A Thesis on

"HOW DO SAVE ENERGY BY CONTROLLING MOTOR"

A Project and Thesis submitted in partial fulfillment of the requirements for the Award of Degree of Bachelor of Science in Electrical and Electronic Engineering

Prepared By

Saiful Alam Khan

ID: 162-33-294

K M Tauhidul Jannah

ID : 162-33-305

Supervised By

Md. Ashraful Haque

Assistant Professor

Department of EEE

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FACULTY OF ENGINEERING

DAFFODIL INTERNATIONAL UNIVERSITY

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Certification

This is to certify that this project and thesis entitled "**HOW DO SAVE ENERGY BY CONTROLLING MOTOR**" is done by the following students under my direct supervision and this work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering. The presentation of the work was held on 31 October 2019.

Signature of the candidates

_____

Name: Saiful Alam Khan
ID #: 162-33-294

_____

Name: K M Tauhidul Jannah

ID #: 162-33-305

Countersigned

_____

Md. Ashraful Haque

Assistant Professor

Department of Electrical and Electronic Engineering

Faculty of Science and Engineering

Daffodil International University.

The project and thesis entitled **"How Do Save Energy By Controlling Motor,"** submitted by : Saiful Alam Khan and K M Tauhidul Jannah. ID No: 162-33-294, 162-33-305, Session: Summer 2016 has been accepted as satisfactory in partial fulfillment of the requirements for the degree of **Bachelor of Science in Electrical and Electronic Engineering**.

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List of Abbreviations

VFD	Variable Frequency Driver
AC	Alternating Current
PLC	Programmable Logic Controller
DC	Direct Current
MOSFET	Metal Oxide Semi-conductor Field Effect Transistor
IGBT	Insulated Gate Bipolar Transistor
RTD	Resistance Temperature Detector
SPDT	Single Pole Double Through
PT	Pressure Transmitter
V	Voltage
A	Ampere
mA	Millie Ampere
KW	Kilo Watt
KWh	Kilo Watt Hour
EMF	Electromotive Force

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ABSTRACTS

This Thesis is on "**How Do Save Energy by Controlling Motor**" Electricity power is basic we can't think our cutting edge existence without power. Power is one of the most significant elements for better monetary development and individuals' life in our nation. Following quite a while of reliance on local flammable gas, we get ourselves not furnished with adequate vitality assets in our territory, and will progressively depend on imported powers. Additionally, we are very much aware that the utilization of fossil vitality expands Greenhouse Gas emanation, which quickens an unnatural weather change and causes environmental change, and endures our nation by common disasters. Power proficiency and sparing is a cross-cutting issue for every one of the individuals. In this nation there is a huge hole between power age and request. In this exploration paper we talk about how to spare power by controlling engine as per weight and temperature.

Chapter 1

Motor

1.1 Introduction:

After the create of DC electrical appropriation framework by Thomas Alva Edison in the United States, a continuous progress to the more practical AC framework initiated. The lighting filled in also on AC as on DC. Transmission of electrical vitality is secured a more drawn out separations at lower misfortune with substituting flow. Air conditioning engines are brushless and build up a superior torque. The speed and the power created can be shifted with the guide of a controller. They can work at higher voltages henceforth diminishing the size of wire. Since there is no commutator, there are no brushes henceforth no starting. Poly stage enlistment engines are typically utilized for better.

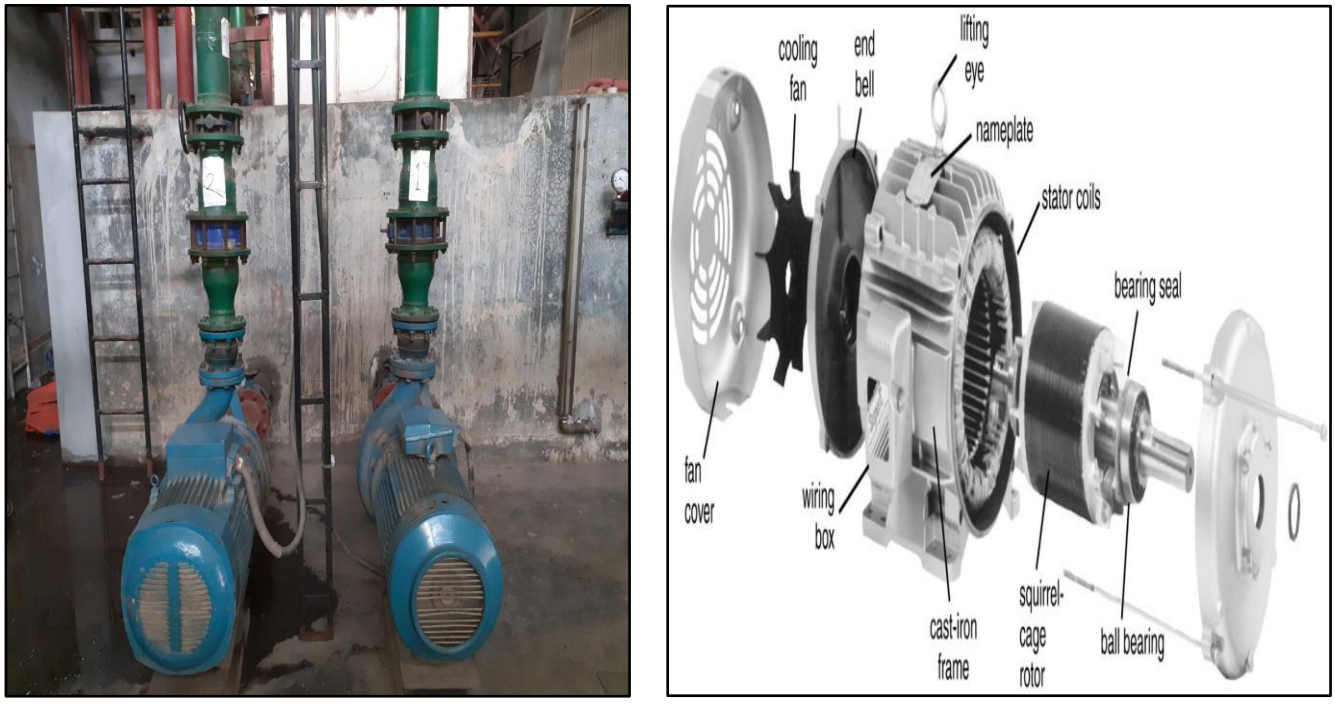


Figure 1.1: Three phase induction motor construction

1.2. Why Use Starter

An enlistment engine is a lot of like a poly-stage transformer whose optional is short circuited. In this way, at ordinary stockpile voltage, as in transformers, the underlying current taken by the essential is enormous for a brief span. Not at all like in DC engines, huge current at beginning is because of the nonattendance of back emf. On the off chance that an enlistment engine is legitimately turned on from the inventory, it takes 5 to multiple times its full burden current and builds up a torque which is just 1.5 to 2.5 occasions the full burden torque. This huge beginning current creates an enormous voltage drop in the line, which may influence the activity of different gadgets associated with a similar line. Thus, it isn't fitting to turn over enlistment engines of higher appraisals (for the most part above 25kW) straightforwardly from the mains supply. The thing that matters is the delicate starter is basically a mechanical delicate beginning. You lessen the voltage and farthest point the current to facilitate the mechanical anxieties related with engine turning over. You do can possibly lessen the current related with beginning.

