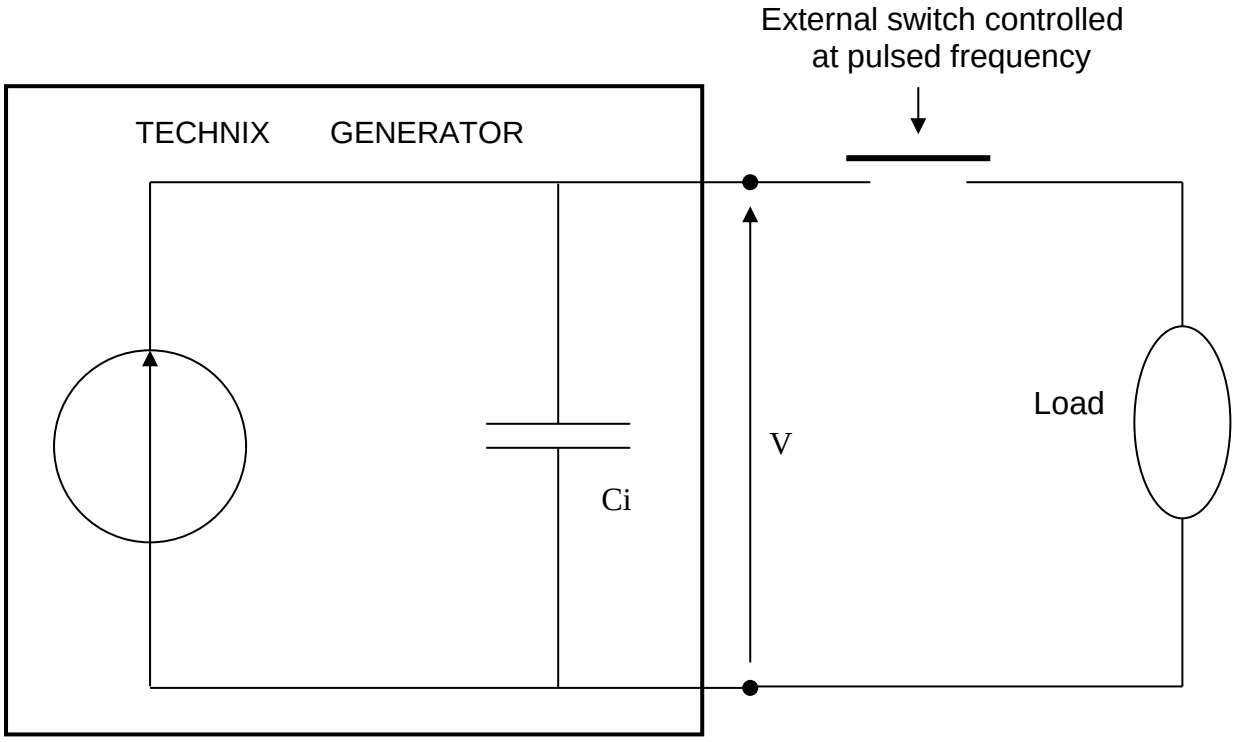
Application note

USING TECHNIX GENERATORS AS PULSED GENERATORS

TECHNIX generators are capable pulsing current even in high frequency.
The basic schematic diagram is shown.



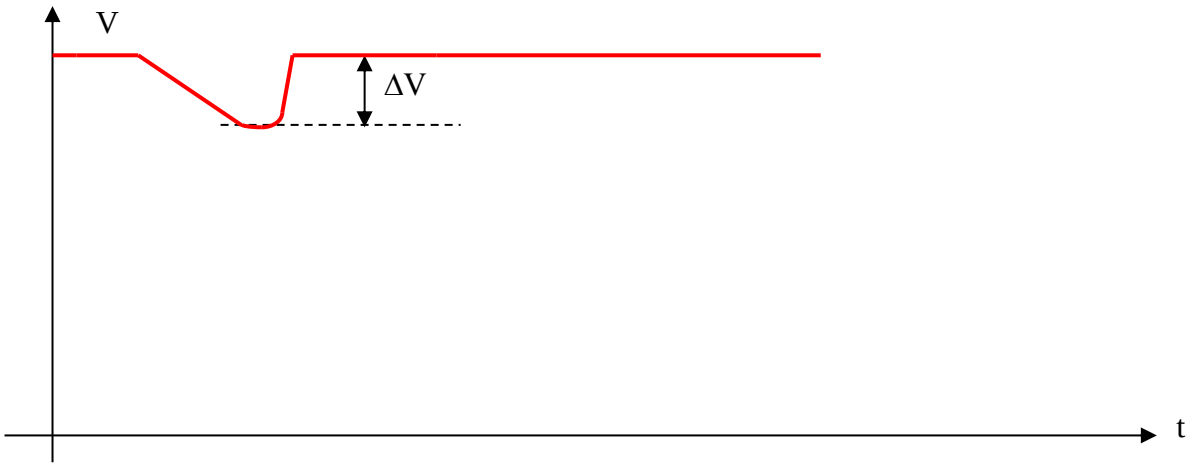
When the switch is closed, the load will require a certain quantity of energy.
Higher is this energy, more powerful the generator has to be to avoid a big droop of voltage.
We propose in this note to determinate the different parameters of this application.

