TECHNICAL MAGAZINE

DEPARTMENT OF CHEMICAL ENGINEERING

2023 - 2024

ER PERUMAL MANIMEKALAI POLYTECHNIC COLLEGE

Koneripalli, Hosur -635117
AN ISO 9001:2015 CERTIFIED INSTITUTION, AFFILIATED TO TN DOTE
ACCREDIATED BY NBA https://www.pmctechpoly.org

DEPARTMENT OF CHEMICAL ENGINEERING

VISION OF THE INSTITUTE

PMC Tech Polytechnic College shall emerge as a premier Institute for valued added technicaleducation coupled with Innovation, Incubation, Ethics and Professional values

Mission of the Institution

1. To foster the professional competence through excellence in teaching and learning
2. To nurture overall development of students by providing Quality Education & Training
3. To provide innovative environment to learn, innovate and create new ideas for the betterment ofoneself and society

VISION OF THE DEPARTMENT

To prepare the chemical engineers who can pursue their goals which will benefit the society and environment

Mission of the Department

1. **Impart** Quality education and training in Chemical Engineering and associated fields to enable the students to imbibe technical and analytical skills through logical thinking
2. **Groom** the students with leadership skills, professional Ethics, transparency and accountability.with technical knowledge.
3. **Inculcate** sense of social and environmental responsibility among students which inspires them to apply Chemical Engineering principles in solving industrial problems through sustainable and eco-friendly technologies for betterment of society and nation

Programme Educational Objectives (PEO's)

PEO 1: Have good training in fundamental and advanced concepts of Chemical and alliedEngineering for good career in industry or for Higher Studies.

PEO 2 : Demonstrate professional excellence, ethics, soft skills and leadership qualities throughskill development

PEO 3 : Contribute to the economic and environment of their communities by providingopportunities for innovation and lifelong learning

Programme Specific Outcomes (PSO's)

PSO 1: Apply knowledge of the basic science, mathematics and chemical engineering in thedesign and Operations of chemical process

PSO 2: Have an ability to Identify, formulate, and solve complex problems in the various domains of Chemical engineering such as momentum transfer, heat transfer, mass transferand mechanical operation in industries.

PSO 3: Possess the attitude of innovation and lifelong learning as per the need of wider context of Technological changes in the field of chemical engineering.

PROGRAMME OUTCOMES

PO1: Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.

PO2: Problem analysis: Identify and analyse well-defined engineering problems using codified standardmethods.

PO3: Design/ development of solutions: Design solutions for well-defined technical problems and assistwith the design of systems components or processes to meet specified needs.

PO4: Engineering Tools, Experimentation and Testing: Apply modern engineering tools andappropriate technique to conduct standard tests and measurements.

PO5: Engineering practices for society, sustainability and environment: Apply appropriate technology in context of society, sustainability, environment and ethical practices.

PO6: Project Management: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

PO7: Life-long learning: Ability to analyse individual needs and engage in updating in the context oftechnological changes.

Messages

FOUNDER'S MESSAGE

Er.P.Perumal Founder
PMC TECH Group of Institutions

"Any place that anyone can learn something useful from someone with experience is an Educational Institution"

Time has now come to realize your dream to be in the main stream of your professional career and must be a great feeling to be a part of most prestigious one. PMC TECH has a history of more than 15 years. In recent years degree in the technical education like Engineering, has become the foremost academic qualification for all leading Industries, Government and Non-Government sectors. Academicians and Industrialists alike have recognized the value of the degree in the developing challenges of the rapidly changing technical environment. One of the strength of our campus is the diversity of programs and members background and experience. The range of functional, professional and vocational skills and knowledge that participants bring to the program allow the lecturing faculty to test the validity of theoretical concept against of rich background of personal and organizational outlooks. The Campus environment and work culture will encourage individuals from all walks of life and from all special and economic backgrounds. To be Engineers and other technical – based professionals, can all benefit from the experience at this beautiful campus.

CHAIRMAN'S MESSAGE

Shri P.Kumar
Chairman

"The object of education is to prepare the young to educate themselves throughout their lives"

True Education indeed paves the path for the children to learn new things in a correct manner. It heals them, broadens their perspectives and enriches their knowledge to face the globally competitive era. PMC TECH- Polytechnic started in 1996 with an objective to provide quality education and excellence in ever changing field of technical education. Technology is moving at a very fast pace. What was breakthrough yesterday is obsolete today. This has made it imperative that future technocrats must be familiar not only with technical skill but also with the technology of tomorrow. The maximum "survival of fittest" is more relevant now than ever before. We believe in value based quality education and faculty Members at PMC TECH – Polytechnic are striving hard for it, so that product of our Polytechnic college is well received by the industry, public and private sector organization and others. I hope young Diploma engineers passing from the institute will create difference in Indian and Global scenario.

SECRETARY'S MESSAGE

Smt. P. MALLAR
Secretary

"Education is a progressive discovery of our own ignorance"

At PMC TECH, we value every individual and it is our aim to provide the best possible environment where students can succeed. Our campus has grown from its inception in 2002 to accommodate almost 3000 pupils in first-class teaching facilities which are amidst beautifully kept grounds. We are fortunate to have a talented, highly committed teaching and supporting staff here to ensure the learning environment of our students is the best it can be. We seek to prepare our young men and women with the very best preparation for life after PMC TECH. Our departing Collegians should be well rounded individuals who are grounded in the Anglican way of faith, hope and love. We seek to instill in our students a passion for learning which brings knowledge and makes them to understand that they need to make a positive contribution to the community where they live and work. The likelihood of achieving this is strengthened by the fact that we offer an academic program that includes indepth rigorous coaching and which can be tailored to individual needs. We encourage high academic standards and have high expectations of personal discipline and motivation from our students.

Director Message

Er.Peumal Manimekalai Polytechnic College is an institution that aims at the complete development of the student and our staff are a hand picked and trained to ensure that the students are given every possible support in all their Endeavour's academic or otherwise it is a multi disciplinary institution and this also ensures that the students have ready access to a wide range of academic material.

Our brand of education does not have narrow horizons, we believe in exposure. Our students are encouraged to widen their knowledge base and study beyond the confines of the syllabus.

Principal Message

Prof N. Balasubramaniam
Principal

Er.Perumal Manimekalai Polytechnic College is continuously strive to impart Quality Education along with high ethical and Moral values which enable us, not only to mould our students as successful Diploma Engineers but also as disciplined citizens of our Nation. Also, we continuously upgrade and maintain world class infrastructure keeping in pace with the rapid technological developments.

We are committed to innovation and continuous improvement. We seek to work closely in partnership with the students and their parents to maximize student performance and success regardless of their ability levels.

HOD Message

Mrs K. Renuga Devi
HOD/Chemical

To provide high quality education and other services the competencies of the teaching staff have to be developed continuously. This will enable them to meet the ever changing technical advancements. We encourage our staff to undergo prioritized need based development programs and to acquire higher qualifications. To expose our students to the practical environment and industrial work culture we provide hands on experience through in plant training, industrial visit, and guest lecturers by calling experts from industries. We are proud of our alumni, many of whom are holding leading positions at major national companies and corporations.

CREATIVE DESK

"Chemical engineering: where the magic of science meets the ingenuity of engineering."

"In chemical engineering, we don't just solve problems; we create solutions."

"Chemical engineers: transforming ideas into reality, one reaction at a time."

"In the world of chemical engineering, every molecule has a story to tell."

"Chemical engineering is the art of converting raw materials into value-added products."

