

Gas/Electric Partnership

New Gas Engine Ignition Technologies from Altronic

February 6, 2013

Houston, Texas

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Altronic Ignition System Innovation

Altronic has spent the last *fifty* years and millions of dollars in research and development to meet a single goal:

To provide gas engine operators around the world with state of the art ignition technology

- **1965** The capacitive-discharge ignition system
- **1984** The digital crankshaft-referenced ignition system
- **1995** Systems featuring multi-strike technology and integrated diagnostics



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What did all three have in common?

They were all game changers...

They made engine operation more efficient

They made engine operation more economical

They made engine operation more environmentally responsible



Get ready for two more...

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Varispark™

Directed Energy Ignition Systems

They harness the power of Altronic's patented directed energy ignition technology

*They provide **COMBUSTION ASSURANCE** across a range of fuel qualities, operating requirements and ambient conditions*

They offer an opportunity for improved emissions and/or light-load performance



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Varispark™ – The Future of Gas Engine Ignition

How?

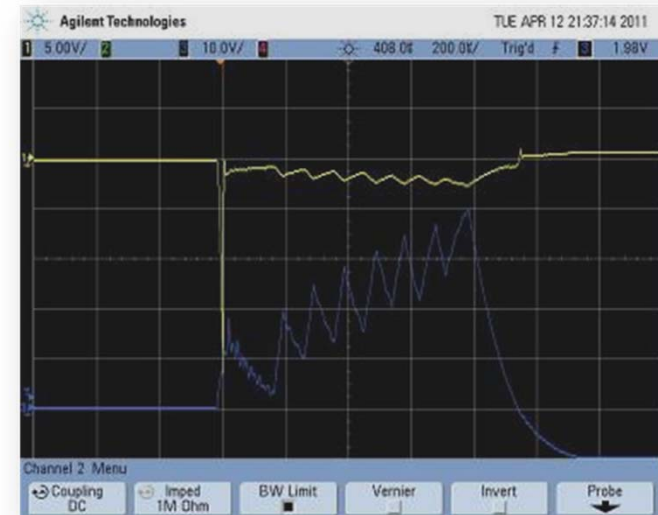
- Secondary current is available and can be delivered to the spark plugs when it can provide the maximum benefit to flame kernel development – often late in the cycle

How does that impact performance?

- *Combustion assurance*

What can OEMs, packagers, and end-users expect from Altronic in terms of new products?

- **Varispark™** directed energy ignition systems for engines from 10 to 10,000hp
- The first system has already been released and is in service: The **CPU-XL Varispark™** System for Large Gas Engines and Integral Compressors
- **CPU-95 Varispark™** for medium/large, high-speed engines due in April 2013
- **CD200 Varispark™** for small, high-speed engines due in June 2013



CD200 Varispark



CPU-95 Varispark



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#2...

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PPC Passive Pre-Combustion Chamber Spark Plugs

*They deliver a high energy source of ignition to the combustion chamber, **WITHOUT** supplemental fueling system cost, complexity or engine modification*

*They promote **COMBUSTION ASSURANCE** across a range of fuel qualities, operating requirements, and ambient conditions*

They offer an opportunity for improved low emissions or light-load performance



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PPC Passive Pre-Combustion Chamber Spark Plugs

How do PPCs work?

- Ignitable air-fuel mixture is forced into the PPC during compression stroke
- A spark discharge event occurs inside the PPC
- The Result: High-velocity flame jets escape through the PPC orifices resulting in combustion of the main chamber air/fuel charge



Utilizing advanced CFD modeling in their design, specific PPC models are developed and optimized for operation on specific engines

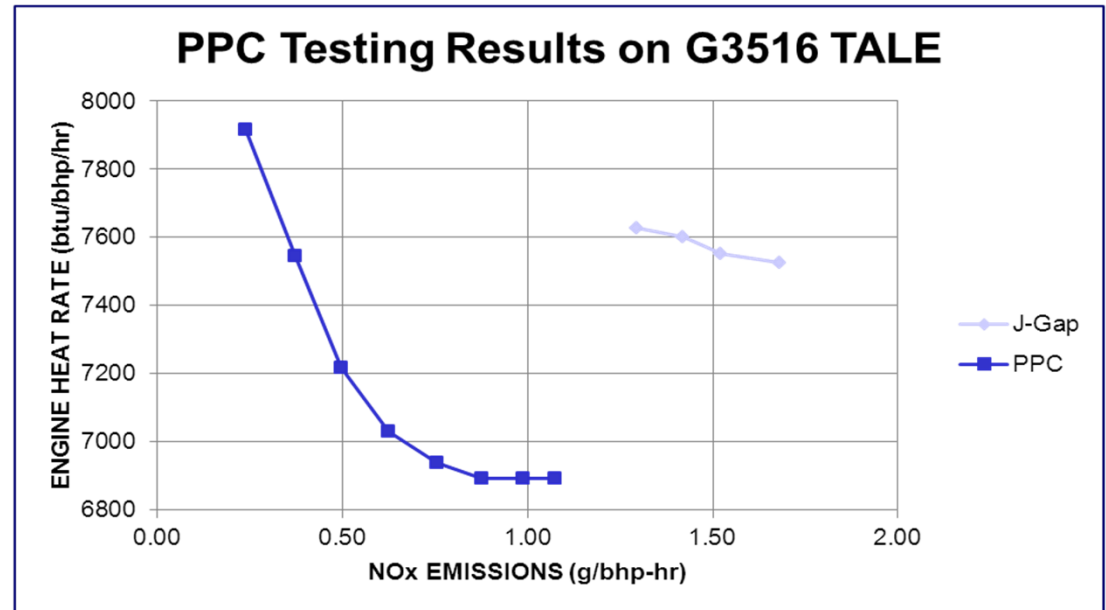
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What the results from the field?

Emission levels below
0.5 g/bhp-hr NOx

Fuel rates of less than
7,000 btu/bhp/hr AND
NOx levels below 1.00 g

Expected service life in
excess of 8,000 hours



Thank you for your attention!

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