



## **Internship Project Report**

### **“Integration of IOT and Analytics for Smart Manufacturing”**

SUBMITTED BY

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**SPECIALISATION: OPERATIONS MANAGEMENT**

ROLL NO.-32

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## About Company

ClairViz is a technology company providing cutting edge solutions for **Digitization of Manufacturing industry**. They have deep focus on creating Smart Factories by leveraging technologies like **Big Data, Internet of Things(IOT)** and Internet of Services(Cloud).

ClairViz strongly believes in Industry 4.0 and has invested in building expertise and capability to help clients achieve their goals in timely and cost effective manner. Their products align with its strategy of creating value for clients.

ClairViz's products and solutions provide deep insights (actionable and meaningful) into end to end functioning of factory processes and hence help clients achieve sustainable profitable growth through **data driven intelligence** and make them more competitive and efficient while delivering products exceeding customers' expectations.

With extensive experience of manufacturing processes and practices, **ClairViz** has developed robust, reliable and scalable products for "**Smart Manufacturing**". Our products are enabling customers to achieve **quick ROI** and delivering profitable sustainable **Data Driven Growth**.

Navi Mumbai-based startup offers a complete suite of digital manufacturing products/solutions that leverage IoT, **big data**, Artificial Intelligence (AI) and **Machine Learning** for the manufacturing sector.

Osprey, its flagship product, is a platform that integrates with a variety of data sources and converts raw information into real-time actionable intelligence on parameters such as OEE (**Overall Equipment Effectiveness**), production, productivity, performance, yield, availability and TPM (**Total Productive Maintenance**) analysis.

They also have a range of digital manufacturing products, including **E-Log Books, E- Kanban, E-Andon, Digital SOPs** (standing operating procedures), and solutions for tracking and tracing, energy management and e-maintenance. Their products seamlessly integrate with ERP (**Enterprise Resource Planning**) and other business intelligence tools which ensure that our customers' existing investments in technology are protected.

Track & Trace solution is used to streamline manufacturing processes and track back various components used during production. The Maintenance Management product provides **condition-based monitoring** (CBM) and predictive maintenance for equipment, which helps customers plan their maintenance activities. With the Digital SOPs solution, customers can complete operational and maintenance activities in a shorter duration, improving their margins.

## End-to-end solutions

Since the IoT field is just maturing, customers need to be thoroughly coached about the proper adoption of technology to gain maximum benefits. The ClairViz team does a complete process analysis and plant study, and provides end-to-end solutions wrapped around the products line.

The benefits automatically start pouring in due to real-time visibility, reduction of waste, proactive information and complete traceability. After using its product / solution, some customers saw improved labour relations, others saw better warranty management and fewer customer complaints. In some cases, the productivity improvement has been up to 40 percent.

## Osprey Cloud

Osprey Cloud, a cloud-based manufacturing analytics platform, which will use a plug-and-play approach to bring on board a manufacturing line. Clients simply need to plug in their devices to track and monitor their manufacturing KPIs (key performance indicators). This will be a highly scalable model where clients can start using the new technology almost immediately from the time they connect their factory to the cloud.

## NASSCOM's 10,000 Startups Programme

Being a part of NASSCOM's 10,000 Startups programme has brought with it several advantages, While NASSCOM's corporate connections have helped ClairViz reach a wider network of corporates, the visibility garnered from events organized by the apex industry body helps them grow and reach more customers, which would otherwise have been challenging if they set out to do it on their own. Startups like ours benefit immensely from Nasscom's programmes and initiatives.

## ClairViz's Products and Services:

- Manufacturing Intelligence → Data Driven Decisions
- IOT → Listen To The Voice Of Machines
- Track & Trace → World Class Quality
- Integrated Info Management → Secure Digitized Information

## Benefits of Smart Manufacturing

- Panoramic Visibility
- Higher Productivity
- Satisfied Customers
- Cost Optimization
- World Class Quality
- Higher Efficiencies
- Increased Profits
- Increased Asset Utilization

## ClairViz's Products

- The Osprey IOT Platform
- Track & Trace
- Integrated Information Management System
- I-Box

