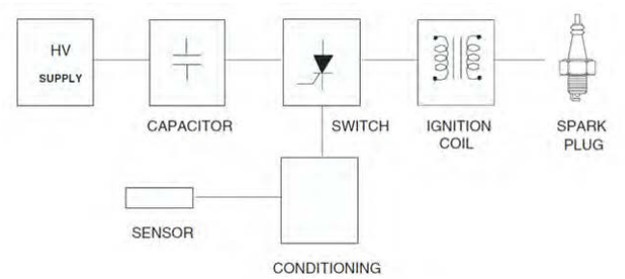
Application Notes

DEKI
Film Capacitor Solutions

Capacitor Discharge Ignition

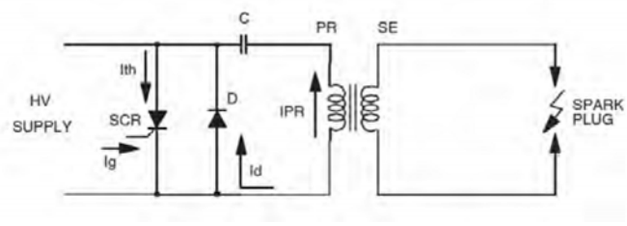
Capacitor discharge ignition (CDI) or thyristor ignition is a type of automotive electronic ignition system which is widely used in outboard motors, motorcycles, lawn mowers, chainsaws, small engines, turbine-powered aircraft, and cars. It was originally developed to overcome the long charging times associated with high inductance coils used in inductive discharge ignition (IDI) systems, making the ignition system more suitable for high engine speeds (for small engines, racing engines and rotary engines). The capacitive-discharge ignition uses capacitor discharge current to the coil to fire the spark plugs.

Let us now understand the basic block diagram of a CDI system as shown below:



The HV supply for the CDI is is supplied by a DC/DC converter. This stage provides 400V from the 12V battery. The value of capacitor generally lies between 0.47 and 2.2µF. This capacitor is used to store the charge from the HV supply.

How does it work?



When a spark is needed, a current I_g is injected to the SCR gate which then fires the SCR. This initiates the capacitor discharge which generates an alternative current.

This will induce the high current voltage in the secondary coil which flows to the spark plug causing arcing between the electrodes of the spark plug.

Deki has designed CDI capacitors in both MPET and MPP types and our Technical Centre has carried out extensive tests on CDI capacitors. Based on our vast experience we would like to present the following properties:

Parameter	PP	PET	Effect
Dielectric constant	2.2	3.2	Less size of PET for same capacitance
Tan Delta	low	high	PP preferred at high freq. if size doesn't matter
IR	high	low	PP preferred for low leakage current
Max Service Temperature	105ºC	125ºC	PET has higher temp withstanding capability.

Deki recommends polypropylene capacitor as the ideal choice for this application because of its low loss factor. For striking, the capacitor should have high dv/dt rating and low loss factor. Low loss factor is preferred because it is directly proportional to the power dissipation and self-rise in temperature of capacitor.

According to the following equations:

$$P = 2\times\pi\times f\times C\times\tan\delta\times V_{RMS}^{2} \quad (1)$$

$$\Delta T = P \times R_{TH}\,^{\circ}C \quad (2)$$

Where P = power dissipation in capacitor, ΔT = Temperature and Rise R_{TH} = Thermal resistance of the capacitor.

It is evident that the power dissipation is directly proportional to the frequency, loss factor and V_{RMS}. Heat generated in the capacitor is proportional to the power dissipation and the capacitor's self-temperature rise should not be more than 10°C at its category temperature.

For polypropylene capacitors loss factor is low and, hence, the temperature rise is less than MPET capacitor.

Deki's Technical Centre is well equipped to carry out surge tests on CDI capacitors and ensure a ZERO DEFECT product to the customer.

For details regarding Deki's CDI capacitors, please contact us on shariq@dekielectronics.com