INDUSTRIAL OUTREACH PROGRAM IN MEXICO

MINI-REPORT QUERETARO 2000

WEST VIRGINIA UNIVERSITY
College of Engineering and Mineral Resources (WVU-CEMR)

COUNCIL FOR SCIENCE AND TECHNOLOGY OF QUERETARO (CONCyTEQ)

UNIVERSIDAD AUTONOMA DE QUERETARO (UAQ-FI)
College of Engineering

This summer, a group of 12 engineering students from West Virginia (WVU) and Queretaro (University of Queretaro and Queretaro's Institute of Technology) teamed up into four groups to work with 8 industrial liaisons and 2 Faculty members in four challenging industrial projects. Each project was tackled in 6 intense weeks in a multi-cultural, multi-disciplinary and bilingual environment. The journey was a professional and cultural immersion, as much as a self-discovery journey for all involved, and yes…… we had lots of fun!!

JOIN US IN QUERETARO SUMMER-2001 !!

Objectives of the Program:

The objective of this program is first and foremost, to add value to engineering education and to produce top quality engineering graduates, by providing a meaningful industrial exposure in a multicultural and multilingual professional environment.

The program seeks to bring value to industry through the projects assigned to the participating students, who develop practical engineering skills as well as communication, leadership and human-relations skills.

In the colonial atmosphere of Queretaro

Program description

This year, five students from West Virginia University and seven from Queretaro were grouped into small intermixed-teams (of four) and assigned an industrial project for a 6-week period. The students worked under the advice of at least two industrial liaisons (designated by each host company) and of two faculty members, one from West Virginia and one from Queretaro. Arrangements were made for WVU Students to live with local families while the companies provided logistic support for transportation and meals.

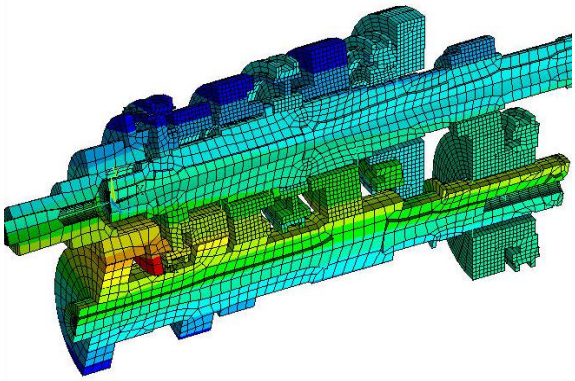
At the end of the six weeks, students prepare a professional presentation for the company on the findings and results of the project.

Mexican students are required to make their presentation in English, whereas WVU students are required to do half of their presentation slides in Spanish (regardless of the level of proficiency in the Language).

Students of the Summer 2000 Group from WVU and Queretaro Universities

Project Descriptions: Summer of 2000

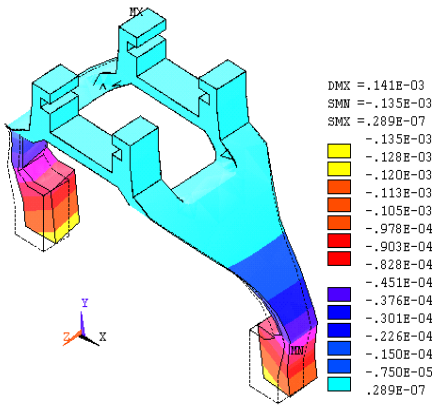
Pr.1 Noise reduction in automotive manual transmissions. The host company was **TREMEC**, a subsidiary of **DANA Corporation** in the USA. In this project a finite element model was developed for vibration analyses for noise reduction purposes. The model allows for gear tooth backlash effects to be included and will be useful for noise reduction studies.



Finite element model of a gear train for dynamic analysis

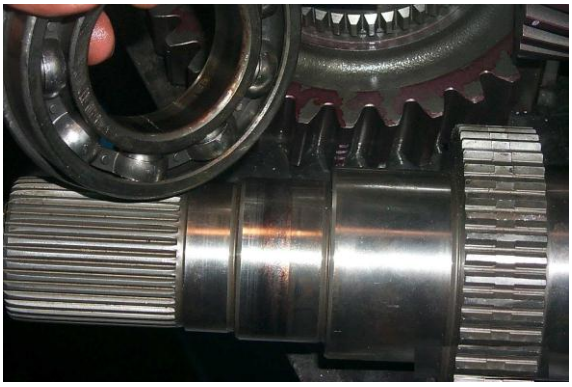
Experimental analysis was also conducted for the assessment of vibration behavior of gear trains.

Pr.2 Synchronizer losses and bearing lubrication analysis for a heavy-duty transmission. This project was developed for **SPICER-TSP** Company, (subsidiary of **DANA Corporation**) In this project, a dynamic model of a synchronizer mechanism was developed to determine friction losses associated to manufacturing tolerances. The analysis required a finite element analysis of one of the shift forks to determine misalignment effects.



