

Project: MPPT converter for electro-mechanical generators

Students	Gilad Konsker Id: 032016008 
	Ori Bagg Id: 017399668 

Supervisor: Prof. Sam Ben-Yaakov
Year: 2005

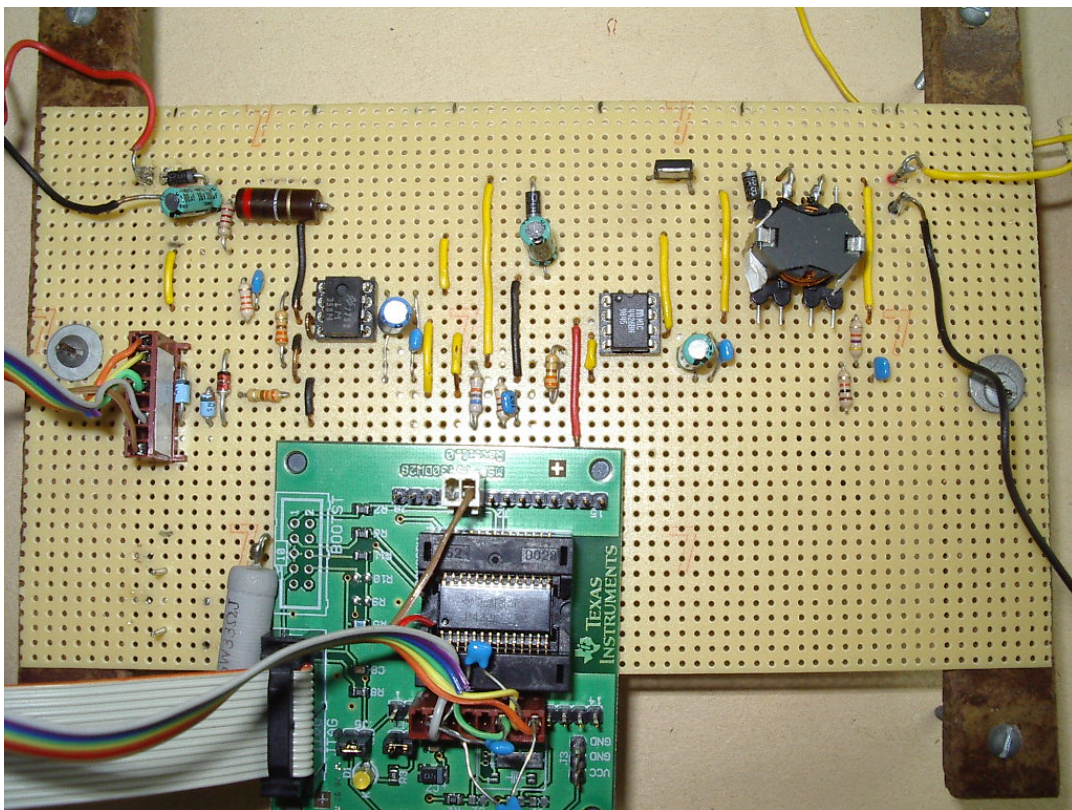
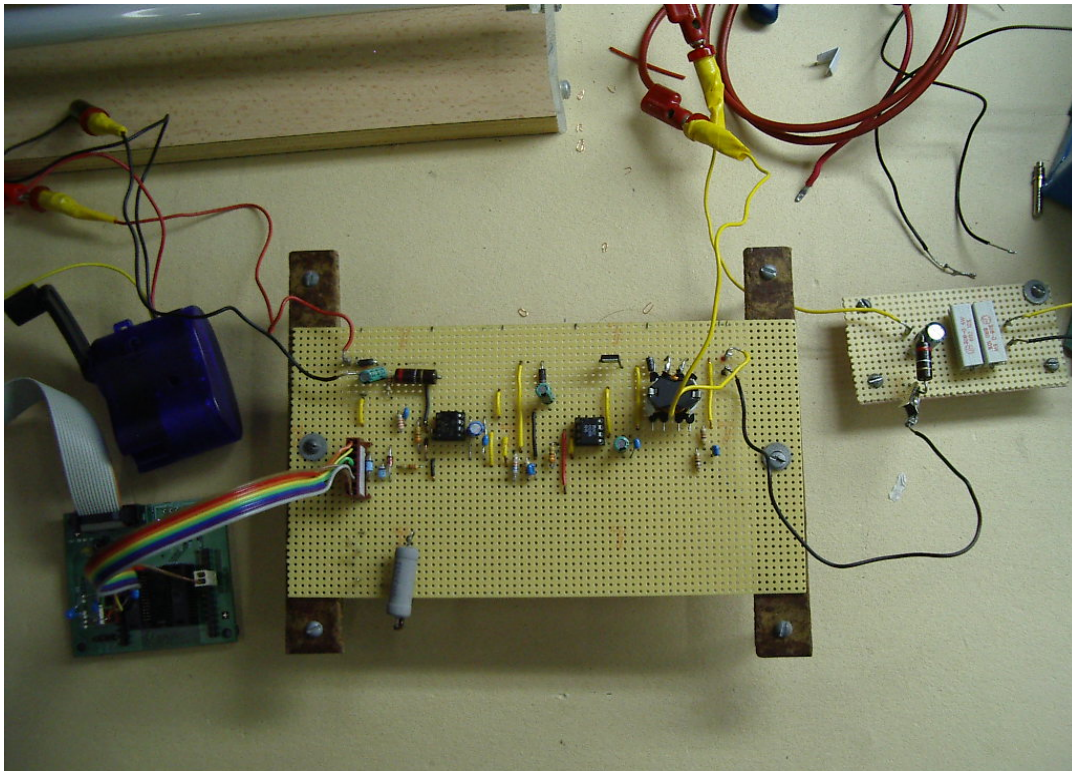
Abstract