Chapter 2

Variable Frequency Driver

2.1 Introduction

Variable Frequency Drive or VFD is the manner in which that empowers controlling of the speed of enlistment engine by applying differing recurrence of AC supply voltage. By controlling the yield AC recurrence, it is conceivable to drive the engine at various velocities dependent on the prerequisites. These are flexible speed drive to a great extent utilized in modern applications, for example, siphons, ventilation frameworks, lifts, machine apparatus drives and so forth It is basically a vitality sparing framework. Consequently the principal prerequisite is to produce sine wave with various recurrence for VFD.

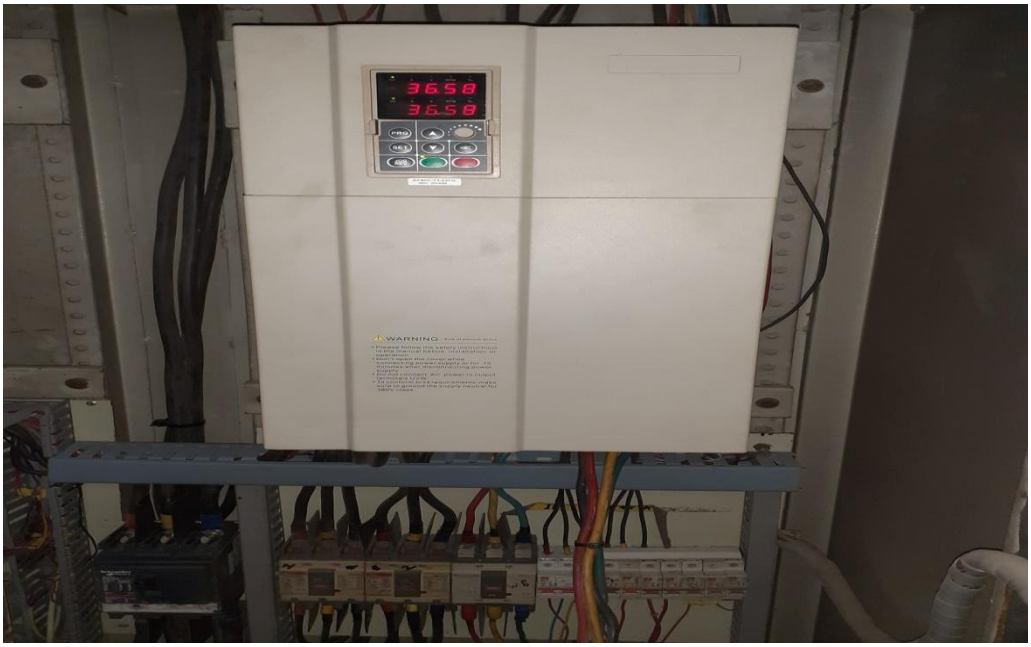


Figure 2.1: Variable Frequency Drive

2.2 Why Use Variable Frequency Driver?

VFDs are used in applications where

1. Required complete speed control
2. Energy savings is a goal
3. Control is need to customized
4. Take input signal from other device for controlling
5. Communicate with PLC

2.3 How Do Variable Frequency Drive work

The Variable Frequency Device has three parts like an AC motor, a Controller and an Operating interface.

The Controller part is the solid electronic power converter circuit to convert AC to DC and then to quasi sine wave AC. The first part is the AC to DC converter section having a full wave rectifier bridges usually a three phase / single phase full wave bridge. This DC intermediate is then converted into quasi sine wave AC using the inverter switching circuit. Here MOSFET / IGBT transistors are used for inverting DC to AC.

The frequency of the power applied to an AC motor determines the motor speed, based on the following equation:

$N = 120 \times f \times p$ where,

N = speed (rpm)

f = frequency (Hz)

p = number of motor poles

For example, a 4-pole motor is operating at 60 Hz. If we need to calculate the speed then we need to use this formula : N = 120 x 60 x 4. Here easy to change frequency that's why inverter control a motor by changing frequency.

