

Automation in Chemical Industry

**Miss. Mansi Vasant Wadhavane, Mr. Shubham Dilip Mali , Mr. Yogesh Shivaji Nirmal ,
Mr. Ajinkya Dilip Mhaske**

Third Year Diploma In Chemical Engineering Pravara Polytechnic Loni

Guided By: Prof.A.S.Shirsath

Lecturer in Chemical Engineering Pravara Polytechnic Loni

ABSTRACT

This Report Presents the information and knowledge gained during planning of Capstone project.

This report is a summary of all the overview of chemical industry where automation is carried out which we have been able to studied. This report contains detailed information about each & every manufacturing process carried out in industry with the help of automation.

In this report all the types of automation process are mentioned. All the operating parameters of a specific plant are specified. Also report presents a Every plant wants to reach

maximum performance – and automation can help to reduce risks and improve productivity. As such, both of these can translate to lower operational costs.

This report contains detailed background of automation in chemical industry.

This report challenges face by chemical industries before automation.

Last but not least in this report included the brief background of automation in chemical industry. This technical report is the summary of what we have learnt during Capstone project planning.

Key words : minimum performance

1. INTRODUCTION

Throughout India, Various chemical plants encounter an array of challenges – and automation can help to provide solutions.

Entire process can be automated, ranging from process control systems to weighing technology to batch requirements.

Further, automation can be customized to the needs of an individual plant.

Commissioning and automation services are capable of reducing the time to market, effectiveness and availability within the plant, as well as reducing plant costs. Every chemical plant across India needs to explore the various options that exist in terms of Commissioning as well as taking advantage of automation services when and where possible.

Every plant wants to reach maximum performance – and automation can help to reduce risks and improve productivity. As such, both of these can translate to lower operational costs.

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to weighing technology to batch requirements. Further, automation can be customized to the needs of an individual plant.

By taking advantage of commissioning and automation services in India, chemical plants are able to learn more about their options, even before they open their doors for the first time. Plants that have struggled in the past may also want to explore new ways to integrate automation for the commissioning process so that it is easier to pass requirements throughout the different regions of India.

2. BASIC CONCEPTS

Due to the rapid advances in technology, all industrial processing systems, factories, machinery, test facilities, etc. turned from mechanization to automation. A mechanization system needs human intervention to operate the manual operated machinery. As new and efficient control technologies evolved, computerized automation control is being driven by the need for high accuracy, quality, precision and performance of industrial processes.

Automation is a step beyond the mechanization which makes use of

high control capability devices for efficient manufacturing or production processes.

Automation is a broad term applied to any mechanism that moves by itself or is self dictated. The word ‘automation’ is derived from ancient Greek words of Auto (means self) Matos (means moving). As compared with manual systems, automation systems provide superior performance in terms of precision, power, and speed of operation.

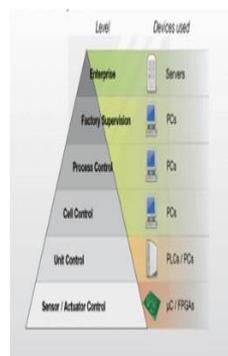
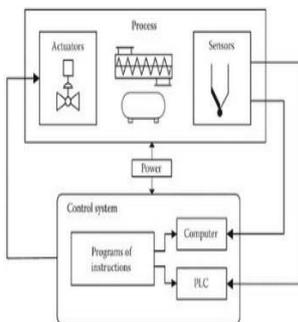
In industrial automation control, a wide number of process variables such as temperature, flow, pressure, distance, and liquid levels can be sensed simultaneously. All these variables are acquired, processed and controlled by complex microprocessor systems or PC based data processing controllers.

2.1 Challenges faced by the manufacturing industry:

1. Demand Forecasting

Despite substantial advancements in demand forecasting and information technology, most businesses struggle to incorporate inventory levels into their production planning procedures. Most of the time, the necessity of choosing the right forecasting approach is ignored, and forecasting is blamed. Many factories are still having trouble anticipating future demand today. The biggest issue is that they lack effective monitoring systems that would allow them to forecast how many goods they should sell in the coming months or years. As a result, their products fall short of client expectations and reduce sales.

What is Industrial Automation?



2. Inventory Management

Inventory management remains one of the most critical challenges faced by the manufacturing industry, but it has become much easier with the help of automated solutions. Nonetheless, many manufacturers, tiny ones, continue to handle their inventories manually. The use of software can cut down time-consuming tasks such as

Inventory management. Manual stock checks are inefficient and prone to errors, resulting in mistakes, shortages, excess, and unidentified losses. Organizations are under a lot of pressure to deliver consistently high-quality goods that meet the needs of their customers. However, if a manufacturer has trouble keeping track of inventory, it could result in shortages and various other issues.

