# Exterior design and concept for an electrical car

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## Abstract

Too keep up with the recent development in the car industry, design students at Chalmers University were assigned to create the exterior of an electric car or partly electric hybrid car, suitable for a small family.

This report demonstrates the process and results of the design progress of a fully electric car through text and visual illustrations. Initially, a general pre-study about car design, Swedish design and local environment and was carried out. This information led to a further design progress. Both pencil sketches and physical sketch models have been used in an iterative process to achieve the final design. A scale 1:10 model, an illustration showing the car in perspective and four plan views were made to illustrate the result.

The result is a premium car aimed at early adopters of ecological and environmental friendly technology, residing in Northern Europe. It is featuring design elements beyond classic car design and therefore enables t to appeal to a wider target group.

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# 1 Background

## 1.1 Introduction

For a modern company, the environmental impact is important. In 1975 UN held their first environmental conference, starting a new era of environmental thinking. Since the 1990s in particular, several legislations have regulated the European market regarding consumer goods and their environmental impact. (Naturvårdsverket, 2010) Many high-status companies now use environmental friendly means for their services to meet legal requirements, take social responsibility and/or to improve their trademark. For example, Google is using renewable power to host their sites (Google, 2012) and Nike spent millions of dollars during the early 2000s, just to get rid of sulfur hexafluoride, a greenhouse gas, in their shoes. (Holmes. S, 2006)

According to the prevailing changes, the market for cars is currently changing as well. Cars and other vehicles that traditionally use fossil fuels to operate are beginning to be questioned due to the levels of carbon dioxide released. In 2010, 33.5 gigatonnes of $CO_2$ were globally released from fossil fuels and cement production (Tyndall Centre, 2010) . Great brands like Volvo (Volvo, 2012), Ford (Ford, 2012) and Mercedes-Benz (Mercedes-Benz, 2012) have developed environmental friendly cars, so called “clean cars”, to be included in their product range. Other companies, like Tesla Motors (Tesla Motors, 2012) and the Norwegian company Buddy Electric (Buddy Electric, 2012), have built their trademarks and range of products entirely on electric, environmentally friendly cars.

Too keep up with the recent development in the car industry, design students at Chalmers University, were assigned to create the exterior of an electric or partly electric hybrid car, suitable for a small family.

## 1.2 Target group

The typical owners of this car reside in or close to urban surroundings in Northern Europe. They live as a single or in a relationship without kids. The users have a steady income and put much value in their social identity. They are early adopters of ecological and environmental friendly technology and it constitutes an integrated part of their lifestyle and social status.

## 1.3 Concept definition.

The objective with this project was chosen to be the design a fully electrical car. It should visually fit into the general view of a modern, elegant car. At the same time it have to be innovative and in some degree express uniqueness through its own style. The design should visually indicate that it is environmental friendly. The intended main market is northern Europe, and therefore the car had to fit the climate and social factors. The car is intended to be a semi-luxurious premium car and express the driver's identity and status, but not in an extravagant manner.

# 2 Method

## 2.1 Pre-study

The first step in this project was to gather information about the current situation in modern cars. To analyze the general shape and detail level on a vehicle, cars parked in the Gothenburg area were photographed and discussed in a large group. To develop a more accurate sense for basic car shapes

and proportions, existing cars from different cultures and time intervals were referenced from the web to be re-created through pencil sketches.

Furthermore, clean cars were examined in particular. Questioning why clean cars tend to follow certain aesthetic guidelines lead to a deeper understanding of how visual design interacts with social and technical factors.

Finally, general technology and architecture currently being developed in a more environmental friendly direction were researched in order to be able to cross the borders of classic car design and to have a broader approach for the design phase.

The inspiration from nature has been vital through the process from the beginning. Rather than focusing on the common “green” iconography, the local environment in Northern Europe has been explored.

