INTERNSHIP REPORT

Department of Electrical Engineering
Kalliyath TMT

NATIONAL INSTITUTE OF TECHNOLOGY, CALICUT

July 2023

ACKNOWLEDGEMENT

From:
Dan Mani Binu

To:
Kalliyath TMT (Gasha Steels)

Respected Sir/Madam,

Subject: Acknowledgement of Internship Opportunity and Farewell

I am writing this letter to express my heartfelt gratitude and appreciation for the opportunity to serve as an embedded systems engineer intern at **Kalliyath TMT (Gasha Steels)**. As I prepare to move on to new endeavors, I would like to take a moment to extend my sincerest thanks to you and the entire management team for your support, guidance, and mentorship during my time with the company.

Working at Kalliyath has been an incredible learning experience, and I am truly grateful for the knowledge and skills I have acquired during my tenure. The trust and confidence you placed in me to take on challenging projects and contribute to the growth of the company have been invaluable. I am grateful for the opportunities I have been given to apply my theoretical knowledge in a practical setting and for the valuable insights I have gained from the experienced professionals at Kalliyath.

I would like to express my deepest appreciation to

1. **Ganesh Sir**
2. **Damodar Sir**
3. **Sateesh Sir**
4. **Reghunathan Sir**
5. **Sharath Sir**
6. **Mr. Vishnu**

for your guidance, encouragement, and support throughout my internship. Your expertise and willingness to share your knowledge have been instrumental in shaping my professional growth. I have learned valuable lessons under your leadership, and I am truly grateful for the mentorship you provided.

I would also like to extend my thanks to the entire team at Kalliyath. The collaborative work environment, open communication, and team spirit have made my time here memorable and enjoyable. I have had the privilege of working with talented individuals who have inspired me and challenged me to grow both personally and professionally.

Thank you for your time, guidance, and support. It has been an honor and privilege to work with you and the team at Kalliyath.

Wishing you and the company continued success in all your future endeavors.

Yours sincerely,

Dan Mani Binu

From:
Jins Biju

To:
Kalliyath TMT (Gasha Steels)

Respected Sir/Madam,

Subject: Acknowledgement of Internship Opportunity and Farewell

I am writing this letter to express my deepest gratitude for the opportunity to work as an Embedded Systems Engineer Intern at **Kalliyath TMT (Gasha Steels)**. As my internship comes to a close, I wanted to take a moment to convey my sincere appreciation to you and the entire management team for your support, guidance, and encouragement throughout my tenure with the company.

Being a part of Kalliyath has been an incredible journey filled with invaluable experiences and opportunities for personal and professional growth. The chance to work alongside highly skilled professionals and engage in challenging projects has equipped me with practical skills and knowledge that will undoubtedly shape my future career path.
I would like to extend my heartfelt thanks to

1. **Ganesh Sir**
2. **Damodar Sir**
3. **Sateesh Sir**
4. **Reghunathan Sir**
5. **Sharath Sir**
6. **Mr. Vishnu**

for your unwavering support and mentorship. Your guidance and expertise have been instrumental in my development as an embedded systems engineer. Your willingness to share your knowledge and provide constructive feedback has motivated me to constantly strive for excellence. I am grateful for the trust you placed in me and the opportunities you provided to take on new responsibilities and challenges.

As I move on to the next phase of my career, I carry with me the lessons and experiences gained at Kalliyath. The knowledge and skills acquired during my internship will undoubtedly contribute to my future endeavors, and I am confident that the strong foundation built at Kalliyath will propel me towards success.
I would like to take this opportunity to express my sincere appreciation for the trust and opportunities bestowed upon me during my time at Kalliyath. I am grateful for the friendships formed, the knowledge gained, and the memories created. If there are any formalities or paperwork required prior to my departure, please inform me, and I will ensure that they are completed promptly.

With heartfelt gratitude and warm regards,
Jins Biju

From:
Sree Govind P B

To:
Kalliyath TMT (Gasha Steels)

Respected Sir,

Subject: Acknowledgement of Internship Opportunity and Gratitude

I am writing this letter to express my utmost gratitude for the opportunity to serve as an embedded systems engineer intern at Kalliyath. As my internship comes to a close, I wanted to take a moment to express my sincere appreciation to you and the entire management team for your guidance, support, and trust throughout my time with the company.

