Storage of electrical energy from wind energy with the aid of a rechargeable battery

Task and equipment

Information for teachers

Additional Information

Accumulators exist at different states of charge. Before you begin with the experiment, make sure that the accumulator’s charge is low enough so that the glow lamp does not glow at the beginning of the experiment. If it glows, the accu can be discharged rather quickly via the 6-V-glow lamp. Alternatively, the accumulator may be unloaded to such an extent, that a recharge time of 3 minutes is not enough. In this case the recharge time must be increased.

Notes on the Setup and Procedure

At the beginning, the interruptor of the switching circuit should be opened, because otherwise the wind wheel will visibly be driven by the accumulator. At the end of the experiment it has to be opened again, because otherwise the accumulator will be quickly discharged by the wind generator.

Attention:
It is important to ensure that the students always stand behind the blower and do not reach into the space between the blower and wind wheel while a voltage is applied on the blower and it is turning the wind wheel.

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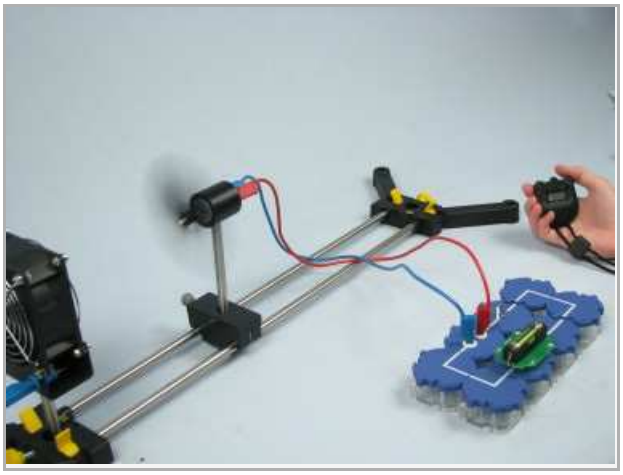
Task and equipment

Task

How can wind energy be stored?

Try to store the energy generated by a wind generator using an accumulator.



Student's Sheet

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Equipment

Position No.	Material	Order No.	Quantity
1	Angled connector module, SB	05601-02	4
2	Interrupted connector module, SB	05601-04	2
3	On-off switch module, SB	05602-01	1
4	Straight connector module, SB	05601-01	1
5	Socket module for incandescent lamp E10, SB	05604-00	1
6	Filament lamps 1.5V/0.15A,E10,10 pieces	06150-03	(1)
7	Ni-MH accus, size AA, 1.3 Ah / 1.2V, 1 pair	07922-03	1
7	Battery holder module (AA type), SB	05606-00	1
8	Blower, 12V	05750-00	1
9	Generator with metrical thread axis and nut	05751-01	1
10	Rotor, 2 pieces	05752-01	1
11	Measuring tape, l = 2 m	09936-00	1
12	Connecting cord, 32 A, 500 mm, blue	07361-04	2
12	Connecting cord, 32 A, 500 mm, red	07361-01	2
13	Digital stop watch, 24 h, 1/100 s & 1 s	24025-00	1
14	Support rod, stainless steel, l = 600 mm, d = 10 mm	02037-00	2
15	Slide mount for optical bench	09822-00	1
16	Support base, variable	02001-00	1
17	PHYWE power supply DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1

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Set-up and procedure

Set-up

Set up the optical bench with the variable tripod foot and both support rods (fig. 1 and fig. 2).

Fig. 1

Fig. 2

Fix the blower in the left part of the tripod-foot so that the side with the connection sockets points away from the optical bench (fig. 3).

Fig. 3

Place both rotors, one after another, on the axis of the generator (fig. 4).
The six blades should be placed equidistant from each other (fig. 5).

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Fig. 4

Fig. 5

Fasten the generator to the rider and put it on the optical bench (fig. 6).
Position the generator in such a way that the distance between the front of the blower and the top of the generator is approximately 10 cm.