## ClairViz's Services

### **Manufacturing Intelligence Solutions**

- Planning Systems
- Online Production Systems
- E-Logbooks
- Real-time Information
- Maintenance Management
- Reports & Analysis
- ERP Integration
- BI Integration
- SPC Analysis
- Auxiliary System Integration

### **Automation Solutions**

- PLC Systems
- SCADA, HMI- Historians
- Energy Management Systems
- Electrical Control Systems
- IOT controllers and RFID & Bar Code Solution
- Process Control Systems
- MES Systems

## Other Solution

- Integrated Production Analysis and Reporting System for Transformer Lamination
- Web Enabled Reporting Server
- Operator Terminal for E Log Book

## ClairViz Osprey Dash boarding and Reporting Platform for:

- Plant View
- Online KPIs: Production, Productivity, OEE, Performance, Availability, Runtime, Downtime
- Excel Reports: Shift, Daily, Monthly Yearly, Shutdown

## Benefits of Osprey Dash Board

- Elimination of Paper Logbooks
- True OEE
- In Depth TPM loss analysis
- Increased Operator performance
- Automated Scheduled / On Demand reports
- Decreased downtime



## Reducing Downtime in Production:

**ClairViz Integrated Production Management System**

Alm (0/0) - Pugmill

PM No. 15 PC Workman: karak PM Operator: nanendra bharati Item#: 0110034 Blank#: 00499

Upper Motor		Bottom Motor		Temperatures		Flow Rates	
RPM:	00.0	RPM:	00.0	Chiller Temp(C):	27.1	Top Motor	Bottom Motor
Current:	00.0	Current:	00.0	Barrel Out Temp(C):	26.2	Oil Pump	Vacuum Pump
KWH:	11534.3	KWH:	52767.3	Perforated Plate Temp(C):	28.0		
Pug Speed(m/min):	05.7	Vacuum Pressure:	00.8				

Stoppage Reason : Operator to Select

- Electrical
- Quality Checkup
- Lunch & Tea
- Mechanical
- Startup Losses
- Others
- Shift Change

Downtime is considered one of the most important KPI metrics to track. When machines are not operating, money isn't being made so reducing downtime is an easy way to increase profitability. Organizations that track downtime typically require operators to enter a "reason code" via keypad, pushbutton or bar code scanner so that the most common reasons can be reviewed at a later time.

The longer amount of time it takes to complete processes and finish products, the more money it costs to get those products out the door. Reducing the amount of time that people or machines idle will be more efficient for the business's bottom line.

### Track Manufacturing Downtime Carefully

Knowing when, where, and how downtime occurs is essential to knowing how to prevent it. An early step toward reducing unexpected production backups or outright downtime can be achieved by carefully and accurately tracking when and where downtime occurs.

Automatic trackers detect downtime immediately and feed this information out to the factory floor for real-time viewing. Alerts are visible and show the exact location issues have occurred. This allows you to figure out why each instance happened. When you know that user errors are causing the majority of your noted stalls, you know what changes to make and what to prioritize in your efforts.

Develop a strategic enrollment plan that allows you to integrate new technologies into your plant with a modernization program. Implementing a modernization program is a good way to reduce the amount of unplanned downtime.

### **New Technology Plan for Your Manufacturing Plant**

A step-by-step plan is a good approach that will not only increase uptime, but also provide a range of benefits for your processing facility. In modernizing the technology in your plant you may choose to install an industrial Ethernet plant network, standardize on single PLC software, introduce networked HMI's. Budgets can be more easily maintained with smaller upgrades that are planned over time. They can possibly be financed by a multiple departmental budgets, which can ease the upgrade processes.

### **OEE (Overall Equipment Effectiveness)**

OEE (Overall Equipment Effectiveness) – Framework for measuring the efficiency and effectiveness of a process, by breaking it down into three constituent components (the OEE Factors). OEE helps you see and measure a problem so you can fix it, and provides a standardized method of benchmarking progress.

It is the gold standard for measuring manufacturing productivity. Simply put – it identifies the percentage of manufacturing time that is truly productive. An OEE score of 100% means you are manufacturing only Good Parts, as fast as possible, with no Stop Time.

In the language of OEE that means 100% Quality (only Good Parts), 100% Performance (as fast as possible), and 100% Availability (no Stop Time). Measuring OEE is a manufacturing best practice. By measuring OEE and the underlying losses, you will gain important insights on how to systematically improve your manufacturing process. OEE is the single best metric for identifying losses, benchmarking progress, and improving the productivity of manufacturing equipment.