CREATIVE DESK

1.MRS.K.RENUGADEVI.M.E, HOD

REVIEWER

2.MRS.P.SIVARANJANI.B.Tech, LECTURER

CONVENOR

3.MR.S.RANJITH KUMAR.B.Tech,LECTURER

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6.SELVAN S.JAISANKAR, III YEAR

STUDENT MEMBER

7.SELVAN L.MOHITH REDDY, II YEAR

STUDENT MEMBER

Index

Articles 01
Students Achievements 12
Projects 14
Alumni 16
Department activities 18
Puzzles 19
Technical Quiz 20
Department Gallery 23
Art Gallery 27

I .GREEN HYDROGEN

By S. Jaisankar – III yr

1. Introduction to Green Hydrogen

Hydrogen is the most abundant element in the universe, and when used as a fuel, it produces only water as a byproduct. However, the environmental impact of hydrogen largely depends on how it is produced. The term "green hydrogen" refers to hydrogen produced through the electrolysis of water using renewable energy sources. This process ensures that the hydrogen is generated with minimal environmental impact.

2. Production of Green Hydrogen

2.1 Electrolysis

The primary method for producing green hydrogen is electrolysis. This process involves splitting water (H_2O) into hydrogen (H_2) and oxygen (O_2) using electricity. When the electricity used is sourced from renewable energy sources such as wind, solar, or hydro power, the hydrogen produced is termed "green."

- **Electrolyzers**: The equipment used in this process is called an electrolyzer. It consists of an anode and a cathode separated by an electrolyte. When an electric current passes through the water, it breaks down into hydrogen and oxygen.
- **Types of Electrolyzers**: There are several types, including:
    - **Alkaline Electrolyzers**: Using a liquid alkaline electrolyte like potassium hydroxide.
    - **Proton Exchange Membrane (PEM) Electrolyzers**: Using a solid polymer electrolyte.
    - **Solid Oxide Electrolyzers**: Operating at high temperatures and using a solid oxide or ceramic electrolyte.

2.2 Renewable Energy Sources

To achieve green hydrogen, the electricity for electrolysis must come from renewable sources:

- **Solar Power**: Solar panels convert sunlight directly into electricity. This method can be deployed at various scales, from small residential setups to large solar farms.
- **Wind Power**: Wind turbines convert wind energy into electricity. Wind farms, whether onshore or offshore, are an effective way to generate renewable electricity for electrolysis.
- **Hydropower**: Dams and hydroelectric plants use flowing water to generate electricity. This method is reliable and can provide a steady supply of power for hydrogen production.

3. Applications of Green Hydrogen

3.1 Energy Storage

One of the significant advantages of green hydrogen is its potential for energy storage. Renewable energy sources like wind and solar are intermittent, meaning they don't produce power constantly. Hydrogen can be stored and used later, providing a buffer for periods when renewable energy generation is low.

3.2 Transportation

Green hydrogen has great potential in the transportation sector:

- **Fuel Cell Vehicles (FCVs)**: Hydrogen fuel cells convert hydrogen into electricity to power vehicles. These vehicles offer a longer range and faster refueling times compared to battery electric vehicles.
- **Heavy-Duty Transportation**: Hydrogen is particularly promising for heavy-duty and long-haul trucks, buses, and trains, where battery storage is less practical due to weight and space constraints.

3.3 Industrial Applications

Hydrogen is a key feedstock in various industrial processes:

- **Ammonia Production**: Hydrogen is used in the Haber process to produce ammonia, which is a crucial component in fertilizers.
- **Refining**: Hydrogen is used in petroleum refining to remove sulfur and other impurities from crude oil.

3.4 Power Generation

Green hydrogen can be used in gas turbines to generate electricity. When blended with natural gas or used in pure form, hydrogen can help reduce the carbon footprint of power plants.

4. Benefits of Green Hydrogen

4.1 Environmental Impact

The production and use of green hydrogen result in zero greenhouse gas emissions. This is a significant advantage over hydrogen produced from fossil fuels, known as gray hydrogen, which emits CO_2 during production.

4.2 Energy Security

By diversifying energy sources and relying on renewable resources, countries can enhance their energy security. Green hydrogen production can reduce dependence on imported fossil fuels.

4.3 Economic Opportunities

The green hydrogen economy presents opportunities for job creation and technological advancement. Investments in hydrogen infrastructure, electrolyzers, and fuel cell technologies can drive economic growth.

4.4 Decarbonization

Green hydrogen plays a crucial role in decarbonizing sectors that are difficult to electrify, such as heavy industry and long-distance transportation.

5. Challenges and Limitations

5.1 Cost

Currently, green hydrogen is more expensive than hydrogen produced from fossil fuels. The high cost is due to the price of electrolyzers and the relatively high cost of renewable electricity.

5.2 Infrastructure

Developing the necessary infrastructure for hydrogen production, storage, and distribution is a significant challenge. Hydrogen requires specialized storage tanks and pipelines due to its low density and high flammability.

5.3 Energy Efficiency

The overall energy efficiency of the green hydrogen production process, from renewable energy generation to hydrogen utilization, is relatively low. Energy losses occur at each stage, including electrolysis, compression, and conversion.

5.4 Storage and Transportation

Hydrogen has a low energy density by volume, which makes storage and transportation challenging. It must be either compressed, liquefied, or stored in chemical compounds, each of which involves energy and cost.

5.5 Technological Development

While advancements are being made, many hydrogen technologies are still in the development or early adoption stages. Further research and development are needed to improve efficiency and reduce costs.

6. Future Outlook

6.1 Technological Advances

Ongoing research aims to improve electrolyzer efficiency, reduce costs, and develop better storage solutions. Innovations in materials science and engineering could lead to breakthroughs in hydrogen technology.

6.2 Policy and Investment

Government policies and investments play a crucial role in accelerating the adoption of green hydrogen. Subsidies, tax incentives, and regulations that promote renewable energy and hydrogen infrastructure can drive growth in this sector.

6.3 Global Initiatives

Countries around the world are increasingly focusing on green hydrogen as part of their climate strategies. Initiatives such as the European Union's hydrogen strategy and national hydrogen roadmaps in countries like Japan, South

Korea, and Australia are paving the way for a hydrogen economy.

6.4 Integration with Other Technologies

Green hydrogen can complement other renewable technologies. For instance, it can be used in combination with solar and wind energy to balance supply and demand, or integrated into existing natural gas infrastructure as a transitional step.

7. Conclusion

Green hydrogen represents a promising solution for achieving a sustainable and low-carbon future. While there are significant challenges to overcome, the potential benefits in terms of environmental impact, energy security, and economic growth make it a key area of focus in the transition to a clean energy system. As technology advances and costs decrease, green hydrogen could play a pivotal role in various sectors, from transportation and industry to power generation and energy storage.

In summary, green hydrogen is an exciting and evolving field that holds great promise for addressing some of the most pressing energy and environmental challenges of our time. With continued innovation, investment, and supportive policies, green hydrogen could become a cornerstone of a sustainable and resilient energy future.

II . Process Intensification

By G.Govindharaj – III yr

Process Intensification (PI) is a broad and transformative approach aimed at significantly improving the efficiency, sustainability, and performance of chemical and industrial processes. Here's a detailed exploration of the concept:

1. Introduction to Process Intensification

Process Intensification (PI) refers to the strategic approach of redesigning and optimizing chemical processes to achieve higher efficiency, reduced energy consumption, and minimized environmental impact. The main goal is to make processes more compact, faster, and safer, while improving product yield and quality. This concept emerged in the late 20th century as a response to the growing need for sustainable industrial practices and more efficient production methods.

2. Principles of Process Intensification

2.1 Compactness and Integration

PI aims to condense the size and complexity of traditional process equipment. By integrating multiple process steps into a single unit or system, PI reduces the need for separate reactors, separators, and heat exchangers. This results in a more compact process footprint, which can lower capital and operational costs.

2.2 Increased Efficiency

One of the key principles of PI is enhancing the efficiency of chemical reactions and separations. This can be achieved through improved mixing, faster reaction kinetics, and more effective heat and mass transfer. Enhanced efficiency often leads to reduced energy consumption and lower operating costs.

2.3 Enhanced Safety

PI emphasizes the design of safer processes by reducing the number of equipment interfaces and minimizing the handling of hazardous materials. By integrating reactions and separations into a single unit, PI can reduce the potential for leaks, spills, and accidents.

