QUIMICA

THROUGH CHEMICAL FIND YOUR WAY

BIT SINDRI, DHANBAD

NEWSLETTER

CHEMICAL ENGINEERING DEPARTMENT

Fourth Edition

www.quimicabits.blogpost.com

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Director's Message

Prof. Pankaj Rai
Director, B.I.T Sindri

MESSAGE FROM THE DIRECTOR'S DESK :-

Our Chemical Engineering Department stands at the forefront of innovation and excellence, fostering a learning environment where theoretical knowledge seamlessly meets practical application. Our dedicated faculty members are not only distinguished educators but also pioneers in their respective fields, guiding students through the intricate and fascinating landscape of chemical engineering. With state-of-the-art facilities and exceptional individuals, the department provides students with unparalleled opportunities for collaboration and growth.

Our undergraduate and graduate programs are designed to equip students with the skills and knowledge required to excel in an ever-evolving industry, emphasizing both technical proficiency and ethical responsibility. Our chemical engineering students are making significant strides across various sectors and industries, both domestically and internationally, along with their outstanding performance in the GATE examinations.

Since its establishment, Quimica has been a cornerstone of our academic community, fostering a spirit of innovation, collaboration, and excellence. The society provides invaluable support to students and faculty, organizing events, seminars, and workshops that bridge the gap between academia and industry. Quimica's dedication to advancing chemical engineering knowledge and practice is truly commendable, and its efforts have significantly enriched our department. I extend my best wishes to the entire Quimica team for their dedication and excellence in advancing our field.

QUIMICA

HOD's Message

DR. Amit Kumar Gupta,
HOD, Chemical Engineering Department, BIT Sindri

FROM THE PEN OF HOD,

"Life is all about exploring your potential and utilizing it to the maximum before you die, said the great man."

I feel obliged to be a part of the chemical family. The Department of Chemical Engineering was established in 1956, with a specialization in B.Tech. and M.Tech. programs. It has several well-equipped laboratories. The department has always envisioned creating an environment for the overall development of the students so that they can compete in the global market. The students of the Chemical Engineering Department have shown their remarkable presence in the fields of research and development, consulting, and various PSUs. Today, we have our students working for IOCL, GAIL, ONGC, Vedanta, Aditya Birla, and other renowned companies. To keep pace with the current world, our students are receiving training and internships from prestigious organizations like CSIR-CIMFR Lab, IIT-ISM Dhanbad, and IOCL, among many others.

In addition to these achievements, five of our students were ranked under 500 in the most prestigious examination of GATE-2021, with one student securing AIR 14. Quimica is another achievement for us. It is an organization of dedicated and progressive members of Chemical Engineering with a huge student community, alumni network, qualified professors, and brand intellectuals, which provides a platform for the holistic development of students. The blogs and content help the students explore and discover the upcoming advancements in the field of research. On behalf of the entire Department of Chemical Engineering, I wish good luck to the Quimica team!

QUIMICA

Professor In-charge's Message

Dr. Ashok Kumar Baranwal,
Professor In-charge,
Chemical Engineering Department, B.I.T. Sindri

"QUIMICA- A bridge between faculties and students."

I am really happy and proud to announce the publication of Quimica's annual magazine. The publication of such magazines is very beneficial for improving, fostering, and honing the editorial and writing abilities of literary-minded students on academic campuses.

The Association of Chemical Engineers (Quimica) has always been an active medium to bridge the gap between faculties and students. The committee's enthusiasm has brought good harmony among faculties and students, which will eventually take the department to a new level. The member's interest and commitment should be applauded; as a result of their efforts, QUIMICA continues to be one of the most active societies at BIT Sindri.

I congratulate the students of Quimica who have taken the initiative and have contributed to this edition of the department magazine. While the area that Quimica deals with is vibrant and keeps reinventing itself in fruitful ways over the years, it is necessary for us from time to time to articulate our thoughts and to re-discover what the field is and what its relevance is. In some way, this magazine contributes to fulfilling this need.

At the end of this, I would like to say that regardless of the results (especially grades), the student is highly aware of what he or she is capable of in that area. It is a type of self-realization for which older people put in a lot of work and frequently pay money to others who provide the conditions and opportunities for it to occur. And we offer it here without charge! We are steadfastly committed to assisting the Department of Chemical Engineering at BIT Sindri in breaking new ground and scaling new heights. I'm happy to welcome students who are interested in writing articles with fresh ideas and brighter themes for the upcoming issue.