3. Improving Manufacturing Plant Efficiency

Manufacturers have been looking for practical solutions to reduce costs and increase efficiency at their factories up until now. Many of them prefer to cut production costs by reducing product quality, but this will only decrease their profitability since dissatisfied customers will stop buying. It's all about revolutions in manufacturing. Every step in the process, every input and output, changes from raw materials to the completed product and progresses. Companies must make a genuine commitment to excellence looking around at all the essential information to increase quality.

4. Wastage of material

Waste is a regrettable but unavoidable element of any process manufacturing production cycle, frequently due to poor planning or recipe or formula changes. To avoid financial losses, prevent high overhead, and improve overall efficiency, a process manufacturer's primary value is to limit the amount of material wasted.

5. Keeping Track of Sales Lead

Another problem that companies commonly experience is managing and evaluating sales leads. Many of them handle their leads the same way; however, this isn't the right strategy. Because each sales lead is unique in terms of persona, preferences, and requirements, they must be treated specifically. Manufacturers also often find it challenging to identify potential leads, so they often focus on unpromising opportunities and forget to follow up with high potential leads.

6. Shortage of Skilled Labor

Although automation and robotics can help close the labour gap, humans will still be required to assess and solve problems and manage out. Moreover, the industrial industry is suffering a staffing shortfall as the baby boomer

generation prepares to retire. It is one of the most severe dangers to the manufacturing industry today.

2.2. Proposed Detailed Methodology of solving the identified problem

Modern-day automation

Of the many trends in the manufacturing industry, automation improves processes such as production, handling, and distribution. It was a result of the development of powered machinery and equipment during Industrial Revolution. The upcoming significant automation offered were Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM). Following are a few examples of automation in the Modern Workplace:

Integration automation is where machines mimic human tasks and repeat them once defined in the machine rules.

Artificial Intelligence (AI) automation is the most complex and challenging degree of automation used by 21st-century organizations. Here, machines will actively “learn” and make

decisions by analysing and taking patterns from previous experiences.

Hyper automation is a concept of combining machine learning, software, and automation tools in the workplace. It maximizes automation processes and boosts productivity. It also provides intelligence, power and the capability to translate intelligence into action by merging various cognitive functions with automation technology.

Manufacturing Analytics

Manufacturing analytics deliver real-time and historical insight into essential performance parameters to manage, monitor and increase operational efficiency. It is part of a more significant transformation known as Industry 4.0. As a result, factories are projected to transform into self-running and healing entities by embracing emerging innovations such as the cloud and the Internet of Things (IoT). Moreover, predictive and big data analytics, the Industrial Internet of Things (IIoT), Machine Learning, and edge computing are all used in manufacturing analytics. Above all, it helps develop better and scalable factory solutions, provides actionable knowledge and gives context-awareness in real-time. Digitizing the

businesses, lowering costs, enhancing quality, and reinventing the customer experience can offer decision-makers a competitive advantage. By putting their large volumes of data to work, manufacturing analytics is assisting organizations in increasing their efficiency and profitability. Thus, manufacturers can unearth insights to make better strategic decisions.

Digital optimization of sales and marketing

Digital marketing is the need of the hour because of its outreach and potential. The traditional way of marketing has lost its impact. Besides, most businesses opt for digital marketing today to increase outreach, create brand awareness, generate leads, and cost-effective marketing solutions. The following are some of the advantages of Internet marketing:

- ▮ The capacity to communicate with prospects and understand what they want
- ▮ The ability to tap into a worldwide market
- ▮ Traditional marketing approaches cost more money than modern approaches
- ▮ Get to know your audience and allow them to know you

personally. It establishes build brand loyalty.

3. The Chemical Industry and Automation

It is likely that your production facility is already much more flexible and efficient today than it was just a few years ago. But the standards of productivity, reliability, and safety are constantly rising. Tried-and-tested, durable, and functionally safe solutions from Festo are the best way to ensure that you continue to meet these requirements. On this page, you will find an overview of our range of products and services.

3.1 Reliable and Efficient Systems

Explosive substances, aggressive media, and extreme temperatures make numerous processes in the chemical industry extremely risky. Festo not only helps you make processes more productive, but also supports you in your goal of ensuring that people and the environment remain safe. But we also know how important it is to cut costs and save energy.

This can be achieved through innovative components and system solutions to safely automate your processes in the oil and gas, refinery, petrochemical, polymer, basic, specialty, and consumer chemical industries. We are constantly working on new solutions and advancements to keep your business profitable – even when requirements change rapidly. Thanks to Festo’s expertise and global support, you can rely on an experienced partner with a worldwide presence. We support you in every phase of the project, from engineering, procurement, installation and start-up to operation and on-site service.