OEE is a metric that multiplies **availability** by **performance** and **quality** to determine resource utilization. Production managers want OEE values to increase because this indicates more efficient utilization of available personnel and machinery.

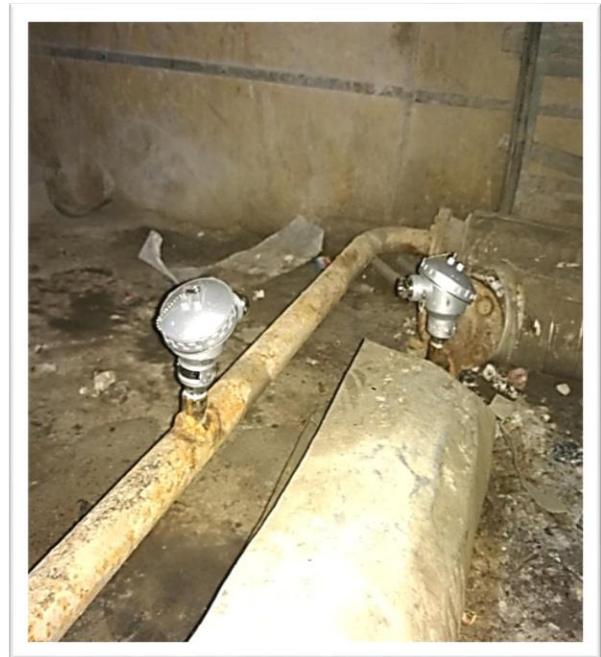
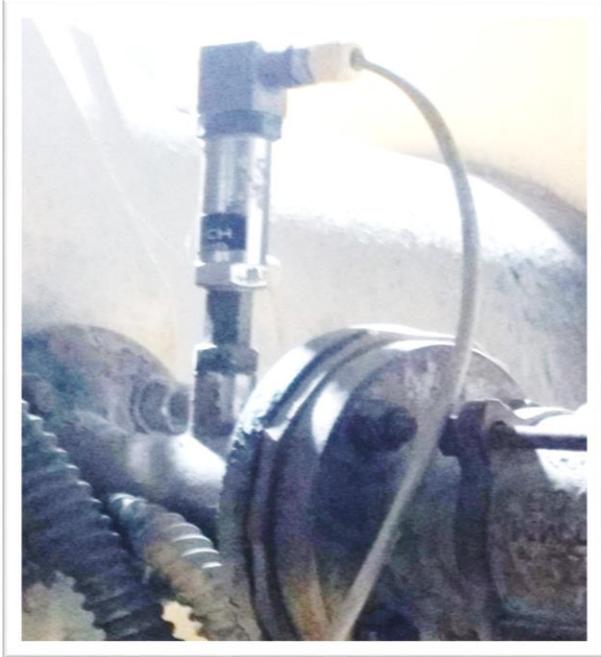
## Key Performance Indicators (KPIs)

KPIs are assorted variables that organizations use to assess, **analyze and track manufacturing** processes. These performance measurements are commonly used to evaluate success in relation to goals and objectives. A Key Performance Indicator (KPI) is a **measurable value** that demonstrates how effectively a company is achieving key business objectives. Selecting the right KPIs will depend on your industry and which part of the business you are looking to track. Each department will use different KPI types to measure success based on specific business goals and targets.

### Few KPI Examples

- Availability Dashboard
- Quality Dashboard
- Performance Dashboard
- Total cycle time
- Turnover
- Maintain Inventory Level

