

USING THE FORMULA SAE COMPETITION TO PROMOTE ENGINEERING IN HIGH SCHOOLS

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Abstract

Universities in Australia find it difficult to attract students into their Engineering courses. There are a number of reasons for this including a perception among High School students and their Careers Advisors that Engineering courses are difficult and the practice of Engineering is, in the main, dull. Also, some people feel that many current Engineering courses do not prepare students for the very rapidly changing and diverse field of Engineering. This paper presents a brief description of the F SAE Competition and how it motivates University students (not only in Engineering).

The phenomenal success of UoW Racing is highlighted. The pinnacle of this success was UoW Racing becoming World Champions in Detroit in May 2003. In so doing, UoW Racing became the first non-USA team to win this prestigious event. UoW Racing's phenomenal success has and is being used by the University of Wollongong to promote Engineering in general and its courses in particular. Eight ways in which this has and is being done are highlighted in this paper. The Faculty of Engineering at the University of Wollongong has record enrolments in its First Year courses in 2005 with the numbers in Mechanical Engineering showing the greatest increase. The Faculty is convinced that these record enrolments are due in the main to its using the success of the F SAE Competition and UoW Racing to increase the awareness of Engineering. Wollongong's experience with F SAE highlights how a successful University open ended real world Engineering problem can be used to promote Engineering, especially in High Schools.

What is Formula SAE?

Formula SAE Competition is an exciting and demanding comprehensive Engineering project that challenges student teams to design, produce, develop and finally prove on track at the annual contest, a small displacement, single seater racing car. The car must be specifically designed as the prototype of a four -a-day production run model suitable for sale at no more than A\$50,000 to the amateur Autocross competitor. Project management and teamwork is a major part of the Competition; hence teams are required to develop and produce a new car each year.

A uniquely American form of motor sport, Autocross involves driving one at a time against the clock around cones that mark out a sinuous course within a vast expanse

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of tarmac. This means that the action mostly takes place a long way from any hard object that an out of control car can hit. Safety is further enhanced by the fact that the tight corners defined by the cones keep speeds in check.

The F SAE Autocross car must have certain mandatory safety features. It is powered by a small displacement engine that breathes through an air restrictor of a mandatory size that relates to engine specification. Structural requirements for the main roll hoops, redundant braking systems and close attention to the fuel system are other major elements of the safety regulations. Otherwise engine and chassis regulations are relatively free to encourage innovation.

At the F SAE event teams are judged both on and off track. On track events are the (straight line), Acceleration, (figure of eight) Skid Pan, Autocross and Endurance (incorporating fuel efficiency) disciplines. Off track, Design Judges evaluate the Engineering merits of each car. In addition, teams are tested on the strength of their project in the context of the overall brief by Cost and (business) Presentation Judges.

Each aspect of the contest is marked and the highest points score determines the overall winner.

UoW Racing's Results in Formula SAE

UoW Racing, the University of Wollongong's F SAE Team, was formed in 2001. It has competed in 7 campaigns, 4 in Australasia and 3 in the United States. The Team has won 3 of the Australasian events it has completed in and in 2003 won the World Championship in Detroit. In doing so, it became the first non-USA team to take out overall first place in the International Event.

In addition to these outstanding results, quite a number of major awards have been achieved by UoW Racing. These include:

- ◆ F SAE-A 2001 Australasian Champion
- ◆ F SAE-USA 2002 "Rookie of the Year"
- ◆ F SAE-A 2002 Australasian Champion and Overall Champion with a record score of 952.9 out of a possible 1000

This car was described as "best car ever" and a "new standard" in SAE vehicle design by the late Carroll Smith, Chief Design Judge, SAE.

- ◆ F SAE-USA 2003 World Champion

In an article "Wizard of Oz" which appeared on p.64 of August/September 2003 edition of RACE TECH, Pat Clarke, F SAE-A Student Liaison Officer stated:

"The Wollongong car was beautifully engineered and well tested, performed strongly on track. It was fast, reliable and fuel efficient. It also looked the part – purposeful and attractive to potential customers. That is significant for the FSAE machine is

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specifically designed as the prototype of a production model for the weekend competitor”.

