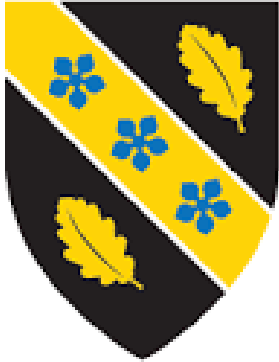


University Of Wales Trinity Saint David

Wales Institute of Science and Art



Prifysgol Cymru

Y Drindod Dewi Sant

University of Wales

Trinity Saint David



Figure 1

Automotive Engineering ACHA4005

Adam James

2107575

March 2022

Contents

Manufacturing.....	
Material	
Control systems.....	
Emissions.....	
Computational Methods.....	
Dynamic.....	
Aerodynamics.....	
Data accusation.....	

Introduction

In this report you will be learning about the 'Tesla model Y' we will be talking about, manufacturing, materials, emissions, control systems and more. The aim of this report is for you to get a better understanding on the tesla model Y and how it has improved and overcome its problems.

Impact of the topics

These topics as mentioned will help you get a better understanding of the tesla model Y each topic will tell you the store and information needed to understand how the car works.

Manufacturing

The most popular car made by tesla is 'Tesla model Y', Not many people know but it starts with coils of raw aluminium which is cut to size for specific details as stated by (et_editor, 2022) Then you can stamp and create the body of the car all in one facility, The average Tesla car can be made in under 1 minute which that's very impressive. The latest aerial documentary shows that. The model S tesla can be made in 44.3 seconds. This itself passes ford who held the previous record for 53 seconds for the F-150 pickup truck. A total of 445 robots are lined up in one facility to be able to keep the pace of each vehicle is made and be able to keep the 44.3 second status.

Kerry Tudor 2022

Materials

The body of the tesla car is made of out bauxite, which is also aluminium, there is about 190kg (410lbs) of aluminium on the body of the car and chassis as stated(Charged EVs | Model Y: Tesla's Latest Model Is Its Most Refined—and It Continues to Improve – Charged Evs, n.d.) . The underbody is made of ultra-high strength titanium, that because the want to protect the passengers and the battery for any serious crashes that has been caused. The battery weighs about 540kg which has been said equals to 26% of the cars weight. Each cell in the battery contains 80% of nickel, 15% of cobalt, 5% aluminium and lithium.

Kerry Tudor 2022

Control Systems

Tesla has a control system that can detect any object on the road, they installed sensors all around the car with this you are able to see if there are any danger that shows on the home screen they have installed in the car. We all have also heard of cruise control, this allows the car to follow any direction you have chosen, you are only allowed to activate this setting by always keeping both of your hands on the steering wheel, only if something has happened where the person needs to take control, they are able to without any struggle of turning the wheel.

Self-parking is another feature that tesla does, how it works is the auto park system uses all the data from the cameras and the ultrasonic sensors and the GPS as stated by *(Autopark, n.d.)* to be able to park on public roads, it uses simple parking manoeuvres to be able to pull a parallel park off, they also mention on the tesla website to only allow the car to do this on its own when the cameras are clean, also mention not to park with auto parking if you have attached a trailer at the back of the tesla. They also suggest parking on your own without auto parking as it is safer for now.

By now we know that the tesla car uses a lot of sensors and cameras to determine on how the car works, for traffic control they use the front camera of the car and a sensor to look at the driver to make sure both hands are on the steering wheel, and they are facing forward, if the car does not detect any hands on the wheel tesla will start beeping at the driver to put their hands on the wheel.

The car is also able to detect road signs to be able to determine when to stop or when to go, even if you set it to where you are driving on the screen in the car you can see object like traffic lights, road signs as stated by (Traffic Light and Stop Sign Control, n.d.) people crossing, bins anything that has been added to the system the car can warn you about.

Tesla control system is so advanced the Traffic Aware Cruise Control uses a radar to get information on the vehicle in front to match its speed, if it notices any increase of the vehicle in front it will automatically slow down and match the speed limit on the road. Another thing Tesla can do with the control system is traction. The traction Control system monitors the wheels if the vehicles experience any loss of traction the system will minimize the wheel spin and able to control the brake pressure and motor power.



Figure 2 image showing tesla control system (Instrument Panel 7.0 User Interface Evolution and Analysis – TeslaTap, n.d.)

Andrew Gibson 2022

Emissions

Tesla Model Y and the other tesla have ZERO emissions, No CO2, No carbon monoxide and No Nitric Oxide. These are deadly gasses that harm Us, plants and animals. Also stated that, Tesla vehicle can access the London Ultra Low Emission zone, and not pay the noncompliance fee of £12.50 as stated by(Vehicle Incentives | Tesla UK, n.d.)even though there is no emission in a tesla, the prices on battery's have gone up.

