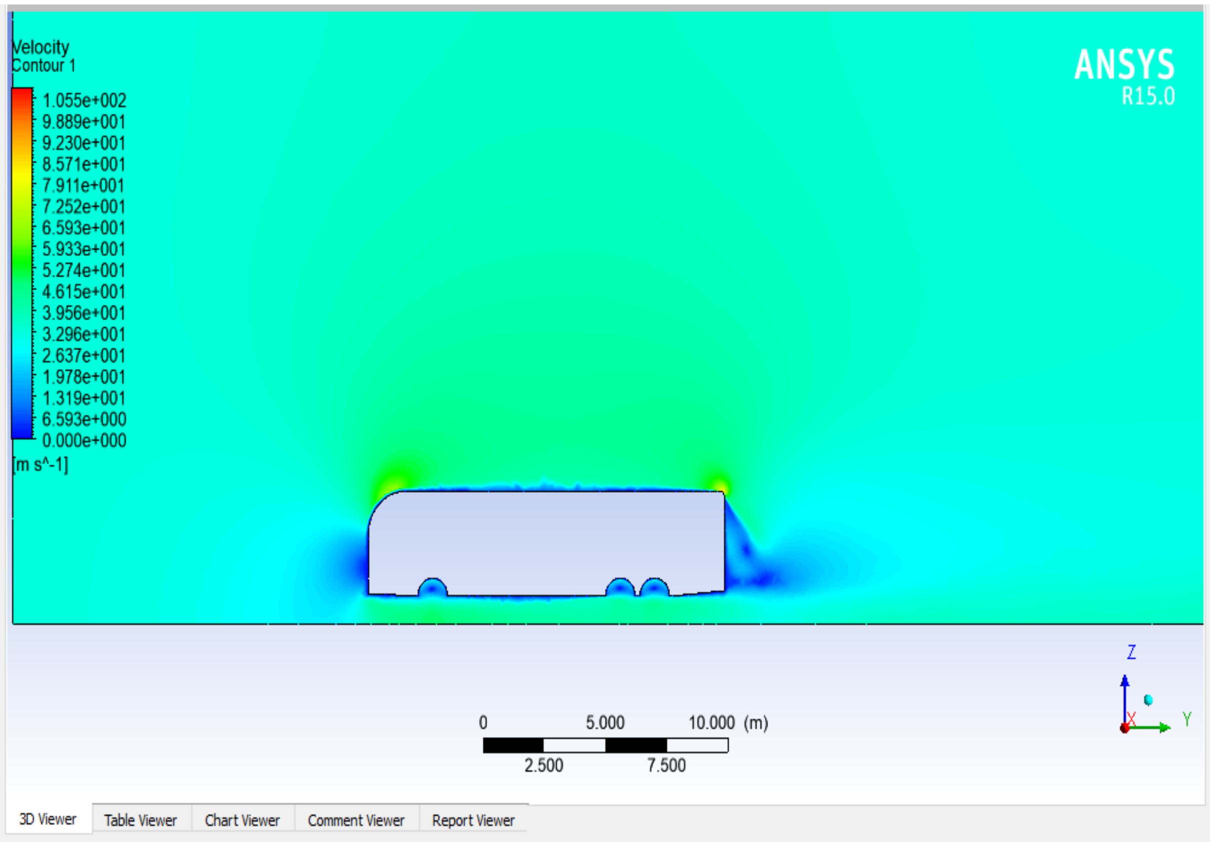

Fig 4.11 Velocity Contour results for Original Bus Dimension in 120 km/hr

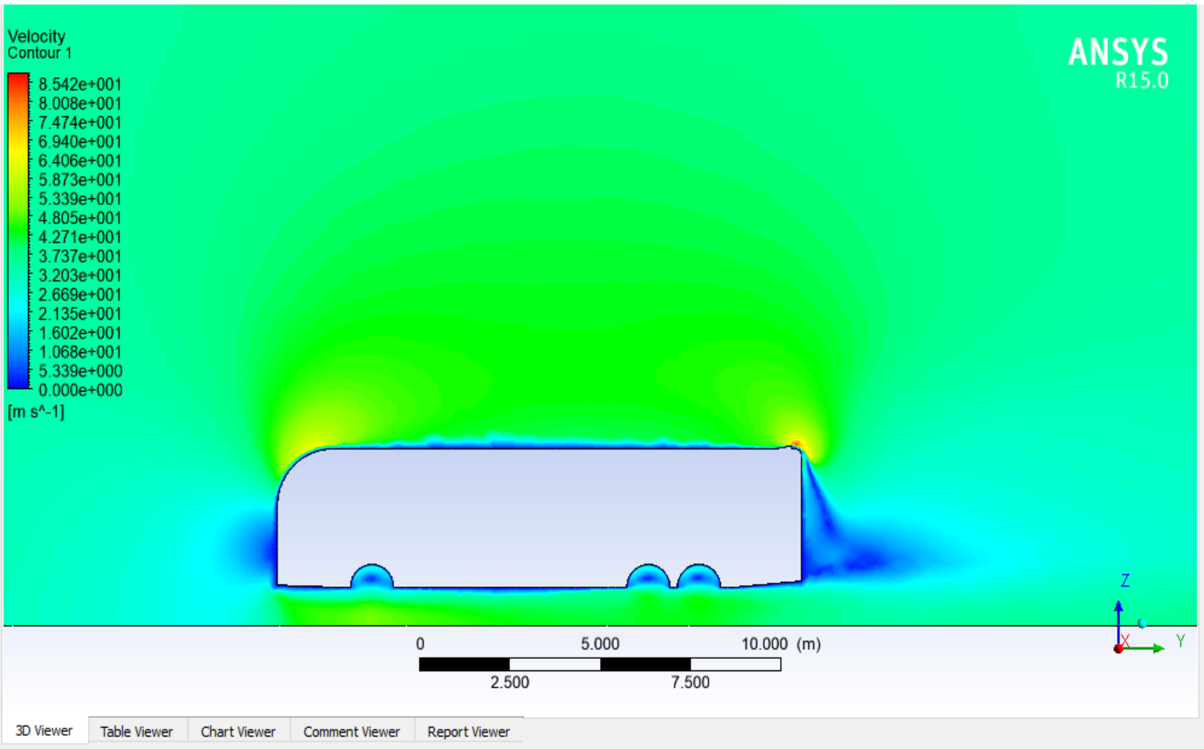

Fig 4.12 Velocity Contour results for Modified Bus Dimension in 120 km/hr

4.3 Turbulence Contour Results

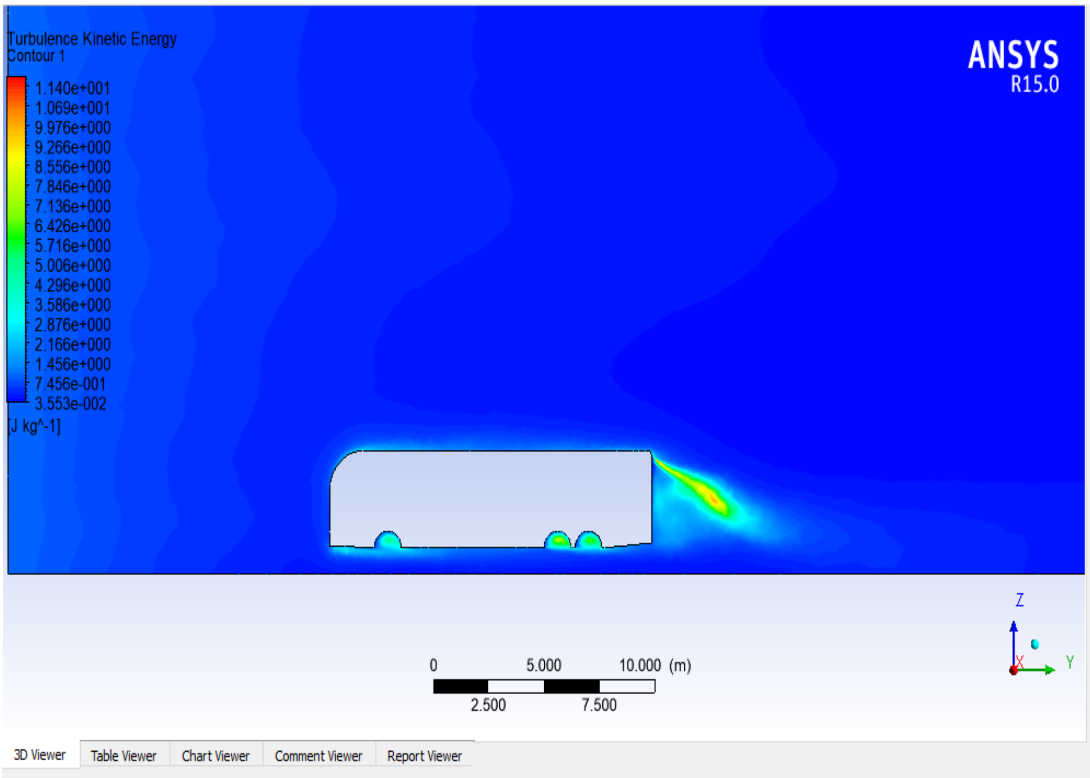

Fig 4.13 Turbulence Contour results for Original Bus Dimension in 80 km/hr