**2.2 Sketches and models**

Using the information received in earlier steps, keywords were written down and a couple of original, rough sketches were made to convey the general idea of new concepts. These were drawn quickly in random perspectives, with the intention to express different ideas rather than to be coherent or exact.

Fig.1 Two rough sketches from a late stage in the sketching process.

Experimenting with these sketches lead to another session of creating new ideas and sketches (fig. 1). After comparing them to ergonomic limitations, available technology and existing cars, they were narrowed down and refined to a single sketch which would come to outline the final design. This was converted from an approximate sketch to four plan view sketches. These drawings depicted the front view, side view, back view and top view, all marked with specific dimensions suitable for the car.

Using the refined images as a base, a rough, small car model was sculpted out of Styrofoam with a rasp. This model did not include small details, but it did express the overall shape, proportions and physical impression of the car. After evaluating the form and comparing it to the main concepts, another two sketch models were made with the intention to further explore possible shapes and variations through a different medium.

After creating a sketch model that fitted the idea and desired aesthetics, an extensive scale 1:10 model was sculptured. This model was sculptured in Styrofoam as well. In this step some minor details were re-considered and changed. Some early ideas from the flat sketches did not work in a

physical model had to be altered. This model concluded the work with the shape and defined the final design of the car. (fig.2)

To get the physical model more distinct to the eye, and to put emphasis on the shape rather than the quality of the material, the surface had to be made smoother. Some minor flaws had to be modified or covered up as well. As Styrofoam is a material that easily gets scratched and is hard to alter when you have cut in it, this had to be done with another material. The model was therefore covered in a thick layer of putty which was sandpapered by hand.

Fig.2. Final result of the Styrofoam sculpturing with putty finish.

### 2.3 Traditional and digital rendering of sketches

As the shape had changed and now slightly differed from the earlier sketch, a new sketch, consistent with the physical model, had to be made. Using the finished scale 1:10 model as reference, a new perspective sketch was drawn with a pencil. By looking and measuring every side separately, four new plan views were altered as well, using pencil for the overall shape and an ink pen to define important lines.  (fig.4 and fig.5)

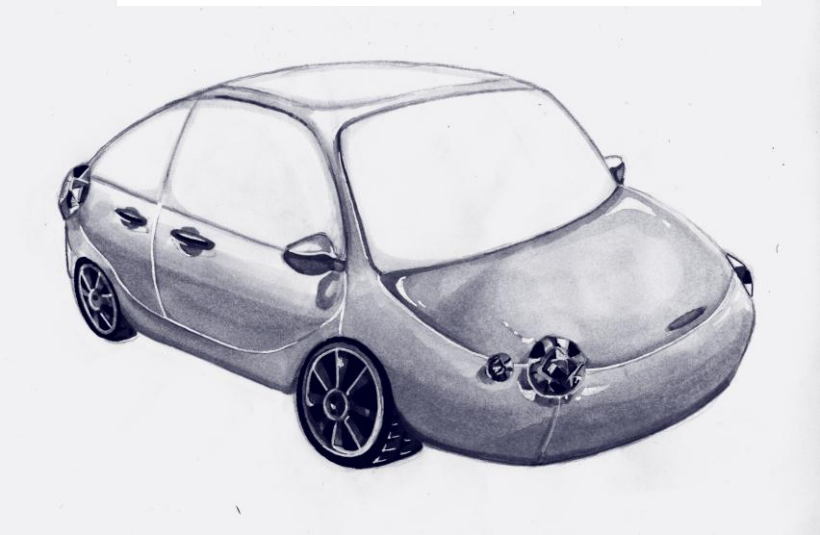

Fig.3 Perspective view of the final car design, rendered with markers.

To put further focus on the three-dimensional shape and add depth to the final illustration, the perspective sketch was traditionally coloured with markers on bleed-proof paper (fig.3). The markers that were used are called COPIC markers, which are pens that can be blended on the paper into to gradients, or put on top of each other as shading layers. Parts with highly reflective light were drawn with a separate white pen over the COPIC layer. In the traditional rendering, the main focus was to show how the reflective surface interacted with the shape of the exterior. Some minor touch-ups were made with Photoshop.