2.4 Environmental Sustainability

Sustainability is a core aspect of PI. The approach seeks to minimize waste, reduce energy consumption, and lower emissions. This aligns with broader environmental goals and regulatory requirements for greener industrial practices.

3. Techniques and Technologies in Process Intensification

3.1 Microreactors

Microreactors are small-scale reactors with high surface area-to-volume ratios. They enable efficient heat and mass transfer, which can enhance reaction rates and improve safety by controlling exothermic reactions more effectively. Microreactors are particularly useful for processes that require precise temperature and pressure control.

3.2 Membrane Technologies

Membrane technologies involve using selective barriers to separate components in a mixture. Techniques such as membrane distillation, membrane filtration, and pervaporation can enhance separation processes by improving selectivity and efficiency. Membranes can also be used for reactions, as in membrane reactors, where reactions and separations occur simultaneously.

3.3 Intensified Heat Exchangers

Traditional heat exchangers are often large and energy-intensive. PI involves the use of compact, highly efficient heat exchangers, such as plate heat exchangers and heat exchanger networks. These systems improve heat transfer efficiency and reduce energy consumption.

3.4 Continuous Processing

Continuous processing replaces batch processing with a continuous flow of reactants through the system. This approach can enhance reaction rates, improve product consistency, and reduce waste. Continuous processing is often used in conjunction with microreactors and other PI technologies.

3.5 Reactive Distillation

Reactive distillation combines reaction and separation in a single unit. This technique allows for the simultaneous conversion of reactants and separation of products, which can improve reaction kinetics and reduce the need for multiple processing steps.

3.6 Catalysis

Advanced catalysts and catalytic processes are integral to PI. By developing more efficient and selective catalysts, reactions can proceed more rapidly and with higher yields. This can reduce the need for excess reactants and energy.

3.7 Process Integration

Process integration involves combining different process steps into a unified system to optimize overall performance. Techniques such as heat integration, where waste heat from one part of the process is used in another, can significantly improve energy efficiency.

4. Benefits of Process Intensification

4.1 Reduced Capital and Operating Costs

By making processes more compact and efficient, PI can reduce the size and number of equipment needed. This leads to lower capital expenditures and reduced operational costs due to less energy and material consumption.

4.2 Improved Energy Efficiency

PI techniques often lead to more efficient heat and mass transfer, which can reduce energy consumption. For example, intensified heat exchangers and membrane technologies can improve heat recovery and reduce the need for external heating or cooling.

4.3 Increased Production Rates

Enhanced reaction kinetics and continuous processing can lead to higher production rates. PI enables faster and more efficient production, which can improve throughput and reduce production cycle times.

4.4 Enhanced Product Quality

With improved control over reaction conditions and more efficient separation processes, PI can lead to higher product purity and consistency. This is particularly important in industries where product quality is critical.

4.5 Reduced Environmental Impact

PI approaches aim to minimize waste, reduce emissions, and lower energy consumption. This contributes to more sustainable industrial practices and helps companies meet environmental regulations and goals.

4.6 Greater Safety

By reducing the complexity and number of process steps, PI can enhance safety. Integrated systems often have fewer points of failure and can better control hazardous reactions, leading to safer operations.

5. Applications of Process Intensification

5.1 Chemical Manufacturing

In chemical manufacturing, PI techniques are used to improve reaction efficiencies and reduce processing times. Microreactors, continuous processing, and intensified heat exchangers are commonly applied to enhance the production of specialty chemicals, pharmaceuticals, and petrochemicals.

5.2 Petrochemical Industry

The petrochemical industry benefits from PI through improved catalytic processes, enhanced separation techniques, and more efficient heat integration. These advancements can lead to higher yields of valuable products and reduced environmental impact.

5.3 Pharmaceutical Industry

In pharmaceuticals, PI enables the efficient synthesis of active pharmaceutical ingredients (APIs) with higher purity and lower environmental impact. Techniques such as continuous processing and reactive distillation are used to streamline drug production.

5.4 Food and Beverage Industry

The food and beverage industry uses PI to enhance processing efficiency and product quality. For example, membrane technologies can improve separation processes in dairy and beverage production, while continuous processing can increase throughput and consistency.

5.5 Energy Sector

In the energy sector, PI is applied to optimize energy production and reduce emissions. Enhanced heat exchangers and advanced catalytic processes are used in refining and power generation to improve efficiency and lower environmental impact.

6. Challenges and Considerations

6.1 Technical Complexity

Implementing PI technologies often involves complex engineering and design challenges. Integrating multiple process steps into a single unit requires careful consideration of materials, reaction conditions, and system interactions.

6.2 Cost of Implementation

While PI can reduce operational costs, the initial investment in new technologies and equipment can be high. Companies must weigh the long-term benefits against the upfront costs of adopting PI solutions.

6.3 Scale-Up Issues

Scaling up PI technologies from laboratory or pilot scale to full-scale production can be challenging. Ensuring that intensified processes perform consistently at larger scales requires thorough testing and validation.

6.4 Process Integration

Effective process integration requires a deep understanding of the interactions between different process steps. Optimizing heat, mass, and energy integration demands advanced modeling and control strategies.

6.5 Safety and Regulation

While PI can enhance safety, the introduction of new technologies and processes may require updated safety protocols and regulatory approvals. Ensuring compliance with safety standards and regulations is essential.

7. Future Directions

7.1 Advancements in Technology

Future developments in PI will likely focus on further advancements in microreactor design, membrane technologies, and catalytic processes. Innovations in materials science and process engineering will drive continued improvements in efficiency and sustainability.

7.2 Digitalization and Automation

The integration of digital technologies and automation will play a crucial role in PI. Advanced sensors, data analytics, and process control systems will enable real-time monitoring and optimization of intensified processes.

7.3 Sustainable Practices

As sustainability becomes increasingly important, PI will continue to focus on reducing environmental impact. Techniques that minimize waste, energy consumption, and emissions will be central to future PI developments.

7.4 Collaboration and Research

Collaboration between industry, academia, and research institutions will be essential for advancing PI technologies. Joint efforts in research and development will drive innovation and address the challenges associated with PI implementation.

8. Conclusion

Process Intensification represents a significant shift in how industrial processes are designed and optimized. By focusing on compactness, efficiency, safety, and sustainability, PI offers a path to more efficient and environmentally friendly chemical and industrial processes. While there are challenges to overcome, the benefits of PI in terms of reduced costs, improved performance, and lower environmental impact make it a critical area of focus for the future of industrial manufacturing.

As technology continues to advance and new solutions are developed, PI will play an increasingly important role in shaping the future of chemical and industrial processes, driving innovation, and supporting sustainable practices across various industries.

III.Zero Liquid Discharge Plant By Vinoth K –II Yr

Zero Liquid Discharge (ZLD) is a sustainable approach to wastewater management aimed at minimizing liquid waste by recovering and reusing water and other byproducts. Here's a comprehensive overview of Zero Liquid Discharge (ZLD) plants:

1. Introduction to Zero Liquid Discharge (ZLD)

Zero Liquid Discharge (ZLD) refers to a set of technologies and processes designed to ensure that all wastewater produced in an industrial operation is treated and reused, leaving no liquid waste to be discharged into the environment. The goal of ZLD is to achieve a closed-loop system where all wastewater is either recycled or converted into useful byproducts, thereby minimizing environmental impact and conserving water resources.

2. Key Components of a ZLD System

2.1 Pre-Treatment

Before wastewater can be treated in a ZLD system, it often undergoes pre-treatment to remove larger particles, contaminants, and impurities. This step is crucial for protecting downstream equipment and ensuring effective treatment. Common pre-treatment methods include:

- **Screening**: Removing large solids from wastewater.
- **Sedimentation**: Allowing suspended particles to settle out.
- **Flotation**: Using air bubbles to float contaminants to the surface for removal.
- **Chemical Precipitation**: Adding chemicals to form solid precipitates from dissolved contaminants.

