

# Evaluation and design impact using CFD modelling of air flow around IXTAbox backbox versus conventional Rooftop boxes

## Background

Basework AB, an innovative company has developed IXTAbox – a backbox mounted directly on the towing hook of a vehicle, offer a challenging and exciting thesis work in collaboration with Chalmers University of Technology.

The thesis work will be performed during fall 2021 or spring 2022 and consists of 2 x 30 credits/ECTS, i.e. the thesis is opened for two students simultaneously.

IXTAbox is made of sustainable, durable, reusable metal materials, visit [www.ixtabox.se](http://www.ixtabox.se) to get an idea of the product and its use.

There are several benefits with this way of transporting and storing equipment and things compared to using a roof top box. These are some of the main benefits:

1. Easy access for anyone to reach transported gear and things
2. Much less wind drag ensures less fuel / electricity consumption / longer range
3. The box is made to last and is good for transporting things, as well as excellent to store things in when not transporting them.

The benefits of less wind drag are believed to become ever more relevant since studies estimate that of all vehicle-based fuel consumed in the World, at least 1% is directly related to rooftop racks and rooftop boxes.

Using rooftop boxes increase the drag / reduce the range in general with an estimated 10-25%. Initial estimations indicate that IXTAbox increase drag with less than 5%.

With increased use of electrical cars where range is an important factor the use of alternatives with less drag would support more sustainable solutions and have a positive impact on the Planet.

## Overall objectives

- Using CFD modelling tools to estimate the impact of wind drag of an IXTAbox to compare that to a rooftop box of corresponding size.
- Identify and evaluate potential principal design recommendations to further reduce the wind drag of an IXTAbox.

This opens up possibilities to shed light on the nature of the winddrag problem from a data driven perspective and thereby tackle the analyses and product design with greater level of understanding and accuracy.

Core motivation for Basework is to take these first steps on this road together with curious and creative students.

## Scope

- Perform literature study with the purpose to map relevant physical flow phenomena occurring for a typical rooftop box and a backbox set-up on a vehicle.
- Clearly understand and map limitations, as well potentials, with current CFD methodology.
- Simulate impact of wind drag of an IXTabox to compare that to a rooftop box of corresponding sizes. Simulation done for backbox and rooftop box on a small-, medium, and large sized car.
- Simulate how the cars performance change with a rooftop box versus a rear backbox like IXTabox; e.g., side wind effects, impact on steering capabilities.
- Simulate how the width of IXTabox relative the width of the car impacts winddrag? Evaluate at general level if design modifications using e.g., wings that “steer” the wind to improve winddrag performance?
- Simulate how the vertical position of the box relative the towing hook impacts winddrag performance. IXTabox can be adjusted 8 cm vertically relative the top of the towing hook. Main purpose being that the same IXTabox could be used on most types of cars and make it possible to open the rear door while having the IXTabox mounted.
- Propose further model improvements and alternative topics for future winddrag studies.

## Candidate profile

- Good knowledge in Fluid Mechanics
- Interest in Aerodynamics and Computational Fluid Dynamics (CFD). Suitable engineering background is Applied Mechanics, Mechanical Engineering, and Engineering of Physics.

## Application

CV and transcripts with courses and grades.

## Duration

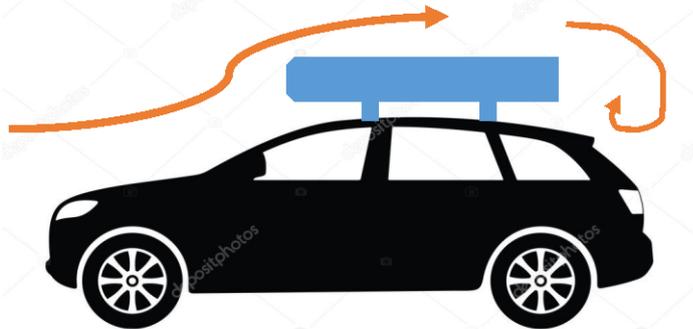
- 20 weeks. Proposed starting date: August 2021 or January 2022
- Academic Credits: 30 ECTS

## Contact info

Carl Rietz  
[info@ixtabox.se](mailto:info@ixtabox.se)  
[www.ixtabox.com](http://www.ixtabox.com)  
070-222 3250

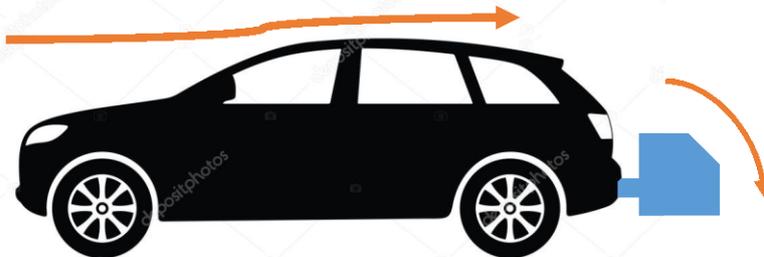
Supervisor and examiner at Chalmers:  
Simone Sebben e-mail: [simone.sebben@chalmers.se](mailto:simone.sebben@chalmers.se)

## Simplistic view of drag around a car with roof top box versus backbox



**Fuel consumption is greatly reduced using an IXTAbox**

Rooftop boxes normally add 10-25% additional fuel / electricity consumption – reducing driving range substantially.



With IXTAbox you bring your gear wasting less energy. Added fuel consumption is typically less than 5%. This is extra good news for electrical cars to increase driving range.

*Estimations are that 1% of World wide fuel consumption from cars are due to roof racks and rooftop boxes – support reducing this waste by using an IXTAbox*