International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 06 | June - 2022 Impact Factor: 7.185 ISSN: 2582-3930

Speed Synchronization of Multiple Motors in Industries

MR. Vijay Patil (Asst.Prof.DIET Satara) , Vaishnavi chikane (B.Tech Electrical)
Sanket Shinde (B.Tech Electrical) , Gauri Salave (B.Tech Electrical) , Vijay Shinde (B.Tech Elctrical)
Department Of Electrical Engineering,Dr.Babasaheb Ambedkar Technological University,Lonere.

Abstract:-

In various industries speed synchronization of the motor plays most important role. Mainly, in textile industries, paper industries the differential speed error leads to much consumption power. In industries many processes required speed synchronization of more than one motors involved in the process. Speed control of motor is very important specially in the fields including industrial application, etc. Speed synchronization is very essential in these all operation to avoid damage to the product. The synchronization is done by using microcontroller chip which controls the master slave whose speed is followed by the other motors which all have to be synchronized. The synchronization is done by using microcontroller chip one motors act as transmit tter and others motors acts as a receiver. The aim of this project is synchronization of multiple motors using wireless technology.

Keyword's:-

Microcontroller,Speed synchronization, BLDC motor,electronic speed controller

Introduction:-

The synchronization speed is the speed of the revolution of the magnetic field in the stator winding of the motor. It is the speed at which the electromotive force is produced by the alternating machine. In this project motors are wirelessly synchronized to make the differential speed error among multiple motors to zero. One motor acts as transmitter and other motors act as receivers. so, if a particular speed is set in the transmitter then automatically the receiver sides of the motors speed would be matched to the same speed of the transmitter. A LCD display connected with the module will display the full speed in rpm and the observer can enter the required percentage with help of a keypad. The pulse width output from the microcontroller would be automatically adjusted by the microcontroller to maintain the DC power to the motor such that the entered speed percentage matches the running RPM. The above operation is taken care by using electronics speed controller connected to BLDC motor.

The aim of this project is synchronization of multiple motor System by making use of wireless technology. This project uses radio frequency to synchronize different motors speeds. This system is used in many industries like textile mills, steel plants, robotics and paper plants where large numbers of the motors used on conveyor are desired to be synchronized for performing certain task. In paper mills & textile mills where multiple motors work together on a conveyor belt to draw clothes, belt can be difficult to clean and generally does not leave a very successful result. Manpower and time is also saved in this arrangement. User can set the speed on transmitter motor. As this system is Wireless, it is easy to operate and control the system. The speed synchronization of multiple motor arrangements is very important task which is wirelessly by using microcontroller chip. Due to wireless connection between the motors the motors can be kept in any position it is not necessary as earlier old concept of conveyor belt.

Thus, if a particular speed is set in the transmitter then all other motors speed would be matched to the same speed of the main motor. The mode of communication is radio frequency. BLDC motors used operate on the basis of PWM control. Each motor has a closed loop feedback mechanism providing RPM reference by a shaft mounted IR sensor arrangement whose output is fed to the controller in the circuit. A display unit displays the full speed and one can enter the desired percentage with help of a keypad to obtain the required speed for all the motors.

Literature review :-

[1] Mohamed S. Zaky says that PI controller gains are the adjustable parameters and depending on the speed error that will be updated online. PI controller gives a high degree of accuracy in the presence of external disturbance. PI controllers is not simultaneously meeting good step reference tracking and also not provide good load torque rejection as well as it gives slow response large overshoots and oscillations.
[2] Xiaoyuan Zhu implemented integrated motor transmission power train system in which driving motor and multigearbox is directly connected. Controller Area Network (CAN) is used in that system with random delays in both feedback and forward channel and the speed synchronization is done and motor speed is control.
[3] Ganiyu, R. A proposed that the motor speed control system requires a closed loop real time system where a very high optical encoder is connected to motor shaft and provide a feedback signal through micro controller. Microcontroller is acts as a proportional controller
[4] Prof. R.V. Katre discussed that in textile industry many processes required speed synchronization of more than one motors involved in the process. Speed control of motor is very important especially in the fields including industrial applications, robotics, textile mills, etc The synchronization is done by using microcontroller which acts as the master slave and control the speed whose speed is followed by the other motors which all have to be synchronized.

