

Get Your Motor Running

DSPs enable new digitally controlled motors

BY PHIL DAVIES

ANALOG DEVICES INC.

A digital signal processor (DSP) in all of your home appliances. A DSP in your exercise equipment. A DSP controlling the power steering system, HVAC, wiper blades and ABS system in your automobile. We are surrounded by electric motors and those motors will be controlled by DSPs.

The digital motor control market is developing rapidly. The applications listed above are just some examples of what will be a very diverse and technically challenging market, driven by the demand for energy efficiency, high-performance variable speed control, the elimination of mechanical systems to reduce cost and to increase reliability and last but not least, the need for increased performance and intelligence in electronic systems.



Over the next five years we will see incredible growth in the market for digitally controlled motors.

This market will require embedded DSP and mixed signal technology capabilities. Semiconductor companies that have advanced signal processing technologies, such as DSPs and precision analog—and the core competencies to integrate them—will take significant market shares.

Companies that have invested in adding the skills of systems engineering to their customer interface teams will significantly differentiate themselves because many customers will require a great deal of service and support in emerging markets such as white goods. For example, white goods customers are demanding full hardware reference designs and full software algorithms for digital motor control. Customers in markets such as factory automation and automotive, who need to increase the processing power of their current micro-processor-based digi-

tal control systems, will require easy-to-use products and simple development tools. These products and tools will need to be developed by systems engineering experts who understand the complexities of digital motor control and how to make the transition from microcontrollers to embedded DSP products easy and seamless.

The estimates for this new embedded DSP market range from 250 million units to 1 billion units per year by 2005. Taking into account that there are billions of electric motors produced every year and the market for motors is growing at a rate greater than 10 percent annually, there is room for excitement in this market's potential. Market leaders such as Electrolux and Emerson have already embraced this new embedded DSP technology and are developing and introducing products to market that are positioning them for future success.

The Japanese white goods industry, driven by the encouragement of the government and the spirit of internal competition to produce the most energy-efficient refrigerators and air conditioners, are now shipping embedded DSP-controlled appliances.

The Chinese white goods markets for refrigerators, washing



machines and air conditioners are also rapidly developing and companies are planning to rapidly deploy high-energy efficient, high-performance appliances to the home and overseas markets. Additionally, the need to replace pollution-spewing motorcycles with more environmentally friendly motorbikes has spurred the Chinese government to require that all new 50cc or less motorcycles be replaced by hybrid or full electric-driven motorcycles. These markets all require multiphase, brushless motors and the use of embedded DSPs to meet their performance requirements.

The European markets for home appliances are being stimulated by new energy efficiency and power quality legislation requiring new multiphase motors and power factor-corrected power supplies to the electronic control systems that control

these motors. An embedded DSP, due to its processing power and analog and digital content, can not only control the motor but also can control the power factor correction circuitry, reducing costs and improving performance.

Because of the feeling that energy is free, the North American market is being stimulated by product differentiation, not power efficiency. The new Maytag Neptune washing machine changed the face of this segment of the white goods market with its high performance and low-energy costs. Many competitors now are looking to develop similar high-performance products enabling a new emerging market for digital motor control systems and embedded DSPs.

The adoption of advanced digital motor control systems, utilizing the benefits of embedded DSPs is now

underway. However, there is one additional technology that will bring significant benefits and is almost a must-have requirement for the future: the addition of on-chip, reprogrammable flash memory to these embedded DSP products — the need to change software programs in the midst of production, if new demands are seen. The ability to upgrade system control software in the field and the ability to store diagnostic parameters will drive the demand for embedded DSPs with flash memory.

DSPs will enable a new generation of consumer, industrial and automotive products. Speaking as a consumer, I am looking forward to their introduction. ■

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