Homebrew Group Newsletter
#47 February 2018

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- Since my last newsletter yet another FM satellite from AMSAT-NA has been launched and is available for traffic. Officially opened on the 26th of January 2018 the U/V transponder of AO-92 has been providing solid contacts for operators with handheld stations. Invariably the antennas in use are commercial offerings being either ‘Elk’ or ‘Arrow’ antennas.

  VK3MQ sought a cheaper solution in a homebrew antenna with a single feed for both bands and using an ‘open sleeve’dipole eliminating the need for a diplexer.

  http://www.qsl.net/dk7zb/Duoband/duoband_principles.htm

  The technique applied to HF situations.

  https://iw7dmh.jimdo.com/antennas/10-15-20-open-sleeve-dipole-and-a-bit-more/
  http://rudys.typepad.com/ant/files/antenna_broadband_dipole.pdf

- Something for the owner of a 3D printer
  https://satnogs.org/documentation/hardware/

- VK5AJL documents a homebrew antenna tuner
  http://vk5ajl.com/projects/tuner.php

- Beware nostalgia alert!
  https://people.ohio.edu/postr/bapix/6SN7_QRP.htm

- A simple weekend project – regen. receiver for 40
  http://www.ke3ij.com/JFETrgn.htm

- ZL2CTM shows and describes a progressive receiver project.
  https://www.youtube.com/watch?v=vU7iFmA6fRs

- VK2ZAY's compact spectrum analyser with regenerative IF.
  http://www.vk2zay.net/article/256

- Make your own variometer for LF/MF
  http://www.vk2zay.net/article/206

- ZL2PD fully describes a QRP digital SWR relectometer.
  http://www.zl2pd.com/SWRmeter.html

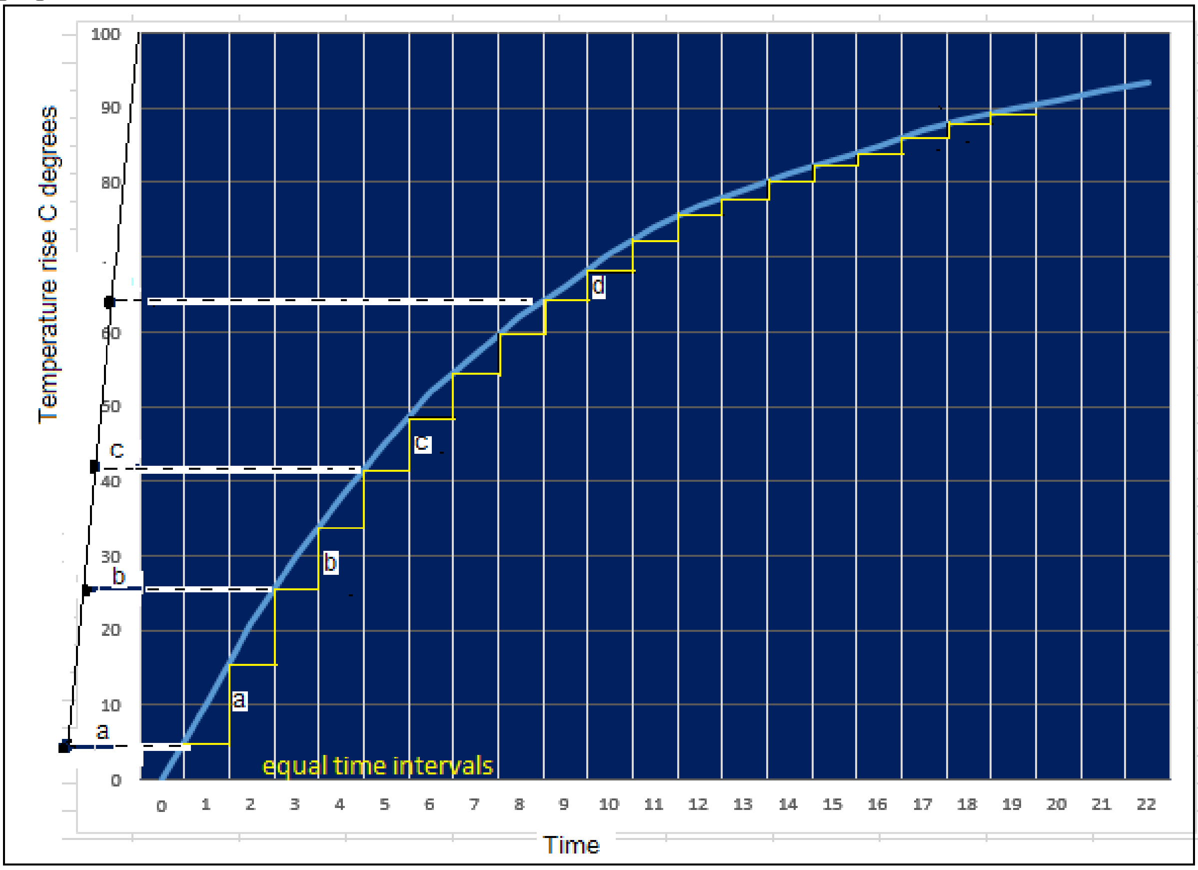
Eric Christer VK3EAC continues his series of technical articles with:

