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HV Micro-Controlled Igniter based on a Piezoelectric Transformer

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Abstract

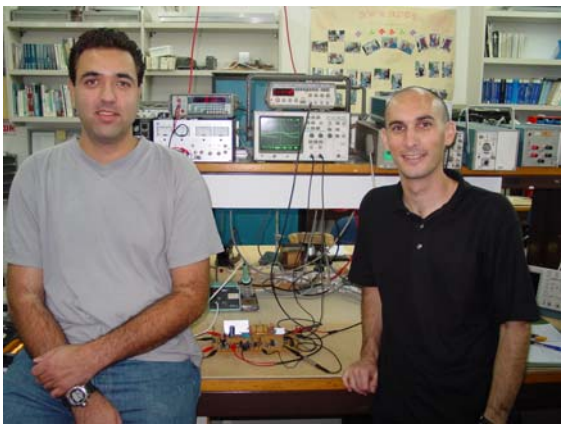
Arc lamps such as HID (High Intensity Discharge) or XENON that are commonly used for street lights are likely to become the norm for car head-lights due to their low energy consumption, making them twice as efficient as other florescent or halogen lights. The problems in using these bulbs are the high voltage (30–40 KV) needed to ignite them and the relatively long ignition time. The solutions available for solving these disadvantages are relatively expensive and physically large, which reduces their utility.

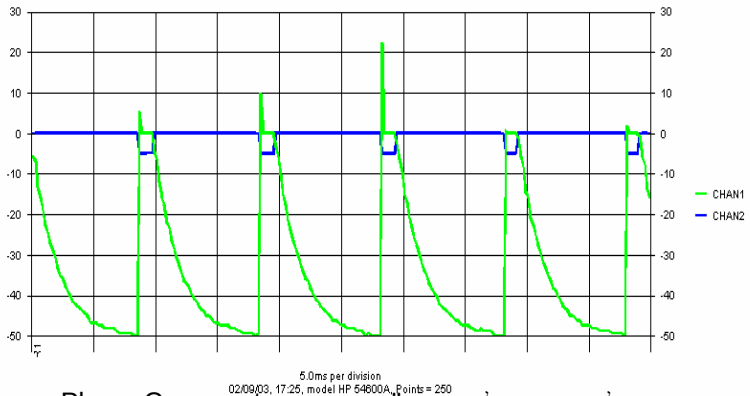
In this project we developed an igniter for Arc lamps based on a Micro-Controlled Piezoelectric Transformer that proposes an efficient and small dimensional solution to these disadvantages.

In order to reach the high voltage needed for the igniter, the working frequency of the transformer must be monitored using feedback to bring the output voltage of the circuit to its maximum. The maximum voltage tracking is based on a criterion offered in [1] in which the difference between the input voltage phase (V_{in}) and the virtual current phase (I_r) in the resonance branch must be zero.

This project is unique in that the frequency tuning was done during the charging of the load capacitor. During the charging of the capacitance, the load of the circuit changes and therefore the frequency tracking is done for a wide variety of loads.

The adaptability of this igniter to a wide rage of loads makes it versatile and therefore compatible to many other applications where high voltage ignition systems are needed.





Phase Comparator תהליך טעינת קבל העומס ע"י שימוש ב

[1] S. Ben Yaakov and S. Lineykin, Frequency Tracking to Maximum Power of Piezoelectric Transformer HV Converters under Load Variations. IEEE Power Electronics Specialists Conference, 2002, Cairns, Australia, 657–662.