

## *Meeting Industrial and Environmental Needs through Research in Engineering*

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The Department of Electrical Power and Control is one of six departments within the Faculty of Engineering. All departments strive to provide excellence in both teaching and research while contributing to the development of Malta as a technologically leading European nation. In particular, the Department of Electrical Power and Control conducts research on alternative sources of energy and better energy utilization techniques aiming to provide a cost effective and environmentally friendly solution for Malta.

One of the department's main objectives is to provide future engineers with a solid and modern understanding of electrical generation, distribution and utilization. For this purpose, undergraduate courses in power distribution, power utilization, electrical machines and control engineering are offered. Other courses at both undergraduate and postgraduate level are also available under the Erasmus agreement in collaboration with the Department of Electrical and Electronic Engineering at the University of Nottingham, UK. A joint M.Sc. programme in Electrical Power and Drives is partly provided by the department, with students travelling to the UK to complete their studies. Postgraduate research programmes in Control Engineering are also available, with projects focusing on intelligent and adaptive control.

Strong links have been forged with departments in universities overseas, such as the Department of Electrical and Systems Engineering at Oakland University, USA and the Department of Automatic Control and Systems Engineering at the University of Sheffield, UK. Maltese students at Oakland University follow postgraduate courses on student exchange programmes. Collaboration with the University of Sheffield includes research, mainly focused on intelligent control and estimation, and teaching, with lecturers from Sheffield conducting courses while visiting the University of Malta.

During the last few years, projects have been undertaken in collaboration with both the private sector and also governmental corporations by which a contribution is made to Maltese industry and to the environment through provision of expertise. Research mainly concentrates on efforts to minimize pollution by making a better use of current resources and by investigating alternate sources of energy and transportation.

One such project being developed in conjunction with the Departments of Communications and Computer Engineering and Mechanical Engineering, with funding from ST Microelectronics, is that of an electric vehicle suitable for the Maltese roads. Electric vehicles are particularly desirable on the Maltese roads due to their quiet operation, lack of emissions and traditionally small size. Efforts are being made to produce a car with adequate speed and range for our island, while minimizing recharging time for its batteries and cost.

Such a small electric vehicle would be cheap to purchase for an individual seeking a small city car. It is also cheaper to maintain than any gasoline-powered vehicle currently on the market. Recharging such vehicles during low electrical demand periods, especially during the night, should also improve load levelling at the Maltese power stations. Moreover, the Maltese environment would benefit from the adoption of electric cars through the resulting reduction in air and sound pollution.

In collaboration with the Water Services Corporation, a project is underway that looks into water leakage localization in the Maltese water distribution network. The active leakage control system being developed uses systematical checks for leaks utilizing acoustic equipment. These detect and analyse sound vibration induced by water escaping the pipes.

A quicker detection and localization of leaks minimizes water loss, thus possibly reducing the increasing demands for water in the Maltese islands.

Renewable sources of energy are being studied as a viable alternative. A grid-connected solar system that could easily be installed in households is being developed with support from Strand Marine Ltd. This system uses photovoltaic panels to generate electrical power that is fed to the national grid. If the energy generated is not sufficient for household needs, extra energy is supplied from the grid. On the other hand, if excessive energy is produced, it is supplied to the grid for other consumers to use. Such a system will lower the daily peak demand on the power station, thus reducing pollution due to electrical generation by fossil fuels.

Research is also carried out in the area of high performance control of electrical drives for various applications. Experimental rigs for induction motors, permanent magnet synchronous machines and even switched reluctance motors have been built. These set-ups are used to investigate the performance of these drives for traction and wind generation. Together with Enemalta Corporation, research that examines large-scale grid connected wind turbines is being initiated. The possibility of utilizing wind generation on a smaller scale for domestic purposes using permanent magnet technology will also be investigated.

Together with contacts in foreign universities, further research is underway in the fields of intelligent and adaptive control, energy utilization and motor drives. Various books and papers have been published in the last few years as a result of such collaborative research.

While working to enhance the Maltese quality of life through research and development, the Department of Electrical Power and Control Engineering is committed to providing excellence in teaching at both undergraduate and postgraduate levels.

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