- ◆ F SAE-A 2004 Overall Champion

Photos 1 – 6 give an indication of the standard, and hence success, achieved by UoW Racing in F SAE Competitions in 2001 – 2004. This success has and is being used by the University of Wollongong to promote Engineering in general and its courses in particular. This has and is being done by creating and taking opportunities to promote the Team’s outstanding results. Examples of this promotion are summarised in the next Section of this paper.

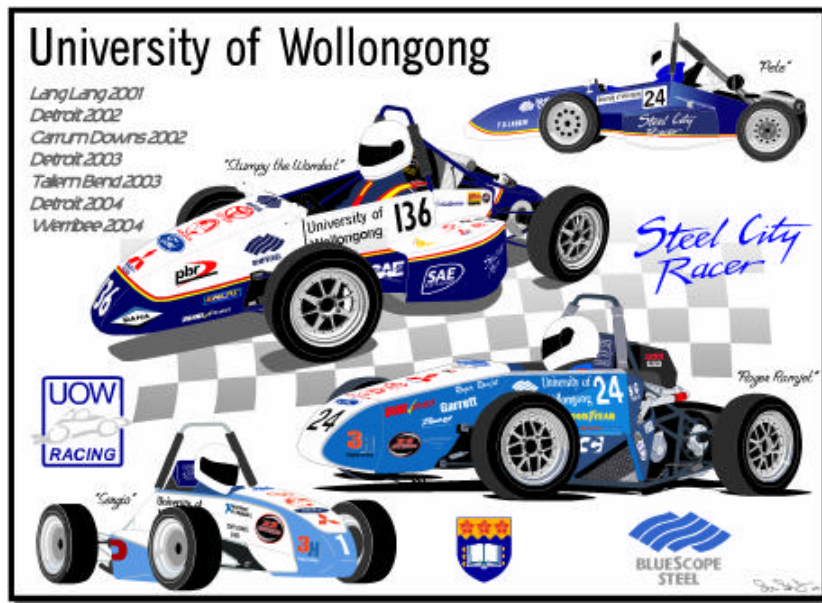


Photo 1 – The 4 F SAE Cars Built by UoW Racing

Using the F SAE Competition to Promote Engineering in High Schools

The University of Wollongong is always seeking ways to promote itself and Engineering. The phenomenal success of UoW Racing over the past 4 years (2001 – 2004) has given it yet another vehicle to promote its Faculty of Engineering and Engineering courses. Some of the ways this has and is being done are summarised below.

Taking a F SAE car and team members to local High Schools

The aim here is to demonstrate the challenge and excitement of applied Engineering. The extremely well engineered car, the outstanding results it has achieved and the enthusiasm of the team members expands the students’ interest in Engineering and shows them what they will be able to achieve if they become members of a F SAE team.

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Promotion through Engineers Australia’s Neighbourhood Engineers Program

The Illawarra/Sutherland Regional Group (ISRG) of Engineers Australia Sydney Division has a Neighbourhood Engineers Program. ISRG Neighbourhood Engineers promote the University of Wollongong and its Engineering courses in their liaison with High Schools by using UoW Racing’s success in their contacts with and visits to High Schools.



Photo 2 – 2001 Car, “Pete”



Photo 3 – 2002 Car, “Stumpy The Wombat” in a Dynamic Event

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Photo 4 – UoW’s World Champion F SAE Car in a Dynamic Event



Photo 5– 2003 Car, “Sergio” in a Dynamic Event

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Photo 6– 2004 Car, “Roger Ramjet” during the Tilt Test

Featuring UoW Racing’s successes at Year 11 Engineering Studies Days and Year 12 Discovery Days

As a spin-off from ISRG’s Engineering Studies Engineering Report Competition, the Faculty of Engineering at the University of Wollongong organises an annual Engineering Studies Day for Year 11 Engineering Studies students. Since its inception in 2001, 248 Year 11 students and 18 Industrial Arts Teachers from 20 High Schools have attended the Days.

