PEER REVIEW

Subject: Pulstar™ pulse plugs

Technology: Peaking the current of a spark plug's discharge by increasing its capacitance.

Claim: Pulse plugs (spark plugs with high power capacitors) increase the peak current during the creation of a large, fast growing flame kernel, which in a spark ignited IC engine improves the combustion process resulting in more work extracted from the same amount of fuel.

Review: Dr. Michael A.V. Ward

Review:

A typical automotive coil stores about 50 mj of energy for delivery into the breakdown spark followed by the arc discharge (~200ma) and ending with the glow discharge (~50ma). The efficiency of these respective phases is 90%, 50% and 30%.

At 50 pF, and 20 Kv breakdown voltage, The pulse plug has a relatively high breakdown spark which delivers approximately 10 mj of energy. The breakdown spark is a low erosion spark, enabling long electrode life even though the current peaks at the order of 1,000 amperes within a period of about 10 nanoseconds.

The peak power of the pulse plug discharge is 10 mj/10 nsecs or approximately 1 Megawatt. This very high power is what makes the pulse plug so effective as compared to regular spark plug. The result of this high power spark is that a shock wave is produced that enhances fuel ignitability. In test conducted in a combustion "bomb" a capacitor-enhanced spark plug extended the lean limit from 21:1ARF to 23:1 AFR.

In conclusion, the efficiency and high current discharge of the Pulstar™ pulse plug has proven to enhance the combustion process.

References:

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About the Reviewer

Michael A.V. Ward PhD, Harvard University. Currently, President of Combustion Electromagnetics, Inc. Dr. Ward has over twenty patents in the fields of lean burn ignition and engine design, and is extensively published in plasma physics, electromagnetics, ignition and combustion, journals: the Journal of Applied Physics, Combustion and Flame, Journal of Microwave Power, the SAE, and others. Dr. Ward was awarded “Best Paper of the Year” in 1981 by the International Microwave Power Institute for his pioneering work on microwave stimulated combustion. His work has been featured in international magazines including The Economist, Harvard Magazine, Design News, Electronics World, Automotive News, and others.