Centre for Ecology & Hydrology

NATURAL ENVIRONMENT RESEARCH COUNCIL

ENVIRONMENT AGENCY

Beaumont, W.R.C., Lee, M.J. & Peirson, G. (2004) R&D Technical Report W2-076 TR-2

ElectroCalc: A spreadsheet to calculate power requirements and voltage gradients (E) of electric fishing systems.

To use: Choose either Single anode or twin anode sheet as appropriate.
Enter the diameter of anode being used (both anodes for twin anode systems)
Choose the resistance value of the cathode being used from the list supplied. In twin anode sytems if only one cathode used enter 0 value for second cathode
Enter the Ambient water conductivity. Use "Conductivity" Sheet to calculate Ambient from Specific (corrected to 25degC) conductivity
If using pdc enter the duty cycle (%) being used. Calculations are based on SQUARE WAVE pdc.
If pulse output in ms then use "Duty Cycle" Sheet to to find duty cycle for frequency used.
Enter the Input voltage (if known).

Output: Left graph displays Input VA required at a range of applied voltages for the set up and water conductivity entered.
VA for dc is read from the red line and left y-axis
VA for SQUARE WAVE pdc is read from the purple line and right y-axis
Right hand graph displays estimated values for 4 thresholds of E for the anode diameter being used (only anode 1 in twin anode systems) at a range of anode voltages.
Anode voltage is calculated (from circuit resistance theory) where input voltage is known and displayed as a vertical line on the graph

Note: This is not the interactive version - for example only

FOR COPY OF INTERACTIVE SPREADSHEET PLEASE VISIT:
http://dorset.ceh.ac.uk/River_Ecology/Fish_Ecology/ElectroCALC.XLS

SINGLE ANODE

INPUT

Enter measured values plus value of cathode resistance from table on right.

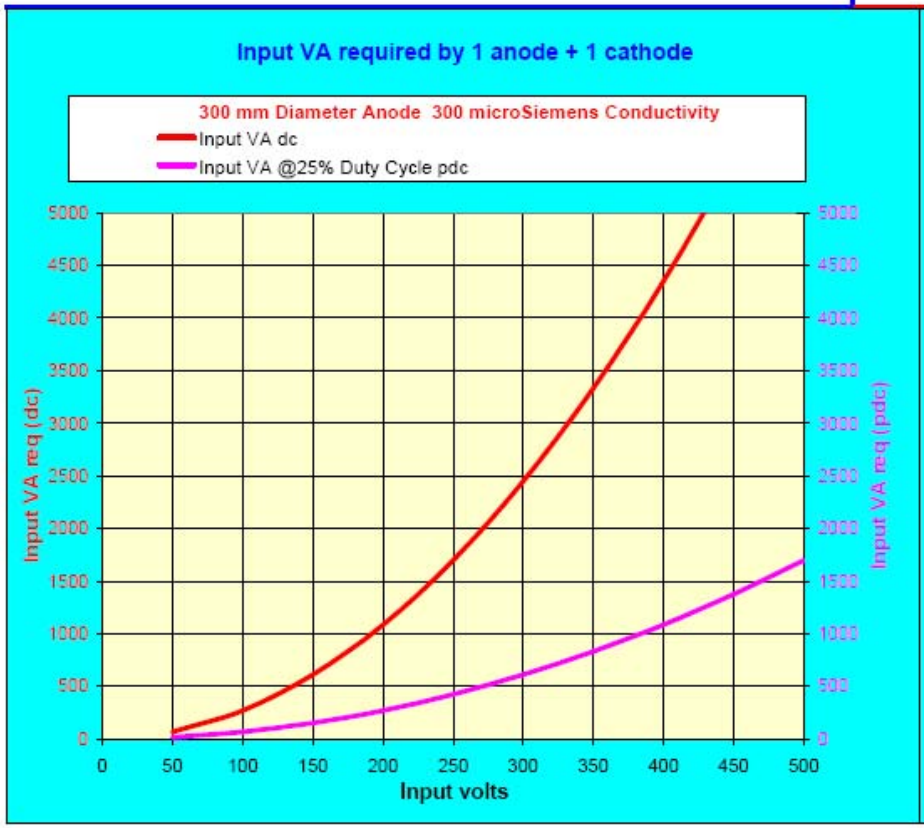
Anode Diameter mm	Cathode Resistance	Ambient Water Conductivity	Duty Cycle (%)	Input Volts
300	20	300	25	100