Fig 4.14 Turbulence Contour results for Modified Bus Dimension in 80 km/hr

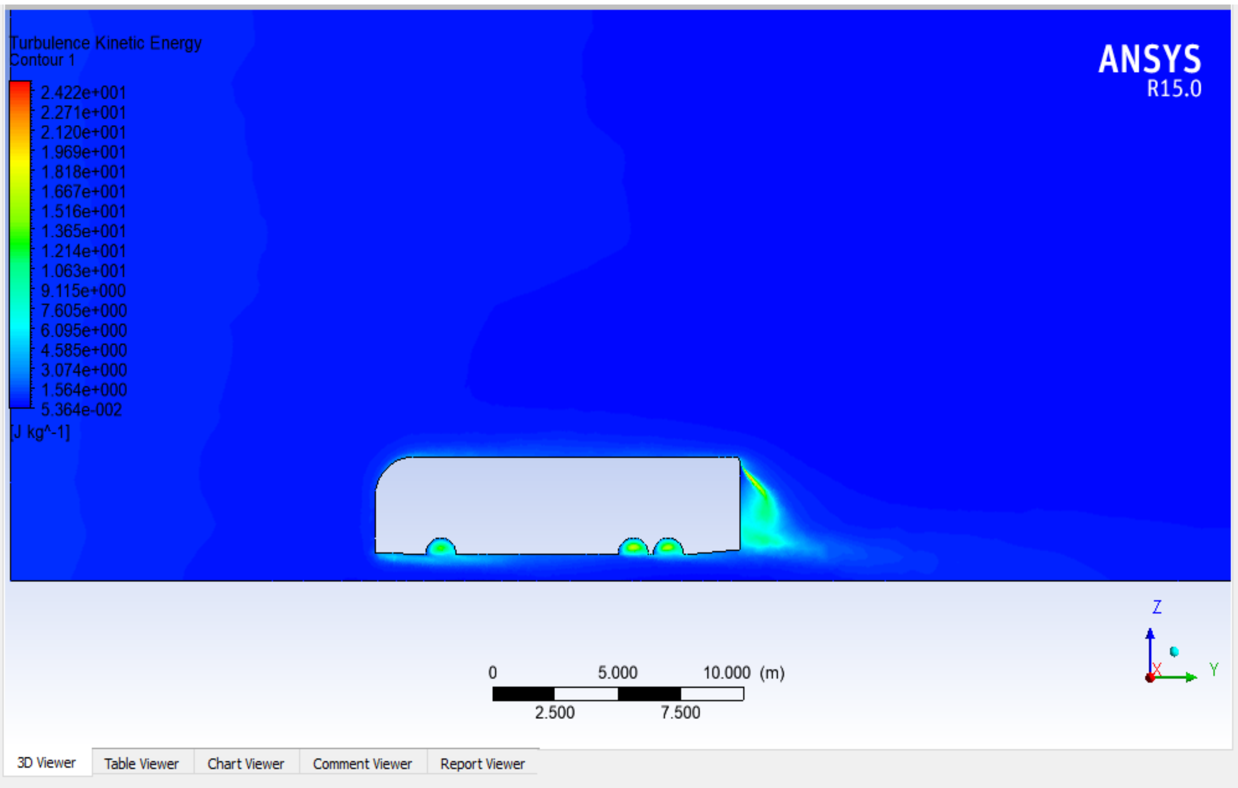

Fig 4.15 Turbulence Contour results for Original Bus Dimension in 100 km/hr

Fig 4.16 Turbulence Contour results for Modified Bus Dimension in 100 km/hr

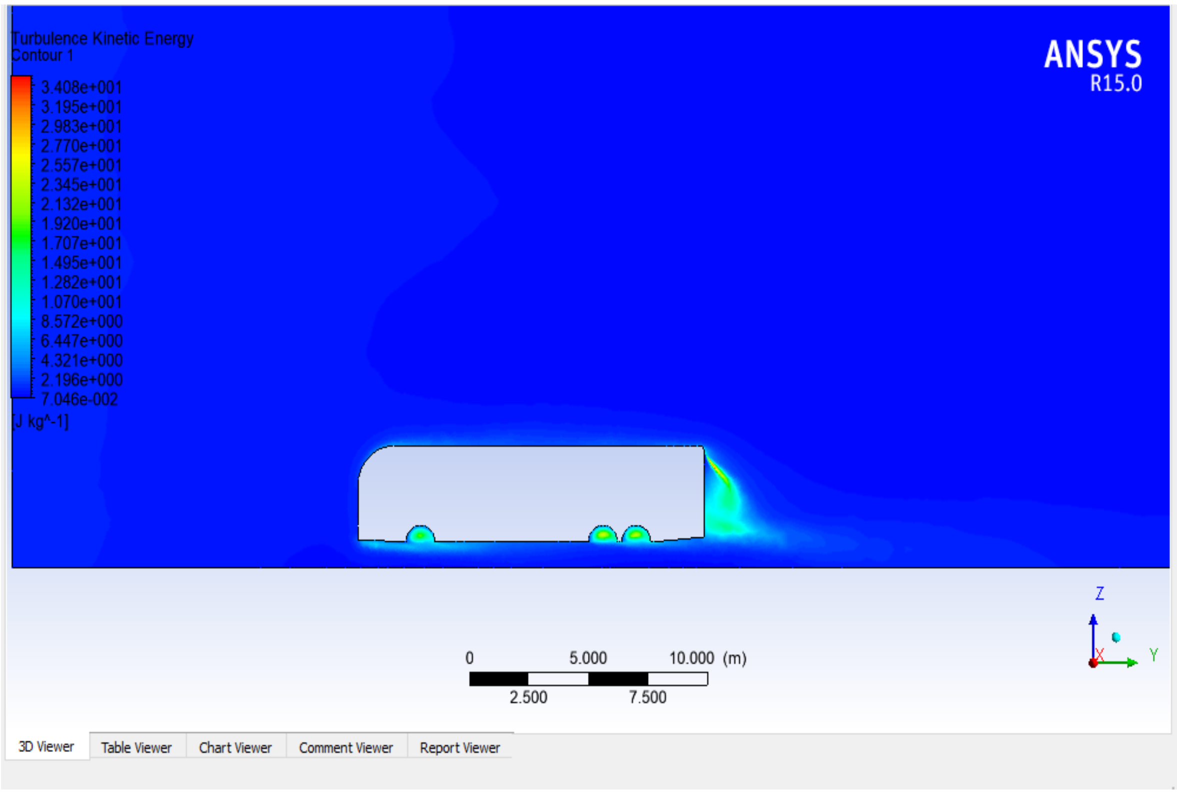