2.2 Primary Treatment

Primary treatment focuses on removing suspended solids and organic matter. This stage typically includes:

- **Settling Tanks**: Allowing particles to settle out by gravity.
- **Dissolved Air Flotation (DAF)**: Using air bubbles to separate suspended solids.
- **Physical Separation**: Using filtration or centrifugation to remove solids.

2.3 Secondary Treatment

Secondary treatment targets dissolved and colloidal organic matter that remains after primary treatment. Techniques used include:

- **Biological Treatment**: Utilizing microorganisms to degrade organic matter. Common methods include activated sludge processes, biofilters, and sequencing batch reactors (SBR).
- **Membrane Bioreactors (MBR)**: Combining biological treatment with membrane filtration to produce high-quality effluent.

2.4 Tertiary Treatment

Tertiary treatment further polishes the treated water to meet specific quality standards. This may involve:

- **Advanced Filtration**: Using microfiltration, ultrafiltration, or reverse osmosis to remove remaining contaminants.
- **Disinfection**: Using UV light, ozone, or chlorine to kill pathogens.
- **Chemical Treatment**: Adding chemicals to remove remaining contaminants or adjust water quality.

2.5 Zero Liquid Discharge Technologies

The final stage of a ZLD system involves the recovery and reuse of water and byproducts. Key technologies include:

- **Evaporation and Crystallization**: Using heat to evaporate water, leaving behind concentrated brine or solid residues. This can be achieved through multiple effect evaporators (MEE) or mechanical vapor recompression (MVR).
- **Reverse Osmosis (RO)**: A high-pressure process that forces water through a semi-permeable membrane, separating purified water from concentrated brine.
- **Zero Liquid Discharge (ZLD) Crystallizers**: Specialized equipment that converts concentrated brine into solid salts, which can be disposed of or reused.
- **Sludge Dewatering**: Removing water from sludge to produce a solid cake that can be disposed of or utilized.

3. Benefits of Zero Liquid Discharge Plants

3.1 Environmental Protection

ZLD plants significantly reduce environmental impact by eliminating liquid waste discharge. This helps prevent water pollution and protects ecosystems from contaminants. By recovering and reusing water, ZLD also conserves valuable water resources.

3.2 Regulatory Compliance

Many industries are subject to stringent environmental regulations regarding wastewater discharge. Implementing ZLD systems helps companies comply with these regulations and avoid penalties or legal issues.

3.3 Resource Recovery

ZLD plants enable the recovery of valuable byproducts from wastewater, such as salts, metals, and other chemicals. These byproducts can be reused or sold, generating additional revenue and reducing waste disposal costs.

3.4 Cost Savings

Although the initial investment in ZLD technology can be high, long-term savings can be substantial. ZLD systems reduce the need for wastewater treatment chemicals, lower disposal costs, and decrease water procurement expenses.

3.5 Enhanced Water Reuse

By recovering and recycling nearly all of the wastewater, ZLD plants provide a sustainable solution for water reuse. This is particularly valuable in regions facing water scarcity or where industrial operations require large volumes of water.

4. Challenges and Considerations

4.1 High Capital and Operating Costs

The implementation of ZLD systems involves significant capital investment in advanced technologies and infrastructure. Additionally, operating and maintenance costs can be high, particularly for complex systems involving multiple stages of treatment and concentration.

4.2 Technical Complexity

ZLD systems require a combination of various technologies, each with its own operational challenges. Integrating these technologies into a cohesive system demands careful design, management, and expertise.

4.3 Energy Consumption

Processes such as evaporation, crystallization, and reverse osmosis consume considerable energy. Reducing energy consumption through efficiency improvements and renewable energy sources is a key focus for optimizing ZLD systems.

4.4 Residual Management

While ZLD systems eliminate liquid waste, they generate solid residues or brine that must be managed. Handling, disposal, or further utilization of these residues presents additional challenges and costs.

4.5 Scalability

Scaling ZLD technology from pilot projects to full-scale operations can be challenging. Ensuring that the system performs effectively at larger scales requires thorough testing and validation.

5. Applications of Zero Liquid Discharge Plants

5.1 Industrial Manufacturing

Industries such as textiles, pharmaceuticals, and chemicals produce large volumes of wastewater containing various contaminants. ZLD plants help these industries meet regulatory requirements and minimize environmental impact.

5.2 Power Generation

Power plants, especially those using fossil fuels or desalination processes, generate significant amounts of wastewater. ZLD systems can manage this waste effectively, recovering water for reuse and reducing brine disposal issues.

5.3 Mining and Metallurgy

Mining operations often produce wastewater containing heavy metals and other contaminants. ZLD plants can treat this wastewater, recovering water and valuable byproducts while minimizing environmental damage.

5.4 Municipal Wastewater Treatment

Municipal wastewater treatment facilities can benefit from ZLD systems by recovering water for reuse and reducing the volume of sludge requiring disposal. This approach supports sustainable urban water management.

6. Future Trends and Innovations

6.1 Advanced Membrane Technologies

Innovations in membrane technologies, such as high-performance membranes and improved fouling resistance, are enhancing the efficiency of ZLD systems. These advancements contribute to better water recovery and reduced operational costs.

6.2 Energy Efficiency Improvements

Research into energy-efficient technologies and renewable energy sources is helping to reduce the energy consumption of ZLD systems. Integrating solar, wind, or waste heat recovery can lower operational costs and improve sustainability.

6.3 Automation and Smart Systems

The adoption of automation and smart technologies is improving the control and monitoring of ZLD systems. Real-time data analytics and advanced process control can optimize performance, detect issues early, and enhance overall efficiency.

6.4 Integration with Industrial Processes

Integrating ZLD systems with existing industrial processes is a growing trend. By designing ZLD solutions that complement and enhance existing operations, industries can achieve greater sustainability and efficiency.

6.5 Policy and Regulation

As environmental regulations become more stringent, the adoption of ZLD technologies is likely to increase. Governments and regulatory bodies may offer incentives or mandates to encourage the implementation of ZLD systems.

7. Conclusion

Zero Liquid Discharge (ZLD) represents a significant advancement in wastewater management, offering a comprehensive approach to treating and reusing wastewater while minimizing environmental impact. By integrating various technologies and processes, ZLD systems can achieve sustainable water management, recover valuable by products, and comply with stringent environmental regulations.

Despite the challenges associated with high costs, technical complexity, and energy consumption, the benefits of ZLD in terms of environmental protection, resource recovery, and cost savings make it a valuable strategy for industries across various sectors. As technology continues to evolve and innovation drives improvements, ZLD systems will play an increasingly important role in supporting sustainable industrial practices and addressing global water scarcity challenges.

IV. SCADA and its Applications By Mohith Reddy L –II Yr

In chemical engineering, the complexity of processes and the need for precision demand sophisticated control systems to ensure safety, efficiency, and productivity. SCADA (Supervisory Control and Data Acquisition) systems play a crucial role in managing these processes by providing real-time monitoring, control, and data analysis. Here's an in-depth look at how SCADA systems are utilized in chemical engineering.

Understanding SCADA Systems

SCADA systems are designed to monitor and control industrial processes from a central location. They collect data from various sensors and instruments, process this information, and present it through a user interface. SCADA systems typically include several key components:

1. **Sensors and Instruments:** Measure physical parameters like temperature, pressure, flow rates, and chemical concentrations.
2. **Remote Terminal Units (RTUs) and Programmable Logic Controllers (PLCs):** Collect data from sensors and execute control commands.
3. **Communication Infrastructure:** Transmits data between field devices and the central SCADA system.
4. **SCADA Software and Human-Machine Interface (HMI):** Processes data and provides a graphical interface for operators to monitor and control the processes.
5. **Databases:** Store historical data for analysis and reporting.