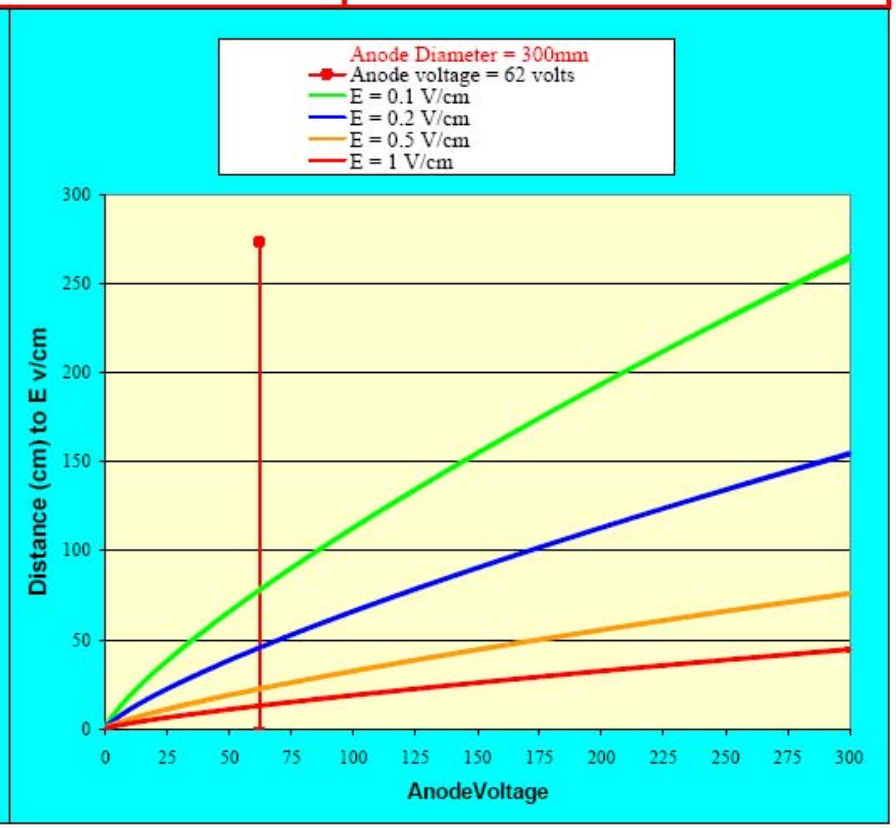
Proportion of input voltage at Anode	Corrected Anode voltage
62%	62

CATHODE RESISTANCE VALUES

Choose appropriate value or enter known value corrected to 350µScm^{-1} ambient conductivity.

750mm Braid / 250^2 mesh	48
1500mm Braid / 500^2 mesh	27
3000mm Braid / 750^2 mesh	20





TWIN ANODE + SINGLE / TWIN CATHODE

INPUT

Enter measured values plus value of cathode resistance from table on right.

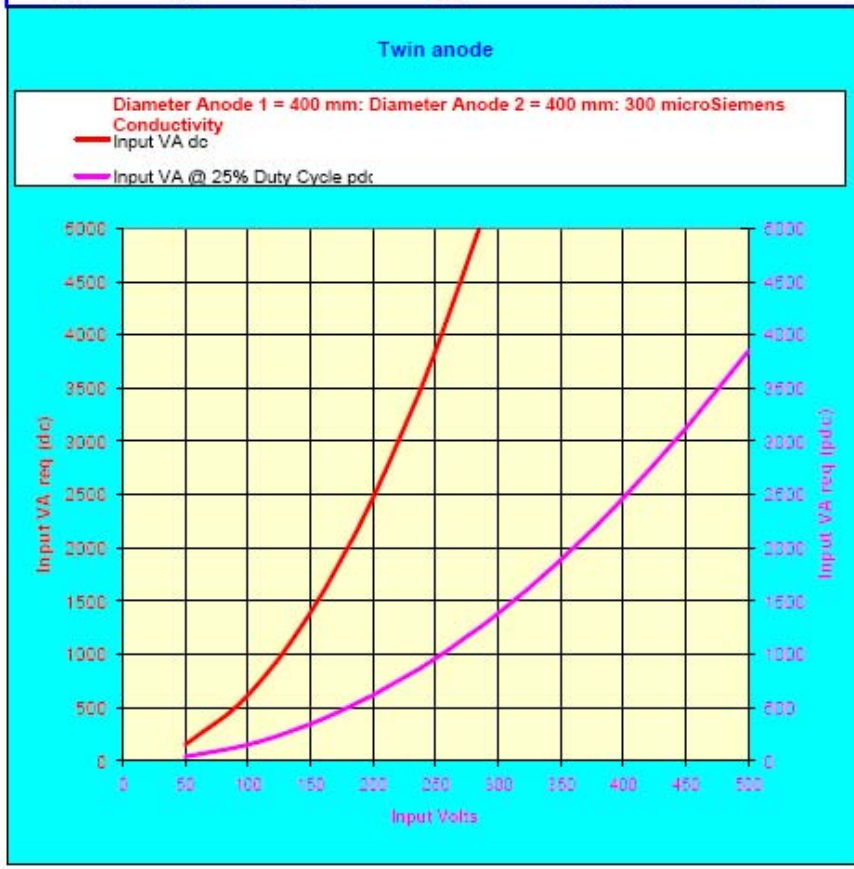
Anode 1 Diameter mm	Anode 2 Diameter mm	Cathode 1 Resistance Ω	Cathode 2 Resistance Ω	Ambient Water Conductivity	Duty Cycle (%)	Input Volts
400	400	20	20	300	25	200

