INTO THE FIRE

In the search for more efficient combustion and reduced Carbon Dioxide (CO_2) emissions one area often overlooked is the roll that high temperature electronic systems could have in achieving this. If electronic systems could be built that were capable of withstanding the temperatures found in engines and combustion boilers the benefits could be two fold.

1) High temperature sensing systems could be mounted close to the source of combustion allowing a much finer control of the combustion gases resulting higher burn efficiency and reduced CO_2.

2) Systems that can withstand higher temperatures would require less thermal control, thus resulting in a significant weight reduction as the need for metal heat sinking and or cooling fans is reduced. Weight reduction for example in aircraft engines results in improved fuel efficiency. Removal of cooling fans for example in domestic ovens results in reduction in electricity consumed.

Most electronic systems available today are based on CMOS technology which can only operate reliably to temperatures of around 125°C. Systems using technologies that are capable of higher temperature operation are available but often have limited life (<6weeks continuous use) or use very expensive materials resulting in sensors costing €100's.

The impact of a short life makes these systems unsuitable for use in engines or domestic boilers due to high replacement rate. Whilst the impact of very high cost limits mass market take up and excludes the domestic market.

There are three drivers to open up high temperature systems to the mass market applications:

1) A significant increase in temperature of operation.

2) Reduction in unit cost.

3) Tenfold increase in operating life.

The EU funded project SOI-HITS (**www.soi-hits.eu**) sets out to address these issues and bring high temperature electronics in the commercial arena. SOI-HITS has the objective of developing autonomous intelligent high temperature sensing systems that are capable of operating at 225°C for long duration (10,000 hours) with a significant cost reduction (€10's).

Such a development requires the collaborated effort and diversity of highly interdisciplinary technical skills that could only be reliably obtained through FP7 collaboration; including material physics, electronic design, mechanical engineering and reliability testing. Individual partners alone would not have sufficient resource to undertake the degree of high risk development involved and requires the collaborated effort and diversity that could only be reliably obtained through FP7 collaboration.

The project, started in 2011, is a collaboration between four of Europe's leading research groups (Cambridge, Warwick, UCL, IREC), two European SME's (CCS & CISSOD) and two of the world's most innovative industrial partners (Honeywell & Microsemi). This carefully crafted consortium offers a clearly defined route to market.

The project is due to finish in 2014 and following a successful first year has already demonstrated encouraging results in high temperature sensing materials, sensors and low cost organic based packaging. Warwick have also developed a state of the art harsh environment test system for the evaluation of year two work.

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