## Installation of Sensors



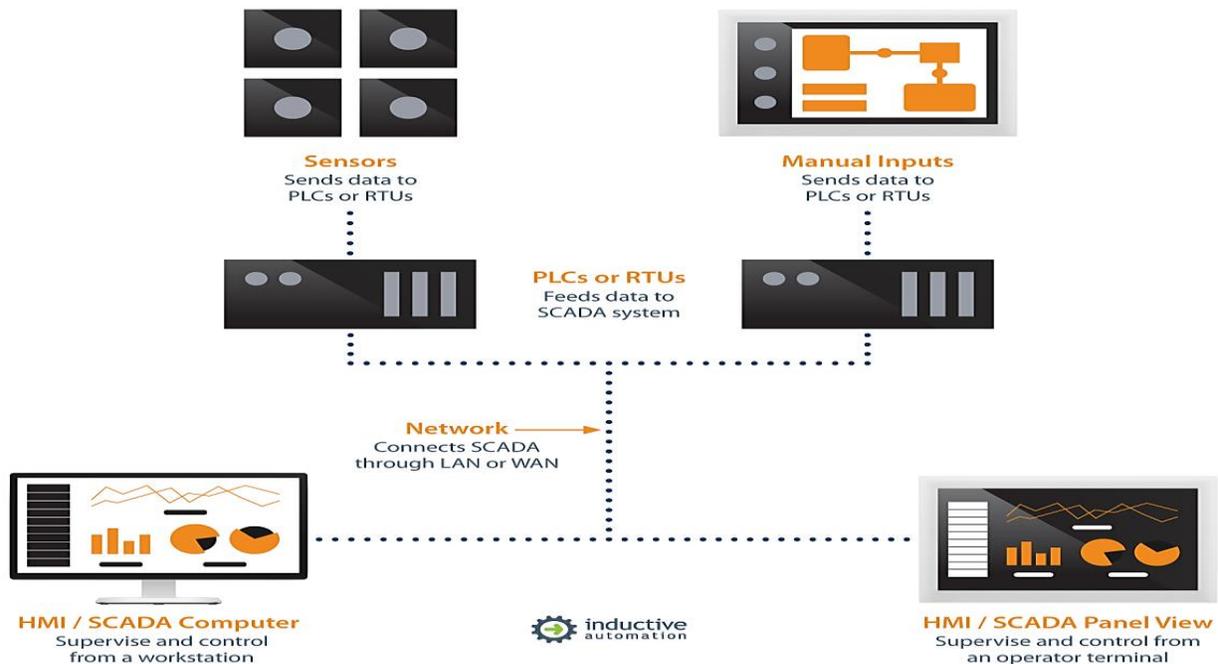
The Internet of Things (**IoT**) couldn't exist without **smart sensors**, and the growing use of smart technology is already transforming how manufacturers implement the IoT. Smart sensors, including radio frequency identification (**RFID**) tags, serve three broad purposes. They identify items, locate them and determine their environmental conditions, all of which have major implications for the supply chain and manufacturing.

Smart sensors are particularly useful in plants or warehouses because they can keep track of temperature and humidity, log data for historical records and quality management, or be used as triggers for alarms or process management.

Smart sensors impact the supply chain by being embedded in products, which can help improve the manufacturing process or the products themselves. They can also permeate the manufacturing process to monitor, control, and improve operations. There are a number of specific purposes of sensors, such as measuring temperature, humidity, vibrations, motion, light, pressure and altitude.

## Introduction of SCADA

### (SUPERVISORY CONTROL AND DATA ACQUISITION)



Automation system contains PLCs and SCADA software. If you use PLC & SCADA combination the advantages, we can have better monitoring and control of the plant and also we have access to the information the way you want. SCADA enables engineers, supervisors, managers and operators to view and interact with the workings of entire operations through graphical representation of their production process.

SCADA runs on a PC and is generally connected to various PLCs and other peripheral devices. It enables you to generate applications for the most demanding requirements of plant engineers, operators, supervisors and managers tailored precisely to the needs of each plant. SCADA constantly gathers data from the plant in real-time, stores and processes it in the database, evaluates and generates alarms, displays information to plant operators, supervisors and managers and can issue instructions to PLCs on the plant floor.

SCADA is a system operating with coded signals over communication channels so as to provide control of remote equipment (using typically one communication channel per remote station).

The supervisory system may be combined with a data acquisition system by adding the use of coded signals over communication channels to acquire information about the status of the remote equipment for display or for recording functions. It is a type of industrial control system (ICS). Industrial control systems are computer-based systems that monitor and control industrial processes that exist in the physical world.