2.4.1 Standard Diagram of VFD

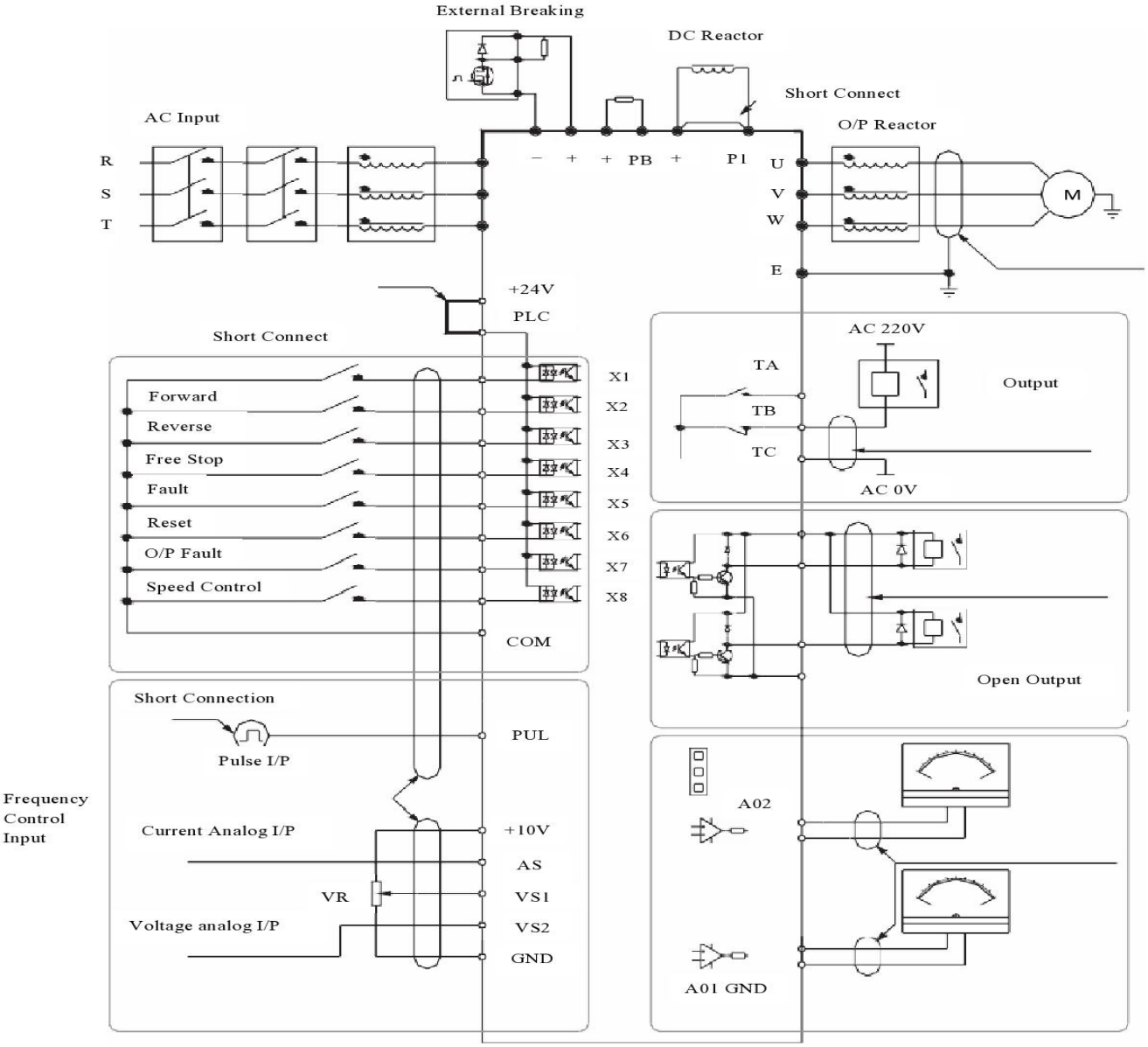


Figure 2.2: Standard Diagram of VFD

2.4.2 Main Circuit Terminals:

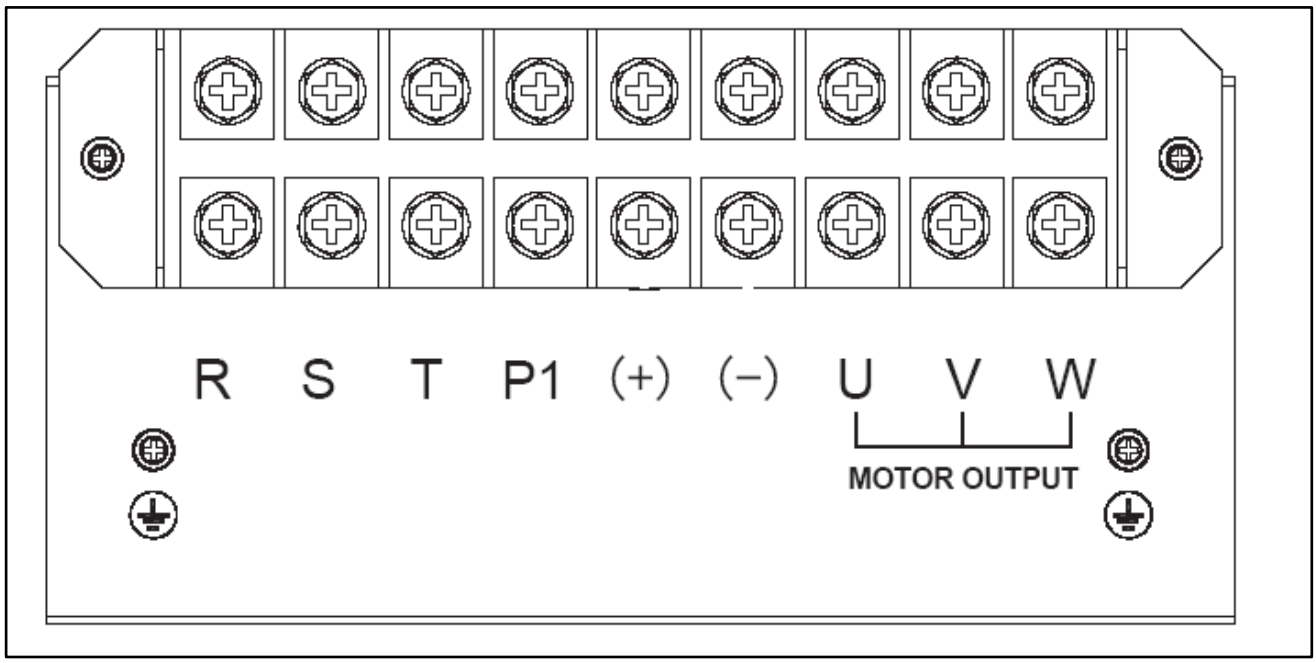


Figure 2.3: Main Circuit Terminals

Terminal	Name of functions	Definition of functions
R	Inverter Input Terminal	Need to connect 3-phase AC power supply
S		
T		
P1	DC reactor terminal	Used for external DC reactor
(+)		
(+)	DC power terminal	DC power output, (-) means DC bus cathode, (+) means DC bus anode, used for external braking unit.
(-)		
U	Inverter output terminal	Motor connection needed.
V		
W		
⏚	Earth	Earth terminal

Table 2.1: Main Circuit Terminals

2.4.3 Control loop terminals:

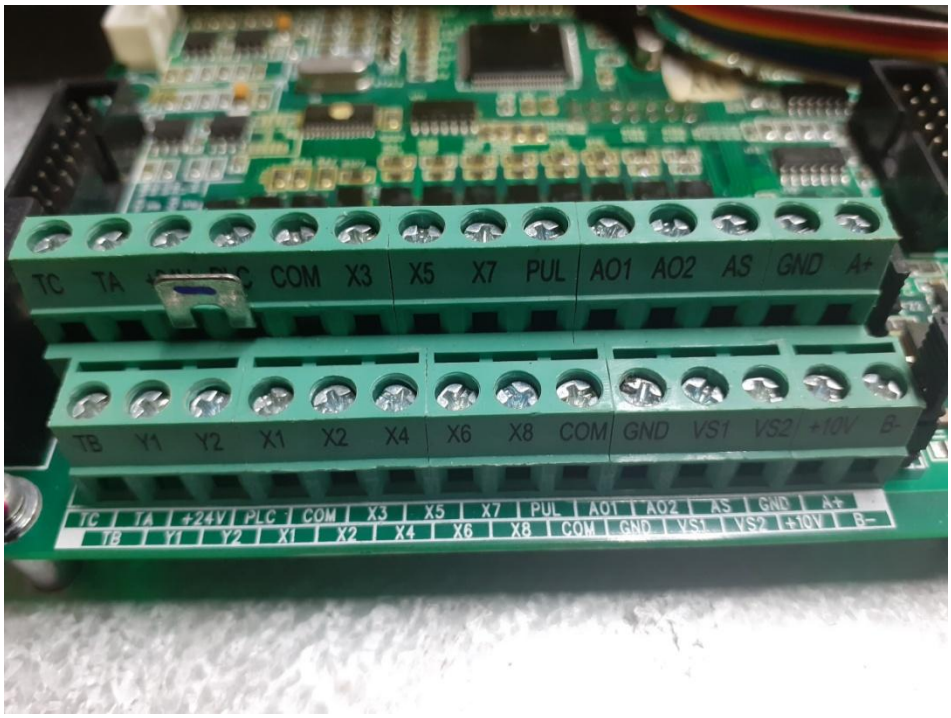


Figure2.4: Control loop terminals

Name	Terminal	Function Name	Function definition
Output passive connection	TA	Normally-open contact	Can set the action-object by program.
	TB	Normally-closed contact	
	TC	Common contact	
State Output	Y1	Collector open output 1	Can set the action-object by program.
	Y2	Open collector output 2	
Auxiliary power supply	+24V	Auxiliary power output +	Max output: 24VDC/100mA.
	COM	Auxiliary power output -	
Input multi-function	X1	Input 1 multi-function contact	Can set the action-object by program.
	X2	Input 2 multi-function contact	
	X3	Input 3 multi-function contact	
	X4	Input 4 multi-function contact	
	X5	Input 5 multi-function contact	

contact	X6	Input 6 multi-function contact	
	X7	Multi-function contact input 7	
	X8	Multi-function contact input 8	
Pulse input	PUL	Input pulse	Pulse range: 0 to 50kHz
Analog output	A01	Output 1 analog	Can set the action-object by program.
	A02	Output 2 analog	
Analog input	AS	Analog current input	As inverter control signal or feedback signal, can set the act range and response speed by program
	VS1	Analog voltage input 1	
	VS2	Analog voltage input 2	
Signal auxiliary power supply	+10V	Signal auxiliary power supply terminal	Max output 10VDC
	GND		Common terminal
Communication terminal	A+	Communication terminal A+	RS485 communication port
	B-	Communication terminal B-	

Table 2.2: Control loop terminals

2.5. Inverter Programming List for Auto Motor Control:

If we want to control a motor then it needs proper parameters setting and proper communication with process controller. Here we listed the function parameter below.