The University also organises an annual Year 12 Discovery Day. In 2005, 250 students opted to become involved in the Engineering activities organised by the Faculty. This number was typical of the response from the students in other years.

Each year, at both of these activities, a F SAE car is on display and UoW Racing Team members and Faculty Advisors highlight the F SAE Competition and UoW Racing’s achievements using a DVD produced from the May 2003 Competition in Detroit and a CD which includes a 148 slide PowerPoint Presentation which provides an overview of a car designed and built by UoW Racing.

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Using UoW Racing's achievements in publicity brochures

From time to time, the Faculty produces a publicity brochure to promote its courses. In its latest brochure, "Engineer Your Future", 2 pages are devoted to the 2003 World Champion Team and car under the heading "World Champions". These 2 pages contain a photo of both this Team and car along with the trophies won in Detroit in May 2003.

Displaying a F SAE car at motoring events and trade fairs

UoW Racing Team members have attended a number of motoring events and trade fairs where they have displayed one of their F SAE cars. Although the primary aim here is to acknowledge the generosity of their sponsors, these events and fairs provide yet another opportunity for High School students to learn more about Engineering and what it has to offer.

Publishing articles in Engineering literature, motoring magazines and company and institution publications

Print articles have been published in the 3 areas listed above.

In the first category, articles have appeared in the Magazine of Engineers Australia, Engineers Sydney, the Newsletter of the Sydney Division of Engineers Australia, and the New Engineer Journal.

In the second category, articles have appeared in RACE TECH.

In the third category, articles have appeared in Steel Connections and Kembla Times, both published by BlueScope Steel, UoW Racing's major sponsor. Articles also appear regularly in Campus News, a newsletter produced by the University's Media Services Unit.

Articles in the popular press

There are 2 local papers printed in Wollongong. Both of these print news stories several times a year on each car produced and each team's performance at F SAE competitions.

Also, on occasions, the University pays for advertisements of its Engineering courses based on the performance of UoW Racing. The latest advertisement "Fastest In Its Class In Australia" was published in December 2004 after UoW Racing's win at Werribee. This advertisement was timed to appear when Year 12 students were making choices on which course to study and at what University to enrol.

The local daily paper has more than 100,000 readers Monday to Friday and more than 135,000 readers on Saturday while 98,500 copies of the local weekly paper are printed and distributed.

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News items on television and radio

There is 1 local television news programme and 3 local radio stations in Wollongong.

Each of these news outlets runs items on UoW Racing's teams and cars and in so doing, promotes Engineering and Wollongong's Faculty of Engineering.

The primary aim of the vast majority of the eight major activities listed above is to raise the profile of Engineering among school students, particularly those at High Schools. At the same time, these activities promote Engineering in general and the Engineering courses offered by the University of Wollongong in particular.

Results and Outcomes

The success of the F SAE Competition and UoW Racing have been used by the Faculty of Engineering at the University of Wollongong to increase the awareness of Engineering, especially in High Schools, and to promote its Engineering courses. It appears that this initiative has been successful with record enrolments in Wollongong's First Year Engineering courses in 2005.

The Faculty has an Early Entry Program for high performing Year 12 students. Many of these students when asked at the Early Entry interviews "Why Engineering?" and "Why Wollongong?" answer "Because of the F SAE car" to each of the questions.

Wollongong's experience with F SAE had highlighted how a successful University open ended real world Engineering problem can be used to promote Engineering especially among High School students.

OLIVER KENNEDY is a lecturer in the School of Mechanical, Materials and Mechatronic Engineering at the University of Wollongong. In 2001, while Director of Studies for the Mechanical Engineering discipline, he introduced the Formula SAE project to the University and has been the Team's Academic Faculty Advisor since that time.

BOB WHEWAY has been an academic in the Faculty of Engineering at the University of Wollongong since 1968. He currently holds the position of Honorary Principal Fellow. Bob has always been active and published in the field of Engineering Education. He assists UoW Racing and the Faculty in publicity and promotion.