Fig 4.17 Turbulence Contour results for Original Bus Dimension in 120 km/hr

Fig 4.18 Turbulence Contour results for Modified Bus Dimension in 120 km/hr

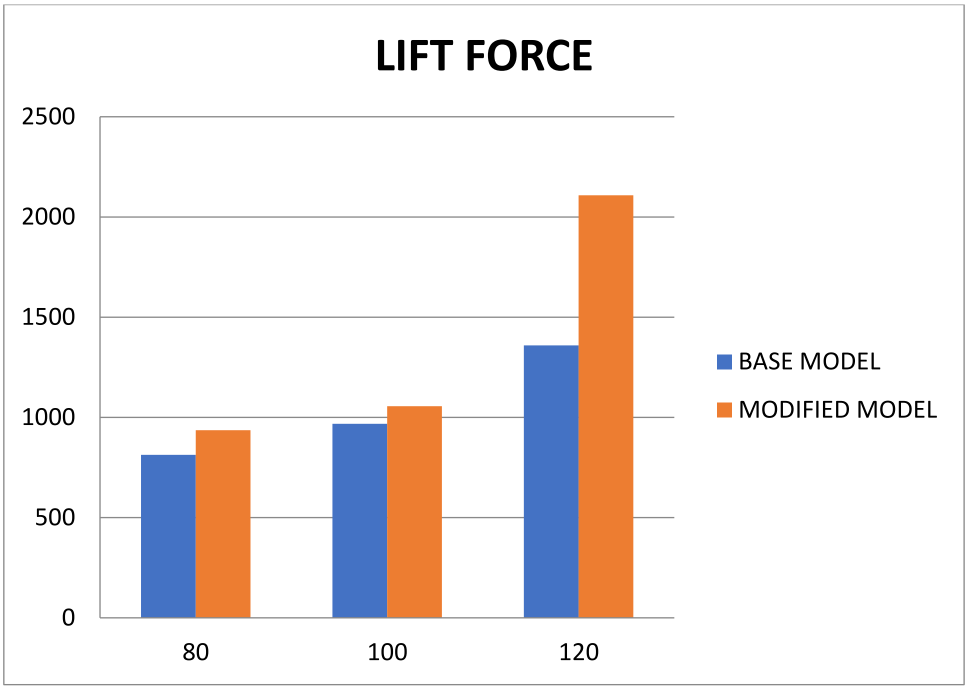

Fig 4.19 Lift Force Comparison for Base model and modified model of the bus in Various Speed

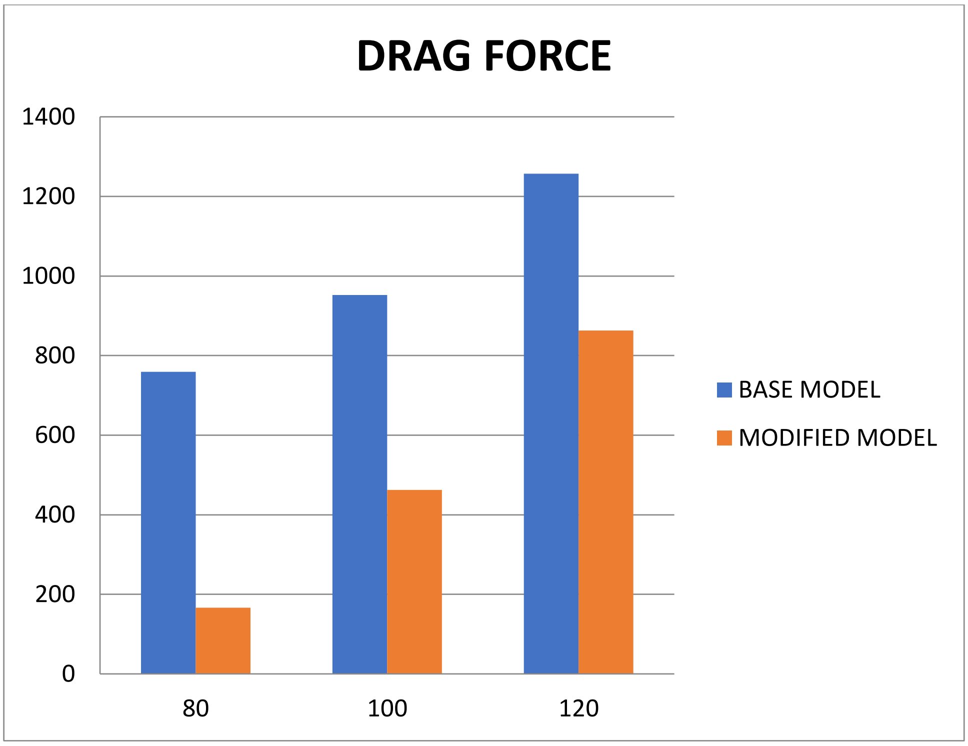

Fig 4.20 Lift Force Comparison for Base model and modified model of the bus in Various Speed

5. Conclusion

The CFD Analysis of the Bus body Structure is done with the ANSYS Fluent software and modelling of bus done in CATIA Software Intercity travel bus is taken for this analysis, mostly in bus body structures base drag will be created in the rear portion of the bus, this drag can be reduced by implementing new design of the vortex generator in the rear section of the bus, from this analysis Lift and Drag forces of the bus calculated in Various bus speed of 80 km/hr, 100 km/hr and 120 km/hr and get the results of drag force reduced in the implementation of Vortex generators

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