

## Section 3. Research highlights

### The Group TEP 192 develops a novel micro-grid system for Aerospace

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The TEP 192 Group and the Power Electronics Laboratory collaborate in the development of a micro-grid at the National Institute of Aerospace Technology (INTA) for a Solar-Hydrogen plant located in El Arenosillo (Mazagón-Huelva). Specifically, the collaboration has materialized in the design, development and implementation of an 8 kW DC/DC converter in four modules of 2 kW each, which allow for a 4-phase interleaved operation, with tracking of the maximum power point. Additionally, the project includes the connection of three inverters to a DC bus, and the development of a Supervisory Control and Data Acquisition (SCADA) for the monitoring and control of the converter and the inverters.



Detail of the power electronics-based installation developed for INTA.

### The group CTS616 investigates on tumor respiratory affections

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Within the tumour pathology that affects the Respiratory System there are several aspects that especially require multidisciplinary collaboration:

#### a) **Tumours of the trachea and main bronchi.**

In the vast majority of cases, these tumours are unresectable, and they are only subsidiary of palliative treatment aimed at guaranteeing the patency of the airway. For this purpose, various types of stents can be implanted, among which those made of silicone cylinders and expandable metallic stand out. Both present serious problems and cause serious alterations in the tracheal tissue due to severe deterioration of the ciliated respiratory epithelium, granuloma formation and stenosis.

Recent experimental studies in the group have shown that the addition of an anti-proliferative drug-releasing platform (paclitaxel) has not only failed to improve the problem, but has sometimes aggravated it. In combination with these problems, the impact of the radial force exerted by the stent on the surrounding tracheal tissue can also determine many of the complications associated with its use. It is also possible that the tracheal implantation of a metallic stent causes systemic alterations. It is therefore necessary to investigate in depth the design of new materials with better biocompatibility, and for these purposes, a broad interdisciplinary collaboration is required.



Detail of primary tumours of the pleura, the mesotheliomas.

**b) Primary tumours of the pleura (mesotheliomas).**

Mostly associated with occupational or environmental exposure to asbestos, these tumours are very aggressive, and cause the growth of large pleural masses, which rarely allow surgical resection and are little or no sensitive to chemo and radiotherapy.

**c) Metastatic tumours in the lung or in the pleural space.**

The control of the metastatic process is one of the biggest challenges in Oncology, and it is in this field where the application of nanotechnology-based techniques and directed to tumour cells circulating or already implanted in places distant from the primary tumour is likely to have more role in the future.