



# Zero Emission for Imperial Racing Green



**Company**

**Imperial College London**

## Additional Participants

**EnVision** - a major Imperial College London initiative focusing on the way the Faculty of Engineering educates its undergraduates and prepares them for their future careers. It aims to build on the Faculty's already excellent international reputation to improve and develop the staff and student experience and set a benchmark for excellence in engineering education across the world.

## Summary

Imperial College London is an exceptional University with a deserved reputation as a world leader, ranking 3rd in Europe and 5th globally in the 2007 Times Higher Education Supplement.

Energy is one of Imperial's key research themes with high calibre research activity in the Grantham Institute for Climate Change, the Centre for Environmental Policy, Centre for Transport Studies and the Energy Futures Lab.

In September, 2006 Imperial Racing Green was founded and with 13 students from three engineering departments at Imperial College London, began designing zero emission hydrogen fuel cell powered go-karts with the intention of competing in the World's first zero-emission, hydrogen powered fuel cell race series - Formula Zero.

Building on their strength, the team this year (08/09) will consist of almost 100 students from 8 departments continuing to improve IRG02 making it lighter and faster. The team will also be building their third, larger, vehicle, IRG03, with the intention of entering into the 2009 Formula Student Championship; in the new Class 1A Category with a triple hybrid zero emission fuel cell powered single seater racecar.

## Key Facts

- Production of two kart-sized racing cars one of which successfully completed in Formula Zero, coming third out of six.
- IRG02 performed almost perfectly in its racing debut, notching up a second fastest time overall in the Formula Zero endurance race as well as the fastest overall time of all competing teams.
- IRG02 was the only Formula Zero car competing able to complete the full endurance distance without stopping, arguably the most reliable vehicle on the track.
- The fuel cell, powered by hydrogen, produces only water - no harmful emissions - and the hydrogen is generated using renewable resources.
- IRG03 will be ready to race by summer 2009.
- Imperial Racing Green has had significant media interest in its environmentally responsible approach to racing.

## The Challenge

Imperial Racing Green's aim was to design and manufacture fuel cell hybrid vehicles to race, win competitions, encourage collaboration between engineering disciplines and to provide a delivery mechanism for re-invigorating engineering undergraduate teaching at Imperial College London.

The team's main racing challenge was to design build and race the most advanced go-cart in the UK in just nine months - from concept to first race.

With support from Envision, Imperial Racing Green was able to successfully manufacture two zero-emission fuel cell vehicles with a third on the way.

With support from EEMS, Imperial Racing Green was able to enter the Formula Zero Championship, representing the UK in the world's first international zero emission race series.

## The Solution

In the summer of 2007, a team of seven students built the first go-cart in just six weeks, which was a prototype fuel cell battery hybrid called "IRG01".

Over the 07/08 academic year, 70 students from seven departments began the process of preparing to enter Formula Zero and within six weeks had produced a complete blueprint for the most advanced go-cart in the UK.

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**“ Our society faces multiple challenges from climate change, resource depletion and poverty. And in order to overcome this we need to be inspiring our younger generation to make a difference and giving them the skills to be able to change the world. Imperial Racing Green's founding principle is to train the next generation of engineers in environmentally sustainable technologies that we need for the future such as electric vehicles and hydrogen fuel cells. By demonstrating this in an exciting way through motorsport we are also able to involve undergraduate students in cutting edge research and demonstration projects that are leading edge. ”**

Dr Gregory Offer  
Imperial College London, Project Manager Imperial Racing Green

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Over the next few months, further steps were completed ensuring their place in the race and by July 2008, the second go-cart - IRG02 - had been completed which was a fuel cell super capacitor hybrid.

In August 2008 in Rotterdam, the team came third in the main event, finishing with the most reliable vehicle and consistently fastest average times, only narrowly missing out on the top spot.

## Benefits

The benefits of a zero emission fuel cell racing car are huge in terms of a reduction in environmental impact as fuel cell vehicles, powered by hydrogen, produce no harmful emissions - just water. Furthermore, if the hydrogen is generated using

renewable resources, there is the opportunity to produce no greenhouse gases at all from wind farm to wheel.

Hybridising a fuel cell, with batteries and super capacitors, provides further improvements through enhancing both efficiency and performance.

## The Future

In 2009, Imperial Racing Green aims to enter its new vehicle - IRG03 - in the Formula Student Championship - Class 1A (for vehicles powered by alternative fuels and low carbon technologies) - and win.

The team wants to win by enough of a margin to prove that, had the car been entered into Formula Student's main Class 1 category (for conventional internal combustion engine vehicles), it would also have won; thereby demonstrating that this form of racing car is equal, if not better, than conventional vehicles of a similar specification. By achieving this, it is hoped that other Universities and mainstream motorsport will see what can be achieved in term of zero emission vehicles.

Imperial Racing Green is aiming to use the success of its racing cars to generate more awareness in the field of zero emission fuel cell vehicles by offering its expertise to other interested Universities.

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