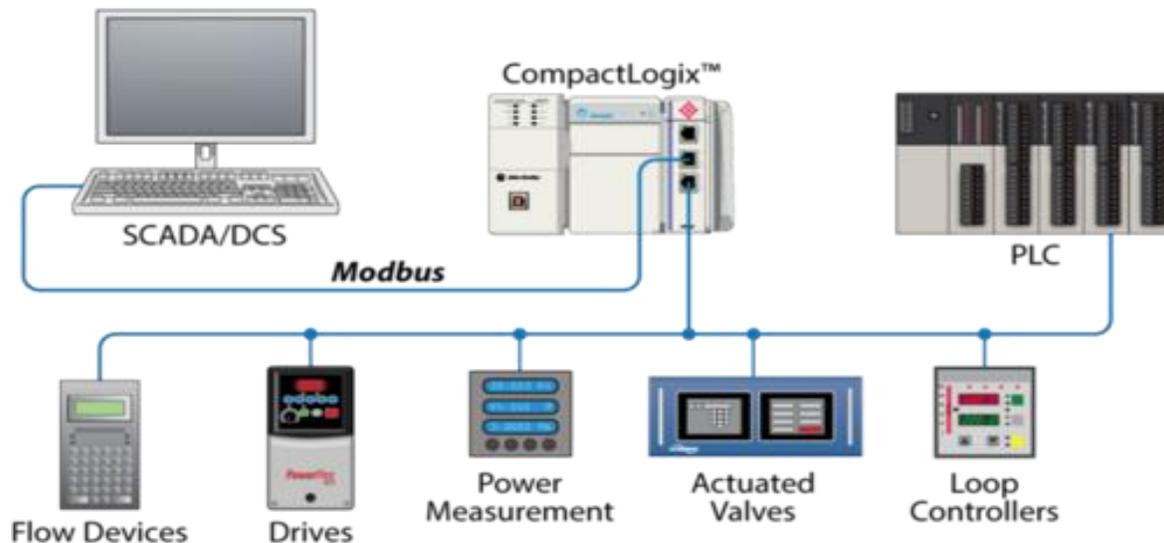
SCADA can be a great tool while working in an environment where operational duties need to be monitored electrical communication instead of locally. For example, an operator can position a valve to open or closed as desired through SCADA without leaving the control station or the computer. The SCADA system also allows to switch a pump or motor on or off and has the capability of putting motors on a Hand operating status, off, or Automatic. Hand would be referring to operate the equipment locally, and automatic would be scaling the equipment to be operated according to set points the operator instructs on a computer that can communicate with the equipment through SCADA.

## **Components of SCADA**

**I) Remote terminal units (RTUs)** connect to sensors in the process and convert sensor signals to digital data. They have telemetry hardware capable of sending digital data to the supervisory system, as well as receiving digital commands from the supervisory system. RTUs often have embedded control capabilities such as ladder logic in order to accomplish Boolean logic operations.

**II) Programmable logic controller (PLCs)** connect to sensors in the process and converting sensor signals to digital data. PLCs do not have telemetry hardware, although this functionality is typically installed alongside them. PLCs are sometimes used in place of RTUs as field devices because they are more economical, versatile, flexible, and configurable.

## Introduction of PLC



**Programmable logic controllers (PLCs)** have been an integral part of factory automation and industrial process control for decades. These systems perform many functions, providing a variety of analog and digital input and output interfaces; signal processing; data conversion; and various communication protocols. All of the PLC's components and functions are centered around the controller, which is programmed for a specific task.

The basic PLC module must be sufficiently flexible and configurable to meet the diverse needs of different factories and applications. Input stimuli (either **analog or digital**) are received from machines, sensors, or process events in the form of voltage or current. The PLC must accurately interpret and convert the stimulus for the CPU which, in turn, defines a set of instructions to the output systems that control actuators on the factory floor or in another industrial environment.

A Programmable Logic Controller, or PLC, is more or less a small computer with a built-in **operating system (OS)**. This OS is highly specialized to handle incoming events in real time, or at the time of their occurrence. The PLC has input lines where sensors are connected to notify upon events (e.g. temperature above/below a certain level, liquid level reached, etc.), and output lines to signal any reaction to the incoming events. It uses a language called "Relay Ladder" or **RLL (Relay Ladder Logic)**.

