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Quartzdyne Newsletter

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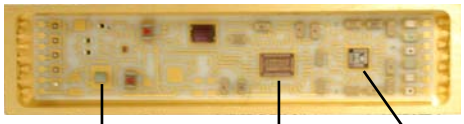
- **ASIC Hybrids are Increasing Reliability**
- **Turn-key Solution: QE Hybrids + Tool Integration**
- **Quartzdyne Seminars**
- **225°C Transducers**
- **Wire Color Change on Digital Transducers**
- **New 7-pin Connector**
- **Coefficient Memory Issue**
- **Quartzdyne's New Facility**

ASIC Hybrids are Increasing Reliability

In addition to the oscillator ASIC introduced in 2007, we've incorporated two additional ASICs into hybrids during 2009: a voltage regulator and a frequency counter. Shane Rose, who designed two of the three ASICs, presented a paper at the recent HiTEN conference in Oxford on the development of these latest ASICs. This paper is now available on our website at: http://www.quartzdyne.com/pdfs/ASIC-HiTEN2009.pdf



In our field reliability report, we stated that the oscillator ASIC should reduce DLS failures through its automated gain control feature. A cursory look at the data during the past 18 months suggests that the number of DLS failure returns is 3X lower for ASIC hybrid transducers than for the non-ASIC hybrid transducers. This is wonderful news, and we expect the step improvement to continue. Also, we've noted that ASIC hybrids have a 33% higher MTBF based on our in-house 225°C Powered-Life and 250°C Life-Cycle qualification tests.

In short, the three ASICs we've incorporated in our hybrids have reduced component count while adding features that improve reliability and functionality.

Turn-key Solution: QE Hybrids + Tool Integration

We're pleased that the QE hybrid business grew briskly in 2009. When we build a customer's hybrid, we apply the same techniques that have made our transducer electronics rugged and reliable at high temperature. For several customers we're also doing some turn-key work. Since we have the capability to fabricate hybrids, assemble tools, and perform electron-beam welding, Quartzdyne can provide a complete turnkey solution to reduce your leadtime, cost, and risk. Please contact us to discuss hybridizing your design or integrating your tool.

Quartzdyne Seminars

When we meet with a new customer or visit an oil and gas company, we teach a 90-minute seminar that explains our technology and how we measure/improve reliability. Since Quartzdyne is the industry-standard transducer in most tools today, the seminar helps customers and end-users understand quartz capabilities, and how quartz compares with piezoresistive sensors. We also clarify metrology terms like accuracy, repeatability, linearity, hysteresis, stability, and resolution.

If you have a field location, a group of staff, or a customer that could benefit from this seminar, we would be pleased to visit them and present this seminar. Please contact us if we can be of service in this area.

225°C Pressure Transducers

For several years we've offered pressure transducers calibrated from 25-225°C [77-437°F]. Although we don't advertise 225°C transducers on our website, the available pressures are 5, 10, 16, 20, 25, and 30 kpsi. We apply a high-temperature conditioning process to screen for suitable sensors that will perform at these temperatures and pressures.

Please note that there are two limitations of 225°C transducers:

1. The wide temperature range of 25-225°C may require a 5th order polynomial curvefit to meet the accuracy specifications (24 coefficients).
2. Transducer life at 225°C is limited: 225°C testing currently shows approximately 6600 hours MTBF.

If you have questions about 225°C pressure transducers, please contact us.

Wire Color Change on Digital Transducers

In November we changed wire colors on digital-output transducers. Since the new tri-ASIC digital hybrid includes a 7.2 MHz reference frequency output, we needed to add a new wire. At the same time, we decided to standardize wire color definitions between frequency and digital transducers. Please reference the table for the new wire colors. (Note that frequency transducer wire colors have not changed.)