I am truly grateful for the experiences and lessons I have gained during my tenure at Kalliyath. The chance to work alongside highly skilled professionals and engage in challenging projects has been invaluable to my professional growth. The collaborative and inclusive work environment fostered by the company has made my internship an enriching and rewarding experience.

I would like to extend my special thanks to

1. **Ganesh Sir**
2. **Damodar Sir**
3. **Sateesh Sir**
4. **Reghunathan Sir**
5. **Sharath Sir**
6. **Mr. Vishnu**

As I transition to the next phase of my career, I am confident that the skills and experiences gained at Kalliyath will continue to serve me well. The opportunities and exposure provided by the company have laid a strong foundation for my professional growth. I will always look back on my time at Kalliyath with fondness and gratitude.

Thank you once again for your support, guidance, and belief in my abilities. I wish you and the entire team at Kalliyath continued success and prosperity in all your future endeavors.

With sincerest thanks and warm regards,

Sree Govind P B

ABSTRACT

This abstract presents the key focus areas and contributions of an internship conducted at Kalliyath, a TMT bar manufacturing company, as an embedded systems engineer. The internship primarily centered on power factor compensation methods for motors in the manufacturing mill, along with the implementation of safety measures. Additionally, a significant portion of the work revolved around introducing PT100 sensors, controlled by the PIC18F4550 microcontroller, to accurately measure the temperature of motors.

The objective of the internship was to enhance the efficiency and performance of the motors by implementing power factor compensation techniques. This involved analyzing the power factor characteristics of the motors and designing and implementing suitable compensation methods. By improving the power factor, the internship aimed to optimize energy usage, reduce power losses, and enhance the overall operational efficiency of the manufacturing mill.

The introduction of PT100 sensors, in conjunction with the PIC18F4550 microcontroller, was a significant aspect of the internship. These sensors were employed to accurately measure and monitor the temperature of motors. The PIC18F4550 microcontroller was utilized to process sensor data, perform necessary calculations, and provide real-time feedback to operators and control systems. This implementation aimed to enable proactive temperature monitoring, facilitate preventive maintenance, and enhance the lifespan and reliability of the motors.

Overall, the internship at Kalliyath provided the opportunity to work on critical aspects of power factor compensation, safety measures, and the introduction of PT100 sensors for temperature monitoring. The practical experience gained in these areas contributes to the improvement of motor efficiency, system safety, and maintenance practices in the TMT bar manufacturing mill.

CONTENTS

INTRODUCTION

Kalliyath TMT, a leading TMT bar manufacturing company, deserves high praise for its outstanding contributions to the industry. With a steadfast commitment to excellence, innovation, and customer satisfaction, Kalliyath TMT has established itself as a trusted name in the market. The company's unwavering dedication to quality, cutting-edge technology, and sustainable practices sets it apart from its competitors.

One of the notable strengths of Kalliyath TMT is its relentless pursuit of excellence in product manufacturing. The company employs state-of-the-art technology and stringent quality control measures to produce high-grade TMT bars that meet industry standards and exceed customer expectations. Kalliyath TMT's commitment to quality ensures the durability, strength, and reliability of its products, providing customers with peace of mind and confidence in their construction projects.

In addition to its focus on product quality, Kalliyath TMT demonstrates a deep understanding of the importance of environmental sustainability. The company consistently adopts eco-friendly practices throughout its manufacturing process, minimizing its carbon footprint and preserving natural resources. By prioritizing sustainability, Kalliyath TMT showcases its commitment to building a greener future while meeting the growing demands of the construction industry.

Kalliyath TMT's commitment to innovation is another hallmark of its success. The company continuously invests in research and development to stay at the forefront of technological advancements. By embracing emerging trends and integrating them into its manufacturing processes, Kalliyath TMT consistently delivers cutting-edge solutions to its customers. This focus on innovation enables the company to address evolving industry needs and provide products that are both efficient and reliable.

Furthermore, Kalliyath TMT's customer-centric approach sets it apart from the competition. The company places immense value on understanding and meeting the unique requirements of its customers. By offering personalized solutions, exceptional customer service, and on-time deliveries, Kalliyath TMT establishes strong and long-lasting partnerships with its clients. This customer-centric approach fosters trust, loyalty, and repeat business, positioning the company as a preferred choice in the market.