2.5.1 Basic Parameters:

No	Function description	Range of setting and definition.
F0.00	Control mode	0: VC without PG 1: V/F without PG 2: VC with PG 3: V/F with PG
F0.02	Run command channel	0: Control of keyboard 1: Control of terminal 2: Communication control RS485 3: Optional card
		0: Given number for keyboard 1: Keyboard potentiometer given 2: Voltage analog given for terminal VS1

F0.03	Frequency given main channel selection	3:Voltage analog given for terminal VS2 4: terminal AS current analog given 5: Terminal pulse signal given 6: RS485 communication port given 7: Ascend, descent control given 8: PID control given 9: Program control given 10: Reserved 11: Optional card given 12: Terminal selection
F0.04	Main channel gain	0.000 to 5.000
F0.08	Frequency of keyboard number setting	0 to upper limit
F0.09	Max frequency output	0 to 320Hz
F0.10	Upper limitation source selection	0: Upper limit frequency digital given 1: Keyboard potentiometer given 2 : Terminal VS1 voltage analog given 3: Terminal VS2 voltage analog given 4: Terminal AS current analog given 5: Terminal pulse signal 6: RS485 communication given
F0.11	Upper limit frequency digital setting	Lower limit□max output frequency
F0.12	lower limit frequency	0 to upper limit
F0.13	lower limit frequency running mode	0: Stop 1: Run as lower frequency limitation
F0.14	Time 1 for ACC	0.01 to 650s
F0.15	Time 1 for DEC	0.01 to 650s

Table 2.3: Basic Parameters

2.5.2 Run-control parameters

No	Description of functions	Range of setting and definition.
F1.00	Start-up mode running	0: Start directly 1: Braking first then start by start frequency 2: Speed tracking , judge direction then start
F1.01	Start time for pre-excitation	0 to 60s
F1.02	Start frequency	0 to 60Hz
F1.03	Start frequency hold time	0 to 50s
F1.07	Stop mode	0: DEC to stop 1: Free stop
F1.24	Emergency stop DEC time	0.01 to 650s
F1.26	Min output frequency	0 to 60Hz

Table 2.4: Run control parameters

2.5.3 Analog terminal parameters

No	Description Functions	Range of setting and definition.
F3.00	Lowest limit of VS1	0V to 10V
F3.01	Corresponding setting for VS1 Lower limit	0 to 100%
F3.02	Upper limit of VS1	0V to 10V
F3.03	Corresponding setting for VS1 upper limit	0 to 100%
F3.04	VS1 filter time	0s to 10s
F3.05	VS2 Lowest limit	0V to 10V
F3.06	Corresponding setting for VS2 Lower limit	0 to 100%
F3.07	VS2 upper limit	0V to 10V
F3.08	Corresponding setting for VS2 upper limit	0 to 100%
F3.09	Filter time of VS2	0s to 10s
F3.10	AS Lower limit	0 to 20mA
F3.11	Corresponding setting AS Lower limit	0 to 100%
F3.12	AS upper limit	0 to 20mA
F3.13	Corresponding setting AS upper limit	0 to 100%
F3.14	AS filter time	0s to 10s

Table 2.5: Analog terminal parameters

2.5.4 Motor parameters

No	Function description	Range of setting and definition.
F5.01	Poles number of Motor	2 to 48
F5.02	Rated power of Motor	0.4 to 1000KW
F5.03	Rated frequency Of motor	0.01Hz to max frequency
F5.04	Rated speed of motor	0 to 65000rpm
F5.05	Rated voltage Of motor	0 to 1500V
F5.06	Rated current Of motor	0.1 to 2000A
F5.07	No-load current of Motor	0.01 to 650A
F5.08	Stator resistance of motor	0.001 to 65
F5.09	Rotor resistance of motor	0.001 to 65
F5.10	Motor stator rotor inductance	0.1 to 6500mH
F5.11	Motor stator rotor mutual inductance	0.1 to 6500mH

Table 2.6: Motor parameters

CHAPTER 3

Process Controller

3.1 Introduction

A Process controller is an instrument used to control temperature or weight. A controller in factor temperature or weight control system will recognize a temperature sensor, for instance, a thermocouple or RTD\ weight sensor as data and differentiation the genuine temperature or weight with the perfect control temperature\pressure, or set point. It will by then give a respect a control part.

3.2 What is process controller?

A procedure controller is an equipment gadget or a product program that oversees or coordinates the progression of electrical flag between two substances. In a general sense, a procedure controller can be thought of as a person or thing that interfaces between two frameworks and oversees interchanges between them.