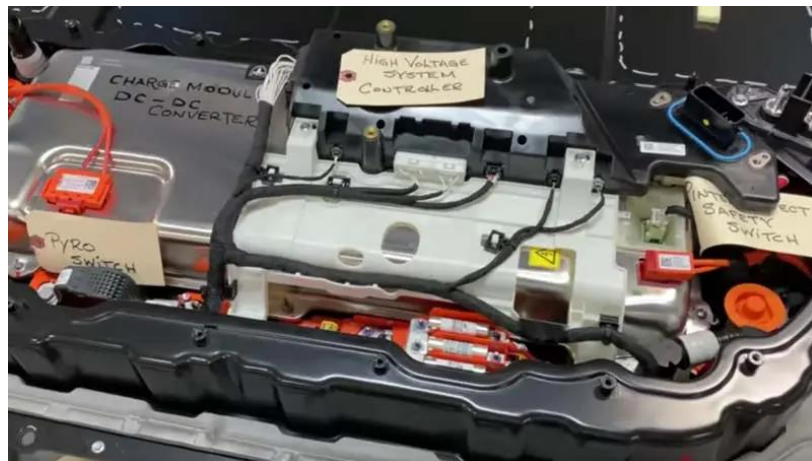


Figure 3 image showing Tesla Battery (Auto Expert Sandy Munro Reveals Tesla Model Y Battery Pack Cost Reductions, n.d.)

Abigail Summerfield 2022

Computational Methods

The engineers used the Star CCM+ and stated our goal in this project was to achieve exceptional range without compromising the performance of the Model Y, for them to keep their promise they made sure they checked every inch of the vehicle to conserve energy (STAR-CCM+ Solves Aerodynamics and Heat in Tesla Model Y - Digital Engineering 24/7, n.d.) .In other terms they used on board energy carrying capacity of the vehicle and the efficiency to add energy to accelerate and propel the vehicles mass. They also need to consider the resistance of gravity the aerodynamic drag at high-speed force. They also mention the battery energy which they need to increase the size and weight which would also increase the thermal energy that has been removed from the vehicle, radiators and condensers work well to remove the heat but also at the cost of the aerodynamic performance and further energy losses through the electric fans.

The Star-CCM+ software provided the tesla motors a good tool to be able to make out all the aerothermal components to optimize the ranges of performance and minimize the vehicles consumptions, so the engineers have thought through every detail to think and how to provide the best of the best software to be able to handle tesla powerful battery and equalise the resistance of gravity and aerodynamic to be able to keep the car safe through high-speed winds etc.

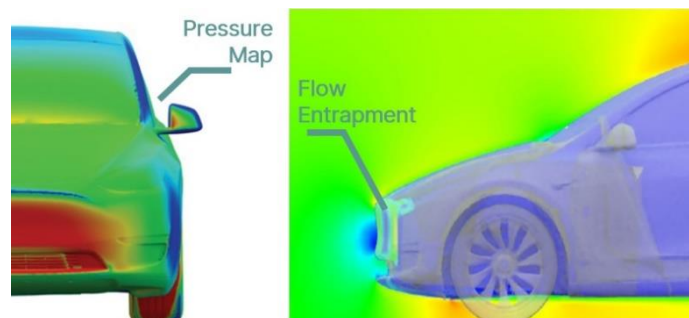


Figure 4

image showing cfd image (Benchmarking the Tesla Model Y - Different Ways to Analyse the Aerodynamics, n.d.)
Andrew Noble 2022

Dynamic

The suspension system used on the tesla model Y is called 'Smart Air Suspension' stated by *(A Brief Review of Tesla Models Y and 3 Suspension System / Torque News, n.d.)*. The smart air suspension is basically storing air into rubber bellows or airbags and the air is compressed which would help created a smooth ride, the air is separated through hoses to each strut and adjust itself to the pressure which it could raise the car or lower the car either with manual controls or automatic controls. The Tesla model Y also has a tech couple programmed that can adjust the suspensions heigh based on the GPS location, speed and even the driving conditions. The smart air suspension was originally made for the model S and model X but became a standard in most tesla cars. Tesla also made an app where the person (driver) can pin locations with different heights, the tesla will store this data and once the car as arrived at the saved location the car will automatically adjust its height to matched to what was saved. Examples of needing to adjust heights would be, a steep drive, an uneven road. The tesla will adjust itself.



Figure 5 image shows Tesla model y suspension(Tesla Model Y Suspension Gets Some Munro & Associates Attention, n.d.)

Aerodynamics

The tesla model Y has a coefficient of 0.23 which is pretty good but once you compare it to another model (Model 3) the tesla model 3 has the same coefficients but the model Y is a bigger car which impacts a lot of cars, but tesla has found away to bypass it and keep the 0.23. Horsepower, the power needed to drive through the atmosphere will increase of cube of velocity. Aero power at 100mph is 2.9 times the power of requirement at 70mph as stated by(Don Sherman, 2014). The drag area is the best way to measure a car aerodynamics performance the reason is it proportional to the horizontal forces. To be able to get these readings they must use a win tunnel, with that they can use smoke to follow the flow pattern of the wind around the car to make it easier to see where more force is being hit. You could also run a CFD simulation, but you will need a 3D model of the tesla mode Y, with that they would create gaps between panels like a real car would have but sometimes it would create a 'false reading' as stated by (*Benchmarking the Tesla Model Y - Different Ways to Analyse the Aerodynamics*, n.d.-b). they would add small details to find out the best readings on a 3D model, once they were reading to use the model, they would use moving wheels and a moving floor to get the best results. Even though the tesla model S has the best aero production car the model Y has being a bigger car comes close.



