

# evGrandPrix - Building links to Purdue University through electric kart racing

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## **Abstract**

This project involved competing in the electric vehicle Grand Prix (evGP) in order to achieve two main goals. The first was to build links to Purdue University and the second to gain an insight into the future of electric vehicles in motorsport. The trip was a success in all aspects.

Two electric karts were built – one due to the Warwick team and the other by the joint Warwick – Motorsports at Purdue Team. Despite being built in a comparatively small timescale both Karts performed well and the University of Warwick Kart finished the Indianapolis Motorspeedway Race in 4<sup>th</sup> place out of a total of 28 Karts. The event showed the viability of electric power trains in Motorsport.

Other tangible benefits of the trip included discussions about overseas exchanges, possible joint collaboration, such as course content exchange.

There will now be a team of fourth year engineers researching the electric go-kart with a view to competing next year with an improved design.

## **Introduction**

A team of 9 students in their 3<sup>rd</sup> year built 2 all-electric go karts and raced them at the prestigious Purdue University as part of the Electric Vehicle Grand Prix (evGrandPrix) and a week later at a similar race at the Emerging Technologies Event hosted at the Indianapolis Motor Speedway in the build up to the Indy 500 race in late May. We were the only UK single-university team at the event.

My interest in taking on this project was to examine how the emergence of Electric Vehicle technology can be linked to motorsport at a time when this industry faces threats from climate change and public acceptance. The project also provided a valuable international experience for all students involved. This extracurricular project improved the employability of the team of students in a highly competitive market where employers are looking for more than just a good academic degree result. It also helped to develop the relationship between Warwick Manufacturing Group and Purdue academics.

## Methodology

WMG staff visited Purdue University in Feb 2011 to explore collaboration and staff and student exchanges. They met with Purdue's Vice Provost for Engagement and a number of senior academics who warmly welcomed the idea of collaboration.

Purdue invited WMG students to participate in the evGrandPrix challenge and WMG was keen for us to do this as it helped demonstrate commitment to the relationship and provided a vehicle for further interaction with both staff and students.

WMG also met with staff at the campus of Indiana University, Purdue University at Indianapolis(IUPUI). Dr Peter Hylton from IUPUI visited WMG in March and agreed that the Warwick students could visit the IUPUI campus during the visit. This was in order to provide further cultural exchange and to help build the relationship with IUPUI.

The team of students were told about the possibility of the trip shortly after Peter's visit and quickly got to work. Below is a timeline of the major milestones over this project:

1<sup>st</sup> March 2011 – Initial meetings and talks took place to consider the possibility of taking part in the competition.

1<sup>st</sup> March 2011 to 18<sup>th</sup> March 2011 – Budget built up. Team members chosen.

21<sup>st</sup> March 2011 to 25<sup>th</sup> April 2011 – Design and fabrication of custom parts.

25<sup>th</sup> April 2011 – Flight to Chicago, onward to West Lafayette (Purdue campus) by cars.

25<sup>th</sup> April 2011 to 29<sup>th</sup> April 2011 – complete kart build.

30<sup>th</sup> April 2011 – Race in evGrandPrix at Purdue University track.

31<sup>st</sup> April 2011 to 6<sup>th</sup> May 2011 – Refine go-kart ready for IMS event.

7<sup>th</sup> May 2011 – Emerging Tech Day - Race at Indy Motor Speedway track.

8<sup>th</sup> May 2011 – Return to UK.

20<sup>th</sup> June 2011 – Presentation of Project to invited audience.

## Results

The first race on the 30<sup>th</sup> of April was a challenge for both teams. Having had just 3 days to complete the Karts, the joint Warwick-MAP Kart missed scrutineering by just 10 minutes. The Warwick Kart on the other hand made it to the track and qualified in 2<sup>nd</sup> position based on the design and build quality. However seconds before the race began the electrics grounded but the loose wire was quickly found. Next the chain broke and by the time the Kart was fixed Darren managed to complete the final 10 laps of the race.

For the second race, at the Indianapolis Motorspeedway, the Warwick Kart qualified in 7<sup>th</sup> position and the joint kart in 13<sup>th</sup>. Unfortunately the Warwick-MAP kart, despite lapping good times, suffered from a battery acid leak. It was later found that the batteries had been undercharged but at a high current. The race was a lot smoother for the Warwick Kart which completed 110 laps and finished in a very respectable 4<sup>th</sup> place.



Many different types of electric power train configurations were used. This allowed the comparison of a huge range of batteries, motors and controllers. The main advantages of the electric power train include:

- Low noise levels
- No emissions at the point of use
- High torque at low speeds

Overall the Karts handled well and the overall opinion was that they were more exciting to drive than the petrol powered Karts.

The disadvantages of electric power trains included:

- Reliability issues
- Long battery charging periods
- Greater weight

The reliability issue can mostly be put down to the inexperience with electric power trains and short build times.

## **Conclusions and Outcomes**

All involved in the emerging technology day at the Indianapolis Motorspeedway agreed that the electric power train is a viable solution for greener motorsport.

WMG are now in the final stages of preparing a NSF network grant with IUPUI and Purdue that will explore the use of motorsport to promote sustainability to a sceptical US public. This evGrandPrix project has strong synergies with WMG's aspirations in this area. Leading from this it has been proposed that a team of fourth year engineers further research the electric powertrain.

A presentation of this project was given shortly after returning to the UK to all interested parties. Many were surprised by the success of the trip and intrigued by the findings. Recently the University issued a press release to local news papers. A blog completed during the trip can be found in the references section.

Without the funding from the IATL it would have been impossible to have successfully completed this project.

## References

<http://www2.warwick.ac.uk/fac/sci/eng/meng/warwickracing/wr2/evgp/>

<http://evgrandprix.org/index.php>

<http://warwickracing.tumblr.com/post/4497725791/the-beginning>