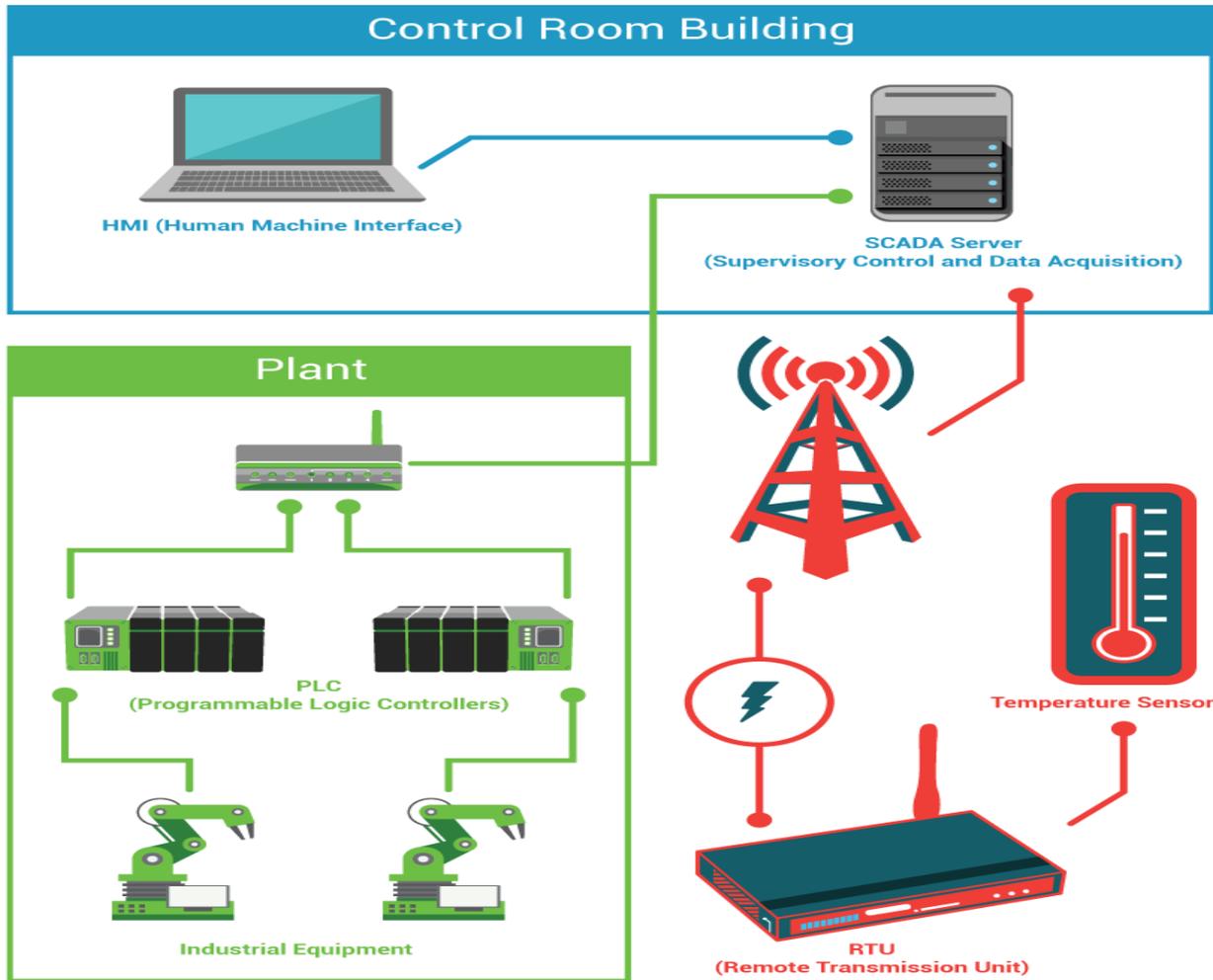
The PLC is primarily used to control machinery. A program is written for the PLC which turns on and off outputs based on input conditions and the internal program. In this aspect, a PLC is similar to a computer. However, a PLC is designed to be programmed once, and run repeatedly as needed. The PLC is a purpose-built machine control computer designed to read digital and analog inputs from various sensors, execute a user defined logic program, and write the resulting digital and analog output values to various output elements like hydraulic and pneumatic actuators, etc.