TASK AND PROGRESS

TASK 1 *5TH JUNE 2023*

STUDY OF THE MILL AND POWERHOUSE

In the first week of the internship, we were shown around the mill and the control room. We familiarised ourselves with the machinery in the mill, particularly the DC motors driving the rollers and shears, the associated blowers, and the induction motors (conveyor and roughing motors), and the panels and switchgear associated with these. In the control room, we studied the SCADA control system used to monitor and control the production line rollers and shears. The layout of the motors, as well as the method by which the size of the bars is controlled (changing the number of rollers used, adding/removing loopers), was made clear. We could also observe how the current drawn by the motors as well as the speed of rolling is monitored as a graph, and we studied the changing curves as the billets went in and came out of the rollers. We understood how the CCTV system is used, especially in quality/length control, catching mis-rolls, etc., and how alerts were given out in the form of a siren.

Next, we were taken into the powerhouse, where the switchgear, transformers, capacitor banks, APFC panels, and DC motor drives were explained to us. The various relays and circuit breakers in use were introduced and their functioning explained. Several new devices were among these, with the MPCB(Motor Protection Circuit Breaker) being of particular interest. This was followed by an inspection of the pumps and panels at the cooling tower.

The various sensors used to monitor production were also explained to us, some of which were new to us. We saw how a newly repaired HMD was installed and verified. Ganesan Sir introduced us to PLC controllers and the ladder logic used to program them.

In the course of our internship, there were situations in which the mill had to be paused(especially in case of mis-rolls or overcurrent) or stopped and restarted(whether for changing the bar size or for maintenance). These were excellent opportunities for us to gain insight into the checks and maintenance activities that an industrial setup demands. We were allowed to observe and be involved in the maintenance of the capacitor banks,DC motors and switchgears. We could also learn and appreciate the coordination and cooperation between co-workers that operating such a plant demands, as well as the managerial and costing aspects.

THEIH:

We visited Theigh Ingots on June 7th. Our main concern of study was the induction furnace and its cooling system. The rectifier-inverter system used to generate the high frequency AC was explained to us. We were also intimated on the air pollution control system to be installed and were given the blueprint for the electrical installations.

TASK 2 *5TH JUNE 2023*

ANALYSIS OF EFFICIENCY IMPROVEMENTS AND COST SAVINGS

UPON UPGRADATION OF CAGE MOTORS IN STEEL ROLLING MILL

ABSTRACT:

The energy efficiency of electric motors is defined in the international standard on efficiency classes for motors: IEC 60034 Part 30 - Efficiency classes of line operated AC motors (IE code). IEC stands for the International Electrical Commission, a global standardisation organisation.

Code IEC 60034-30	Efficiency class
IE1	Standard Efficiency
IE2	High Efficiency
IE3	Premium Efficiency
IE4	Super Premium Efficiency

IE3 motors offer higher efficiency compared to IE2 ones and thus can enable more savings in energy costs resulting in higher profits over a long period.

In this report, we perform the cost - benefit analysis of replacing the IE2 motors used in the steel rolling mill (mostly as part of the conveyor system, blowers of the DC roller motors and in the pumps) with IE3 motors.

OBSERVATIONS:

SL. NO.	LOCATION OF MOTOR	COUNT	RATING (kW)	EFFICIENCY (%)		ENERGY SAVINGS PER DAY* (kWh)
				RATED	IE3(NOMINAL)	
01.	Furnace oil preheater	2	2.2	84.3(IE2)	86.7	211.2
02.	Furnace air fan	2	55	93.2(IE2)	94.3	2420
03.	Input to mill	1	1.5	80(IE1)	85.3	159
04.	Input to furnace/ reheater?	1	1.1	76.8(IE1)	84.1	160.6
		1	15	89(IE1)	92.1	930
		1 (fan)	2.2	83.2(as. IE2)	85.9	118.8
05.	Fans at billet feeder	1	2.2	80(IE1)	85.9	259.6
		1	2.2	83.2(IE2)	85.9	118.8
06.	Conveyor motors (slope)	3	7.5	88.7(as.IE2)	90.4	765
	Other conveyor motors(furnace side)	1	7.5	87.5(IE2)	89.1	240
	(next to roughing motor)	1	as. 7.5	88.7(as. IE2, 4 pole)	90.4	255
		1	7.5	88.7(IE2)	90.4	255
		1	7.5	87(IE1)	90.4	510
	(under control room)	1	as. 7.5	88.7(as. IE2, 4 pole)	90.4	255
	Other side conveyors	1	11	89.8(IE2)	91.4	352
		1	7.5	87(IE1)	90.4	510
07.	Above the rollers/shears	4	0.746	71	82.5	686.32

