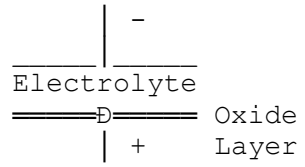
Reforming Caps

By G8MNY (Updated May 15)

(8 Bit ASCII graphics use code page 437 or 850, Terminal Font)

Electrolytic capacitors are formed by repeatedly apply a formation voltage that corrodes the anode of the pure aluminium foil, to make a very thin insulating oxide layer.

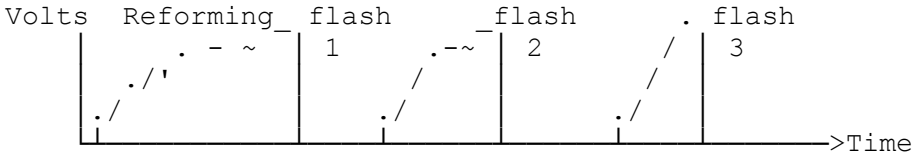


This thin layer is the reason the capacitance value is so high (1000x) compared to other types of the same size. The oxide layer's thickness is proportional to the operating voltage. The electrolyte is a WET salt solution (Borax) in a porous tissue used to initially keep the foils apart. If the electrolyte dries out the capacitance value often decreases by >100 times & the ESR (Equivalent Series Resistance) goes very high too. Failed capacitors often look pregnant after high pressure has occurred.

NEED FOR REFORMING

The problem is that over time if the capacitor is not exercised to the formation voltage, the layer shrinks in thickness & the capacitor will need reforming to safely work at its rated voltage. Failure to do refoming means DC current continues to pass & the capacitor heats up & may explode!

Noticeable reforming occurs in some applications like a photographic flashgun every time the capacitor is 1st used after a few days, & it takes much longer to charge up as formation current is flowing. After each flash the recharge is quicker.

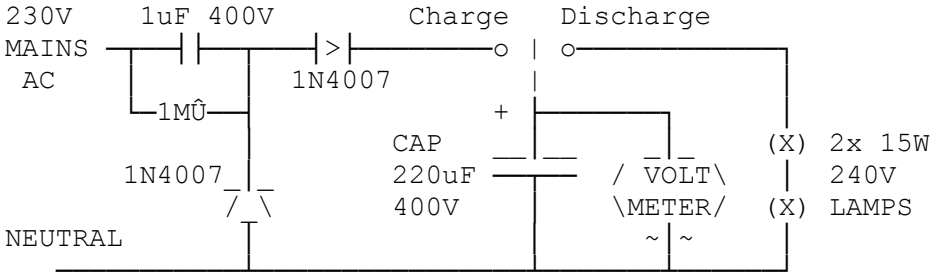


But for larger power capacitors in PSUs, the formation voltage will be some 10% greater than the rated voltage, so when the formation voltage (voltage the oxide layer will withstand) is too low, much higher currents will flow & heat up the capacitor. To reform the layer the capacitor must be charged & discharged sometimes repeatedly. Hence on unused kit it is wise to power up briefly for a few seconds, then let the HTs drop to zero & re-power.

POWERING UP REFORMING

If kit has not been used for many years, then some reforming can be done by briefly repeatedly powering on (until HT appears) for a few seconds, then powering off for a few minutes. Do this a couple of times for each year of non uses & you will avoid the capacitor or valve rectifier blowing up.

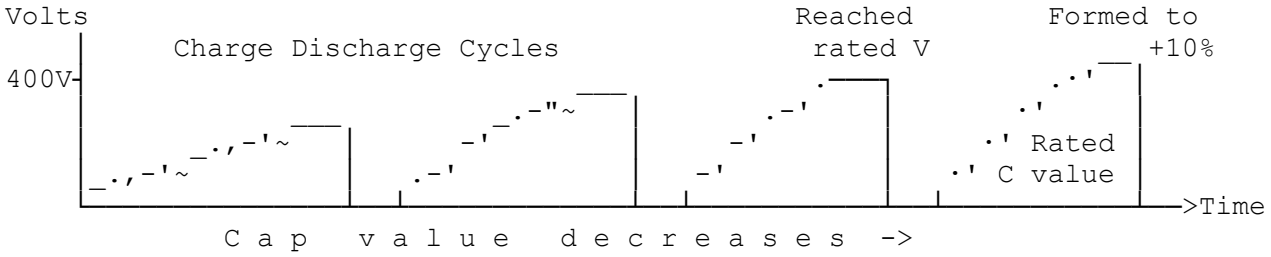
REFORMING CAPS
For new caps that may have been stored for a while the same applies. Here is a reforming circuit I have used for high voltage electrolytics.



The 1uF limits the charging current to a max of 75mA, but the peak voltage can be +650V, so an eye on the meter is needed! THIS IS A HIGH VOLTAGE MAINS CIRCUIT! Take safety precautions!

For lower voltage high value Caps, use a variable voltage bench PSU to do the same thing.

REFORMING
Apply charging current until voltage rise nearly stops (e.g. current stays flowing), then discharge the capacitor.



Repeat the charge discharge cycles & something like a 10% voltage increase will be seen for each. Repeat the cycles until the voltage is about 10% higher than the rated value is achieved. Anymore than that will risk insulation failure & or a drop in the rated capacitance value.

NON POLAR TYPES
These are really just 2 electrolytic capacitors in series in one can. So a middle foil is needed in manufacture to make the 2 caps, but not wired to the outside world. Because of this no direct reforming can be done again, but using them on AC solves this, as long as the do not get hot! Typically used in a rotator controller, for low voltage motor phase split capacitors that must have a high C value, as the voltage is low.

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73 De John, G8MNY @ GB7CIP