École affiliée IMT

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Cycle Initial en Technologies de l'Information de Saint-Étienne

REPORT TP ENER
DC MOTORS

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1. Abstract

We'll be studying DC Motors both in a configuration with and without a load in an attempt to better understand the principles that tie the theory translated by formulas to their direct implication in a laboratory setting.

2. No-Load Experiment

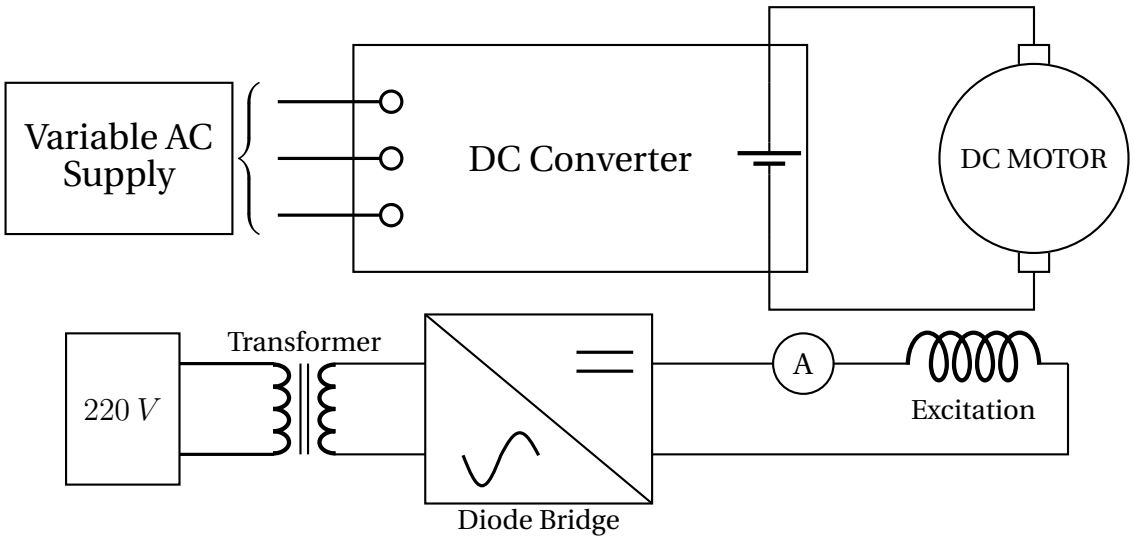


Figure 2.1. No-Load Circuit Configuration

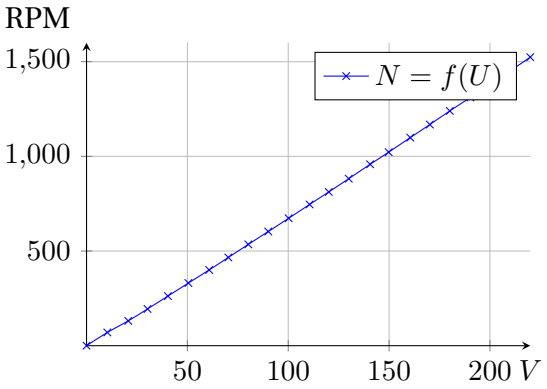


Figure 2.2. RPM according to the potential difference delivered

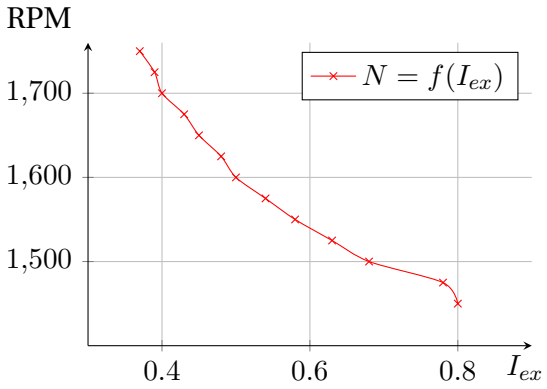


Figure 2.3. RPM according to the excitation current

On our first graph we can conclude that when the excitation current is held at constant value the only factor influencing the speed of our motor is the potential difference delivered to it directly.