The object of this project was to design and build an MPPT converter for an electro-mechanical generator. We took a manual electro-mechanical generator based on a simple regulator with a zener diode to limit the output voltage, and built a new circuit based on a Buck DC-DC converter and a micro controller (msp-430 of T.I.) that changed the PWM according to the inputs from the generator.

The method for implementing MPPT – Maximum Power Point Tracking – is to maintain the optimal input impedance of the circuit (determined by taking measurements from the generator). We identified the input impedance by sampling the input voltage and current, by the A/D converter of the micro controller, and after processing the results of the sampling, the controller produced a PWM for the Buck's switch, thereby stabilizing the input impedance.

The improvement of electrical efficiency in our circuit, compared to the original circuit, is between 20% and 40%.

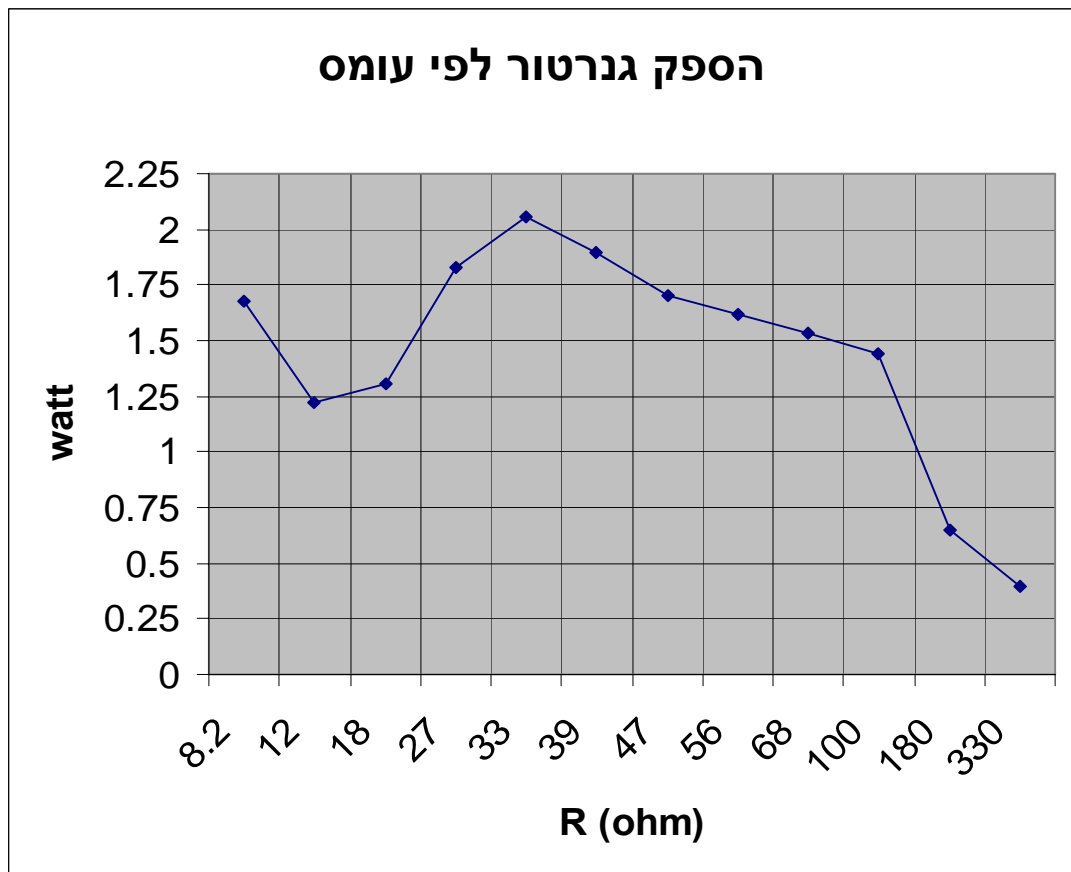
Pictures of the circuit



Some measurements

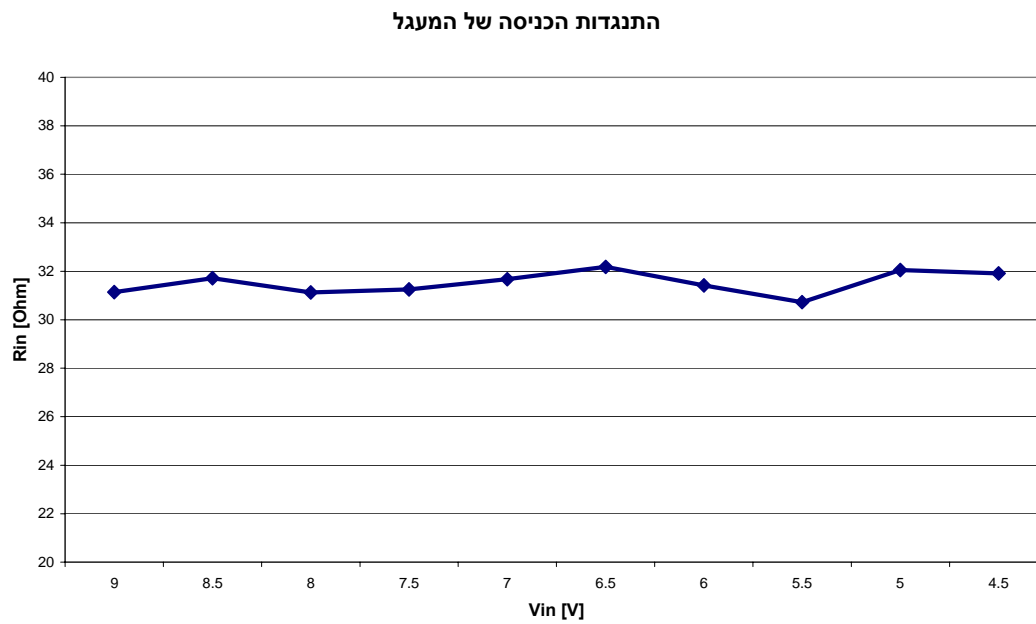
1. DC generator performance

R	I
8.2	440
12	320
18	270
27	260
33	250
39	220
47	190
56	170
68	150
100	120
180	60
330	35

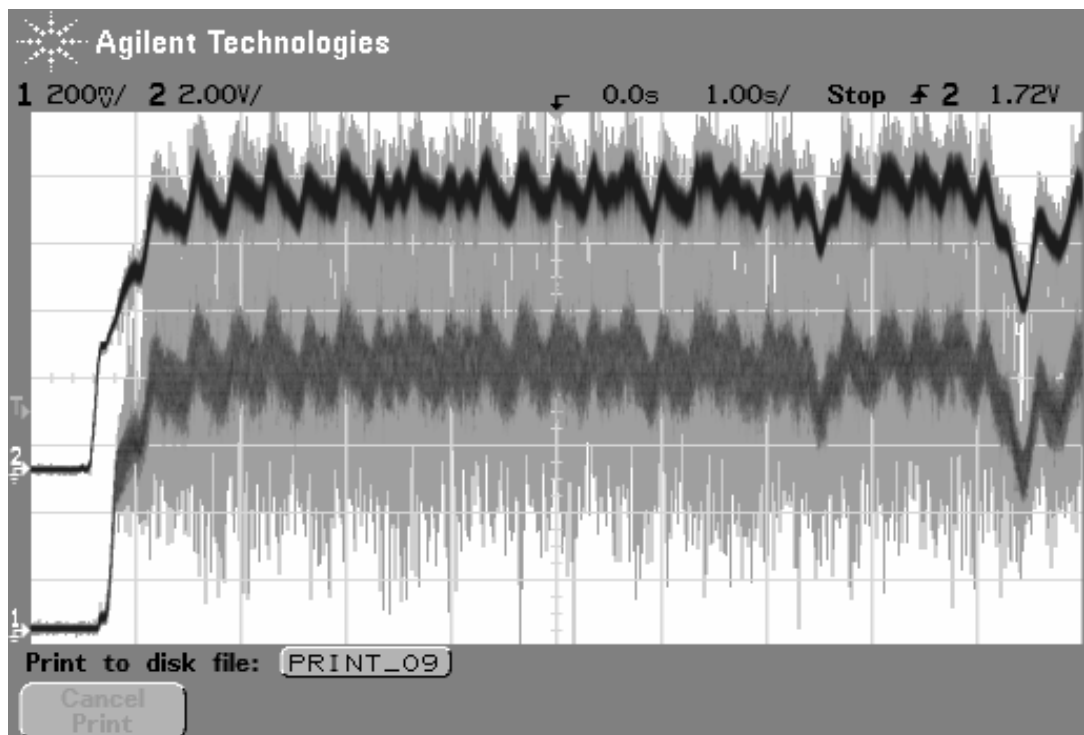
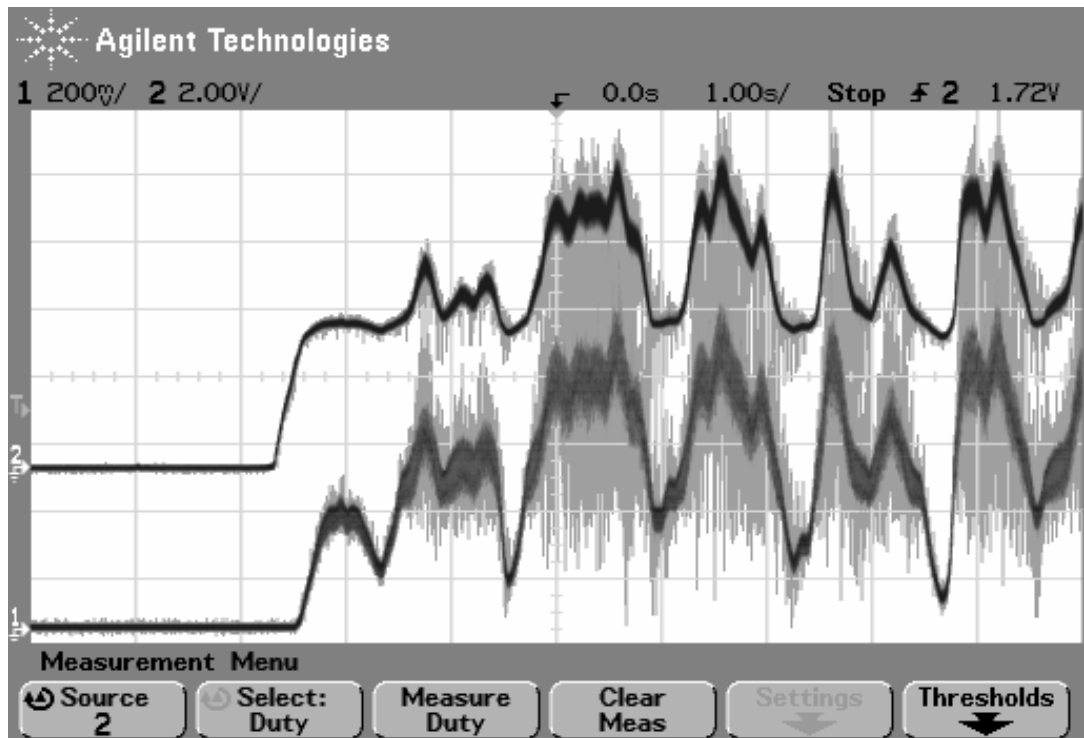


