

Case Study

This instrument is so good it could catch your breath!

Respiratory rate is one of the most important physiological parameters used in patient care and for many years medical workers have searched for a method of continuously monitoring breathing that would be simple, non-intrusive, rugged and inexpensive.

In 1999, researchers in the Electronic Engineering Department of Bolton Institute (home of the Electronics Design North Support Centre), working with the Department of Emergency Medicine at the University of Manchester, published results of experimental work on pyroelectric polymers (PEP), which demonstrated the feasibility of measuring breathing rate using a small piece of PEP film incorporated into a face mask. The film was shown to generate an open circuit output voltage, typically around 250mV, related to the temperature differential between the inhaled and exhaled breath. This voltage, after amplification, sampling and processing was able to drive a numerical display of the breathing rate. Preliminary trials of an experimental breathing monitor using this approach and designed by the Support Centre were conducted at Hope Hospital A&E Department and these were so encouraging that the Institute resolved to seek ways of exploiting the discovery commercially.



The Pippa breathing monitor shown with two examples of patient mask

An approach was made to really Smart ideas Ltd (rSi), a local company specialising in the translation of innovative healthcare ideas into saleable products. rSi was impressed with the combination of experimental results and clinical trials and, with the help of the Support Centre and discussions with medical advisers, was able to confirm the feasibility of developing a practical breathing monitor based on the PEP sensor. Within 12 months, rSi and the Institute had set up a joint venture company, c-Lect medical Ltd, to develop prototypes and a marketable product. Meanwhile, the Support Centre produced initial prototypes of the equipment for additional clinical trials at Rochdale Infirmary. These served to confirm the potential of the proposed product and results were reported at a major conference of anaesthetists in July 2002.

In Jan 2002 c-Lect medical Ltd was awarded a SMART Development Grant to take the project further and, with ongoing help from Support Centre engineers, has now developed the first model of a practical, low cost, safe, accurate and easy to use monitoring system. This is based



Electronics Design

c-Lect medical Ltd

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George Steele, Technical Director and Dick Badami, Research Director of c-Lect medical, receive their Smart Award 'statue' at a formal presentation in November 2002.

on a standard oxygen mask fitted with a PEP pyroelectric device. The electronics are based on the original experimental equipment developed by the Support Centre, with the addition of high and low level alarm triggering to summon emergency help. Facilities are provided to add other functions at a later date should customers require them. Manufacture of the prototypes has been subcontracted to a local company.

Plans to market this novel sensor are now at an advanced stage and a distribution agreement has been signed with Viamed Ltd, a leading medical devices specialist, as a result of which prototypes of the equipment (now called the Pippa Breathing Monitor), were exhibited at Medica, Düsseldorf, in November, 2002 and at Arab Health, Dubai, in January, 2003. They attracted a great deal of interest. Battery powered and with an acoustic alarm, which sounds if breathing rate falls below 8 or rises above 30 breaths per minute, Pippa provides either an instantaneous reading, or an average reading based on four consecutive breaths.

c-Lect medical Ltd expects certification testing to CE standards to be completed during April 2003, so that this innovative medical instrument could be on the open market. Applications envisaged include patient monitoring in A&E Units, paramedic ambulances, medical wards and obstetric units. The North Support Centre continues to provide expert electronics support, helping c-Lect medical Ltd to exploit what could well become the most successful medical instrument of its kind worldwide.