### **Data acquisition**

Data acquisition begins at the RTU or PLC level and includes meter readings and equipment status reports that are communicated to SCADA as required. Data is then compiled and formatted in such a way that a control room operator using the HMI can make supervisory decisions to adjust or override normal RTU (PLC) controls. Data may also be fed to a Historian, often built on a commodity Database Management System, to allow trending and other analytical auditing. SCADA systems typically implement a distributed database, commonly referred to as a tag database, which contains data elements called tags or points. A point represents a single input or output value monitored or controlled by the system.



## SCADA Systems



### Control room:



## My Responsibilities as an Intern

My first assignment was to travel to client location at following location:

- ➔ G Industries Limited: Unit:  
A. B. Insulators (Vadodara, Gujarat)



### A. B. Insulators

A. B. Insulators, the largest Indian manufacturer of high voltage porcelain insulators, is a part of G. Industries Ltd. World class technology and cost competitiveness produce high quality insulators at state-of-the-art manufacturing facilities.

A recipient of the Capexil's top export award and special export award during the last 18 years, the company has also bagged awards from the President and Prime Minister of India for exports excellence.

The world's fourth largest manufacturer of electrical insulators, with an extensive product range that includes hollow, solid core, disc, pin, post insulators, finding applications in substation equipment and in transmission systems.

A. B. Insulators caters to the entire spectrum of sub-station and transmission insulators. It specializes in the production of high strength equipment porcelains for use in SF6 circuit breakers, instrument transformers, condenser bushings, disconnections and insulators for the traction system of the Indian Railways, and high end transmission products up to 765 KV system voltages.



A. B. Insulators is the preferred partner of a global clientele that includes leading power utilities and national and international power equipment manufacturers. Its products are exported to over 58 countries worldwide, with focused markets in Europe, America, Middle East, Africa and China.

## **My Responsibilities as an Intern**

**Designation:** System Analyst

### **Responsibilities:**

- Maintaining relationships with clients by providing support, information, and guidance.
- Maintains professional and technical knowledge by attending Conference, Meetings and Social Networking events like Nasscom's 10,000 Startups Programme.
- Analyzing and understanding the current state processes to ensure that the context and implications of change are understood by the clients and the line Operators.
- Getting feedbacks about the system from the clients and line operators and communicating well to the Operation team for improvements.
- Develop and manage digital marketing campaigns like to create Marketing Pitch video as a social media strategy,
- Preparing reports by collecting, analyzing, and summarizing information.
- Assisting in preparation of User guide manuals of the systems like Pugmill, FilterPress and Osprey Dash Board for the Operator terminal.

## Social Media Campaign Plan



### Social Media Campaign

[www.hootsuite.com](http://www.hootsuite.com)

This website helps handling multiple Social sites like Facebook, Twitter, Instagram, YouTube etc. It manages these platforms using Single Dashboard via hootsuite.com.

### YouTube Videos

YouTube users want to watch content they can relate to in some way, and the very best campaigns nowadays reflect that. Brands are increasingly choosing to tap into influencers with huge reach, or create their own content

### Social Media Campaign

**Definition:** A social media campaign is a coordinated marketing effort to reinforce or assist with a business goal using one or more social media platforms. Campaigns differ from everyday social media efforts because of their increased focus, targeting and measurability.

- Getting feedback from users.
- Building email marketing lists
- Increasing website traffic
- Improving overall brand engagement
- Directly driving sales

### **Social Media channels helps to:**

- Promote a product/service
- Build brand awareness
- Create a sense of community

It unites people around a common interest or experience, and ideally, creates a trend.

### **Search Engine Optimization**

- Website Ranking
- Use of Social Media like Facebook, twitter, Linked in etc
- Pull Marketing

### **Search Engine Marketing**

Quality results, Target Segments.

- AdWords Campaign
- Attractive Ads
- Display Ads
- YouTube Ads

## Conclusion

It gives us immense pleasure on presenting my project report entitled,

### **“Integration of IOT and Analytics for Smart Manufacturing”**

I express my deep sense of gratitude and sincere regards to my Mentors **Mr. Aditya Vermani** and **Mr. Ranjeev S. Andotra**. Their timely guidance and friendly discussions has helped me immensely completing my project work. I am also thankful to **ClairViz** Systems LLP for giving me this opportunity

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