Applications of SCADA in Chemical Engineering

1. **Process Control:** In chemical engineering, processes often involve complex reactions and multiple stages, requiring precise control over variables such as temperature, pressure, and flow rates. SCADA systems allow engineers to monitor these parameters in real-time, adjust control variables, and ensure that the process remains within optimal operating conditions. For instance, in a distillation column, SCADA can control the temperature and pressure to optimize separation efficiency.
2. **Safety Management:** Safety is paramount in chemical engineering due to the potential hazards of chemical reactions and the handling of toxic or flammable substances. SCADA systems enhance safety by continuously monitoring critical parameters and detecting deviations from safe operating ranges. They can trigger alarms and shut down systems automatically in case of emergencies. For example, if a reactor's pressure exceeds a safe limit, the SCADA system can

activate safety valves or stop the reaction to prevent an explosion.

3. **Quality Control:** Consistency in product quality is essential in chemical manufacturing. SCADA systems help maintain quality by ensuring that all process parameters are controlled and monitored accurately. They provide real-time data on product specifications and can adjust process conditions to meet quality standards. For instance, in the production of pharmaceuticals, SCADA can ensure that the mixing of ingredients is done under precisely controlled conditions to meet the required purity levels.
4. **Energy Management:** Chemical processes can be energy-intensive, and managing energy consumption is crucial for cost control and environmental sustainability. SCADA systems can monitor energy usage, identify inefficiencies, and optimize energy consumption by adjusting process parameters in real-time. For example, SCADA can help manage the energy usage of heating systems in reactors or control the operation of pumps and compressors to minimize energy waste.
5. **Maintenance and Troubleshooting:** Preventive maintenance is critical in chemical engineering to avoid unplanned downtime and ensure reliable operation. SCADA systems provide valuable data for predictive maintenance by analyzing trends and identifying potential issues before they lead to equipment failure. They can also assist in troubleshooting by providing detailed information about process conditions and historical data, helping engineers diagnose problems more effectively.
6. **Data Logging and Reporting:** SCADA systems continuously log data from various sensors and instruments, creating a comprehensive record of process conditions. This data is essential for regulatory compliance, performance analysis, and continuous improvement. SCADA systems can generate reports and charts that help engineers and managers review process performance, track trends, and make informed decisions. For example, compliance reports for environmental regulations can be automatically generated based on the data collected by the SCADA system.

Benefits of SCADA Systems in Chemical Engineering

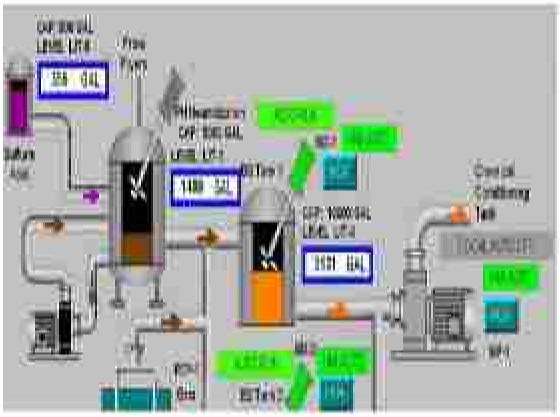
1. **Real-Time Monitoring and Control:** SCADA systems provide real-time visibility into process operations, enabling engineers to respond quickly to changes and maintain optimal conditions. This capability is crucial in chemical processes where conditions can change rapidly and require immediate adjustments.
2. **Improved Safety:** By continuously monitoring critical parameters and automating safety controls, SCADA systems enhance safety and reduce the risk of accidents. Automated alarms and emergency shutdowns help prevent hazardous situations and protect both personnel and equipment.
3. **Enhanced Efficiency:** SCADA systems optimize process performance by providing precise control and real-time data analysis. This leads to improved efficiency, reduced waste, and lower operational costs. Efficient control of processes also helps in maintaining consistent product quality.

4. **Data-Driven Decision Making:** The data collected and analyzed by SCADA systems support informed decision-making. Engineers and managers can use historical data and trend analysis to make strategic decisions, improve processes, and implement best practices.
5. **Scalability and Flexibility:** SCADA systems can be scaled to accommodate growing operations and adapted to new processes or technologies. This flexibility ensures that the system remains effective as the needs of the chemical plant evolve.

Challenges and Considerations

While SCADA systems offer numerous benefits, there are also challenges to consider:

1. **Complexity:** Implementing and configuring a SCADA system can be complex, requiring specialized knowledge and expertise. Integration with existing systems and processes may also present challenges.
2. **Security:** SCADA systems can be vulnerable to cybersecurity threats. Ensuring robust security measures, such as encryption and access controls, is essential to protect against unauthorized access and potential attacks.
3. **Cost:** The initial investment in SCADA systems can be significant. However, the long-term benefits in terms of efficiency, safety, and data analysis often justify the cost.



Conclusion

In chemical engineering, SCADA systems are indispensable tools for managing complex processes, ensuring safety, and optimizing performance. By providing real-time monitoring, control, and data analysis, SCADA systems enhance operational efficiency, product quality, and safety. Despite the challenges, the advantages of SCADA systems make them a valuable asset in the chemical industry, driving innovation and continuous improvement in process management.

STUDENTS ACHIEVEMENTS

Sl.No	Student Name	Year	Events	Institute	Status
1	Moovendhar C	III Year	Paper Presentation	Kongu Polytechnic College , Perundurai	Participated
2	Lakshmi Pathi P	III Year	Paper Presentation	Kongu Polytechnic College , Perundurai	Participated
3	Mohith Reddy L	II Year	Paper Presentation	Kongu Polytechnic College , Perundurai	III Prize
4	Vinoth K	II Year	Paper Presentation	Kongu Polytechnic College , Perundurai	III Prize
5	Veera Kumar C	III Year	Project Presentation	Excel Polytechnic college , Namakkal	Participated
6	Vinith C	III Year	Project Presentation	Excel Polytechnic college , Namakkal	Participated
7	Elumalai B	III Year	Project Presentation	Excel Polytechnic college , Namakkal	Participated
8	Jai Shankar S	III Year	Project Presentation	Excel Polytechnic college , Namakkal	Participated
9	Mohith Reddy L	II Year	Paper Presentation	Thanthai Roever institute of Polytechnic College , Perambalur	Participated
10	Mohith Reddy L	II Year	Poster Presentation	Thanthai Roever institute of Polytechnic College , Perambalur	Participated
11	Mukesh Raj L	II Year	Paper Presentation	Thanthai Roever institute of Polytechnic College , Perambalur	III Prize
12	Mukesh Raj L	II Year	Poster Presentation	Thanthai Roever institute of Polytechnic College , Perambalur	Participated
13	Mukesh Raj L	II Year	Quiz	Thanthai Roever institute of Polytechnic College , Perambalur	Participated
14	Abhijith V S	II Year	Paper Presentation	Thanthai Roever institute of Polytechnic College , Perambalur	III Prize
15	Abhijith V S	II Year	Poster Presentation	Thanthai Roever institute of Polytechnic College , Perambalur	Participated
16	Abhijith V S	II Year	Quiz	Thanthai Roever institute of Polytechnic College , Perambalur	Participated

Sl.No	Student Name	Year	Events	Institute	Status
17	Sanjey E	II Year	Paper Presentation	Thanthai Roever institute of Polytechnic College , Perambalur	Participated
18	Sanjey E	II Year	Poster Presentation	Thanthai Roever institute of Polytechnic College , Perambalur	Participated
19	Sanjey E	II Year	Paper Presentation	Thanthai Roever institute of Polytechnic College , Perambalur	Participated
20	Govindharaj V	III Year	Paper Presentation	Seshasayee Institute of Technology, Thiruchirapalli	II Prize
21	Jaisankar S	III Year	Paper Presentation	Seshasayee Institute of Technology, Thiruchirapalli	II Prize
22	Mohith Reddy L	III Year	Paper Presentation	Seshasayee Institute of Technology, Thiruchirapalli	I Prize
23	Mukesh Raj L	III Year	Paper Presentation	Seshasayee Institute of Technology, Thiruchirapalli	I Prize
24	Abhijith V S	III Year	Paper Presentation	Seshasayee Institute of Technology, Thiruchirapalli	Participated
25	Sanjey E	III Year	Paper Presentation	Seshasayee Institute of Technology, Thiruchirapalli	Participated