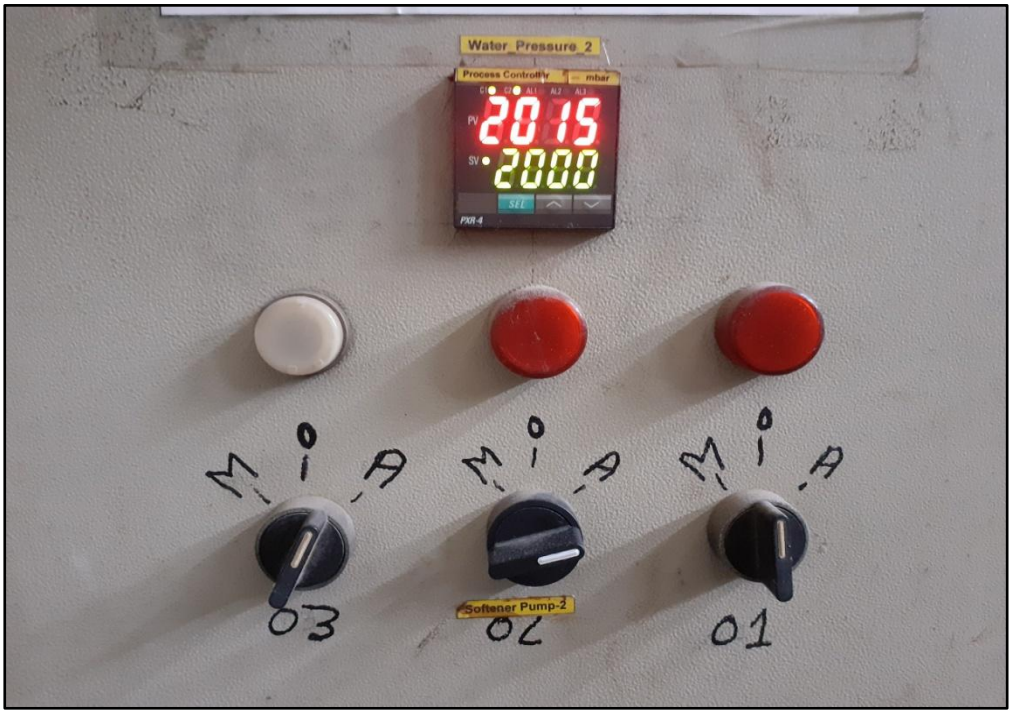
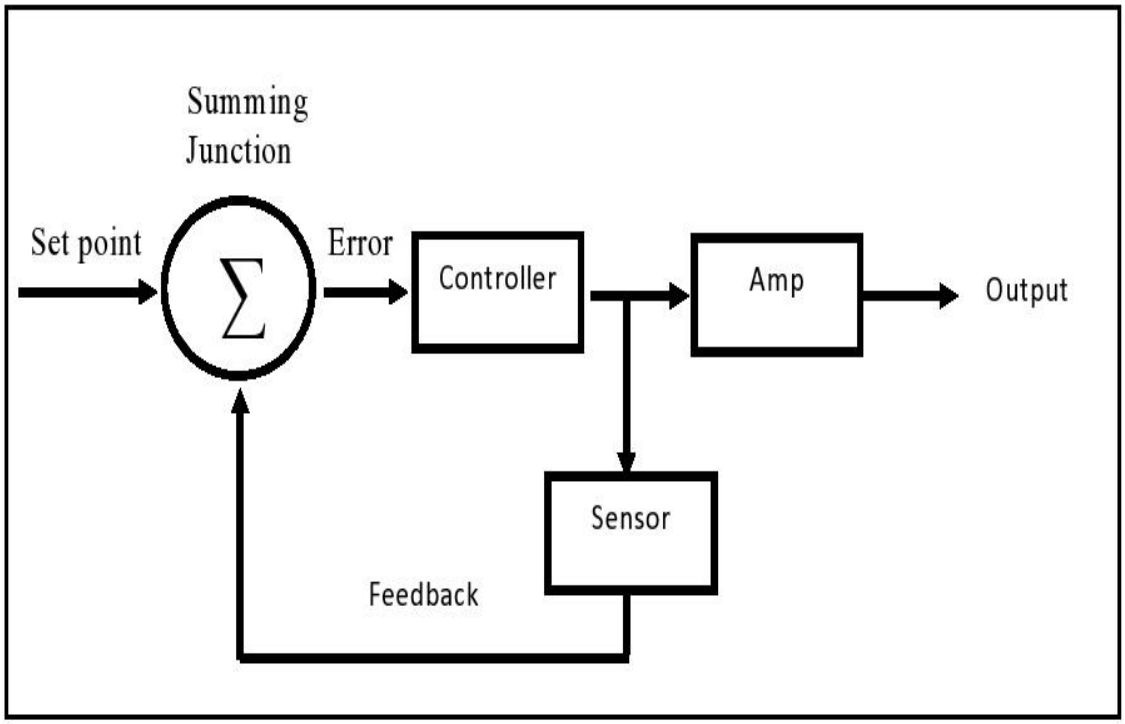


Figure 3.1: process controller

3.3.1 How Process Controller Work:

All controllers, from the fundamentals to the most unpredictable, work essentially a similar way. There are two factors required by the controller; real info sign and wanted set point worth. The information sign is otherwise called the procedure esteem. The contribution to the controller is tested all the time, contingent upon the controller.

This info, or procedure, esteem is then contrasted and the set point esteem. On the off chance that the real worth doesn't coordinate the set point, the controller produces a yield sign change dependent on the contrast between the set point and the procedure worth and whether the procedure worth is moving toward the set point or going amiss more remote from the set point. This yield signal at that point starts some sort of reaction to address the genuine worth so it coordinates the set point.



3.2: Block Diagram of Controller

3.3.2 Process Controller Inputs:

Controllers can have a few sorts of sources of info. The kind of info sensor and sign required may fluctuate contingent upon the sort of controlled procedure. Run of the mill input sensors incorporate thermocouples and resistive warm gadgets (RTD's), and straight sources of info, for example, mV and mA. Regular institutionalized thermocouple types incorporate J, K, T, R, S, B and L types among others. Controllers can likewise be set to acknowledge a RTD as a temperature detecting input. A commonplace RTD would be a 100ω platinum sensor.

On the other hand, controllers can be set to acknowledge voltage or current flag in the mile volt, volt, or milliamp extend from different kinds of sensors, for example, weight, level, or stream sensors. Normal info voltage sign incorporate 0 to 5VDC, 1 to 5VDC, 0 to 10VDC and 2 to 10VDC. Controllers can likewise acknowledge milliamp flag, for example, 0 to 20mA or 4 to 20mA.

A controller will ordinarily consolidate a component to distinguish when an information sensor is flawed or missing. This is known as a sensor break identify. Undetected, this flaw condition could make critical harm the hardware being controlled. This component empowers the controller to stop the procedure quickly if a sensor break condition is identified.

3.3.3 Process Controller Output

In each controller has a yield state. Each yield can be utilized to complete a few things including control a procedure, (for example, turning on a warming or cooling source), start an alert.

Run of the mill yields gave temperature controllers incorporate transfer yields, strong state hand-off (SSR) drivers, and straight simple yields.

A hand-off yield is generally a solitary post twofold toss (SPDT) transfer with a DC voltage loop. The controller empowers the transfer loop, giving detachment to the contacts. This

gives the contacts a chance to control an outer voltage source to control the loop of an a lot bigger warming contact.

It's essential to take note of that the present rating of the transfer contacts is normally under 2A. The contacts can control a warming contact with a rating of 10–20A utilized by the radiator groups or warming components.

Another kind of yield is a SSR driver. SSR driver yields are rationale yields that turn a strong state hand-off on or off. Most strong state transfers expect 3 to 32VDC to turn on. A run of the mill SSR driver turn-on sign of 10V can drive three strong state transfers.

Simple yields are given on certain controllers which put out a 0–10V sign or a 4–20mA sign. These sign are aligned with the goal that the sign changes as a level of the yield. For instance, if a controller is sending a 0% signal, the simple yield will be 0V or 4mA. At the point when the controller is sending a half sign, the yield will be 5V or 12mA. At the point when the controller is sending a 100% sign, the yield will be 10V or 20mA.