Features

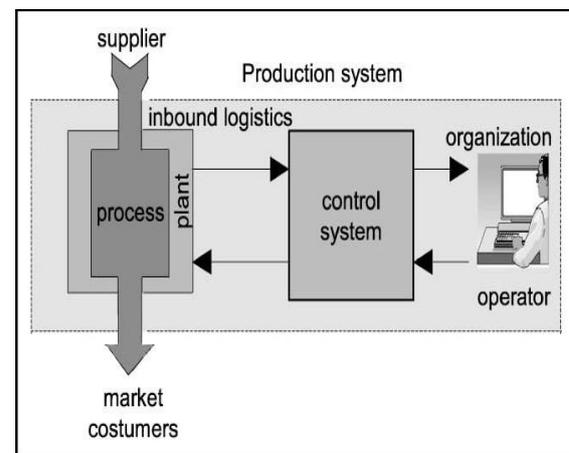
- Integrated automation and information management systems
- Safety interlocking systems interfaced to the automation system
- Process history data, process operation and product tracking
- Batch processes

Benefits

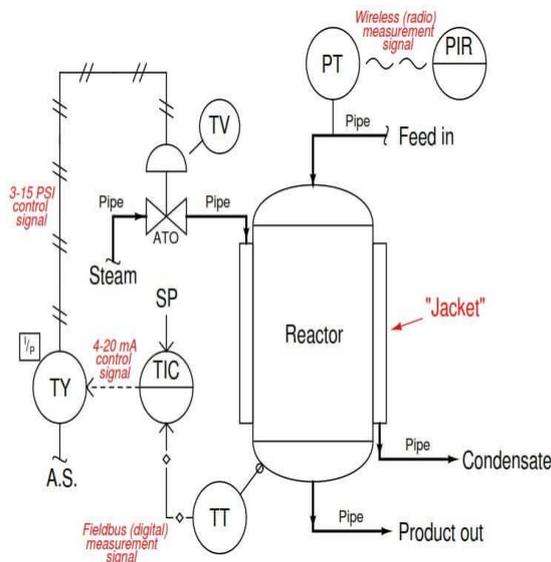
- High automation and production process availability

- Improved operational efficiency
- Easy repeatability of process operations
- Open system structure
- Reliability
- Scalable for further extensions
- Life cycle services close to the customers

The extensive field of chemical processes varies from simple, continuous processes to complex batch processes with recipe controls and automatic grade changes. They may be harmless, or they may be hazardous exothermic processes, where safety issues must be strictly followed.



4. Chemical Temperature Control System



The purpose of this control system is to ensure the chemical solution inside the reactor vessel is maintained at a constant temperature. A steam-heated “jacket” envelops the reactor vessel, transferring heat from the steam into the chemical solution inside.

The control system maintains a constant temperature by measuring the temperature of the reactor vessel,

and throttling steam from a boiler to the steam jacket to add more or less heat as needed.

We begin as usual with the temperature transmitter, located near the bottom of the vessel. Note the different line type used to connect the temperature transmitter (TT) with the temperature indicating controller (TIC): hollow diamonds with lines in between. This signifies a digital electronic instrument signal – sometimes referred to as a fieldbus – rather than an analog type (such as 4 to 20 mA).

The transmitter in this system is actually a digital (fieldbus), and so is the controller. The transmitter reports the process variable (reactor temperature) to the controller using digital bits of information. Here there is no analog scale of 4 to 20 milliamps, but rather electric voltage/current pulses representing the 0 and 1 states of binary data.

Digital instrument signals are capable of transferring multiple data points rather than single data points as is the case with analog instrument signals. This means digital instrument signals may convey device status information (such as self-diagnostic test results)

as well as the basic measurement value.

In other words, the digital signal coming from this transmitter not only tells the controller how hot the reactor is, but it may also communicate to the controller how well the transmitter is functioning.

5. CONCLUSION

With massive churning and changes in the industrial landscape globally, new opportunities for manufacturers opened up. The new way of production, supply, procurement, marketing, selling and distribution is transforming the old and traditional processes in the industry. With growing demand and supply, the industry needs to change the way of its functioning and operation. With all that in mind, this blog touched every aspect of new innovative technology and trends in the manufacturing industry. These can be helpful for the industry to grow and build a great organization. Lower costs, more efficiency, easier inventory management, payback cycles, and increased output are evident and measurable benefits of the new manufacturing industry. All this is

achieved through the planned and thoughtful development. The benefits of the industrial revolution are also felt in developing countries like India, where technological advances were neglected in the past. Now, the question is, What's the result? Professionals on the shop floor and manufacturers get to work in the future factories, improving their business and growth while providing customers with precisely what they desire.

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