PROJECTS

TITLE: DESIGN AND FABRICATION OF KNEADING DOUGH MIXER

Sl.No	Reg.No	Student Name
1	22601035	HAREES . K
2	22601036	HEMACHANDRAKUMAR.K
3	22601038	JANA . K
4	22601041	MOOVENDAR . C
5	22601051	SRINIVASAN . P
6	22601052	THIMMARAJ . S

SYNOPSIS:

The kneading process is the crucial operation in food industry. There is still need for improvement on design of kneading dough mixers, despite the availability of a number of them in the market. It is required that the constituents be mixed efficiently at a shorter time. The cost of the machine should also affordable. A kneading dough mixer has been designed for this purpose whilst the mixing basin stationary, the stirrer (suspended on the mixing basin) rotates in clockwise direction. Performance test result shows that proper dough mixing is achieved in a comparatively shorter time and the cost is quite affordable with 90% process efficiency.

TITLE: DESIGN AND FABRICATION OF HORIZONTAL CRYSTALLIZER

Sl.No	Reg.No	Student Name
1	22601053	VEDHACHALAM
2	22601042	NAVEEN KUMAR G
3	22601047	SANKAR T G
4	22601032	DINESH K
5	22690561	CHANDRU S

Synopsis:

Industrial Crystallizer is a device in which hot solution is allowed to cool and form crystals. The formation of crystals is known as crystallization. Hot water from boiler is let into the crystallizer and chemicals are added so as to make the solution super saturated, as the temperature of solution Reduces the formation of crystals takes place and this is known as nucleation. Blades of the crystallizer rotates continuously so as to form even sized crystals. The function of the crystallizer is mainly to form crystals. This project is to design a Horizontal Crystallizer.

TITLE : LEMON BALM FROM MELISSA MINT LEAVES

Sl.No	Reg.No	Student Name
1	22690579	PAVAN KUMAR G
2	22690565	DHANUSH S
3	22690566	ELUMALAI B
4	22690580	POOMANI P
5	22010460	SANJAY R

Synopsis:-

Lemon balm is also known as Melissa officinalis or mint is a herb belongs to the mint family for centuries this perennial herb from the mint family has been used for its calming effects and various health benefits . one of the most popular method to harness this herbs is by creating a concentrated form called lemon balm extract.Chop fresh leaves: If using fresh lemon balm, chop the leaves into small pieces using a sharp knife or kitchen scissors. This will help release their natural oils during extraction. Powder dried leaves: For those who prefer working with dried material, use a mortar and pestle or an electric grinder (like one used for grinding flaxseeds) to grind your dried lemon balm into a fine powder

ALUMNI CORNER

By Balaji Manager/ Global Calcium Ltd (2009 Passed Out)

Current opportunities for freshers in entry level in various domains

1. Process Engineer

Role: Process Engineers design, implement, and optimize industrial processes. They work to improve efficiency, quality, and safety in manufacturing environments.

Industries: Chemical manufacturing, petrochemicals, pharmaceuticals, food and beverages, and materials science.

Opportunities: Entry-level positions in process engineering often involve working under the guidance of senior engineers to learn the intricacies of process design and optimization.

2. Chemical Plant Operator

Role: Plant Operators oversee the day-to-day operations of chemical plants. They monitor equipment, ensure safe operations, and troubleshoot issues.

Industries: Oil and gas, chemical manufacturing, and specialty chemicals.

Opportunities: Freshers can start in roles such as control room operators or process technicians, with opportunities for career progression as they gain experience.

3. Quality Control/Assurance Engineer

Role: Quality Control Engineers ensure that chemical products meet specified standards and regulations. They conduct tests, analyze results, and implement quality improvement measures.

Industries: Pharmaceuticals, food and beverages, cosmetics, and industrial chemicals.

Opportunities: Entry-level positions include quality control technician or analyst roles, with potential advancement into more specialized or managerial positions.

4. Research and Development (R&D) Chemist

Role: R&D Chemists work on developing new products or improving existing ones. They conduct experiments, analyze data, and collaborate with other scientists.

Industries: Pharmaceuticals, agrochemicals, materials science, and consumer goods.

Opportunities: Fresh graduates can start as junior chemists or research assistants, contributing to experimental work and data analysis.

5. Environmental Engineer

Role: Environmental Engineers focus on reducing the environmental impact of industrial processes. They design systems for waste treatment, pollution control, and sustainability.

Industries: Chemical manufacturing, energy, waste management, and environmental consulting.

Opportunities: Entry-level positions involve supporting environmental compliance efforts, conducting site assessments, and developing mitigation strategies.

6. Safety Engineer

Role: Safety Engineers ensure that chemical processes and facilities operate safely and comply with health and safety regulations. They conduct risk assessments and implement safety protocols.

Industries: Chemical manufacturing, petrochemicals, pharmaceuticals, and construction.

Opportunities: Freshers can start in roles such as safety coordinators or assistant safety engineers, working on safety audits and incident investigations.

7. Technical Sales Engineer

Role: Technical Sales Engineers bridge the gap between engineering and sales. They provide technical support and expertise to clients, helping them understand and use chemical products.

Industries: Chemical manufacturing, industrial equipment, and specialty chemicals.

Opportunities: Entry-level roles involve working with senior sales engineers to develop client relationships and support sales activities.

8. Supply Chain Analyst

Role: Supply Chain Analysts manage the flow of materials and products within the chemical industry. They optimize logistics, procurement, and inventory management.

Industries: Chemical manufacturing, pharmaceuticals, and consumer goods.

Opportunities: Fresh graduates can start as supply chain coordinators or analysts, focusing on logistics planning and supply chain efficiency.

9. Consulting

Role: Chemical Engineering Consultants provide expert advice to improve processes, manage projects, and solve technical problems in various industries.

Industries: Consulting firms, chemical manufacturing, and government agencies.

Opportunities: Entry-level consultants may assist in research, data analysis, and project management under the supervision of experienced consultants.

Emerging Trends

- **Sustainability:** Increasing emphasis on sustainable practices opens up opportunities in green chemistry, waste reduction, and renewable energy.
- **Digitalization:** The integration of digital technologies like IoT and data analytics in chemical engineering is creating new roles in process automation and data analysis.

Where to Find Opportunities:

- **Job Boards and Company Websites:** Platforms like LinkedIn, Indeed, and Glassdoor list numerous entry-level positions.
- **University Career Services:** Many universities have dedicated career centers that help students find internships and job placements.
- **Industry Conferences and Networking Events:** Attending industry events can provide valuable connections and insights into job openings.

Fresh graduates in chemical engineering should explore various industries and roles to find the best fit for their skills and interests. The diverse opportunities available cater to different aspects of chemical engineering, offering pathways for professional growth and development.

