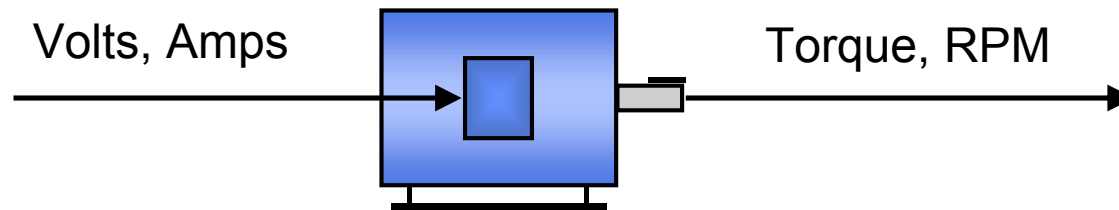
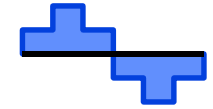


Power Conversion

Definition

- Power conversion is a change in which there is a change in physical parameters that describe the power.
 - For example, an electric motor converts electrical power to mechanical power.
 - Power that is described in terms of electrical parameters, volts and amps, is converted to power that is described in terms of mechanical parameters, torque and RPM.

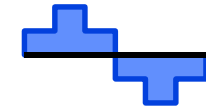




Power Conversion

Fixed Power Conversion

- With fixed power conversion there are a fixed conversion constants that describe the relationship between the parameters describing the input power and the parameters describing output power of the conversion process.

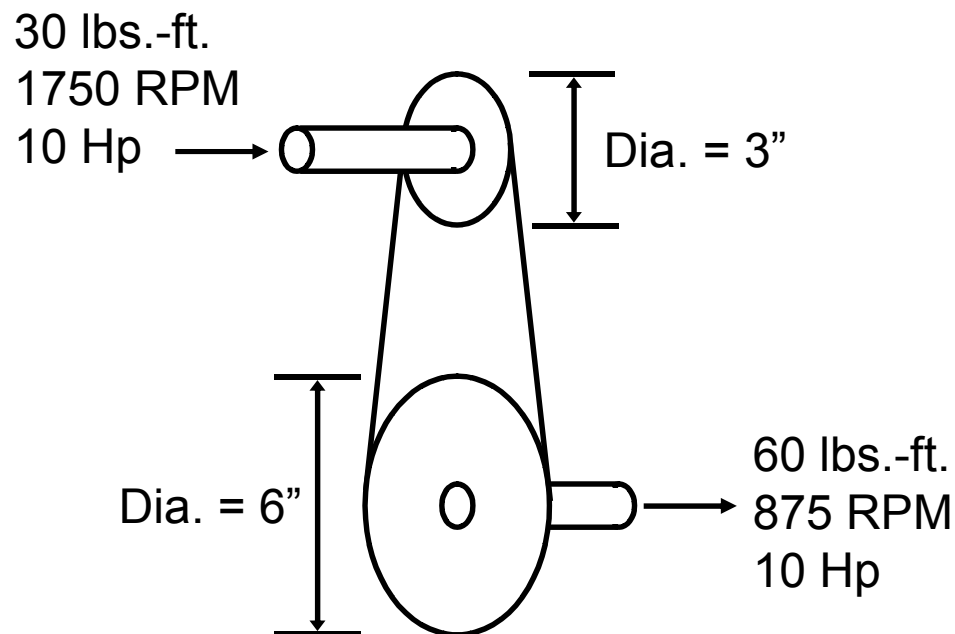


Power Conversion

Fixed Power Conversion

- Mechanical Speed Changer

≡ A mechanical speed changer such as a gearbox or a set of pulleys performs a conversion from mechanical power to mechanical power with a fixed ratio of speeds and torques between the input shaft and the output shaft.

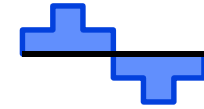


Conversion Constants

(neglecting losses)

$$\text{RPM}_2 = \text{RPM}_1 \times D_1/D_2$$

$$\text{Torque}_2 = \text{Torque}_1 \times D_2/D_1$$

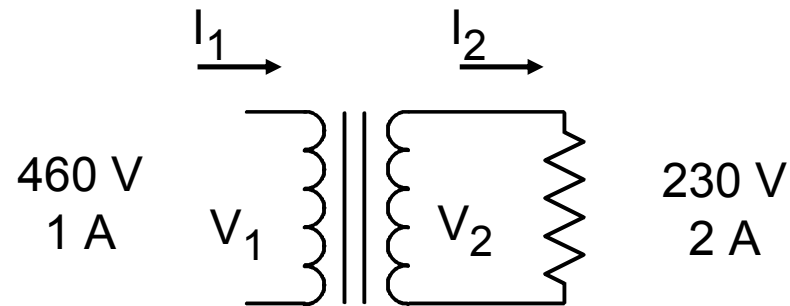


Power Conversion

Fixed Power Conversion

- Electrical Power Transformer

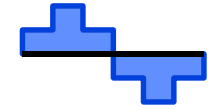
≡ An electrical power transformer converts electrical power to electrical power with a fixed ratio of voltages and currents between the input terminals (primary) and the output terminals (secondary).



