



## Quartzdyne, Inc.

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## Quartzdyne Newsletter

April 2008

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### **ASICs Improve Transducer Reliability**

Our customers are aware that we're rapidly incorporating ASICs (application-specific integrated circuits) into our hybrids. ASIC technology allows us to reduce component count while adding new features that improve reliability and functionality. The oscillator ASIC is already in production; we hope to have the Voltage Regulator and Frequency Counter ASICs qualified by the end of 2008. Since that will total three ASICs in our hybrid by 2009, an explanation of each ASIC's function and benefits is given below:

**Oscillator ASIC.** This ASIC oscillates the pressure, temperature, and reference crystals. It cuts startup time in half, eliminates half of the components inside the hybrid, and reduces the probability of DLS failures. (See our reliability technote below for an explanation of DLS.) We finished qualifying the oscillator ASIC in late 2007. It is used in all digital-output hybrid transducers and in all frequency-output transducers where '1' occupies the first numeric digit of the transducer part number, i.e., QHB108, QMB102, SPB115.

NOTE: Since the oscillator ASIC runs at low voltage, our customers may need to reduce their supply voltage: frequency-output ASIC hybrid transducers require a 3.6 to 5.5 VDC supply. (The old hybrid required a 4.5 to 12.6 VDC supply.) SPB (¾") customers may switch to the lower voltage ASIC version at any time during 2008. After January 1, 2009, as we will not accept orders for old (high voltage) SPB transducers. We kindly ask for your cooperation as we phase in the oscillator ASIC on new SPB1xx transducer part numbers and phase out the old SPB0xx part numbers.

**Voltage Regulator ASIC.** This ASIC provides a stable 2.5 VDC voltage to the circuit core, and does the function of nine discrete components inside the present hybrid. It will lower the minimum supply voltage of frequency-output hybrid transducers to 2.7 VDC, making digital- and frequency-output transducers equivalent in supply requirements: 2.7 to 5.5 VDC. It has also been designed to operate above 200°C--the present temperature limit of digital-output transducers. (We presently use a REF191 in the digital hybrid which cuts out at 204°C.)

Qualification of the Vreg ASIC has begun this month, and we hope to finish qualification by the end of this year.

**Frequency Counter ASIC.** This ASIC performs the simultaneous, period-based counting of the pressure and temperature frequencies, and replaces seven components inside the digital-output hybrid. It will provide two new options for customers: a clock output (7.2 MHz or 1 kHz), and a 5th byte checksum on the 32-bit pressure and temperature counts.

Like the Vreg ASIC, it has been designed to operate above 200°C. We also expect that its current draw will be significantly less than the 42MX16 FPGA that it replaces. This ASIC is due to arrive at Quartzdyne in June.

Prior to releasing any ASIC into production, we qualify ASICs as follows:

- functional testing from -40 through 250°C
- quantify metrology effects by calibrating transducers over multiple temperature ranges
- >1000 hours survival at 250°C in life-cycle test. (Hybrids with the oscillator ASIC have surpassed 6500+ hours in our 250°C life-cycle test.)
- >1000 hours operation in continuously powered tests at 225°C. (Hybrids with the oscillator ASIC have surpassed 5000+ hours in our 225°C powered test.)

### **Quartzdyne Breaking Ground on a New 50,000 ft<sup>2</sup> [4650 m<sup>2</sup>] Facility**

We are pleased to announce that Quartzdyne will begin construction on a new facility this summer. It's projected completion date is mid 2009, and it will be located five miles northwest of our present location (closer to the airport.) We've designed it with growth and flexibility in mind, and it will make a significant improvement in our LEAN manufacturing initiatives. Those who have visited our current facility know that we're running out of space. We have over 90 employees, and it is increasingly difficult to make room for additional people and equipment. We're keenly aware that moving a company is a significant disruption, and we will mitigate the disruption by carefully managing inventory and moving manufacturing cells in stages. We will also use outside resources to advise and assist in the relocation process to minimize the impact on customer orders.

### **Quartzdyne Electronics (QE) Presents at HiTEC**

On May 15th, Milton Watts will present "Design Considerations for High Temperature Hybrid Manufacturability" at the International Conference on High Temperature Electronics (HiTEC) in Albuquerque, New Mexico. It will outline the key steps to transition reliably from surface-mount or through-hole electronics to a hybrid multi-chip module.

Quartzdyne launched QE two years ago in response to customers' needs to upgrade circuits to hybrid technology. By leveraging our manufacturing and test-qualification experience, QE will fabricate your hybrid to the high standard you've come to expect from Quartzdyne transducer hybrids. To demonstrate the long life at high temperature provided by our hybrid electronics, we've deliberately destroyed thousands of circuits in our lifecycle tests since 1998.

QE will build your hybrid circuit, allowing you to achieve longer life, higher temperature operation, reduced circuit size, and rugged packaging for severe downhole environments. Our techniques and specialized materials ensure resilient component attachment and exceptional wirebonds. QE will screen and qualify your custom hybrid circuit prior to shipment, just as we do for the hybrids used in our transducers. Although the up-front costs of die acquisition and layout are higher for hybrids, the revenue generated from increased tool up-time can easily compensate for the initial investment.

### **2008 Reliability Statistics from Field Returns**

We track our field reliability by recording failure modes and elapsed time for each returned transducer. Each year we analyze the database for trends, and share the results openly on our webpage. This report describes the general design of a Quartzdyne pressure transducer, and provides the reliability statistics and common failure modes for each of the major components. In this year's report we highlight our efforts to understand and address drive-level sensitivity (DLS) of quartz crystals. We recently acquired a scanning-electron microscope to facilitate our research into the cause(s) of DLS.

Publicizing failures is an important part of our continuous improvement. We hope that our customers appreciate our candor and honesty, as well as our ongoing efforts to improve the reliability of our products. You'll find this year's report at <http://www.quartzdyne.com/pdfs/reliability.pdf>

### **Visit Quartzdyne and QE at OTC**

We invite you to visit Quartzdyne and QE in booth 3635 during the Offshore Technology Conference and Exhibition in Houston during May 5-8. Please contact us at [sales@quartzdyne.com](mailto:sales@quartzdyne.com) if you would like a complimentary daypass. We look forward to seeing you there!

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