Shift mechanism fork deformations

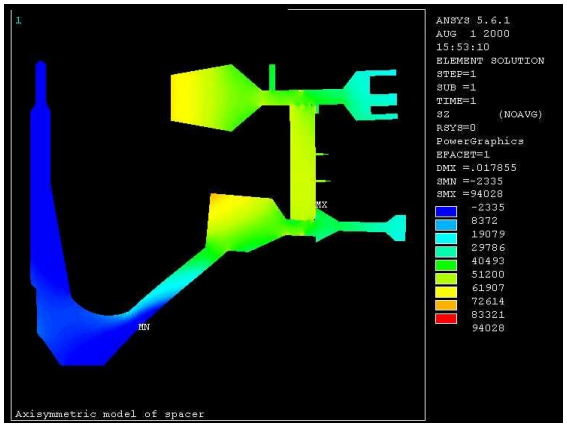
In addition, a lubrication analysis was conducted of an actual bearing application to determine life expectancy of the transmission. The work done involved tests conducted in the field as well as in the laboratory. Recommendations for design improvements were put forward to the company.



Gear and bearing elements of a heavy duty transmission

Pr. 3 Analysis of a spacer seal welding repair for aircraft engine. The host company was **Industrias ITR**. In this project, a load analysis was conducted of the knife-edge seals of an aircraft engine spacer, for certification purposes. The work involved the use of finite element analysis and welding considerations.

P&W Aircraft engine being serviced



Axisymmetric model of a spacer with disks

Pr. 4. Study of the construction equipment applications in Mexico. This project was developed for **Terramite Corporation** of West Virginia. The company produces compact construction equipment and the project involved the study of potential technology applications of this type of equipment in the construction industry of Mexico. A case study was also conducted for the stress analysis of a linkage element using the finite element method.

Compact construction equipment: Linkage finite element analysis

Cultural Highlights

While work in industry was intense (30 hrs/week),Queretaro offers magnificent opportunities for sightseeing during weekends such as "Pena de Bernal" and "La Sierra Gorda", in addition to local attractions such as bullfights, state-fairs, markets and great restaurants! Finally, after the projects were completed….yes, Acapulco awaits for a long and well deserved weekend.

At the end, sunny Acapulco for a looong weekend Ahhh…..Perfect !!

Four Year Summary

After four years, this program has involved a great number of people from various institutions, industries, and research centers from both countries.

Students, faculty and industrial liaisons have teamed up to work on 13 meaningful projects. (See summary Table below).

Some of the alumni of this Program have returned to the industries in a professional capacity, as most of the companies have either corporate or customer-supplier relations with US industry. That is particularly the case with the companies that are subsidiaries of US companies.

Conclusion

Our Program is unique. It pursues the main objective of adding value to engineering education through an industrial exercise in an international setting. The program addresses issues that range from communication skills and cultural differences to human relations in the context of a practical engineering project.

This experience has brought forward not only the practical engineering dimension (from industry), but also the human dimension that comes with the territory.

Indeed, cultural differences actually exist. They come forward when people disagree, when people negotiate, when people reach agreements. In the concept of "value" as well as in attitudes toward life. But being able to understand and better yet, anticipate cultural differences may be the difference between failure and success in professional situations in today's industry.

In an increasingly globalized professional environment, we are doing our share to meet the challenge.

Institutions Involved	**Participant students**	**Faculty from both countries**	**Industrial Liaisons**	**Industries/Research Centers**	**Projects developed**
• West Virginia University • University of Guanajuato • University of Queretaro • Institute of Technology of Queretaro • CONCyTEQ	• 25 (WVU) • 10 (UG) • 9 (UAQ) • 7 (ITQ)	• 3 (WVU) • 2 (UG) • 2 (UAQ)	(2) GM (Gto) (4) TREMEC (Qro) (2) Transm-TSP (Qro) (1) Micro-Troq. (Qro) (2) IMT (Qro) (2) LAPEM (Gto) (2) I. TurboReact. (Qro) (1) Terramite (WV)	• GM • TREMEC • Transm-TSP • Micro-Troquelados • IMT* • LAPEM* • I. TurboReact. • Terramite Corp.** * Research Centers ** From West Virginia	(1) GM Mexico (4) TREMEC (1) SPICER-TSP (1) Micro-Troq. (2) IMT (2) LAPEM (1) I. TurboReactors (1) Terramite Corp.** ** From West Virginia
5 Institutions	**51 Students**	**7 Faculty**	**16 Liaisons**	**8 Companies**	**13 Projects**

Four-year summary table of people, companies and projects developed in this Program.

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