Conversion Constants (neglecting losses)

$$V_2 = V_1 \times T_2/T_1 \text{ and } I_2 = I_1 \times T_1/T_2$$

where T_2/T_1 is the secondary/primary turns ratio



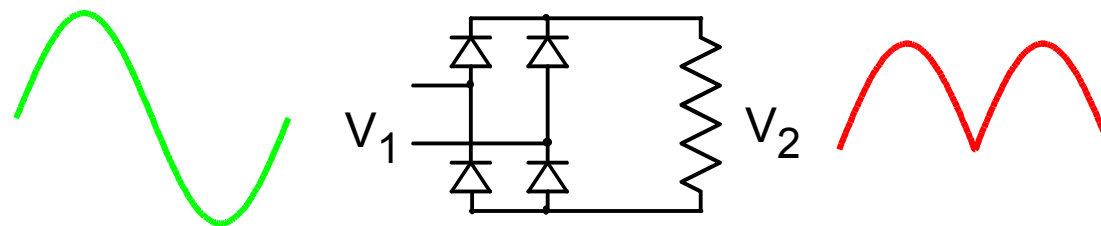
Power Conversion

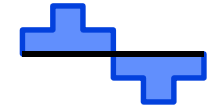
Fixed Power Conversion

- Electrical Power Rectifier

≡ A rectifier changes alternating current power to direct current power.

≡ The conversion process is a little more complicated, but the process is essentially described by fixed conversion constants, as were the previous examples.

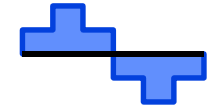




Power Conversion

Adjustable Power Conversion

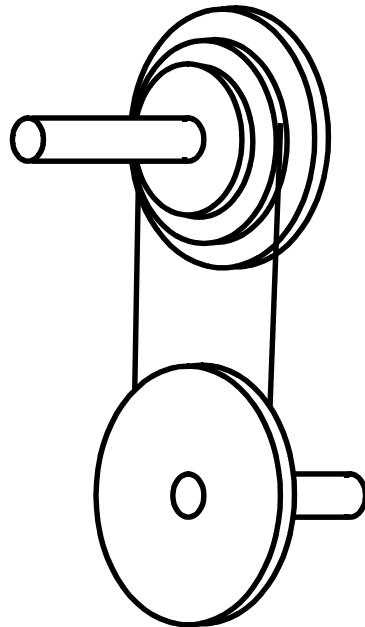
- With adjustable or controlled power conversion, power is converted from one form to another with adjustable conversion constants.

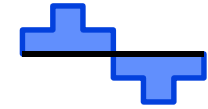


Power Conversion

Adjustable Power Conversion

- Mechanical Speed Changer with Adjustable Speed Ratio

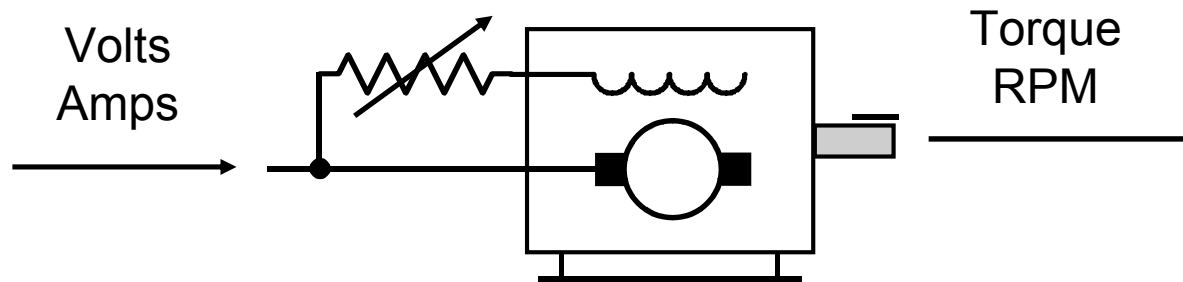


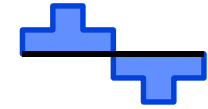


Power Conversion

Adjustable Power Conversion

- DC Motor with Adjustable Field Excitation





Power Conversion

Power Conversion and Adjustable Speed Drives

- Adjustable speed drives are types of adjustable power conversion equipment as several of the previous examples illustrated.
 - Adjustable speed drives utilize one or more conversions of power
 - ≡ Electrical power to electrical power
 - ≡ Electrical power to mechanical power
 - ≡ Mechanical power to mechanical power
 - ≡ One or more of the stages of power conversion have adjustable conversion constants.
 - Engines convert heat to mechanical power and provide some degree of speed adjustment in the heat to mechanical power conversion.
 - ≡ Although engines may compete with electric drives in some situations, they will not be discussed here.