Some special features of the car required special illustrations, and these were rendered digitally by both drawing and colouring directly in the image manipulation program GIMP.

## 3 Results and Discussion

The final design is a car called Euro Eco Flow Rimfrost. It's a fully electrical car intended to be used in urban areas in Northern Europe. It has a total of four seats, placed in two rows.

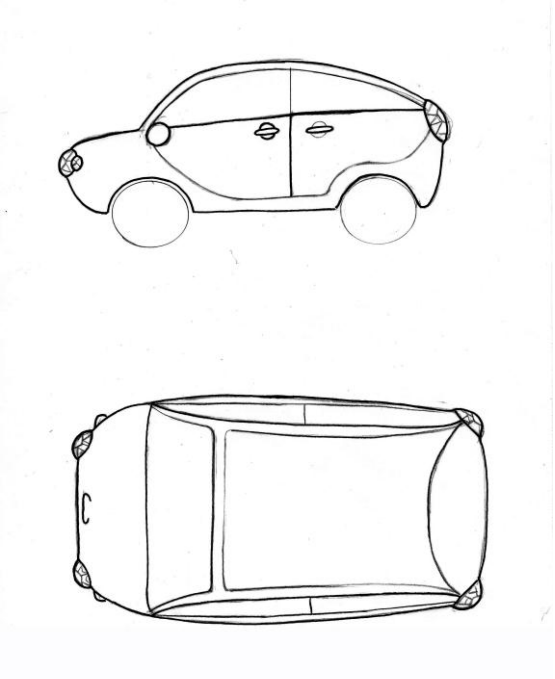

Fig.4 Side and top view

### 3.1 Shape and proportions

The shape of this car is partly following and partly breaking the visual rules of a classic clean car. In contrary to many contemporary electrical cars, this is a broad vehicle. The reason for this is that the target group is supposed to feel powerful and of importance in their cars. To keep the visual experience of a smart, eco-friendly vehicle, it is short, inclining that there is no big motor taking up space. However, the front hood is still defined, and the car is instead shortened from behind, to communicate the feeling of sporty premium cars. Luggage can be placed in in the hood, working as a front trunk. Apart from the mentioned visual aspects it serves a function in safety as well, since a hood makes the driving safer in case of frontal crashes.

### 3.2 Design features

As mentioned in the pre-study, the nature has been a vital source of aesthetic influence from the beginning of this project. The intention with this is to connect the visual design with its eco-friendly drive. To link the design with its origin and avoid the common “green” iconography, the Scandinavian nature has been of particular interest. Swedish design and architecture in general have also been included in the inspirational process, to approach the project in a broad design perspective, not solely limited to vehicles.

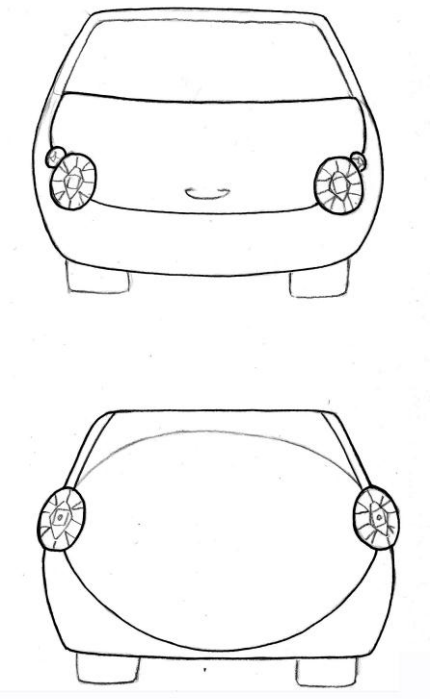

Fig.5 Front and back view

ICEHOTEL in Jukkasjärvi, a hotel is built out of ice every year to melt at the summer (ICEHOTEL, 2012), was a vital inspiration to *Rimfrost*. The influences can be seen in the snowy paint and ice crystal headlights, but most importantly, ICHOTEL works as a demonstration of the fact that the Swedish nature is constantly changing due to the seasons.