QUIMICA

Professor In-charge's Message

Dr. Nirupama,
Professor In-charge,
Chemical Engineering Department,
B.I.T. Sindri

"QUIMICA- A scaffold to express creativity"

It is a matter of great pride to pen down a message for Quimica's annual magazine, BIT Sindri. The institute magazine is a platform for the students to express their creative pursuits, which develop in them originality of thought and expression. The contents of the magazine reflect the creativity and imagination of our students. Academic excellence, along with co-curricular and extra-co-curricular activities, completes the process of education.

It also gives me great pleasure that BIT is progressing in its endeavor toward the overall personality development of the students. I take this opportunity to congratulate the director, faculty members, and students for their strong sense of commitment, service, and responsibility that has facilitated transforming this institution into an outstanding and significant temple of learning. Technical comments, placement developments, departmental activities, poetry, short tales, academic success, and all other activities are evenly distributed throughout our publication. I would like to express my gratitude to Dr. Amit K. Gupta, our esteemed professor, for having faith in me and appointing me to the position of Quimica.

Because new technology is being incorporated into our lives on a daily basis, teaching on a chalkboard with chalk is no longer sufficient in today's competitive world. In Quimica, we typically use it to explore newly developed ideas and provide participants with the chance to present themselves if they also wish to explore newly created ideas. Chemical engineering students, in particular, have the opportunity to develop additional skills outside of the classroom, such as management, communication, and presentation abilities, which are crucial for their future and useful in a variety of jobs.

Quimica is currently carrying out its work very efficiently, but I would like to suggest that future events and topics focus on more recent technologies used in the industry and be multidisciplinary. If you join any company, you won't just be working as an engineer; you'll also be exposed to a variety of other tasks, so it's crucial to be well-prepared for this. According to my understanding and perspective, Quimica should also focus on the industry and find out its issues. Every industry has a huge problem at the beginning and end, but once it is well established, the problem disappears.

Without the kids' enthusiastic participation and good answers, none of this would have been possible. They stand as a witness to the monumental efforts taken by the management to make the college a center of excellence in education and research. I wish the college's management, staff, and students success in their future. endeavors.

QUIMICA

ABOUT QUIMICA

Quimica is a group of committed and forward-thinking students in the Chemical Engineering Department. The yearly technical colloquium and festival are organized by it. Additionally, it has a team that frequently posts blogs and other content related to chemical engineering.

A small group of the department's eager students laid the organization's foundation, but it now has a large network of professors, qualified professionals, alumni, and intellectuals involved in the study of chemical engineering.

It offers a fantastic platform for aspiring engineers to develop, pick up useful skills, investigate, and learn about the unexplored areas of chemical engineering. The forum is progressing with commendable accomplishments and gaining wider and more valuable exposure every day. We make a lot of effort to further our mission of educating everyone about the depth of chemical engineering knowledge and moving closer to sustainable development.

Mission Statement

To impart quality technical education to UG and PG courses in Chemical Engineering.

To activate and pursue research in thrust/emerging areas of technology in Chemical Engineering.

To provide consultancy services to Industries and Entrepreneurs.

To create qualified human resources to cater the needs of a sound national economy through developmental activities.

To make the department a center of excellence for research and development in Chemical Engineering and related fields.

OUR DEPARTMENT

The Department of Chemical Engineering, established in 1956, is one of the oldest discipline at Bit Sindri. It is considered as a premier centre for Chemical Engineering in India by industries as well as academia.

The department offers four-year B.Tech. degree courses and postgraduate program of M.Tech. with specialization in Chemical Plant Design in Engineering. It has experienced and qualified faculties, associated with numerous industrial projects to promote research and development.

The department has several well-equipped laboratories such as Unit Operations Lab, process Control Lab, Petroleum Refinery Engineering Lab, Plastics Technology Lab, Process Engineering Lab, Chemical Engineer Thermodynamics Lab etc. With talented and well-placed students, Department of Chemical Engineering Holds a good association of its alumni all over the world.