Figure 6 image shows tesla aerodynamics

(Independent Aerodynamic Study of Tesla Model Y
by Unplugged Performance, n.d.) Tim Tudor 2022

Data acquisition

The Dutch government forensic lab has talked about driving data-storage system to uncover wealth of information that could be good to investigate serious accidents as stated by (EXCLUSIVE Dutch Forensic Lab Says It Has Decoded Tesla's Driving Data | Reuters, n.d.). NFI has mentioned that tesla vehicles store information of operation of its driver's assistance system, Francis hoogendijk spoke about how these data can help investigations for the near future to figure out what happened on fatal accidents. Even then the safety highway (IIHS) mentions that the tesla model Y has been rewarded the highest possible safety rating as stated by (*Tesla Model Y Achieves Highest Possible IIHS Safety Rating - Electrek, n.d.*) Tesla also claims that it is able to detect any type of crash in 10 milliseconds and deploy the airbags at the correct time to make sure everyone's safety. It able to detect the position of the seat and steering wheel to what the driver has positioned them.

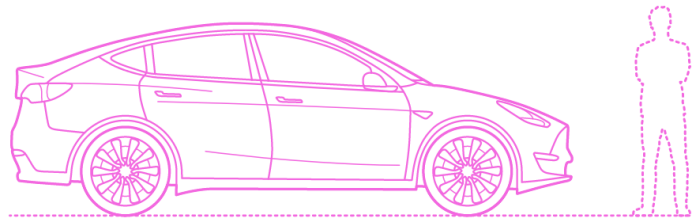


Figure 7 image shows before crash(Tesla Model Y Dimensions & Drawings | Dimensions.Com, n.d.) Andrew Harrison 2022

Current state of the industry

The current state of the company 'Tesla' is going strong, and Tesla was ranked the most valuable automotive brand worldwide in 2021 as stated by *(Tesla - Statistics & Facts | Statista, n.d.)* Tesla was the fastest brand growing worldwide also. The growth was 157 percent in 2021, Tesla can earn up to 8-13 billion per year, Tesla also mentioned they achieved the best net income of operating profit and gross profit stated by *(Elon Musk's Tesla Reports Record Sales and Profits - BBC News, n.d.)* Mostly every year Tesla brings out new upgrades and updates to the car to make sure the safety of the vehicle and passengers. Tesla has sold 499,535 cars in 2020 which made it the most popular EV manufacturer in that year, Tesla outsold SAIC-GM-Wuling which is Tesla's closest competitor, passed them with 77.06% stated by *(Tesla Revenue and Production Statistics for 2022, n.d.)*

Conclusion

In conclusion tesla model Y is a very reliable and good working car, you can tell by all the reports and statistics that they have put time and effort in making the perfect electrical car, There is no doubt that tesla went through some rough patches to make it to where it is now but they still managed to make one of the best electric cars on the market to this day, The amount of time they spent on making the control systems correct and perfect, the time they spend on making the battery last as long as 200 miles. You can just tell tesla worked hard for what they wanted to create. Hopefully the report has given you a better understanding on why tesla model Y is reliable car.

References

(et_editor, 2022)

(Charged EVs | Model Y: Tesla's Latest Model Is Its Most Refined—and It Continues to Improve - Charged EVs, n.d.)

(Autopark, n.d.)

(Traffic Light and Stop Sign Control, n.d.)

(Vehicle Incentives | Tesla UK, n.d.)

(Instrument Panel 7.0 User Interface Evolution and Analysis – TeslaTap, n.d.)

(STAR-CCM+ Solves Aerodynamics and Heat in Tesla Model S - Digital Engineering 24/7, n.d.)

(Tesla Model Y Performance Exhaust Systems Prices Perth - Morley Midland, Kelmscott., n.d.)

(Benchmarking the Tesla Model Y - Different Ways to Analyse the Aerodynamics, n.d.-a)

(A Brief Review of Tesla Models Y and 3 Suspension System | Torque News, n.d.)

(Auto Expert Sandy Munro Reveals Tesla Model Y Battery Pack Cost Reductions, n.d.)

(Tesla Model Y Suspension Gets Some Munro & Associates Attention, n.d.)

(Don Sherman, 2014)

(Benchmarking the Tesla Model Y - Different Ways to Analyse the Aerodynamics, n.d.-b)

(Independent Aerodynamic Study of Tesla Model 3 by Unplugged Performance, n.d.)

(EXCLUSIVE Dutch Forensic Lab Says It Has Decoded Tesla's Driving Data | Reuters, n.d.)

(Tesla Model Y Achieves Highest Possible IIHS Safety Rating - Electrek, n.d.)

(Tesla Unveils Its New Crash Safety Tech Based on Collecting Real-World Data - Electrek, n.d.)

(Tesla - Statistics & Facts | Statista, n.d.)

(Elon Musk's Tesla Reports Record Sales and Profits - BBC News, n.d.)

(Tesla Revenue and Production Statistics for 2022, n.d.)