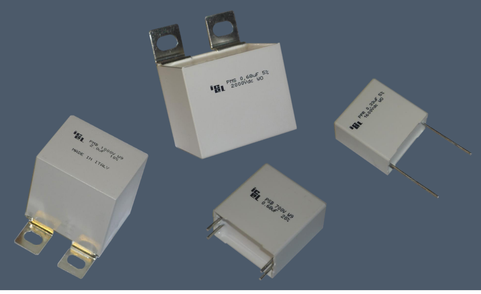
Application & Technical Support

Snubber capacitors



WHY SNUBBER CAPACITORS?

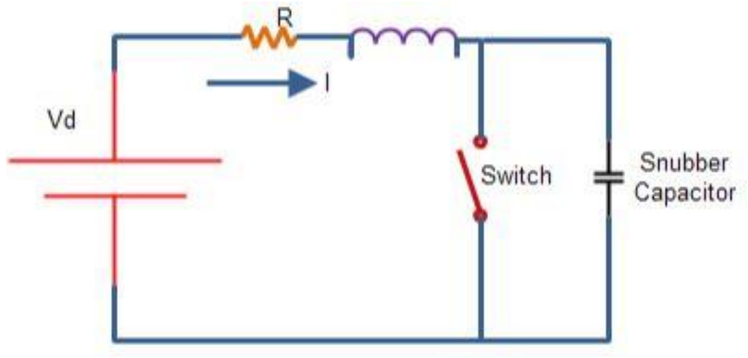
- Snubber capacitors are essential in a ***power conversion circuit***
- The main function of the snubbers is to ***protect*** FETs, IGBTs and other switching devices ***from large voltage spikes***, commonly produced during switching operations

MAIN APPLICATIONS

- The ***range of applications*** in which snubbers are used is ***very wide***
  - reduction or elimination of voltage or current spikes
  - limitation of the du/dt
  - suppression of electromagnetic interference (EMI)
  - losses reduction caused by switching operation
  - shaping of the load lines
  - transfer of power dissipation to resistors or useful loads

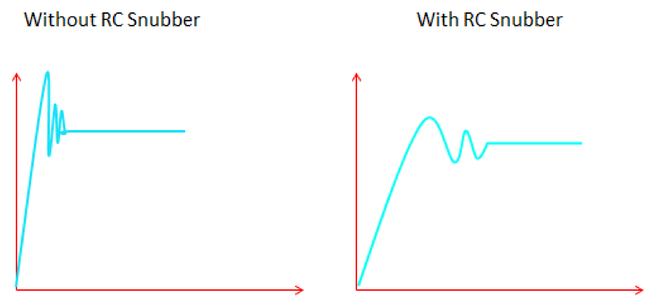
FUNCTIONALITY

- A “hard switching” operation subjects a switch to voltage and current stress and causes high switching loss
  - the presence of ***parasitic inductance*** increases this stress further
- The electronic circuits of ***motor drives***, ***lamp ballasts***, ***power converters***, and ***other power devices*** may be different, most have common switch-diode-inductor networks and waveforms
  - same snubber requirements since the behavior of the fundamental network is identical
- Most of today’s high voltage inverter circuits use ***IGBTs*** as the switching devices
  - IGBTs can switch high currents within short time frames, so they are exposed to potentially harmful voltage transients and therefore ***require protection circuits***



PLASTIC FILM SNUBBER CAPACITORS

- Snubber circuits are exposed to high stress, so the capacitors used in such circuits are subjected to and ***must withstand high du/dt and extremely high values of peak and rms current***
- *Plastic film capacitors* are widely used for snubber applications, for both high power and low power circuits



MATERIALS AND CONSTRUCTION

- Most snubber capacitors are designed with *polypropylene* material
  - ***low-loss dielectric*** material, suitable for designing capacitors for use in both low and high pulse applications
- The properties of a film capacitor are significantly dependent on the construction technology used
- Polypropylene *film/foil*, *metallized film* and *double-sided metallized film* are commonly used as snubber capacitors
  - ***lug terminals*** execution available for direct mounting on IGBT modules and busbars
  - a combination of metallized film and discrete foil can also be considered

PROPERTIES AND CHARACTERISTICS

- Polypropylene snubber capacitors offer ***high tolerance and stability***, together with ***high voltage and current withstanding***
  - changes in temperature or applied voltage have minimal effects on the performance characteristics
  - low and virtually linear temperature coefficient
  - very stable capacitance
  - low equivalent series inductance (ESL) and low equivalent series resistance (ESR)

ICEL PRODUCTS - SNUBBER

- *Boxed – LUGS execution* for direct mounting on IGBTs
  - *PMB/RMB*★– high pulse, high current, low ESR
  - *PMS* – medium pulse, high current, low ESR
- *Boxed – PINS execution*
  - *PPR/PPB*★– high performance, high pulse, high frequency
  - *PSB/RSB*★– high pulse, high current
  - *PHS* – medium-high pulse, high current
- *Axial execution*
  - *PPA*★– high pulse
  - *PPS* – medium-high pulse
  - *PWS* – film foil snubber, very high pulse, low losses

★ recommended

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