08.	Cooling bed	2	15	90.6(as. IE2)	92.1	900
09.	Final shear before bed	2	2.2	83.2(IE2)	85.9	237.6
10.	Second-to-last shear	1	5.5	87(IE2)	89.2	242
11.	C16	1	7.5	88.1(IE2)	90.1	300
	C15	1	7.5	88.1(IE2)	90.1	300
	C14	1	5.5	87.6(IE2)	89.2	176
	C13	1	5.5	87.6(IE2)	89.2	176
	C12	1	5.5	87(IE2)	89.2	242
	C11	1	7.5	88.7(IE2)	90.1	210
	C10	1	5.5	87(IE2)	89.2	242
	C9	1	7.5	88.1(IE2)	90.1	300
12.	Assuming similar values for C8 through C1					1946

*Assuming 20 hours of operation per day.
Energy savings = 20*(kW rating)*(nominal efficiency of equivalent IE3 motor - rated efficiency of motor)

<u>RESULTS OF ANALYSIS:</u>

Thus,

Total energy savings (kWh/day) = 13,477.92
Savings from replacing conveyor and blower motors alone(kWh/day) = 7,034.00

Cost savings at Rs. 6.10/unit = Rs. 82,215.312 /day
Savings from replacing conveyor and blower motors alone = Rs. 42,907.4

TASK 3 *8TH JUNE 2023*

VAR - COMPENSATION AND POWER FACTOR IMPROVEMENT FOR STEEL RE-ROLLING MILL

ABSTRACT :

This report provides Thyristor Switched Capacitor controlled by help of programmed microcontroller where it is depicted that the power factor can be improved to unity with light loading and can be maintained to around 0.98 with increase in system loading. This paper provides implementation done on 8051 microcontroller using Keil software to program the microcontroller, PSpice to determine time lag between current and voltage and Proteus to display power factor according to the load. Whenever an inductive load is connected to the transmission line, power factor lags because of lagging load current. To compensate for this, a shunt capacitor is connected which draws current leading the source voltage. The net result is improvement in power factor. The time lag between the zero voltage pulse and zero current pulse duly generated by suitable operational amplifier circuits in comparator mode are fed to two interrupt pins of the 8 bit microcontroller of 8051 family. Thereafter program takes over to actuate appropriate number of opto-isolators duly interfaced to back to back SCRs. This results in bringing shunt capacitors into the load circuit to get the power factor till it reaches unity. Keywords-Thyristor Switched Capacitor (TSC), Keil, PSpice, Proteus, Power factor improvement

<u>Implementation of Thyristor Switched Capacitors for</u>

<u>Power Factor Improvement</u>

Power factor correction brings the power factor of an AC power circuit closer to by supplying reactive power of opposite sign, adding capacitors or inductors which act to cancel the inductive or capacitive effects of the load, respectively.The reactive
elements can create voltage fluctuations and harmonic noise when switched on or off. They will supply or sink reactive power regardless of whether there is a corresponding load operating nearby, increasing the system's no-load losses. In a worst case, reactive elements can interact with the system and with each other to create resonant conditions, resulting in system instability and severe overvoltage fluctuations.An automatic power factor correction unit is used to improve power factor. A power factor correction unit usually consists of a number of capacitors that are switched by means
of contactors. These contactors are controlled by a regulator that measures power factor in an electrical network. To be able to measure power factor, the regulator uses a current transformer to measure the current in one phase.Depending on the load and power factor of the network, the power factor controller will switch the necessary blocks ofcapacitors in steps to make sure the power factor stays above a selected value.

<u>SYSTEM MODELLING</u>

This circuit consists of DC power supply unit, zero voltage crossing detectors, Micro-controller, LCD display, opto-isolator, SCR and Capacitor. The required DC power supply for Micro-controller and other peripherals is supplied by the DC power supply.For the calculation of the power factor by the Micro-controller we need digitized voltage and current signals. The voltage signal from the mains is taken and it is converted into pulsating DC by bridge rectifier and is given to a

comparator which generates the digital voltage signal. Similarly the current signal is converted into the voltage signal by taking the voltage drop of the load current across a resistor of 10ohms. This A.C signal is again converted into the digital signal as done for the voltage signal. Then these digitized voltage and current signals are sent to the micro-controller. The micro-controller calculates the time difference between the zero crossing points of
current and voltage, which is directly proportional to the power factor and it determines the range in which the power factor is.
Micro-controller sends information regarding time difference between current and voltage and power factor to the LCD
display to display them. Depending on the range it sends the signals to the opto-isolators that in turn switch ON back to back connected SCRs (power switches) to bring the capacitors in shunt across the load. Thus, the required numbers of capacitors are connected in parallel to the load as required. By this the power factor will be improved.