3.4 Wiring Diagram of Process Controller:

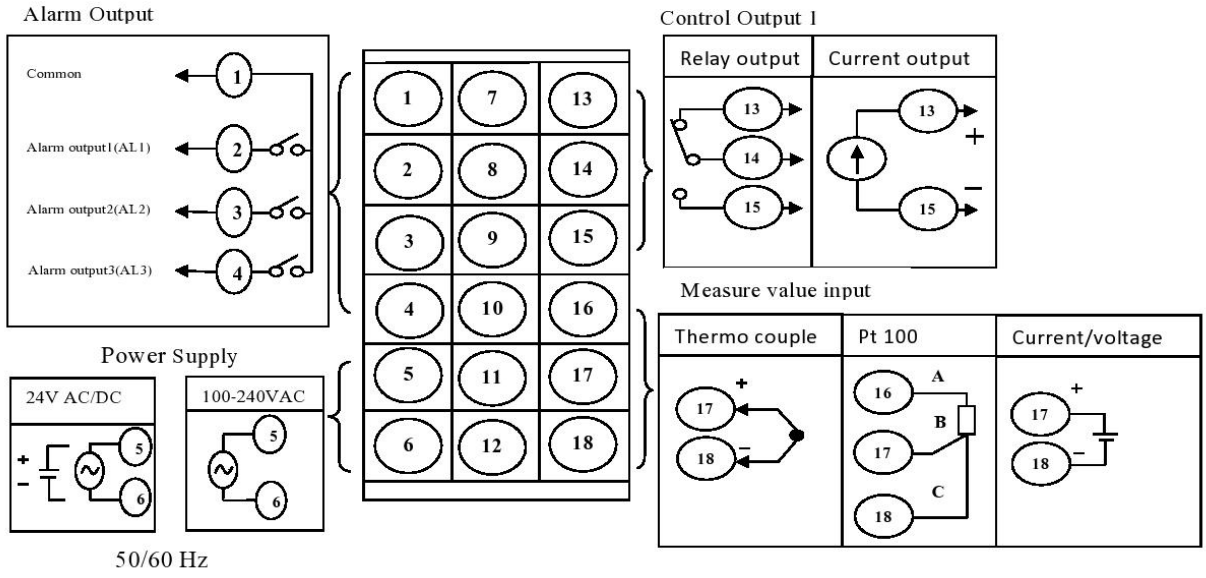


Figure 3.3: Wiring Diagram of Process Cont

3.5 Process Controller Parameters List:

Parameter name	Description	Setting and definition range
P	Proportional band	0 to 999%
I	Integral time	0 to 3200 sec
D	Differential time	0 to 999 sec
HYS	Hysteresis range for ON/OFF control	0 to 50%
Cool	Cooling-side band co-efficient	0 to 100
db	Dead band	-50 to +50
P-n2	Input signal code	1 to 16
P-SL	Measuring range Lower limit	-1999 to 9999
P-SU	Measuring range Upper limit	-1999 to 9999
P-dP	Decimal point position Setting	0 to 2
P-dF	Input filter Time constant	0 to 900 se
P-n1	Control action	0 to 19

Table 3.1: Process Controller Parameters List

CHAPTER 4

PT-100 Sensor

4.1 Introduction

We can PT-100 sensor use for measuring temperature. The main element of this sensor is platinum. It has a resistance of 100 ohms at 0C. There have different size of sensor like 2”, 4”, 6” etc.

4.2 Working Principle of Pt-100 Sensor

A PT-100 sensor work by RTD technique. A RTD comprises of an obstruction component and protected copper wires. The quantity of wires is 2, 3 or 4 wires. The resistive component is the temperature detecting component of the RTD. Platinum use as a material it is exceptionally steady after some time, it has a wide temperature extend, it offers a practically straight connection among temperature and opposition and it has a compound latency. An electrical flow is gone through the sensor, the obstruction component is utilized to quantify the opposition of the flow being gone through it. As the temperature of the opposition component expands the electrical obstruction likewise increments. The electrical obstruction is estimated in Ohms. The opposition worth would then be able to be changed over into temperature dependent on the attributes of the component.

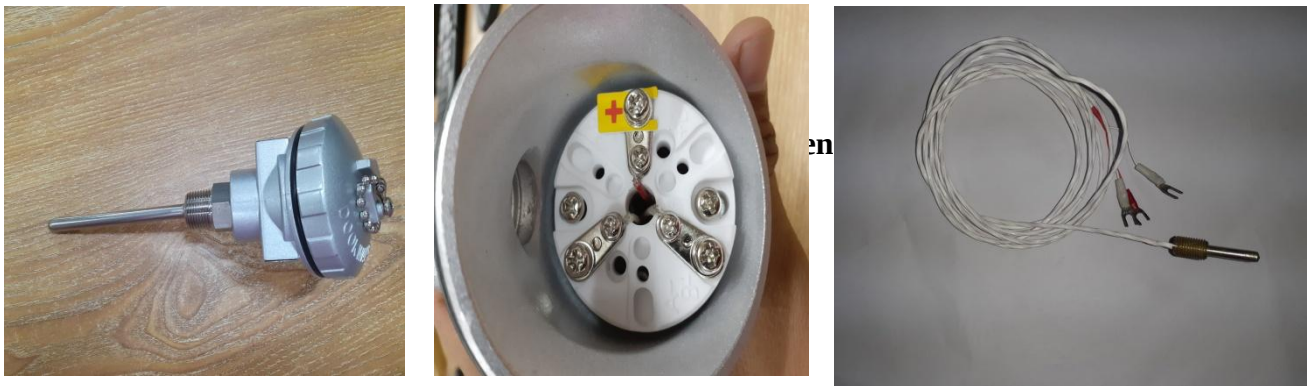


Figure 4.1: PT-100 Sensor

CHAPTER 5

Pressure Transmitter

5.1 Introduction

A pressure transmitter use to measuring pressure of liquid substance and air. It converts pressure to electrical signal. There are different size and range of pressure transmitter available. We use ½ inches diameter and 5 bar range pressure transmitter.

5.2 Working Principle of Pressure Transmitter

The transformation of weight to electric sign gain by physical distortion of strain gages which are fortified into the stomach. The strain will create an electrical opposition change corresponding to the weight. It has two terminal one for given inventory voltage and another for yield signal. In first terminal we supply 10 to 30volt Dc and from second terminal we take a yield current 4mA to 20 mA as indicated by weight. This yield sign got by procedure controller.

