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Test of a 25 K. W. Dynamo in Use at the Rhode Island College

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Electricity is divided into two classes, static and current. Of these current electricity is by far the most important, and is fast becoming the source to which we look for our light, heat, and power.

It is produced in two ways; by means of a voltaic cell; and by a dynamo or generator. A battery composed of one or more cells is suitable only where a small current and a low electro-motive force are required; hence it is well adapted for use in call bells, telephones, in running small motors, and in experimental work. The dynamo is used for lighting, running cars or machinery and similar purposes.

The dynamo is a machine for the conversion of mechanical power into electricity. It transforms from one kind of energy to another. The theory of the dynamo is based on the discovery made by Faraday in 1831, that electric currents are generated in conductors when moved in a magnetic field. A simple ideal dynamo would be a loop of wire revolved between the poles of a magnet. Based on this principle, many inventions have been made and improvements added from time to time until we have the complete and useful machine of the present day.

In connection with the dynamo the storage , or secondary battery is becoming more and more important. This battery consists of two lead plates in an electrolyte. As the battery is charged the electrolyte is decomposed and remains in this condition until it is discharged, when the action goes on in the opposite direction ant the liquid regains its original form. The value of the battery lies in the fact that it can be charged at any time, as when running the dynamo for lighting in the evening, thus avoiding the necessity of keeping steam on the boilers and starting the engine when the current is desired for only a short time.

There are two types of dynamos: those furnishing an alternating current, or--as it is sometimes called--an oscillating current; and those which give a direct, or steady current. The latter kind is in general use in small plants and it was on one of this type that the test was made.

In the study of a dynamo a few of the important points to be noticed are: The kind of dynamo, whether direct or alternating, normal speed, electro-motive force and current for which it is constructed, external resistance, current and watts at full load, horse power required to drive it at full load assuming an efficiency of 80%, particular uses for which it is adapted.

Style of field, form, material and construction, the winding whether series shunt or compound, size of wire, field current at normal potential , watts lost in heating, field coils at normal excitation.

Type of armature, number of coils, resistance of armature circuit between brushes, percentage of armature covered by pole pieces, connection of coils to commutator bars, kind and proper position of brushes, means of regulation.

Tests applied to dynamos and motors are of two kinds; those which relate to the design and construction, including tests for magnetic leakage resistance, insulation etc.; those which relate to efficiency and working capacity, including tests for horse power expended and electrical output. The indicator brake and dynamometer are the most common methods of ascertaining the horse power.

The dynamo on which this test was made was an Eddy, four pole, compound wound, direct current generator manufactured by the Eddy M'f'g Co., Windsor, Conn. The machine was designed for a speed of 850 revolutions per minute, a potential of 125 volts, and a capacity of 200 amperes. The armature is of the drum type made up of copper bars held in place by bands of wire. The commutator is composed of 87 copper segments through which connections are made about fourteen times per second.

The test occupied three hours, readings of the various instruments being recorded every ten minutes during the run. The instruments employed were a Weston direct reading volt-meter, registering on three scales, thus enabling fractions of a volt to be read with accuracy, a direct reading Weston am-meter; and a direct reading Weston mil-am-meter for determining small fractions of an ampere. Each set of six readings was averaged and results computed from these figures obtained, thus giving the efficiency of the machine under various conditions. The data and results are recorded in a concise form as follows.

Data and results of Efficiency test.

Test of 25 K. W. Dynamo.

Date of test, April 10, 1899. Duration of run, 3 hours.

Kind of dynamo, Eddy 4 Pole Direct current.

Field, Compound wound.

Armature, Drum type.

Commutator segments, 67.

Resistence of armature: cold, .516 ohms; hot, .885 ohms.

" " series field, cold, .00406 ; " .00757 .

" " shunt field " 38.61 ; " 45.85

Extra resistance in shunt field circuit, 40 ohms.

External resistance, .55 ohm

Temperature of armature before run, 26°C. ; of room, 26°C.

" " " at end of run, 40°C.; of room, ~~40~~ 26°C.

Current: in armature, 107 ; in shunt field, 2.25

" in external circuit, 107 ; in series field, 107.

Potentials at terminals, 113 ; Revolutions per min, 950

Computed Results.

Electrical power, external (W_E.) 11752.

" " in self-excited series field, 11752.

" " " " shunt " 254. 25

" " " armature, 11752.

Total electrical power, ($W_{T.E.}$) 12006.25.

Electrical efficiency at light load was found to be 70%, at heavy load 81%.