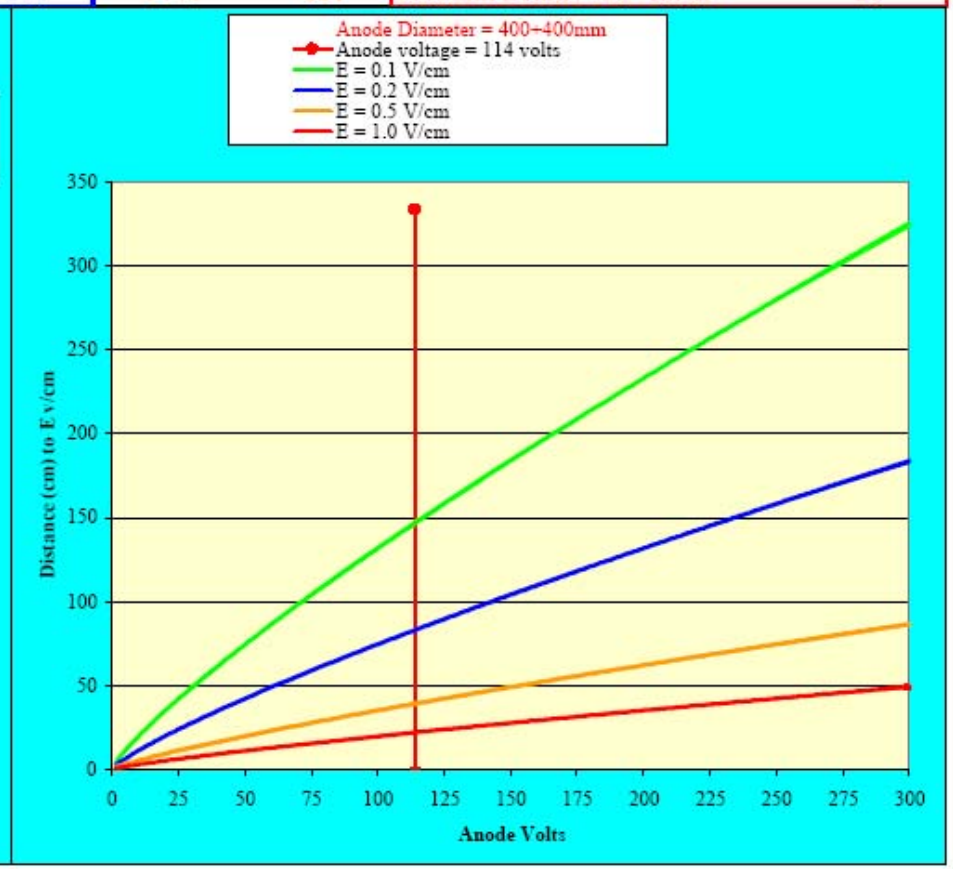
Proportion of input voltage at Anodes	Corrected Anode voltage
57%	114

CATHODE RESISTANCE VALUES

Choose appropriate value or enter known value corrected to 350µScm^{-1} conductivity.