2. The impedance in a different bias point

מתח כניסה של המעגל [Vdc]	זרם הכניסה של המעגל [Idc]	ההתנגדות [Ohm]
9	289	31.14186851
8.5	268	31.71641791
8	257	31.12840467
7.5	240	31.25
7	221	31.67420814
6.5	202	32.17821782
6	191	31.41361257
5.5	179	30.72625698
5	156	32.05128205
4.5	141	31.91489362

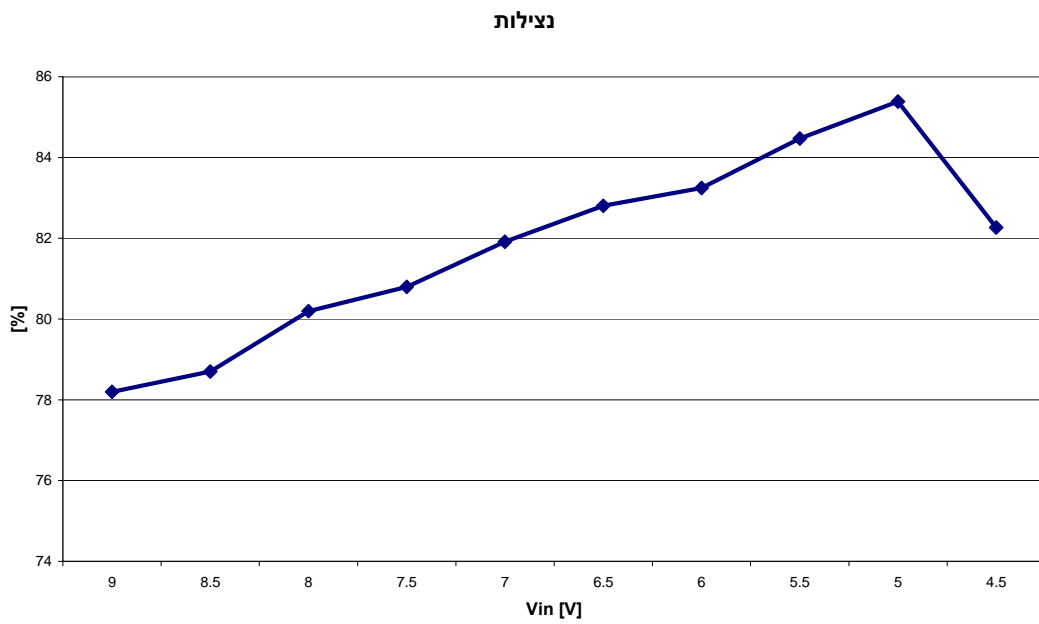


3. Tracking of the circuit after input changes



4. Electric efficiency measurements

מתח כניסה [Vdc]	הספק כניסה [W]	הספק מוצא [W]	הספק מופסד [W]	נצילות [%]
9	2.601	2.034	0.567	78.20069204
8.5	2.278	1.7928	0.4532	78.70061457
8	2.056	1.6488	0.4072	80.19455253
7.5	1.8	1.4544	0.3456	80.8
7	1.547	1.2672	0.2798	81.91338074
6.5	1.313	1.0872	0.2258	82.80274181
6	1.146	0.954	0.192	83.2460733
5.5	0.9845	0.8316	0.1529	84.46927374
5	0.78	0.666	0.114	85.38461538
4.5	0.6345	0.522	0.1125	82.26950355



5. Improvement compared with the original circuit

מתח ספק המתח [Vdc]	נקודת עבודה במעגל שלנו [Vdc]	זרם מוצא של המעגל המקורי [mA]	השיפור בהספק המוצא במעגל שלנו [%]
18	9	325	25.16923077
17	8.5	293	22.37542662
16	8	270	22.13333333
15	7.5	242	20.19834711
14	7	216	17.33333333
13	6.5	186	16.90322581
12	6	159	20
11	5.5	132	26
10	5	104	28.07692308
9	4.5	76	37.36842105

השיפור בהספק המוצא של המעגל שלנו מול המעגל המקורי