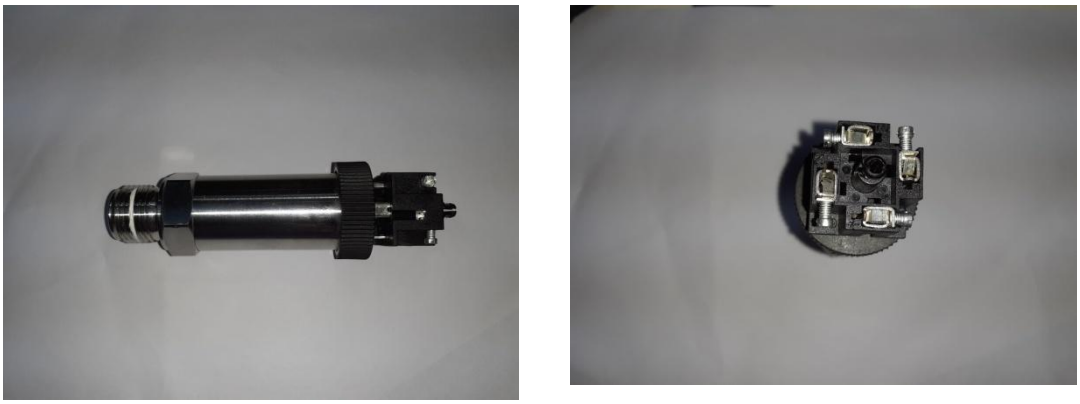


Figure 5.1: Pressure transmitter

5.3 Wiring Diagram of Pressure Transmitter

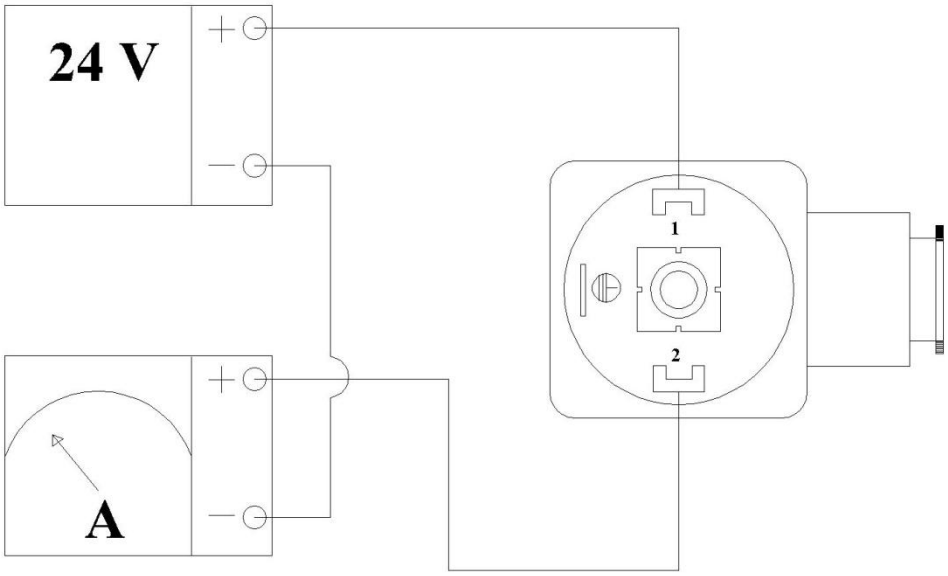


Figure 5.2: Wiring Diagram of Pressure Transmitter

CHAPTER 6

Energy Saving Process

6.1 Energy Saving Process by Controlling Pressure

By controlling water pipe line pressure we save energy. Here we use one pressure transmitter of 5bar range. Which environment temperature range is -20c to 100c. First we set pressure transmitter where need to control pressure. Than pressure transmitter output signal sent to process controller as input signal. We need to program process controller. From process controller we set our controlling pressure. Process controller gives an output signal this output signal received by inverter input signal. Inverter controls the motor according to the input signal.

6.2 Block Diagram of Energy Saving Process

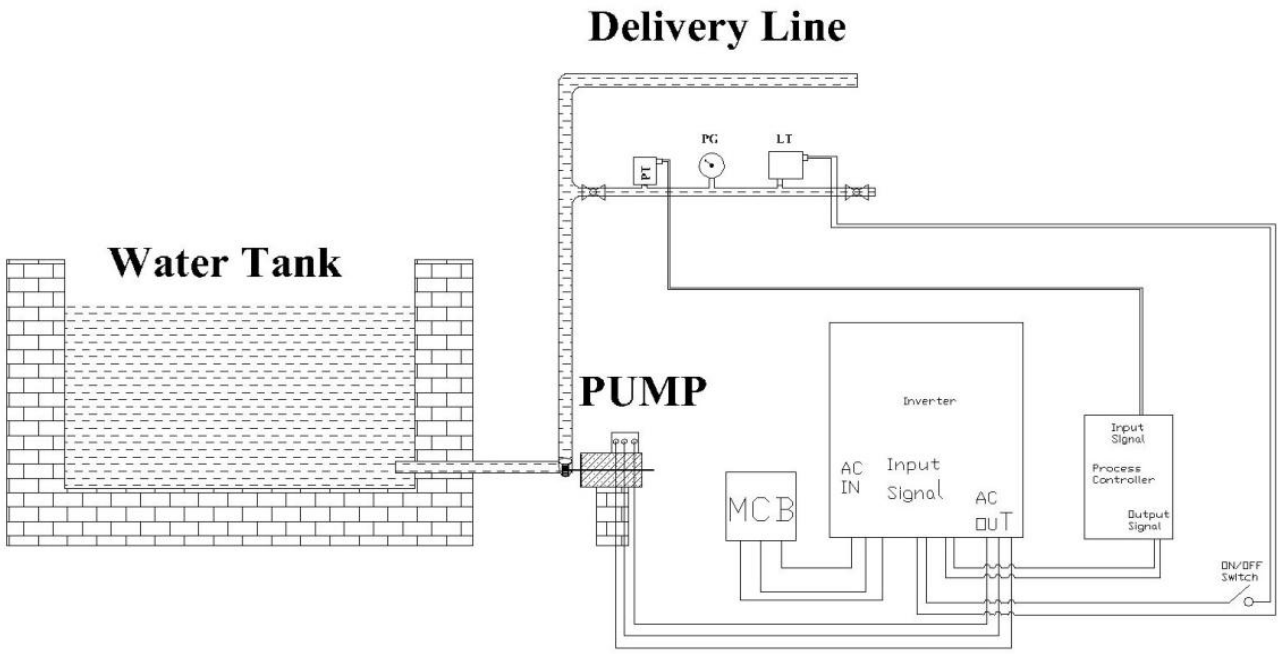


Figure 6.1: Block Diagram of Energy Saving Process

6.3 Energy Saving Report

Pump									
SL	Direct			Inverter 50 Hz			Inverter with Controlling		
	Time	Reading KWh	Difference	Time	Reading KWh	Difference	Time	Reading KWh	Difference
1	4:00 PM	98.9	20.3	5:00 PM	600	18.9	10:00 AM	1237	6
2	5:00 PM	119.2	23.2	6:00 PM	618.9	20.8	11:00 AM	1243	9.7
3	6:00 PM	142.4	19.7	7:00 PM	639.7	22.4	12:00 PM	1252.7	12.7
4	7:00 PM	162.1	20.6	8:00 PM	662.1	22.9	1:00 PM	1265.4	7.8
5	8:00 PM	182.7	19.6	9:00 PM	685	22.8	2:00 PM	1273.2	8.2
6	9:00 PM	202.3	19.6	10:00 PM	707.8	22.5	3:00 PM	1281.4	10.6
7	10:00 PM	221.9	25.9	11:00 PM	730.3	24	4:00 PM	1292	9
8	11:00 PM	247.8	25.1	12:00 AM	754.3	20.3	5:00 PM	1301	9.2
9	12:00 AM	272.9	18.5	1:00 AM	774.6	22	6:00 PM	1310.2	11
10	1:00 AM	291.4	19.4	2:00 AM	796.6	23.5	7:00 PM	1321.2	10.6
11	2:00 AM	310.8	20.2	3:00 AM	820.1	21.2	8:00 PM	1331.8	10.8
12	3:00 AM	331	21	4:00 AM	841.3	21.1	9:00 PM	1342.6	8.8
13	4:00 AM	352	20.23	5:00 AM	862.4	30.2	10:00 PM	1351.4	8.2
14	5:00 AM	372.23	19.98	6:00 AM	892.6	21.35	11:00 PM	1359.6	12.2
15	6:00 AM	392.21	19.94	7:00 AM	913.95	21.35	12:00 AM	1371.8	8.3
16	7:00 AM	412.15	19.83	8:00 AM	935.3	16.7	1:00 AM	1380.1	7.1
17	8:00 AM	431.98	26.42	9:00 AM	952	21.8	2:00 AM	1387.2	10.9
18	9:00 AM	458.4	18.4	10:00 AM	973.8	29.7	3:00 AM	1398.1	5.6
19	10:00 AM	476.8	28.5	11:00 AM	1003.5	21.8	4:00 AM	1403.7	9
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21	12:00 PM	523	14.5	1:00 PM	1044.7	29.6	6:00 AM	1423.7	8
22	1:00 PM	537.5	23.2	2:00 PM	1074.3	18.8	7:00 AM	1431.7	7.6
23	2:00 PM	560.7	14.9	3:00 PM	1093.1	23.6	8:00 AM	1439.3	11.4