Proposed System :-

In our speed synchronization project, we use PIC16F877A micro-controller has been used. RF communication technology for wireless communication. We can program microcontroller to control its speed and also can set the required speed through keypad to get our work done. Motor drive (ULN) is used to operating the BLDC motor. MPLAB software coding has been used for controlling the speed of the motor. The required speed is entered using a keypad which is interfaced with microcontroller. Lcd which is used to display the speed.The wireless control of a BLDC Motor involves the design and implementation of microcontroller based control unit to use RF (radio frequency) to wirelessly control a BLDC Motor.It was the first practical device to convert electrical power into mechanical power.The successful design and implementation of the Wireless BLDC Motor control will enable the wireless supervision of robots and machines that utilize BLDC Motors.
An RF transmitter module is a small PCB sub-assembly capable of transmitting a radio wave and modulating that wave to carry data. Transmitter modules are usually implemented along side a micro controller which will provide data to the module which can be transmitted.
An RF receiver module receives the modulated RF signal, and demodulates it. There are two types of RF receiver modules: super hetero dyne receivers and super-regenerative receivers Super-regenerative modules are usually low cost and low power designs using a series of amplifiers to extract modulated data from a carrier wave. Super-regenerative modules are generally imprecise as their frequency of operation varies considerably with temperature and power supply voltage. Super heterodyne receivers have a performance advantage over super-regenerative; they offer increased accuracy and stability over a large voltage and temperature range.

Block Diagram:-

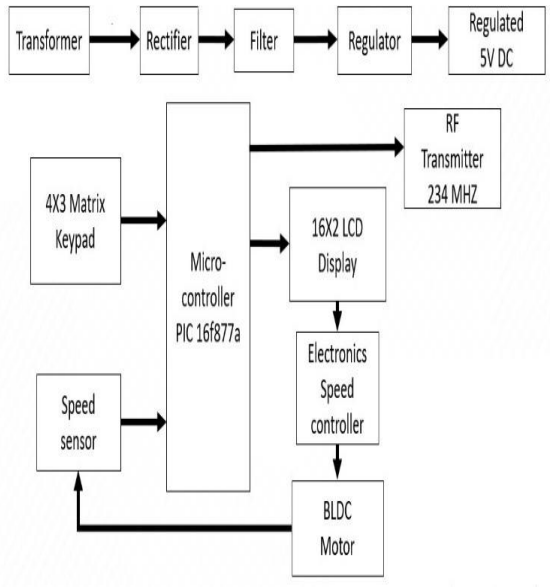


Fig:1 Block diagram of transmitter

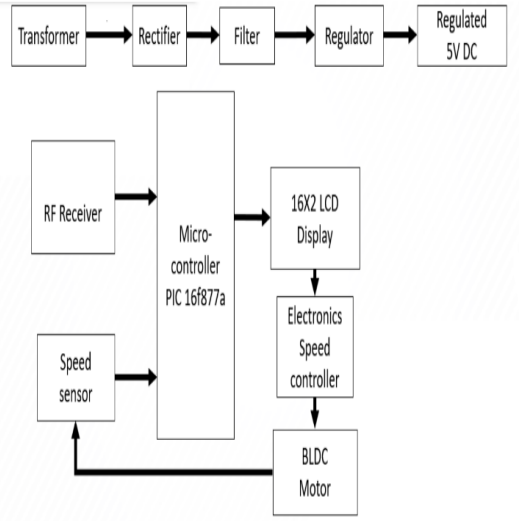
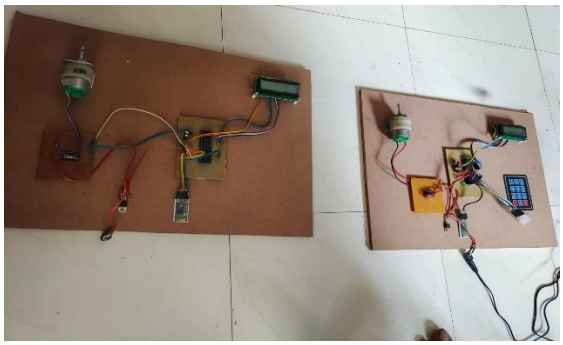
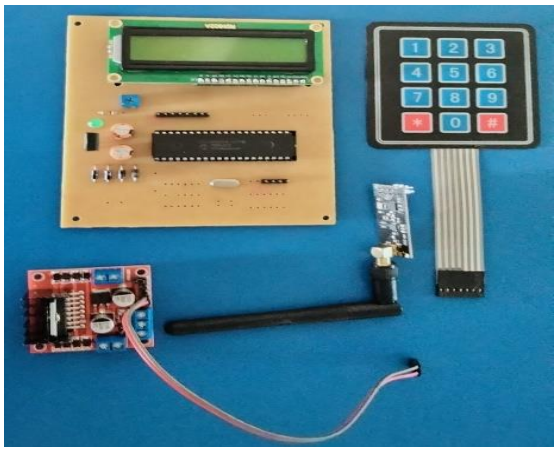


