Applications of dc series motors

INTRODUCTION:

WHAT IS ELECTRIC MOTOR?

Anelectric motor is a device using electrical energy to produce mechanical energy, nearly always by the interaction of magnetic fields and current-carrying conductors. The reverse process, that of using mechanical energy to produce electrical energy, is accomplished by a generator or dynamo. Traction motors used on vehicles often perform both tasks. In principle, all electric motors can run as generators and vice versa, although that is not practical with all types in all applications. As a convention the termelectric engineis not used for electric motors, but instead refers to a railroad electric locomotive.

Electric motors are found in a myriad of applications such as industrial fans, blowers and pumps, machine tools, household appliances, power tools, and computer disk drives, among many other applications. Electric motors may be operated by direct current from a battery in a portable device or motor vehicle, or from alternating current from a central electrical distribution grid. The smallest motors may be found in electric wristwatches. Medium-size motors of highly standardized dimensions and characteristics provide convenient mechanical power for industrial uses. The very largest electric motors are used for propulsion of large ships, and for such purposes as pipeline compressors, with ratings in the thousands of kilowatts. Electric motors may be classified by the source of electric power, by their internal construction, and by application.

The principle:

The principle of conversion of electrical energy into mechanical energy by electromagnetic means was demonstrated by the British scientist Michael Faraday in 1821 and consisted of a free-hanging wire dipping into a pool of mercury. A permanent magnet was placed in the middle of the pool of mercury. When a current was passed through the wire, the wire rotated around the magnet, showing that the current gave rise to a circular magnetic field around the wire This motor is often demonstrated in school physics classes, but brine (salt water) is sometimes used in place of the toxic mercury. This is the simplest form of a class of electric motors called homopolar motors. A later refinement is the Barlow's Wheel. These were demonstration devices only, unsuited to practical applications due to their primitive construction

TYPES OF ELECTRIC MOTORS:

1. AC MOTORS

2. DC MOTORS

- SERIES MOTORS
- SHUNT MOTORS
- COMPOUND WOUND MOTORS

DC Motors:

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homopolar motor (which is uncommon), and the ball bearing motor, which is (so far) a novelty. By far the most common DC motor types are the brushed and brushless types, which use

internal and external commutation respectively to create an oscillating AC current from the DC sourceso they are not purely DC machines in a strict sense

Series Wound:

The series wound motor has only one voltage supply to the motor and the field winding is connected in series with the rotor winding.

Universal Motors or Series wound:

In a series wound DC motor, reversing either the field winding leads or the rotor winding leads will reverse the direction of the motor. However, simply reversing the leads from the power supply will have no effect on the direction of rotation since it is equivalent to reversing the current through both the individual windings – in effect a double reversal. In other words the motor will turn in the same direction even though the current through the series windings is reversed. This means that the motor can run on alternating current as well as direct current since the direction of rotation is independent of the direction of the current through the series windings. Universal motors are often used in power tools and household appliances such as vacuum cleaners and food mixers.

Characteristics:

- The series motor has poor speed regulation. It delivers increasing torque with increased motor current but this is at the expense of speed which falls with increasing torque demands.
- This motor has a very high starting torque because there is zero back EMF at zero speed however as the speed builds up so does the back EMF causing a reduction in torque.

Increasing the load on the motor tends to slow it down, but this in turn lowers back EMF and increases the torque to accommodate the load.

- Speed control is possible by varying the supply voltage.
- Under no load conditions the speed will accelerate to dangerous levelspossibly causing destruction of the motor. The motor can be reversed by reversing the connections on either the field or the rotor windings but not both.
- Regenerative braking is not possible since the field current needs to be maintained but it collapses when the rotor current passes through zero and reverses.

Applications:

- It is a variable speed motor i. e. very low speed at high torqe and vice versa. However at no load motor tends to occupy dangerous speed. The motor has a very high starting torque. So it is used for :
    - The series DC motor is an industry workhorse for both high and low power, fixedandvariable speed electric drives.
    - Applications range from cheap toys to automotive applications.
    - They are inexpensive to manufacture and are used in variable speed household appliances such as sewing machines and power tools.
- Its high starting torque makes it particularly suitable for a wide range of traction applications.
- Industrial uses are hoists, cranes, trolly cars, conveyors, elevators, air compressors, vacuum cleaners, sewing machines etc.

This is just an introduction to my term paper and it will be explained in final term paper.