DEPARTMENT ACTIVITIES

GUEST LECTURE

S.NO	NAME OF THE RESOURCE PERSON	DATE	TOPIC	YEAR	No of students attended
1	Mr. R.S. Dhamodharan , Sr. Executive, Anthem Bioscience Ltd, Bangalore	14/7/2023	GDP and DATA Integrity	II	59
2	Mr. G.S.Karthik , Deputy General Manager, Global Calcium Ltd, Hosur	28/7/2023	Pharmaceutical Industry & Career Growth	III	61
3	Mr. N .Sridhar, Officer, Hikal Limited, Bangalore	13/9/2023	Identification and Transportation of Fluids in process industry	II	59
4	Mr. Dinesh kumar Officer, Birla Paints, Chennai	04/10/2023	Industrial Paints	III	61

INDUSTRIAL VISIT

Sl.No	Industry Visited	Date of Visit	Year	No of students Visited
1	INDUSTRIAL TOUR FOR FINAL YEAR STUDENTS (ITC PHARMA , CIPET , RAIL MUSEUM , BRINDAVAN GARDEN , KRS DAM, MYSORE PALACE) MYSORE	15/02/2024 To 17/02/2024	III	61
2	HATSUN AGRO PRODUCT LTD, PALACODE	20/03/2024	II	50
3	DHARMAPURI DISTRICT CO OPERATIVE SUGAR MILLS LTD	20/03/2024	II	56

Puzzles

Mystery

The Mysterious Reactor

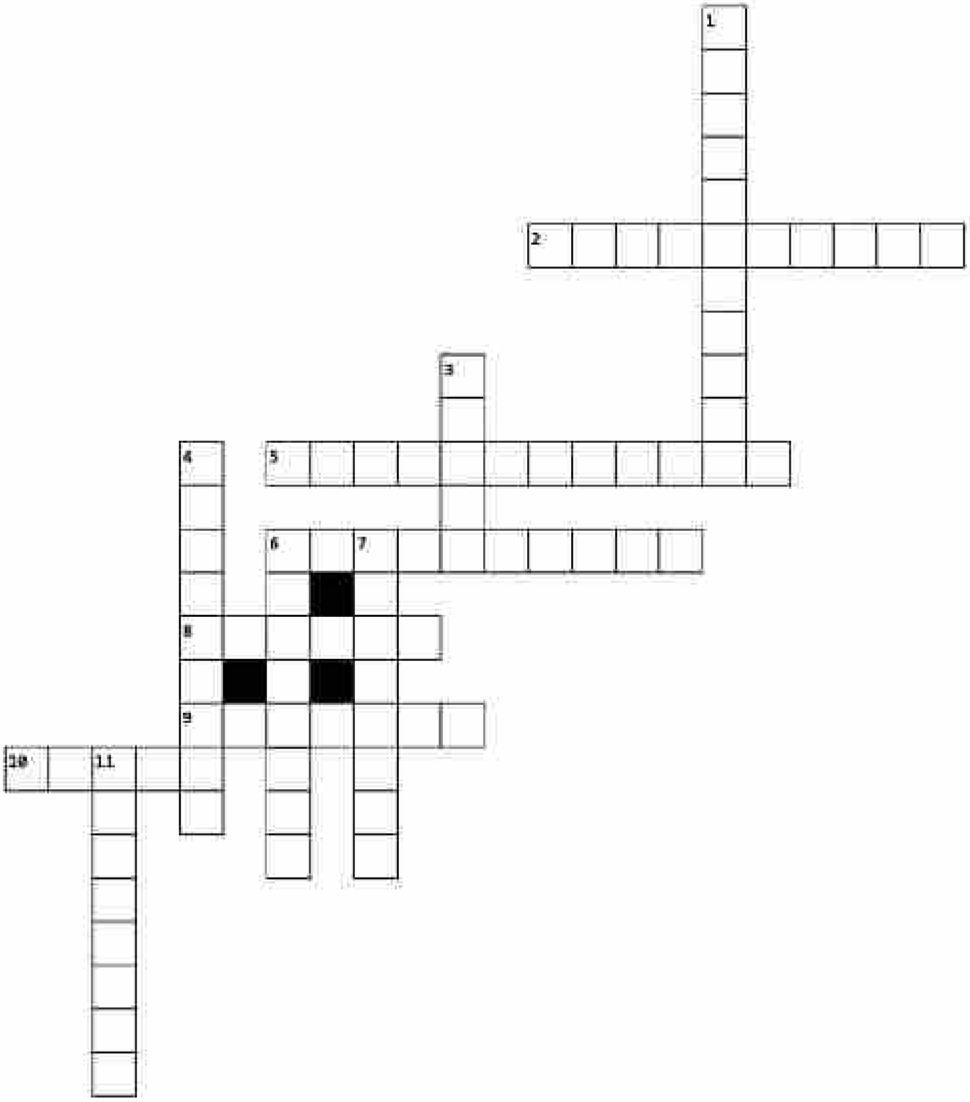
In a chemical plant, there's a reactor that's known for its efficiency, but recently, engineers have noticed a drop in performance. The reactor's efficiency seems to be tied to a specific set of conditions, but no one is quite sure what those conditions are.

You have the following data about the reactor:

1. **Feed Composition:** The reactor takes two inputs: A and B. The feed consists of 60% A and 40% B by mole fraction.
2. **Reaction Details:** The main reaction in the reactor is A+B→CA + B \rightarrow CA+B→C. The reaction is first-order with respect to both A and B.
3. **Reaction Rate Constant (k):** The rate constant for the reaction is given by k=0.05 L/(mol\cdotps)k = 0.05 \text{ L/(mol·s)}k=0.05 L/(mol\cdotps) at the operating temperature.
4. **Reactor Volume (V):** The volume of the reactor is 100 liters.
5. **Flow Rates:** The feed flow rates are such that the total molar flow rate into the reactor is 10 mol/s.
6. **Conversion Data:** At steady state, the conversion of A is observed to be 40%.

Your task is to determine the following:

1. **The concentration of A and B in the reactor.**
2. **The actual volumetric flow rate of the feed into the reactor.**
3. **Why might the reactor efficiency have dropped?**



Across

2. some chemical engineers may make these and get patents for them

5. The basic material for which a product is made

6. An important skill for chemical engineers to have in order to design new technology

8. A sector a chemical engineer may work in, something that can not be created nor destroyed

9. Chemistry, biology, and physics are all types of these

10. Slang or shortened name for Chemical Engineers

Down

1. examples of products made by chemE

3. A place where many chemical engineers work to install their devices

4. Chemical engineers work to develop new chemical...

6. The things chemical engineers make and work with

7. a person who designs, builds, or maintains, engines, machines, or public works.

11. Chemical engineers combine these to make new chemicals, there is a periodic table of them

MCQ Questions

1. What is the primary function of a chemical reactor?
A) To store chemicals
B) To mix chemicals
C) To carry out chemical reactions
D) To separate chemicals

2. In a first-order reaction, the rate of reaction depends on:
A) The concentration of reactant raised to the power of 2
B) The concentration of reactant raised to the power of 1
C) The square root of the concentration of reactant
D) The concentration of reactants to the power of 0

3. Which of the following is a common unit for measuring flow rate?
A) Pascal
B) Joule
C) Liter per second
D) Kelvin

4. The ideal gas law is given by:
A) PV=nRTPV = nRTPV=nRT
B) P=nRTVP = \frac{nRT}{V}P=VnRT
C) V=nRTPV = \frac{nRT}{P}V=PnRT
D) All of the above

5. In a distillation column, the purpose of the condenser is to:
A) Heat the vapors
B) Convert vapor to liquid
C) Cool the liquid
D) Separate solids from liquids

6. Which type of reactor provides the highest conversion for a given residence time?
A) Batch reactor
B) Plug flow reactor
C) Continuous stirred-tank reactor
D) Packed bed reactor

7. The activation energy of a reaction is:
A) The energy required to break bonds
B) The energy needed to initiate a reaction
C) The energy released during a reaction
D) The total energy of the reactants

8. In heat transfer, the term 'conduction' refers to:
A) Transfer of heat through fluid movement
B) Transfer of heat through radiation
C) Transfer of heat through a solid medium
D) Transfer of heat through phase change

9. What is the role of a catalyst in a chemical reaction?
A) To increase the concentration of reactants
B) To decrease the activation energy of the reaction
C) To increase the temperature of the reaction
D) To change the equilibrium constant of the reaction

10. Which of the following equations represents the continuity equation in fluid mechanics?

A) Q=A×V\text{Q} = \text{A} \times \text{V}Q=A×V
B) P=V×T\text{P} = \text{V} \times \text{T}P=V×T
C) F=m×a\text{F} = \text{m} \times \text{a}F=m×a
D) E=m×c×T\text{E} = \text{m} \times \text{c} \times \text{T}E=m×c×T