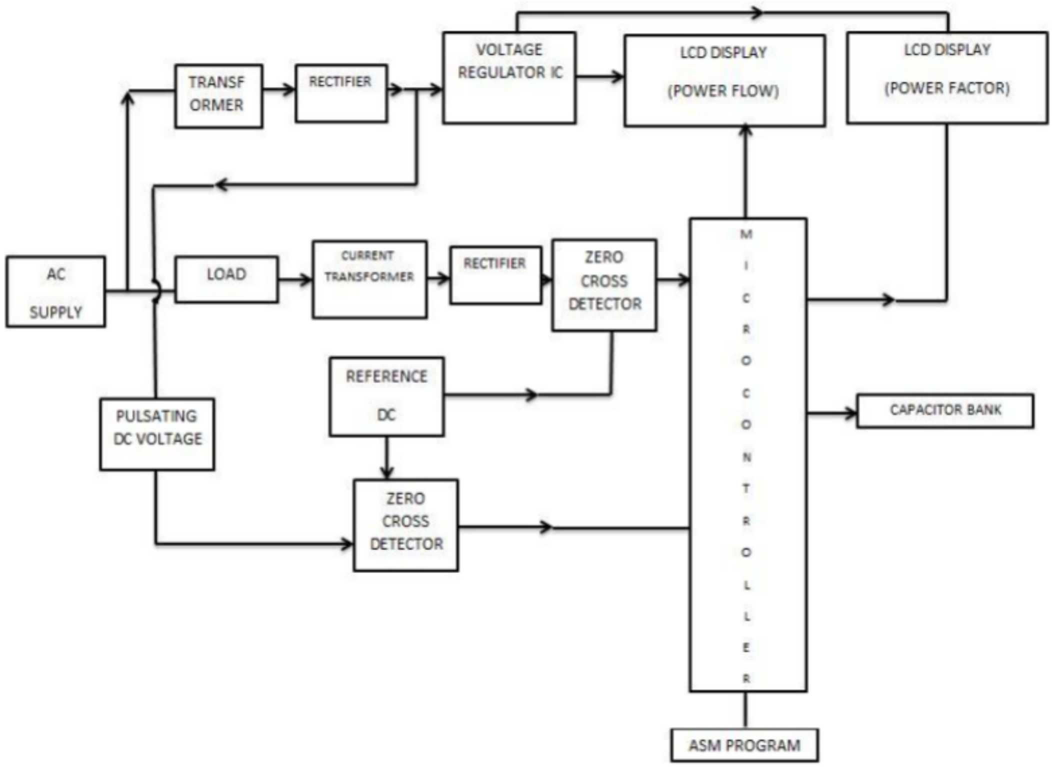


Fig. 1: Block diagram for power factor improvement using Thyristor Switched Capacitor.

SOFTWARE USED AND IMPLEMENTATION

Keil is aGerman based Software development company which has been used to program the 8051 microcontroller.It provides several development tools likeIDE (Integrated Development environment), Project Manager,Simulator, Debugger, C Cross Compiler, Cross Assembler, Locator/Linker. OrCadPSpice is a SPICE analog circuit and digital logic simulation program for Microsoft Windows. The name is an acronym for Personal SPICE - SPICE itself being an acronym for Simulation Program with Integrated Circuit Emphasis. SPICE (Simulated Program with Integrated Circuit Emphasis) is a general purpose software that simulates different circuits and can perform various analysis of electrical and electronic circuits.It has been used to determine time lag between current and voltage. Proteusis software for microprocessor simulation, schematic capture, and printed circuit board (PCB) design. It is developed by Labcenter Electronics.It has been used to display power factor according to the load.

OTHER METHOD

Power factor is necessarily present in any electrical system. It is defined as cosine of the angle between the current and the voltage. As the power factor decreases, the kW delivered by any electrical motor decreases, simply meaning for the same kVA, delivery of kW shall be less as power factor decreases.

This not only decreases output, but also leads to various mechanical stalling. Electrical system unnecessary gets burdened to meet supply of increased kVA for same kW. The electrical system then needs to be designed for higher current capacity for no gain. Also electricity utility bills also increases.