Digital Function	Old Color	New Color
Vcc (3–5V)	Red	Blue
Ground (GND)	Black	Black
Reference (REF)	-	White
Address 1 (A1T)	Orange	Yellow
Address 2 (A2P)	Blue	Purple
Clock (SCL)	White	Slate / Grey
Data (SDA)	Green	Green

If you wish to use the 7.2 MHz reference frequency on a digital transducer, you'll now find the white reference wire inside the electronics housing on models that have a connector. Over the next several months, we will include a wiring diagram with all digital units shipped, and we are also working to update our drawings online to reflect the change.

New 7-Pin Connector

Our standard 0.88-inch and 0.75-inch transducers currently have a Fischer electrical connector. Many of our customers have expressed a desire for a solderable connector for wire hookup. We have designed a new 7-pin connector that is pluggable during our calibration and solderable by the customer. We expect that this change will save customers time and money, since many remove the Fischer or pay for a connector change. This connector change will be phased in during 2010. A drawing of the new 7-pin connector is available at:

http://www.quartzdyne.com/spec/dmb002_connector.pdf

If you have any concerns or questions about this connector change, please contact us.

Coefficient Memory Issue

We have observed a memory issue with the on-board coefficients in digital hybrid transducers. This issue does not affect the functional reliability of the transducer.

We use a non-volatile memory (FRAM) in our digital hybrid transducers to store the transducer serial number and calibration coefficients. The memory issue could result in an incorrect read of this information. The problem has likely existed since the product introduction in 2004. We observe two issues with the FRAM:

1. The first is an occasional bit that is stuck, or toggles value. It is rare below 180°C. We now screen 100% of our digital hybrids for data retention over a 1-week period which includes several 225°C excursions. (The test verifies the FRAM at ambient temperature.)

2. The second symptom is 100% data loss on any FRAM when queried near 200°C. We have not seen this problem when the FRAM is queried below 180°C.

In short, we've determined that the FRAM works below 180°C, but it should not be trusted above 180°C. We strongly recommend that customers always verify the file checksum prior to using FRAM coefficients.

The result of a corrupted bit depends upon the customer's use of the FRAM. If the tool doesn't query the FRAM coefficients to calculate pressure and temperature downhole, no effect will be observed. However, if the tool uses the FRAM to calculate pressure and temperature and if the customer doesn't verify the checksum and if a significant bit has changed, the computation will yield an erroneous result.

As a short-term countermeasure (in addition to the increased screening), we will store four (4) redundant copies of the coefficients in the lower 1024 bytes of memory. Four redundant copies will reduce the probability or error by 4X. For this to be an effective countermeasure, the customer must read successive copies until a valid checksum is found.

As a long-term corrective action, we are considering several options, including: (1) finding an alternative EEPROM, (2) designing a one-time programmable ROM ASIC, or (3) eliminating the FRAM from the hybrid. (FRAM die are sold to Quartzdyne as-is; there is no indication that the vendor will improve the technology.)

If you wish to provide input on these countermeasures, please contact us.

Quartzdyne's New Facility

We moved to a new 50,000 ft² [4650 m²] facility in May. The building has improved our internal communication, product flow, safety, and manufacturing capabilities. Since we're only 10 minutes from the airport, we invite you to come see us if you're connecting through Salt Lake City.

The Rocky Mountains surrounding Quartzdyne's facility are a constant reminder of our connection with the environment. So when we considered a new facility to accommodate growth, we designed it with sensitivity to the environment, while carefully weighing capital and operating costs. Quartzdyne's new facility was designed to satisfy Silver LEED requirements (certificate pending). LEED, or Leadership in Energy and Environmental Design, is the nationally accepted benchmark for the design, construction and operation of high-performance "green" (environmentally sustainable) buildings. At the following link you'll find a summary of the features we implemented in our building with the environment in mind: http://www.quartzdyne.com/pdfs/LEED.pdf

We're proud to manufacture precision pressure transducers and hybrid circuits that enhance recovery of hydrocarbon reservoirs. Enhanced recovery reduces demand for new drilling and its environmental impact. Similarly we've sought to sustain the environment with our new facility.

We wish you a safe and pleasant holiday.