750mm Braid / 250^2 mesh	48
1500mm Braid / 500^2 mesh	27
3000mm Braid / 750^2 mesh	20



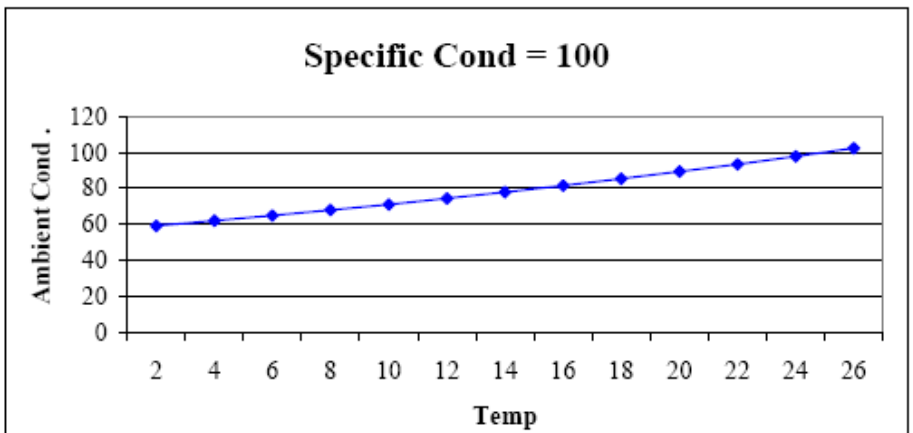


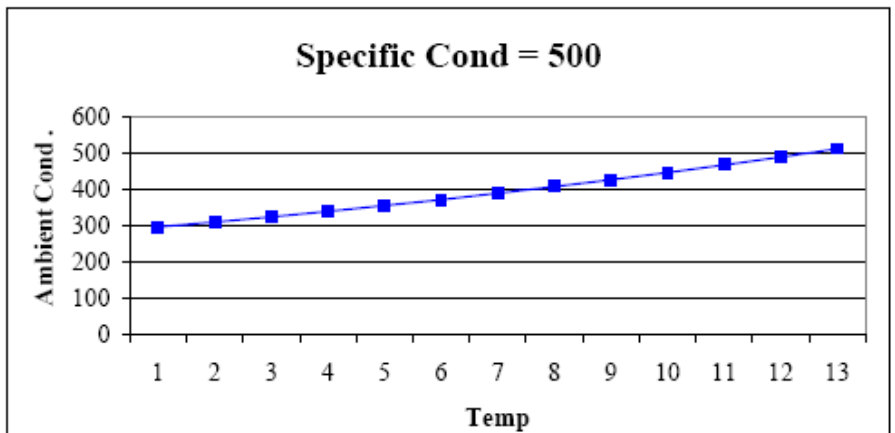
Conductivity correction: $k_{25} = k_t * 1.023^{(25-t)}$

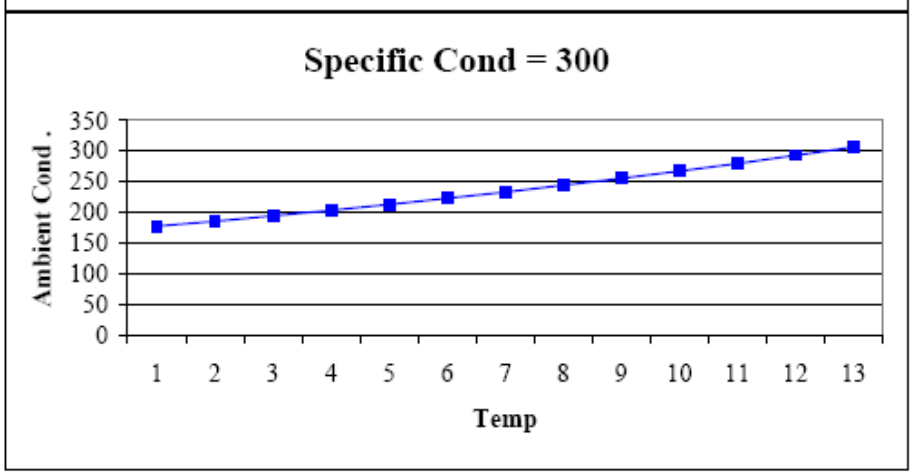
[from Mackereth, FJH, Heron J & Talling JF 1978. FBA Scientific publication No 36].

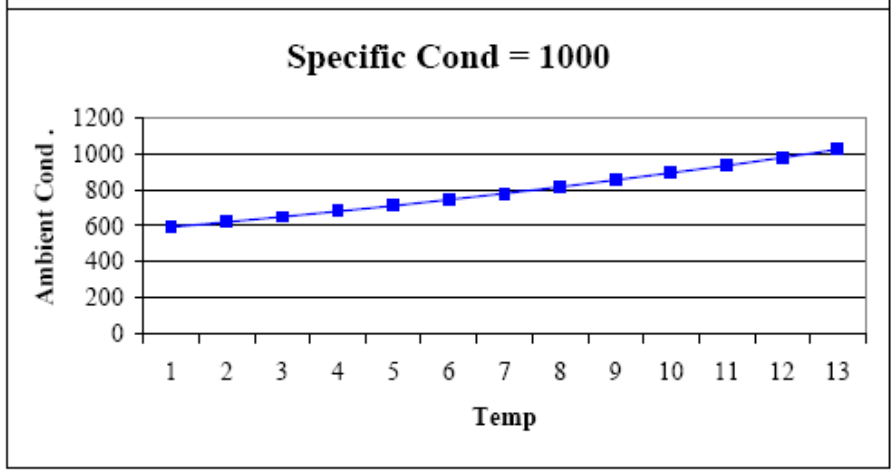
Enter Specific Conductivity (μScm^{-1}) and Temperature (degrees C)