24	3:00 PM	575.6	24.2	4:00 PM	1116.7	20	9:00 AM	1450.7	8.4
25	4:00 PM	599.8		5:00 PM	1136.7		10:00 AM	1459.1	
			500.9			536.7			222.1

 # Energy Save 56%

Blower									
SL	Direct			Inverter 50 Hz			Inverter with Controlling		
	Time	Reading KWh	Difference	Time	Reading KWh	Difference	Time	Reading KWh	Difference
1	12:00 PM	4629.6	8.6	6:00 PM	4874.7	9.5	10:00 AM	5251.4	4.7
2	1:00 PM	4638.2	8.5	7:00 PM	4884.2	9.4	11:00 AM	5256.1	9.3
3	2:00 PM	4646.7	8.8	8:00 PM	4893.6	8.8	12:00 PM	5265.4	11.8
4	3:00 PM	4655.5	8.6	9:00 PM	4902.4	8.9	1:00 PM	5277.2	7.8
5	4:00 PM	4664.1	7.6	10:00 PM	4911.3	11.6	2:00 PM	5285	4.8
6	5:00 PM	4671.7	9.8	11:00 PM	4922.9	11.1	3:00 PM	5289.8	6.9
7	6:00 PM	4681.5	10.8	12:00 AM	4934	8.2	4:00 PM	5296.7	5.3
8	7:00 PM	4692.3	8.9	1:00 AM	4942.2	8.5	5:00 PM	5302	8.6
9	8:00 PM	4701.2	6	2:00 AM	4950.7	9	6:00 PM	5310.6	10.3
10	9:00 PM	4707.2	9.7	3:00 AM	4959.7	9.5	7:00 PM	5320.9	9.8
11	10:00 PM	4716.9	8.6	4:00 AM	4969.2	9.1	8:00 PM	5330.7	10
12	11:00 PM	4725.5	8.9	5:00 AM	4978.3	10.4	9:00 PM	5340.7	8.4
13	12:00 AM	4734.4	8.1	6:00 AM	4988.7	10.1	10:00 PM	5349.1	7.9
14	1:00 AM	4742.5	8.7	7:00 AM	4998.8	8.3	11:00 PM	5357	12.2
15	2:00 AM	4751.2	8.3	8:00 AM	5007.1	8.8	12:00 AM	5369.2	8.4
16	3:00 AM	4759.5	8.6	9:00 AM	5015.9	8.5	1:00 AM	5377.6	7.3
17	4:00 AM	4768.1	8.2	10:00 AM	5024.4	12.8	2:00 AM	5384.9	11.2
18	5:00 AM	4776.3	8.9	11:00 AM	5037.2	7.8	3:00 AM	5396.1	5.6

19	6:00 AM	4785.2	8.4	12:00 PM	5045	6.5	4:00 AM	5401.7	9.4
20	7:00 AM	4793.6	10.9	1:00 PM	5051.5	9.9	5:00 AM	5411.1	10.7
21	8:00 AM	4804.5	24.4	2:00 PM	5061.4	10.8	6:00 AM	5421.8	2.5
22	9:00 AM		0	3:00 PM	5072.2	8.7	7:00 AM	5424.3	8
23	10:00 AM		0	4:00 PM	5080.9	8.3	8:00 AM	5432.3	11
24	11:00 AM	4828.9	9.4	5:00 PM	5089.2	8.7	9:00 AM	5443.3	7.7
25	12:00 PM	4838.3		6:00 PM	5097.9		10:00 AM	5451	
			208.7			223.2			199.6

 # Energy Save 4%

Cooling Tower									
SL	Direct			Inverter 50 Hz			Inverter with Controlling		
	Time	Reading	Difference	Time	Reading	Difference	Time	Reading	Difference
1	6:00 PM	1383.7	3.7	6:00 PM	1459	3.6	10:00 AM	1799.5	1.6
2	7:00 PM	1387.4	3.1	7:00 PM	1462.6	3.4	11:00 AM	1801.1	3.3
3	8:00 PM	1390.5	2.2	8:00 PM	1466	3.2	12:00 PM	1804.4	1
4	9:00 PM	1392.7	3.6	9:00 PM	1469.2	3.2	1:00 PM	1805.4	2.7
5	10:00 PM	1396.3	3.2	10:00 PM	1472.4	4.5	2:00 PM	1808.1	2.9
6	11:00 PM	1399.5	3.1	11:00 PM	1476.9	4	3:00 PM	1811	2.8
7	12:00 AM	1402.6	3.1	12:00 AM	1480.9	3	4:00 PM	1813.8	3.5
8	1:00 AM	1405.7	3	1:00 AM	1483.9	3.2	5:00 PM	1817.3	3
9	2:00 AM	1408.7	3	2:00 AM	1487.1	3.4	6:00 PM	1820.3	3.6
10	3:00 AM	1411.7	3.1	3:00 AM	1490.5	3.5	7:00 PM	1823.9	3.3
11	4:00 AM	1414.8	2.5	4:00 AM	1494	3.3	8:00 PM	1827.2	3.6
12	5:00 AM	1417.3	3.1	5:00 AM	1497.3	4	9:00 PM	1830.8	2.9
13	6:00 AM	1420.4	3.2	6:00 AM	1501.3	4.4	10:00 PM	1833.7	2.9
14	7:00 AM	1423.6	4.5	7:00 AM	1505.7	2.5	11:00 PM	1836.6	4.3
15	8:00 AM	1428.1	9.1	8:00 AM	1508.2	3	12:00 AM	1840.9	2.6
16	9:00 AM		0	9:00 AM	1511.2	3.2	1:00 AM	1843.5	2.5
17	10:00 AM		0	10:00 AM	1514.4	4.7	2:00 AM	1846	3.8
18	11:00 AM	1437.2	3.5	11:00 AM	1519.1	3.1	3:00 AM	1849.8	2
19	12:00 PM	1440.7	2.5	12:00 PM	1522.2	2.4	4:00 AM	1851.8	2.1
20	1:00 PM	1443.2	3.4	1:00 PM	1524.6	3.8	5:00 AM	1853.9	0.4
21	2:00 PM	1446.6	3.6	2:00 PM	1528.4	4.1	6:00 AM	1854.3	3

22	3:00 PM	1450.2	2.9	3:00 PM	1532.5	4.1	7:00 AM	1857.3	2.8
23	4:00 PM	1453.1	3	4:00 PM	1536.6	2.2	8:00 AM	1860.1	3.8
24	5:00 PM	1456.1	2.9	5:00 PM	1538.8	3.3	9:00 AM	1863.9	2.7
25	6:00 PM	1459		6:00 PM	1542.1		10:00 AM	1866.6	
			75.3			83.1			67.1

 # Energy Save 11%

Chapter 7

Discussions and Conclusions

7.1 Discussion and Conclusion:

This requires a sharp building concentration from Maintenance experts and the conveyance of excellent frameworks that are exceptionally useful and basic into the association and tasks. The investigation and practices of JK Group Ltd. under Maintenance uncovered that representatives are the most important assets for the advancement of the association and furthermore a well support framework is required for the improvement of these significant assets there are numerous components included. In such manner "Sparing Energy By Controlling Motor" assume the most significant job. To build the efficiency of an association powerful and lessen electric misfortunes and bills too.

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Thank You