Stress, causing electrical system to heat up and wear out soon, increased power consumption gives financial impact besides national loss, as power production is always finite.

To annihilate the same, capacitors are used preferably at load end to correct the power factor and keep it as close as unity. Even electrical utilities reward the plants with better power factor and impose penalty when power factor reduces beyond certain prescribed value. In Rolling Mills of all sectors, whether primary or secondary steel, the power factor correction requirement and its benefits become more grossly visible because of large quantum of power being consumed.

Besides power factor, presence of harmonics plays a vital role in degrading the electrical system, hence, negatively affecting the plant performance. Harmonics are concern in the management of electrical system. Designers are required to pay more attention to quality power, energy efficient and reliable system. Because of variety of load requirement, especially in mills, with multiple periodic or non-periodic impacts, the electrical system has to employ advanced electronics devices. These electronics devices, though capable of precise process control and energy savings benefits, bring in a drawback to disturbance in electrical system, called Harmonics.

Harmonic Filtration

Harmonics: Origin, Effects and Consequences

Harmonics currents are caused by non-linear loads connected to the distribution system. A load is said to be non linear when current it draws does not have same wave shape as the supply voltage. The flow of harmonic current through the system impedances causes voltage distortion in the distribution system. Following are the major Harmonic generators:

- Industrial Processes viz, Welding, Impact Loads, Induction Furnaces, Battery Charger, DC Power Supplies
  - Variable speed Drives for AC & DC motors
  - Uninterrupted power Supplies
  - Office Equipment (PCs, Printers, Servers, displays etc.)

Harmonic currents increase the RMS current in electrical systems and deteriorate the supply voltage quality. They stress electrical network and potentially damage the equipment. They may disrupt normal operation of devices and increase operating costs.

Symptoms of problematic harmonic levels include overheating of transformers, motors and cables, thermal tripping of protective devices and logic faults of digital devices. In addition, the life span of many devices is reduced by elevated operating temperatures.

Mitigation of Harmonics

In the state-of-the-art ever evolving electrical technology, active front end is used in all the drives being used in Mills, Cranes and Welding Process.

These electronic power quality devices are designed to measure the load current, calculate variance from objectives set in the Mill and inject the right amount of current to meet the required level of harmonics, displacement power factor or load balancing.

When harmonic mitigation is required, the logic measures the load current and calculates the harmonic current spectrum, i.e the amplitude and phase angle for every harmonic to as high as 50th order. The control signal is generated and semiconductors (IGBT) are directed to duplicate the control signal as injected into the supply. This reduces the supply side Harmonics.

CONCLUSION

This paper presents simulation of automatic switching of capacitor bank for power factor improvement. Power factor improvement is very useful in any installation as low power factor when corrected, leads to consequent saving in charges, by way of reduced demand charges, and lesser low power factor penalties.Apart from penalties like maximum demand charges, penalty for low power factor, the factory cabling and supply equipment can be relieved of a considerable wattless or reactive load, which will enable additional machinery to be connected to the supply without enlarging these
services. Additionally, the voltage drop in the system is reduced.
The method employed to achieve the improvements outlined involves introducing reactive power into the system in phase opposition to the wattless or reactive current mentioned above which effectively cancels its ill impact in the system. It is evident from the simulation results that the microcontroller based Thyristor Switched Capacitor is providing a better power factor to nearly unity with light loading and can be maintained to around 0.98 with increase in system loading.

TASK 4 *15TH JUNE 2023*

TEMPERATURE SENSOR USING PIC18F4550:

AIM:

Motor temperature monitoring is important in TMT (Thermo-Mechanically Treated) manufacturing mills for several reasons:

1. Preventing motor damage: Continuous monitoring of motor temperature helps in identifying potential overheating issues. Excessive heat can lead to insulation degradation, bearing failure, or even motor burnout. By detecting abnormal temperature rises, appropriate measures can be taken to prevent motor damage and ensure its longevity.

2. Maintaining production efficiency: Motors play a crucial role in driving the rolling process in TMT manufacturing mills. Overheating of motors can result in reduced efficiency and performance. By monitoring motor temperature, any deviations from the optimal operating range can be detected, allowing for timely interventions to maintain production efficiency.

3. Ensuring worker safety: Overheating motors pose a safety hazard to workers in the mill. High temperatures can cause electrical malfunctions, which may result in equipment failures, electrical faults, or fires. Monitoring motor temperature helps in identifying potential safety risks, allowing for prompt actions to mitigate them and ensure a safe working environment.