On the second, with the potential difference being at the nominal voltage, the factor that influences the speed of the motor is the excitation current which as it diminishes accelerates the motor.

Therefore when looking for a safe and reliable way to modify the speed of a motor, it is preferred to simply regulate the voltage input since a bigger deviation is needed to adjust the rotor's speed. If it is modified using the excitation current there is a bigger risk of potentially destroying the motor as anything so much as a slight nudge can speed the motor beyond safe speed.

3. Loaded Experiment

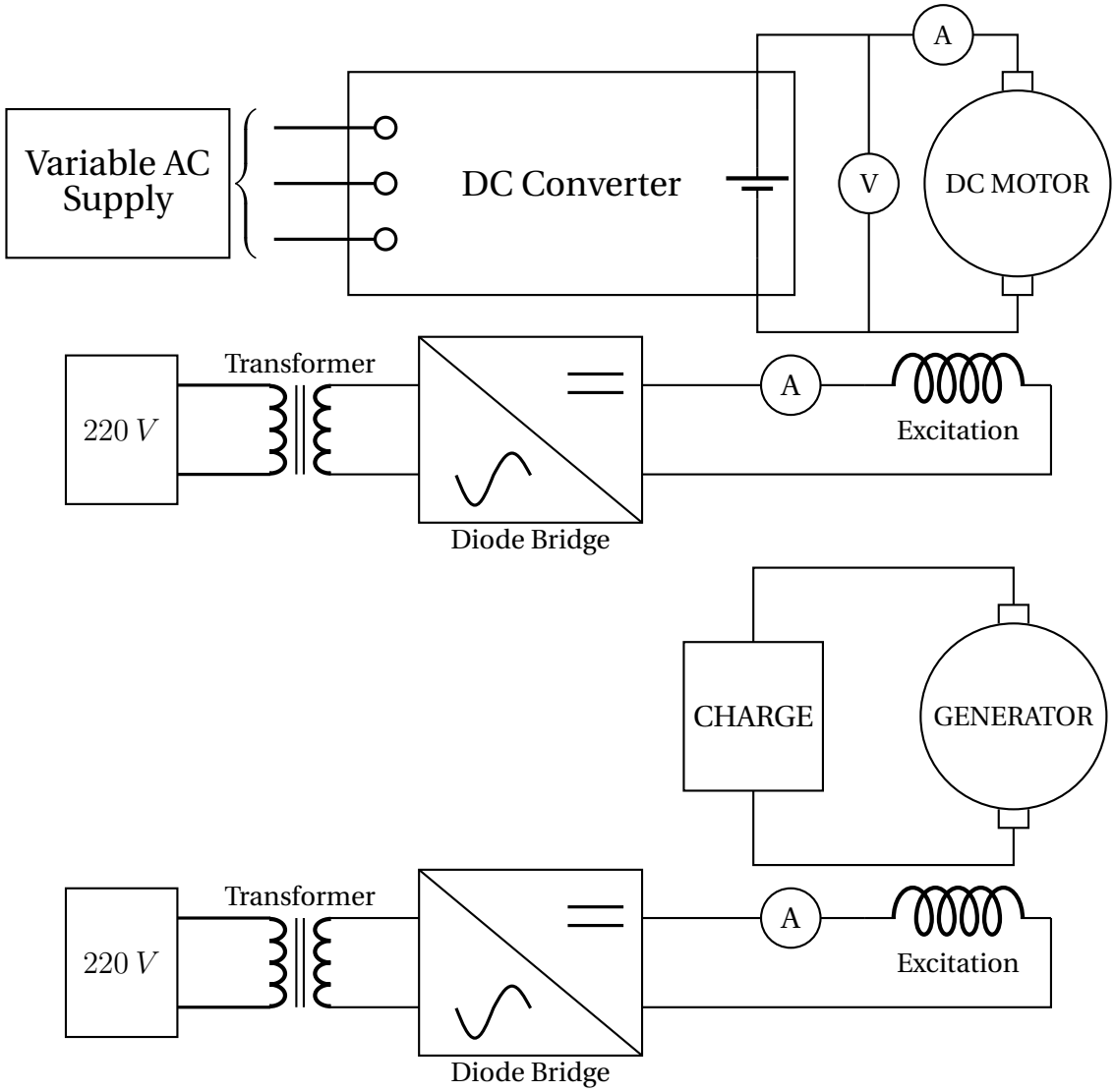
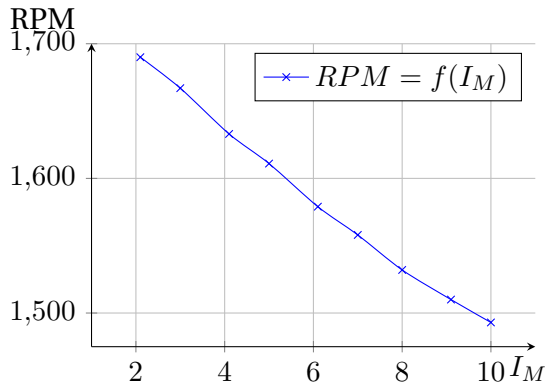
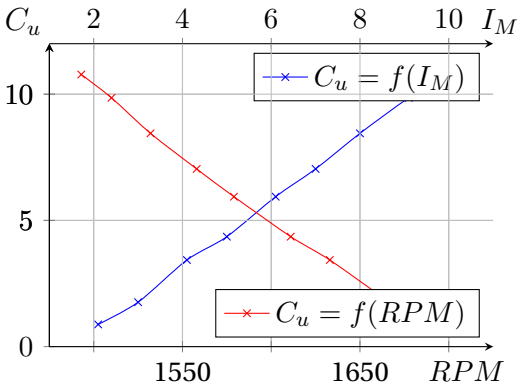