Estimating the maximum temperature rise of a transformer.

To estimate the temperature rise of, say, a loaded transformer (or other device) without waiting hours for it to reach a final temperature, the following method can be used. It is a theoretical approach that assumes such things as constant ambient conditions.

A curve of temperature rise can be plotted with respect to time and this follows an exponential law as illustrated in the following graph.

For equal time intervals, the temperature increment values can be plotted horizontally as shown from the vertical axis: (These are the values a – a, b – b, c – c, etc). A straight line can then be drawn through the end points and the expected maximum temperature rise is given where it intersects the LHS vertical axis. In this example, the maximum temperature rise (above ambient temperature) will be 100 C. Like RC timing, the time constant (T) is at approx. 63.2%. In this graph, T is 8.3 units.



The equation for temperature rise after a time t hours is $\theta = \theta_{max} (1 - e^{-t/T})$

θ_{max} = the final temperature rise, T = the time constant of the transformer

Another method is to measure the temperature rise (θ_1) at a time t from the beginning and then at twice the time interval (2Xt) (θ_2). The final temperature rise can be calculated:

Final temperature rise = $\theta_1{}^2/(2\theta_1 - \theta_2)$

In the above example approximate temp rise at time t = 4 is 38° C and at time t = 8 is 62° C then final max rise is 103 C. A few calculations at different times (t and 2 x t) could be averaged.

Estimating temperature rise of copper wire windings – transformers, solenoids, relays etc.

By measuring the copper wire resistance at the start of a test, and then when the winding has been under load, the winding temperature can be estimated using the following table. The measurement when 'hot' has to be done quickly as cooling can be rapid. Also the winding must be disconnected for safety reasons!

A DC circuit resistance can be determined from accurate voltmeter and ammeter readings at any time during the test.

The temperature coefficient of resistance for copper for this sort of application is 0.0039 per degree Celsius and the temperature increase is basically linear.

Wire resistance increase from ambient conditions %	Temperature above ambient Degrees C	Wire resistance increase from ambient conditions %	Temperature above ambient Degrees C	Example:
1	3	11	28	Temperature of winding at
2	5	12	31	start of test = 25°C
3	8	13	33	Measured resistance at
4	10	14	36	start .
5	13	15	38	= 54 Ω
6	15	16	41	'Hot' resistance = 59Ω
7	18	18	46	Increase: 59 - 54 = 5Ω
8	21	20	51	Percentage increase
9	23	25	64	= 5/54 X 100 =
10	26	30	77	9.26%
		35	90	From table, estimated
		40	103	temperature rise
				. =
				24°C
				Actual winding
				temperature
				. 25+24 = 49°C

A practical equation for calculating resistance at temperature T is:

$R = R_{20}[1+\alpha(T - 20)]$ and from this $T = [R/R_{20} - 1 + (\alpha.20)]/\alpha$ Using above R values in the example above for start at 20°C, T=43.7°C a 23.7°C rise over 20°C

R = Conductor resistance at temperature T (Ohms)

R_{20} = Conductor resistance at the reference temperature of 20° C (Ohms) as usually supplied in tables otherwise the measured value at the beginning of a test.

α = Temperature coefficient of resistance for the conductor (resistance change / degree C) Typical value for copper is 0.0039.

T = Conductor temperature (degrees C)
For the small changes of temperature, the relationship of resistance and temperature is linear.

Finally something to consider as you start your next project:

"A good beginning makes a good ending."

73's Rob VK3MQ
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