11. The term 'enthalpy' refers to:

A) The internal energy of a system
B) The energy required to maintain constant pressure
C) The total heat content of a system
D) The heat transferred during a phase change

12. In a chemical equilibrium, if the reaction A+B↔C+DA + B \leftrightarrow C + DA+B↔C+D shifts to the right, it indicates:

A) The formation of more reactants
B) The formation of more products
C) No change in the concentration of reactants or products
D) Decrease in temperature

13. The Reynolds number is used to determine:

A) The heat transfer coefficient
B) The flow regime (laminar or turbulent)
C) The reaction rate
D) The density of the fluid

14. Which of the following is a common method for separating components in a mixture?

A) Filtration
B) Centrifugation
C) Distillation
D) All of the above

15. In a centrifugal pump, the impeller is used to:

A) Increase fluid pressure
B) Reduce fluid temperature
C) Measure fluid flow rate
D) Separate solid particles from the fluid

16. The term 'stoichiometry' in chemical engineering refers to:

A) The study of reaction rates
B) The measurement of chemical substances
C) The calculation of reactant and product quantities in a reaction
D) The design of chemical reactors

17. What does the term 'effluent' refer to in a chemical process?

A) Input material
B) By-product of the process
C) Waste or discharge from the process
D) Catalyst used in the process

DEPARTMENT GALLERY

II year students Industrial visit to Hatsun Agro Products , Palacode

II year students Industrial visit to DDC Sugar Mills , Palacode

III year students Industrial visit to ITC Pharma limited , Mysore

Nan Mudhalvan Training for Third Year students

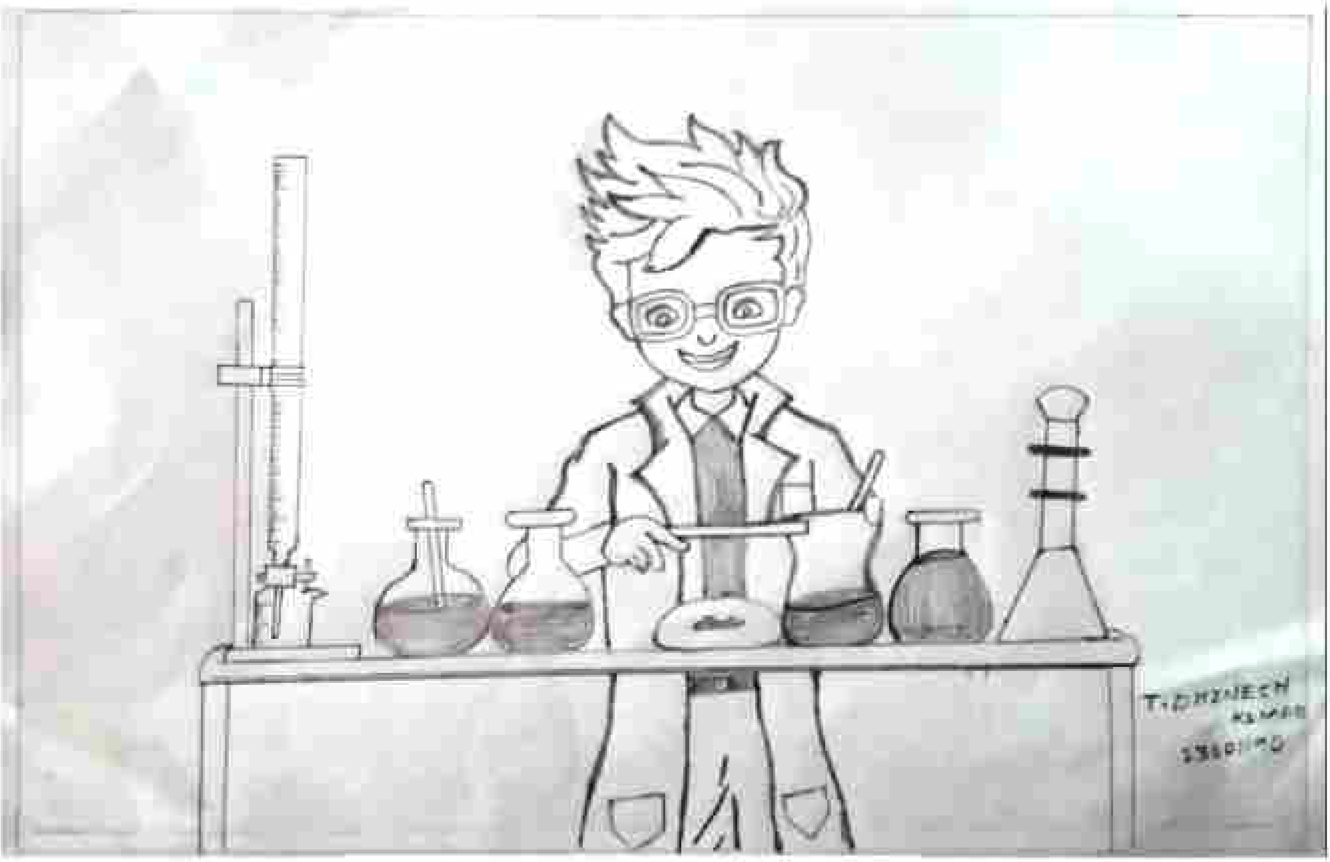
Guest Lecturer for second year and third year

III year students Industrial Tour to Mysore

year

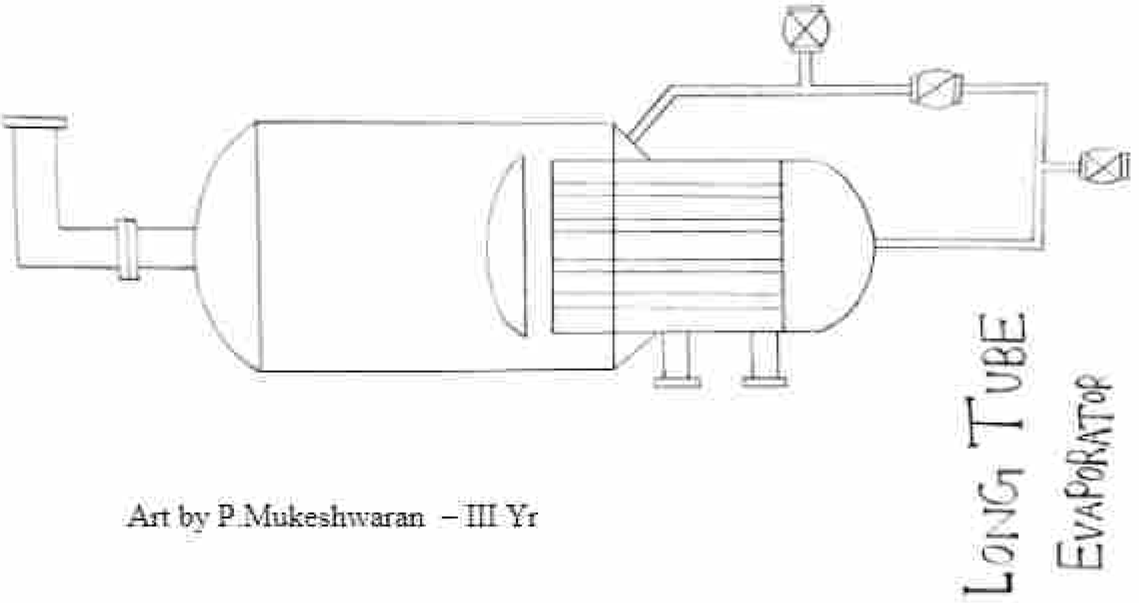
Techfest 2k24

ART GALLERY



Art by T. Dinesh Kumar – III Yr

Art by S.Aravind samy – II Yr



Art by P.Mukeshwaran – III Yr

Picture by G.Kalaiarasu – III Yr

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CHEMICAL ENGINEERING: 2021–2024

Date:21.03.2024