Fig. 6

Connect the blower with the connection sockets for DC voltage of the power supply (fig. 7).
The power supply is switched off.

Fig. 7

Set up the electric circuit according to fig. 8.

Open the interruptor and screw the 1.5-V-glow lamp into the bulb socket.

Fig. 9 shows the interruptor in an open state, fig. 10 in a closed state.

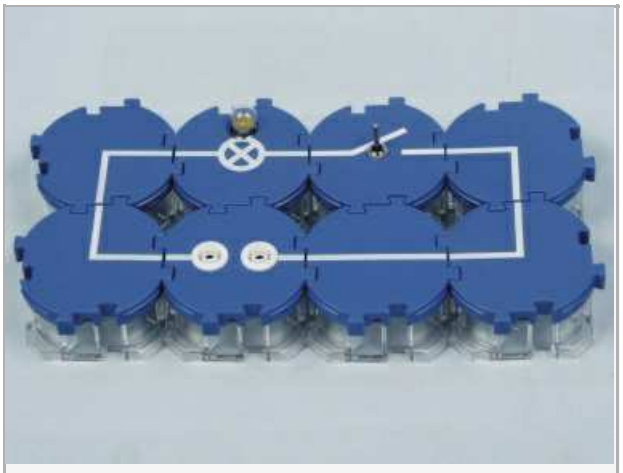

Fig. 8

Fig. 9

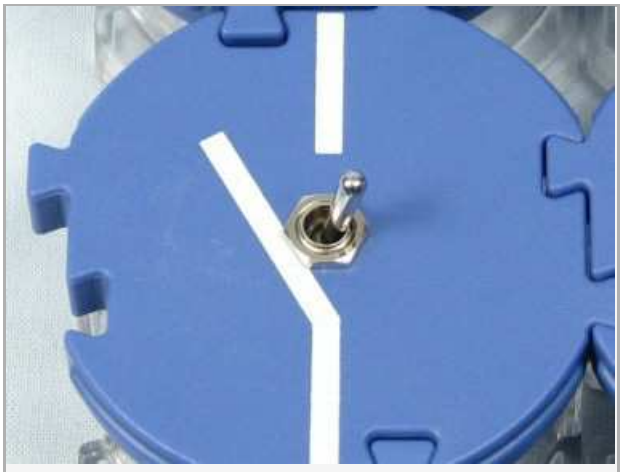

Fig. 10

Put the accumulator in the battery holder, and place them on the interrupted connector module (fig. 11).

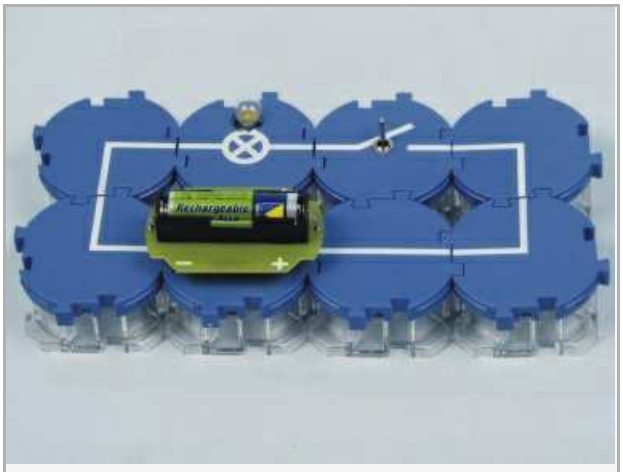

Fig. 11

Procedure

Connect the interruptor in the electric circuit.

Write down in the results section under Result - Observations 1 whether the glow lamp glows or not.

Open the interruptor and replace the lamp module with an interrupted connector module (fig. 12).