4. Preventing unscheduled downtime: Motor failures can lead to unplanned equipment downtime, which can have a significant impact on production schedules and overall productivity. By monitoring motor temperature, any signs of overheating can be detected early on, enabling proactive maintenance and minimizing the risk of unexpected motor failures and subsequent downtime.

5. Energy efficiency optimization: Motor temperature monitoring can also be used to optimize energy consumption. Overheating motors are often indicative of inefficient operation, such as excessive friction or inadequate cooling. By identifying and rectifying these issues, energy efficiency can be improved, resulting in cost savings and reduced environmental impact.

<u>OBJECTIVE:</u>

The range of motor temperatures in a TMT manufacturing mill can vary depending on several factors, including the type and size of the motor, the load it is subjected to, the ambient conditions, and the specific requirements of the mill. However, as a general guideline, motor temperatures typically fall within the following ranges:

1. Surface Temperature: The surface temperature of a motor is usually monitored to ensure it remains within safe limits. It is typically expected to be below 80 to 90 degrees Celsius. Surface temperatures above this range may indicate excessive heat buildup and the need for investigation and corrective measures.

2. Winding Temperature: The temperature of the motor windings is another critical parameter that is monitored. The winding temperature is influenced by factors such as motor load, ambient temperature, insulation class, and cooling mechanisms. For motors with Class F insulation, the winding temperature should generally be kept below 155 to 165 degrees Celsius. For motors with Class B insulation, the temperature limit is lower, usually around 130 to 140 degrees Celsius.

It's important to note that these temperature ranges are general guidelines, and specific motor manufacturers may provide their own recommended temperature limits based on the motor design and construction. Additionally, motor temperature monitoring systems in mills may have alarm thresholds set to trigger warnings or shutdowns if temperatures exceed predetermined limits, ensuring the safety and reliability of the motor operation.

Our main objective is to set up a temperature monitoring system for the motors using pt100.

COMPONENTS:

The system consists of the following components:

- PT100 Sensor: Provides resistance changes in response to temperature variations.
- 1K Ohm Resistor: Connected in series with the PT100 sensor to form a voltage divider circuit.
- Voltage Regulator: Supplies a stable 5V voltage to the voltage divider circuit.
- PIC18F4550 Microcontroller: Reads the voltage across the PT100 sensor using the onboard ADC.
- ADC: Converts the analog voltage into a digital value.
- LCD Display: Displays the temperature readings.
- UART Receiver: Utilized for the initial calibration process.

WORKING:

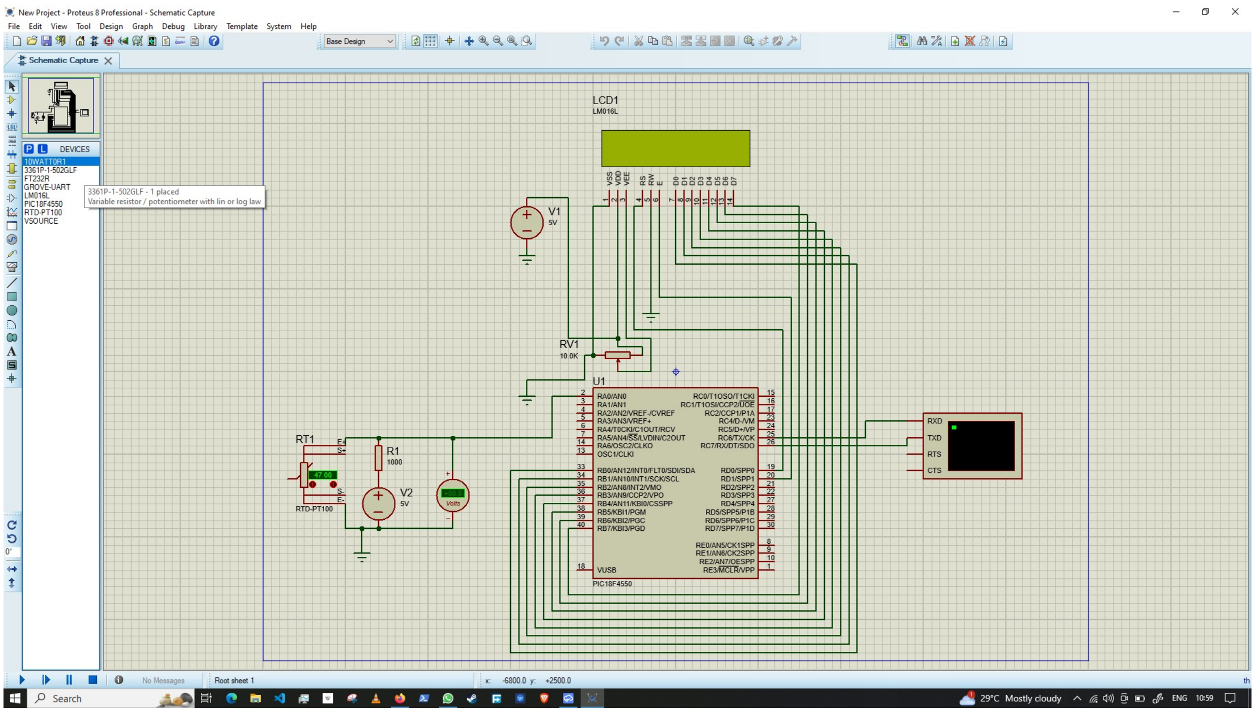
The system was implemented by connecting the PT100 sensor and the 1K Ohm resistor in series. The voltage across the PT100 sensor was measured using the ADC pin of the PIC18F4550 microcontroller. The microcontroller performed analog-to-digital conversion on the measured voltage, resulting in a digital value. This digital value was processed using the calibration code to determine the corresponding temperature. The temperature readings were displayed on the connected LCD display.