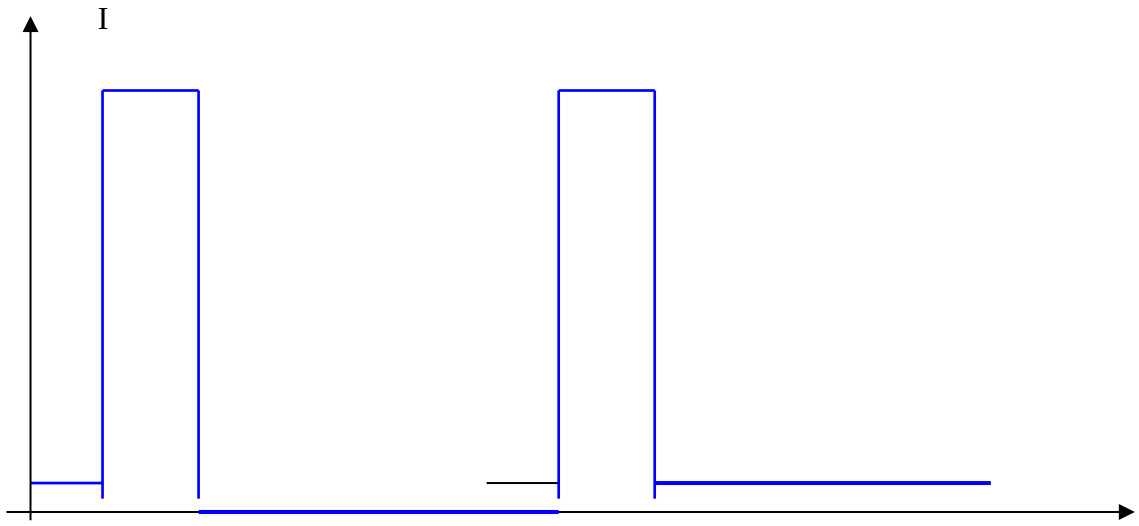
We can use this formula:

$$\Delta V = E_L / Ci * V \qquad (1)$$

Where: ΔV is the droop of the voltage
E_L is the energy consumed by the load when the switch is closed
Ci is the internal capacitor of the generator
V is the output voltage before the droop.

Remark : this formula is correct when the droop is relatively low.





Stored energy, in TECHNIX standard products, is 1 J for 1 kW. This means we calculate Ci to respect this ratio.

We obtain from this : $\Delta V/V = EL/2P$ (2)

Where: $\Delta V/V$ is the relative droop of the voltage
EL (in Joule) is the energy consumed by the load when the switch is closed
P (in kW) : is the maximum power of the generator

Examples : - For getting a max droop of 1 % of the voltage, the power P in kW of the generator has to be 50 times the Energy consumed by the load
- With a Power (in kW) 100 times the Energy consumed, the droop ratio is 0.5 %.

For improving the performance, capacitor value can be increased.
This can be made either internally or externally.

In this case the formula becomes: $\Delta V/V = E\mathbf{L}/2kP$ (3)

Where k = Ceq/Ci
and Ceq is the equivalent capacitor and Ci is the standard TECHNIX output capacitor (corresponding to the ratio 1 J/1 kW)

Remarks :
1- Increasing Capacitor will automatically increase the stored energy.
This could be unacceptable for some application.
2- As the space in the generator chassis is limited, internal capacitor is also limited.

Example :
If we consider an SR25-X-3000 model : adjustable from 0 to 25 kV and from 0 to 120 mA.
And if the load to be pulsed has following features:
During the switch which is 1 ms long, the current in the load is 15 mA.
E**L** = 25kV*15mA*1 ms = 0.375 J
The relative droop is 6.25 %. This means the droop is 1562 V and Vmin = 23437 V.

For getting a droop of only 1% (250 V), equivalent capacitor has to be multiplied per 6.25.
$Ci = 2P/V^2$ = 9.6 nF, therefore Ceq =60 nF.
This could be possible for instance by ordering to TECHNIX an internal capacitor of 20 nF and to add an external capacitor of 40 nF.
Stored energy in this case becomes 18.75 Joules.