ENTER VALUES	Specific Conductivity (μScm^{-1})	500	Water Temperature (degC)	20
CALCULATED VALUES	Ambient Conductivty (μScm^{-1})	446		









Appendix III: Duty cycle / pulse width conversion.

Conversion table for pulse width in milliseconds to % duty cycle for different frequencies of pdc																					
Frequency (Hz)		5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
		Pulse Width (ms)																			
Duty Cycle (%)	5	10	5	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	10	20	10	7	5	4	3	3	3	2	2	2	2	2	1	1	1	1	1	1	1
	15	30	15	10	8	6	5	4	4	3	3	3	3	2	2	2	2	2	2	2	2
	20	40	20	13	10	8	7	6	5	4	4	4	3	3	3	3	3	2	2	2	2
	25	50	25	17	13	10	8	7	6	6	5	5	4	4	4	3	3	3	3	3	3
	30	60	30	20	15	12	10	9	8	7	6	5	5	5	4	4	4	4	3	3	3
	35	70	35	23	18	14	12	10	9	8	7	6	6	5	5	5	4	4	4	4	4
	40	80	40	27	20	16	13	11	10	9	8	7	7	6	6	5	5	5	4	4	4
	45	90	45	30	23	18	15	13	11	10	9	8	8	7	6	6	6	5	5	5	5
	50	100	50	33	25	20	17	14	13	11	10	9	8	8	7	7	6	6	6	5	5
	55	110	55	37	28	22	18	16	14	12	11	10	9	8	8	7	7	6	6	6	6
	60	120	60	40	30	24	20	17	15	13	12	11	10	9	9	8	8	7	7	6	6
	65	130	65	43	33	26	22	19	16	14	13	12	11	10	9	9	8	8	7	7	7
	70	140	70	47	35	28	23	20	18	16	14	13	12	11	10	9	9	8	8	7	7
	75	150	75	50	38	30	25	21	19	17	15	14	13	12	11	10	9	9	8	8	8
	80	160	80	53	40	32	27	23	20	18	16	15	13	12	11	11	10	9	9	8	8
	85	170	85	57	43	34	28	24	21	19	17	15	14	13	12	11	11	10	9	9	9
	90	180	90	60	45	36	30	26	23	20	18	16	15	14	13	12	11	11	10	9	9
	95	190	95	63	48	38	32	27	24	21	19	17	16	15	14	13	12	11	11	10	10

CEH Reports and papers dealing with Electric Fishing

Beaumont, W.R.C., Lee, M. J. & Rouen, M. A. (1999) Development of lightweight Backpack Electric Fishing Gear – Phase II. Final Report to Environment Agency (National Coarse Fish Centre) 55 pp

Beaumont, W.R.C., Lee, M. & Rouen, M.A. (2000) An evaluation of some electrical waveforms and voltages used for electric fishing; with special reference to their use in backpack electric fishing gear. *J.Fish.Biol.* 57: 2, 433-445

Beaumont, W.R.C., Taylor, A.A.L., Lee, M.J. & Welton, J.S. (2002) Guidelines for Electric Fishing Best Practice. Report to Environment Agency 179pp EA Technical Report W2-054/TR

Beaumont, W.R.C., Lee, M.J. & Peirson, G (2003) An Investigation of the Equivalent Resistance, Power Requirements and Field Characteristics of Electric Fishing Electrodes. Report to Environment Agency 42pp EA Technical Report W2-076.

Beaumont, W.R.C., Lee, M.J. & Peirson, G (2004) Further Investigations on the Equivalent Resistance, Power Requirements and Field Characteristics of Electric Fishing Electrodes. Report to Environment Agency 35pp EA Technical Report W2-076/2

Beaumont, W.R.C., Lee, M.J., and Peirson, G. (in press) The Equivalent Resistance and Power Requirements of Electric Fishing Electrodes *Fisheries Management & Ecology*

Beaumont, W.R.C. (in press) Factors Affecting Electric Fishing Best Practice. Institute of Fisheries Management Annual Study Course. Nottingham.