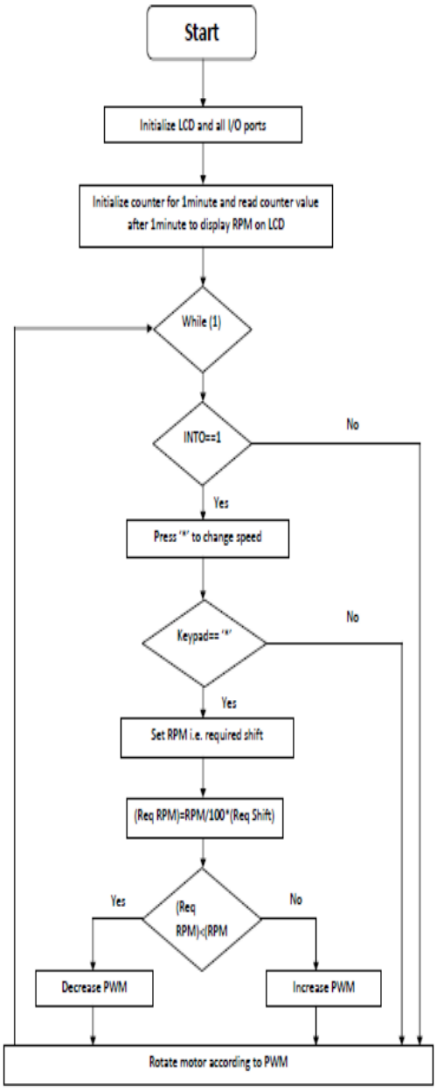
Fig:2 Block diagram of receiver

Hardware Module :-





Flow chart diagram:-



Observation Table:-

Sr. No	Transmitter motor Speed (rpm)	Receiver motor Speed (rpm)	Speed Measure Using tachome -ter
1	45	45	45
2	70	70	70
3	175	175	175
4	215	215	215
5	250	250	250

Conclusion:-

We can tabulate different-different speeds of motor as we keep on giving input from the Keypad and same speed change can be observed and displayed at the receiving motors. From this project we can successfully control the speed of multiple motors wirelessly through RF communication. Whatever the percentage of speed that we enter at transmitter unit of system same can be observed at the receiving motors. The whole operation is made simple by using this technology. The future works include giving intelligence to the whole system like if any of the motor senses any fault, the whole system will shut down.

References:-

[1] Perez-Pinal, Nunez, C., Alvarez, R., Cervantes, I., "Comparison Of Multi- Motor Synchronization Techniques Industrial Electronics Society", 30th Annual Onference Of Ieee Volume: 2, Pp 1670 – 1675, Vol. 2 23, May 2005'

[2] Ashab Mirza, Dr. Sarfraz Hussian, "D.C. Motor Speed Synchronization In Non Linear Process By Selective State Feedback & Integral Control", Pakistan Navy Engg. College, National University Of Sciences & Technology (Nust), Jauhar, 13th April 2001.

[3] K. Boudjit, "Real-Time Digital Control Using Dsp Of A Multiple Motors System", Journal Of Electrical Systems Special Issue No. 01, 2009.

[4] Fang He, Weiming Tong, Qiang Wang, "Synchronization Control Strategy Of Multi-Motor System Based On Profibus Network". Vol; 1, Pp 3029 – 3034, 08 October 2007

[5] Bhim Singh, Sanjeev Singh, State of the art on permanent magnet brushless DC motor drivers.Journal of Power Electronics, 9 (1) (2009), pp. 3–17