This is represented with a design that changes in the same manner. Interactive, dimmable windows allow the car to create an illusion of its windows to be “built up” and “melt” around the passenger seat. Not only does this relate to Northen Europe, but it is also a reference to how the use of fossil fuels makes part of our polar regions to melt.

”Ice Mode” ”Car Mode” ”Sky Mode”

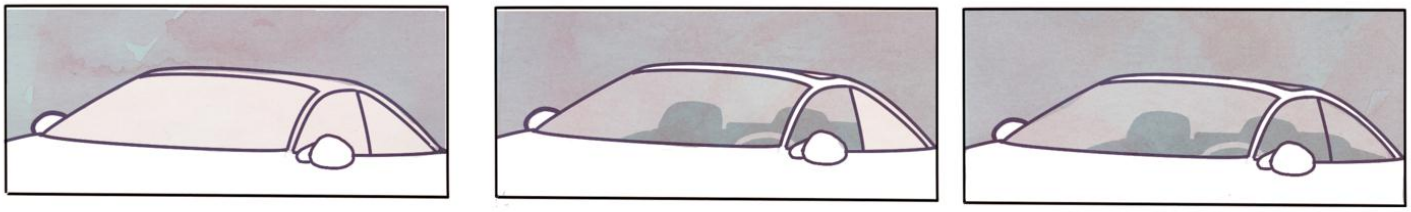

Fig.6 Three different modes for the windows and glass roof

There are three available modes for the windows (fig. 6), the “Ice Mode”, the “Car Mode” and the “Sky Mode”. The “Ice Mode”, render all of the cars windows dimmed, giving them a translucent milky white appearance. This protects the interior from sun heat and prevents bypasses to look inside. This mode is only available when the car is parked. The “car mode” renders the front, front seat and back windows clear transparent, resulting in the car to attain a classic appearance. Finally, the “sky” modes renders the entire front, sides, back and roof transparent, giving the passengers a feeling of open space and air. To make this possible, the glass panels on the sides, front, back and roof are processed with a so-called smart glass film. This is a film prepared with liquid crystals, making it go from translucent white to transparent when electric current is applied. (Glassonweb, 2006) The electricity for the windows and the engine is taken from the same main batteries, but every glass is prepared with a small emergency battery in case of unforeseen discharge.

To instill a greater sense of luxury and personal space, the doors to the front and back seat are facing each other, making it able to be opened as a large double door. The front seats can, if the car is parked, be turned 180 degrees to face the back seat, and combined with the doors and frosted “Ice mode”, this makes the car serve as a personal mini hut for the driver or a group of friends. An electronic lock prevents the doors to be opened while driving at a high speed.

The unusual placement of luggage, the door and hut function, as well as the windows makes this car noticeable all invite people to react, giving the owner a reason to talk about their car and its technology, something the target owner wish to do.

## 4 Conclusion

When designing an electrical car, the user’s ability to express its identity is vital. The design of this car was initially aimed at a group of customers that adopt new eco-friendly technology early, but expanded to be possible to market as an innovative car to a group who might haven’t considered a clean car earlier. Even though it is aimed at the Scandinavian users, a global market is possible as well.

In the progress, the proportions and shapes were in a significant degree determined before the main features became elaborate. To develop this project further, different shapes proportions could instead be explored in relation to the main design features. More detailed renderings of the full car showing the different state of the windows would give a more elaborate opinion on how it change the expression of the car.

A final step could be exploring new target groups and investigate if it’s possible to adapt it to an entirely different market in the future.

## 5 List of references


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