Performance comparisons of different front-ends for UPS systems

Parameters	Diode-IGBT Chopper	Thyristorised converter	IGBT based active converter
Efficiency	**Improves AC-DC and overall AC-AC efficiency – typically more than 90% at full load** • Low switching & conduction loss for diode device – natural commutation • IGBT chopper switching and conduction loss negligible • Additional input current harmonic filters are not required • Low operating cost	**Reduces AC-DC and over all AC-AC efficiency** • SCR switching and conduction losses • Simple On gate circuit • Self commutating (natural off control) • Additional input current harmonic filters required • High operating cost	**Improves AC-DC and overall AC-AC efficiency. Typically , its 94-96% AC-AC efficiency at 100% load** • IGBT switching n conduction losses • Simple IGBT drive control circuit • Low IGBT control power consumption • Additional input harmonic fitlers not required • High operating cost
Cost	**Cost competitive converters** • Reasonably priced as diodes with large power capabilities are available for many years now • No control circuitry required for diode bridge • IGBT chopper utilises small quantity of IGBTs • Simple IGBT drive circuitry • Additional input not required so additional cost is avoided •	**Cost competitive converters** • SCR devices with large current capabilities are available for many years and quite reasonably priced • Simple on gate circuit • Self commutating (natural off control) • Additional cost towards input current harmonic filters can drive the cost upwards.	**Costly converters** • Cost is important when applying IGBTs in converter section. However, the cost is gradually coming down, though, higher ratings converters are more competitive than the lower one.

UPS TECHNICAL NOTES

Performance	**High converter performance** -Fast response time for the converter • IGBT chopper ON/OFF control • Fast switching speed • Improved PWM control, high converter performance and specs -Low input current harmonic • Typically more than 10% at 100% load • No need for additional filter • No effect to utility • No generator compatibility issues -High input power factor • Typically 0.9 to 0.95 (naturally generated due to diode bridge) -No generator derating required • No over – sizing required due to high input power factor and low input current harmonics -Low audible noise -Small size	**Poor converter performance** Slow response time for the converter • Slow switching • Poor control, converter performance and specs -High input current harmonic • Typically more than 33% at 100% load • Additional filters required for harmonic reduction at the input • High THD feedback to utility • Generator compatibility issues at low loads -Low input power factor • Typically 0.7 lagging , large input KVA requirement -Generator derating required • Over – sizing required due to low input power factor and high input current harmonics -High audible noise -Large size and space requirements	**Best converter performance** Fast response time for the converter • IGBT chopper ON/OFF control • Fast switching speed • Improved PWM control, high converter performance and specs -Low input current harmonic • Typically less than 3% at 100% load • No need for additional filter • No effect to utility • No generator compatibility issues -High input power factor • Near unity power factor -No generator derating required • No over – sizing required due to high input power factor and low input current harmonics -Low audible noise -Small size
Large capacity	**High converter power capabilities – all devices with large current capabilities available for many years**	**High converter power capabilities – large rating SCRs available**	**High converter power capabilities – large rating IGBTs available.**