Case Study

TORQSENSE™ with ASIC solution

Research and market analysis convinced Transense that their non- contact transducer Torqsense™ had the potential to be a world leader in torque measurement for Electric Power Assisted Steering (EPAS). In order to be successful, EPAS systems had to be reduced in both size and cost for the mass market.

A Potential World Leader

Operating in Bicester, Oxfordshire since 1991, Transense is a company with 11 employees which concentrates its efforts on the production of low cost, non contact transducer technologies for use in automotive applications. Key application areas serviced by the company are torque measurement for Electric Power Assisted Steering (EPAS), traction control and passive tyre pressure monitoring systems. The company researches technologies and produces prototype and reference systems that demonstrate the technology to potential licensees in the automotive and automotive component industries.

The growth for EPAS from 2001 onwards is anticipated to be rapid, with General Motors forecasting that EPAS will overtake conventional power steering by 2006. All the major car companies are looking at EPAS and Transense is currently working with most of these and their key component suppliers.

Having assessed other products and technologies in the market by price, performance and general acceptance, Jim Perry, CEO and Anthony Lonsdale, Technical Director from Transense realised that the Torqsense™ non-contact transducer was a potential world leader in the EPAS market and as a result placed world wide patents to protect it.

In order to be commercially successful, the Transense EPAS products needed to be reduced in both size and cost for the mass market and this endeavour became the subject of an EC FUSE 'Replication Exercise' conducted with the assistance of the Electronics Design Centre at the University of Hertfordshire.

Figure 1

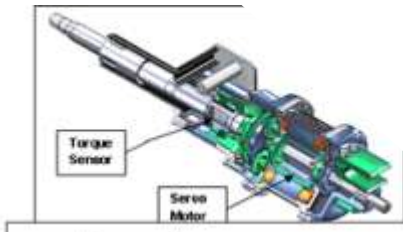

Figure 2

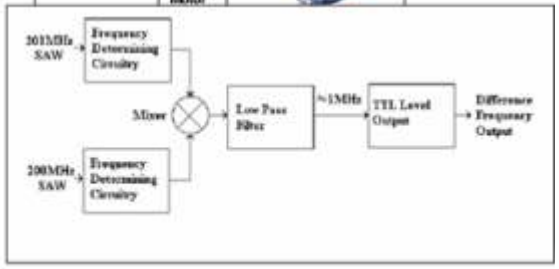

Figure 1 shows a complete EPAS system and Figure 2 is a simplified block diagram of the ASIC design used. Essentially, the system design allows the measurement of the difference in frequency between the two SAW sensors. One part of the ASIC (not shown) generates the various reference frequencies needed. The main input to the ASIC is two slightly different frequencies and the main output is a digital signal that oscillates at the difference between the two input frequencies. This output frequency is proportional to the measured torque.

Prior to the Replication Exercise, Transense EPAS built prototype and reference systems, using discrete components assembled on PCBs. These required skilled manual calibration and were both too bulky and too costly to manufacture for volume application. In collaboration with the Support Centre at the University of Hertfordshire, an ASIC design was proposed which would replace most of the prototype electronics and sensor assembly (about 150 cm^2 of PCB). When packaged together with a SAW- based MST device which had already been developed, the combination was of a size and cost for use in commercial automotive applications and offered the additional advantages of very suitable large volume potential and improved reliability. The ASIC and new packaging technology also meant that the price of such systems could be reduced from €1500 to €15.

Electronics Design

Transense Technologies

Case Study

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Transense wanted to use an analogue ASIC as the key electronic control part of the sensor system and the assistance provided by the Electronics Design (ED) Support Centre during the replication exercise provided Transense with the benefit of experience that other companies have had with the adoption of ASIC technology.

Best Practices Established

The ED Support Centre and its Business Advisor assisted Transense significantly during the specification phase, during which Transense also had to deal with the acquisition of a key subcontractor by ATMEL. This and other issues meant that the specification phase did not make progress as rapidly as had been anticipated. The main achievement of the Support Centre was to move the company ethos on from 'Internal Research' to 'Development in Partnership'.

For instance when attempting to specify a certain parameter (e.g. output voltage) the company tended to say:

“We do not know what is the absolute minimum value to meet the requirements, so we need to do more research”.

Colin Dente, the Support Centre Business Advisor encouraged the company to:

- Define a (higher) minimum value which they knew would meet requirements
- Discuss the potential achievement of this with the subcontractor
- Perform additional research, only if the subcontractor indicated that the higher value would be difficult to achieve

The training and assistance provided by the Support Centre resulted in significant change to the company's practices and ultimately a full time member of staff was hired to take over from the Support Centre in managing the project.

A Winning Formula

The replication exercise proved an economic benefit to the company, enabling production of a solution which matches automotive production needs. Without the ASIC developed in the exercise the system would have been too large and expensive for commercial use. The completed ASIC has now been licensed exclusively to ATMEL and this deal is expected to provide approximately €10 million revenue over the life of the product.

During the period of cooperation between Transense and the Support Centre, the valuation of the company has risen from £10 million in 1999 to £190 million today. By any standards this is success, so what was the formula?

The long-term vision of the company directors is difficult to fault in terms of market needs analysis and the identification of appropriate sensor technology. These elements were already 'in house'. Significantly the company realised too where skills and technology knowledge were lacking and were able to fill the gap with government supported initiatives (such as the DTI Electronics Design programme and EC FUSE programme). Jim Perry and his team identified a winning formula that other British companies might do well to emulate.



Further Information on the web:

http://strc.herts.ac.uk/ttt/ttt.htm
http://www.transense.co.uk/