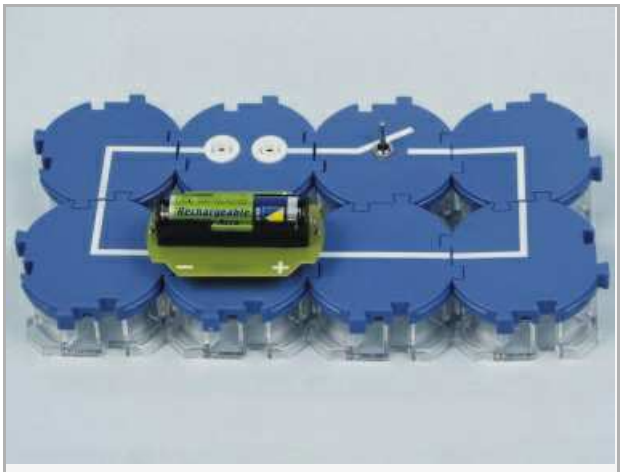

Fig. 12

Connect the generator with the switching circuit (fig. 13).
Make sure that the red connection cord is connected to the positive pole of the battery.

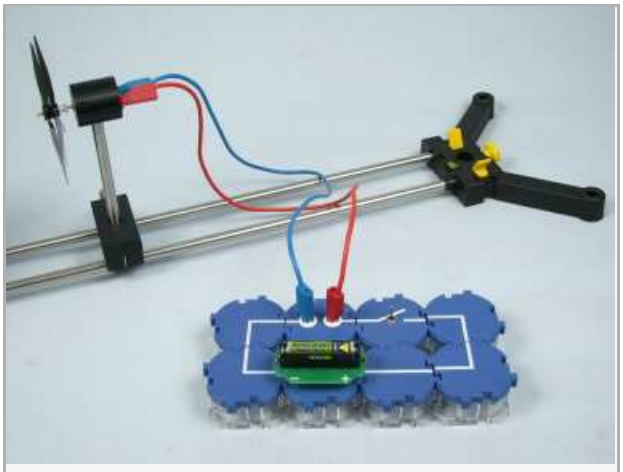

Fig. 13

Switch on the power supply and turn the adjusting knob for the current to the right. Then turn the adjusting knob for the voltage to 12 V (fig. 14).

Fig. 14

Connect the interruptor of the switching circuit and keep track of the time with the stopwatch (fig. 15). Open the interruptor again after 3 minutes.

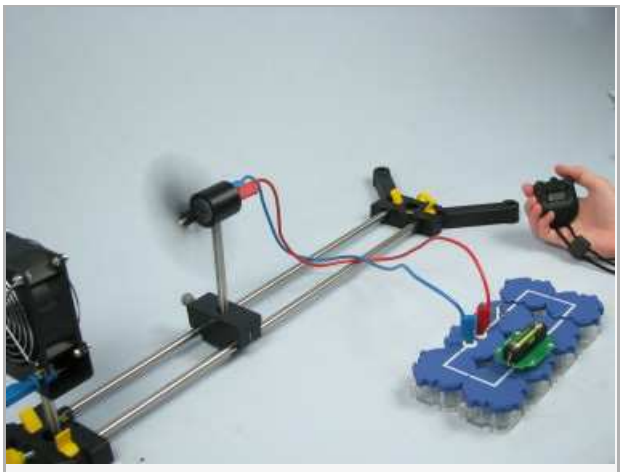

Fig. 15

Switch off the power supply and replace the interrupted connector module once more with the connector module with the glow lamp.
Close the interruptor and write down in the results section under Result - Observations 2 whether the glow lamp lights up or not.

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Report: Storage of electrical energy from wind energy with the aid of a rechargeable battery

Result - Observations 1

Note your observations.

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Result - Observations 2

Note your observations.

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Student's Sheet

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Evaluation - Question 1

Explain the observations noted down in your results under Observations 1. Which statement can you make with regard to the charging state of the Ni-Cd accu?

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Evaluation - Question 2

Explain your observations noted down under Observations 2. Include the charging state of the accumulator in your explanation.

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Evaluation - Question 3

For which purpose could accumulators be applied in the usage of wind energy?

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