Calibration Procedure:
To calibrate the system, known temperature values were transmitted via the UART receiver. The PIC18F4550 microcontroller read the voltage across the PT100 sensor using the ADC and converted it into a digital value. This digital value was then calibrated against the known temperature values received via the UART receiver. This calibration process established a calibration curve or equation to map the digital value to the corresponding temperature value.

Note:

MPLAB X IDE v5.15 was used for generating the HEX file and MPLAB X IPE v5.15 was used to program the PIC18F4550 using PICKit. Please make sure to use the same.

CIRCUIT DIAGRAM:



TASK 5 *15TH JUNE 2023*

CIRCUIT BREAKER USING CURRENT TRANSFORMER INTERFACED BY PIC18F4550:

This proposal presents a circuit breaking solution based on current measurements obtained through a current transformer. The purpose of this project is to address the need for a reliable circuit breaking mechanism to safeguard electrical systems from excessive current. By utilizing the PIC18F4550 microcontroller for interfacing, the proposed solution aims to provide increased safety, protection of equipment, and reduced downtime.

The proposal highlights the potential risks and consequences of not having an effective circuit breaking mechanism in place. It outlines the technical details of the solution, including the algorithms and logic implemented in the embedded C code. The PIC18F4550 microcontroller acts as the central component for interfacing and controlling the circuit breaking process.

To implement the solution in hardware, a comprehensive implementation plan is provided, including timelines, resource requirements, and potential challenges. The proposal also addresses the importance of testing and validation procedures to ensure the reliability and accuracy of the circuit breaking mechanism.

The benefits and return on investment of the proposed solution are discussed, emphasizing potential cost savings, improved efficiency, and reduced maintenance costs. The solution aligns with the company's goals and objectives, providing a strong rationale for its implementation.

In conclusion, this proposal seeks approval and support for implementing the circuit breaking solution based on current measurements. The proposal emphasizes the importance of the project, the value it brings to the company, and requests further discussions to move forward with its implementation. Supporting documentation, including diagrams, code snippets, and simulation results, can be provided upon request.

PROPOSAL AND UPGRADES

- This proposal outlines the development of a current sensed circuit breaking system that uses the PIC18F4550 microcontroller. The software for the system has already been developed, and the project will now focus on implementing the software in hardware. The benefits of the system include increased accuracy, reduced size and weight, and lower cost. The project is expected to be completed within 6 months.

- Increased accuracy: By interfacing 8 PT100 sensors, the project would be able to measure temperature more accurately. This is because PT100 sensors are very accurate and reliable temperature sensors.

- By displaying the temperature through a single LCD display, the project would be easier to use and maintain. This is because a single LCD display can be used to display the temperature from all 8 PT100 sensors.

- By integrating a buzzer system, the project would be able to alarm the control room in case of high-temperature detection. This would help to prevent accidents and damage.

Link for Code Files: Kalliyath code

Link for Simulation Files: Kalliyath PCB Gerber files

Link for PCB Layout: Kalliyath simulation