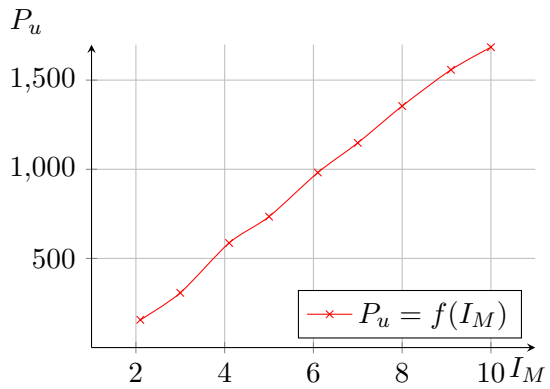
Figure 3.1. Loaded Circuit Configuration

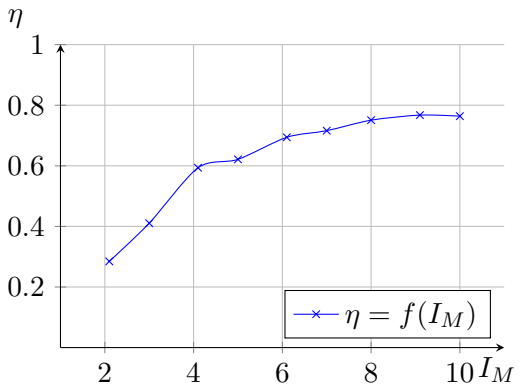
After having set the excitation current and the potential difference across the motor to its nominal value, we'll steadily be increasing the excitation current to the generator until the motor is feed $10\ A$ of current. Following this procedure we'll tweak the current excitation of the motor in order to have $1500\ RPM$

3.1. Extracted Data









As we can see by judging the slopes of these different curves, everything is proportional, with the exception of the efficiency of the motor which decreases as the intensity to the motor is decreased.

This proportionality is unsurprising when compared to its respective formula, and so is the sharp decrease of the efficiency since as the latter decreases the speed of the rotor increase, thereby generating more mechanical losses as it accelerates.