Program-Educational Outcomes(PEOs)

- **PEO1: Knowledge:** To generate high-quality humans with fundamental knowledge resources in our core areas of chemical engineering competence and the emerging fields of research, as well.
- **PEO2: Design Abilities:** To make a valuable contribution to technology with problem-solving skills, laboratory skills, and design skills for technical careers in solving critical problems for the social and economic development of the nation.
- **PEO3: Professional concern:** To exert focused efforts to generate graduate students, competent for finding their place in leading companies and work as an effective team members with communication and teamwork skills as well as an appreciation for ethical behavior necessary to thrive in their careers.
- **PEO4: Specialization aspects:** Graduates of the program will be prepared to pursue career choices in chemical engineering, allied and interdisciplinary fields of industries and renowned educational institutes for pursuing higher education that benefit from a strong background in applied sciences or engineering.
- **PEO5: Self-Learning:** Graduates will be practiced to persist their professional development through education and personal development established on their awareness of library resources and professional societies, workshops, industrial visits, expert talks, industry interactions, etc.

Program-Specific Outcomes(PSOs)

PS01: Apply the knowledge of mathematics, science, and chemical engineering basics and to solve complicated problems, critical issues in Chemical Engineering and to design equipment in core chemical and allied industries.

PSO2: Development of new process plant with study of basic requirements and feasibility studies with knowledge in instrumentation, process dynamics and control, process design perform modeling and simulation using modern chemical tools such as CHEMCAD, MATLAB,etc.

PSO3: Be prepared to work in Chemical Industries and able to identify the health, safety, legal, environmental, and cultural issues and to excel in careers in the chemical, petroleum, petrochemical, pharmaceutical, food, biotechnology, energy, materials processing, or other related industries and organizations.

FEATURES

- The department has an annual intake of 91 students in B.Tech. course and 25 students in M. Tech. course.
- Along with theoretical and numerical subjects, the students are also trained in Computer Aided Design in the 7th Semester to enhance their computational skills to fit the need of the industrial plants.
- The qualified faculties guide the students in B. Tech. and M. Tech. projects to improve their research acumen.
- Industrial tours are frequently conducted by the department to various industries such as SAIL, IOCL, HINDALCO, ACC, CFRI, and BCCL to provide industrial exposure to its students.

FEATURES

- To keep the students in touch with the latest technical explorations in the field, the department has a library with newer research journals and numerous course books.
- Every student of the department is a member of the Indian Institute of Chemical Engineers (IIChE).
- Seminars and Symposia on new technologies and contemporary challenges of chemical engineering are organized regularly.
- The department is provided with a conference hall to conduct seminars, workshops etc.

LAB FACILITIES

- Fluid Mechanics Lab
- Fluidization Engineering Lab
- Thermodynamics Lab
- Process Control Lab
- Petroleum Refinery Lab
- Process Engineering Lab
- Unit Operations Lab
- Computer Lab

QUIMICA

FACULTY'S PROFILE

Dr. Amit Kumar Gupta

H.O.D & Assistant Professor

Academic Background :-

PhD in Chemical Engineering, IIT Delhi
M-Tech in Chemical Engineering, IIT Bombay
B-Tech in Chemical Engineering, HBTI Kanpur

Research Area :-

Heat Transfer, Computational Fluid Mechanics, Interfacial Science

Courses Taught :-

Thermodynamics, Computer Aided Design, Process Equipment Design

Dr. Amar Kumar

Assistant Professor

Academic Background :-

PhD in Chemical Engineering, VBU Hazaribagh
M-Tech in Chemical Engineering, BIT Sindri
B-Tech in Chemical Engineering, BIT Sindri

Research Area :-

Computational Fluid Mechanics, Fluidization Engineering

Courses Taught :-

Fluidization Engineering, Energy Option, Bio-Energy Engineering

Prof. Ajay Oraon

Assistant Professor

Academic Background :-

PhD (Pursuing) in Chemical Engineering, IIT-ISM Dhanbad
M-Tech in Chemical Engineering, IISc Bangalore
B-Tech in Chemical Engineering, BIT Sindri

Research Area :-

Fluid Mechanics, Separation Process

Courses Taught :-

Chemical Technology, ICC, Fluid Mechanics

FACULTY'S PROFILE

Dr. Usha Kumari

Assistant Professor

Academic Background :-

PhD in Chemical Engineering, IIT Kharagpur
M-Tech in Chemical Engineering, IIT Roorkee
B-Tech in Chemical Engineering, BIT Sindri

Research Area :-

Pollution Control, Material Surface Engineering, Biomass Pyrolysis

Courses Taught :-

Chemical Technology, Heat Transfer Operation, Mass Transfer Operation

Dr. Sunil Kumar Singh

Assistant Professor

Academic Background :-

PhD in Chemical Engineering, IIT Guwahati
M-Tech in Chemical Engineering, IIT Kanpur
B-Tech in Chemical Engineering, BIT Sindri

Research Area :-

Micro and Nano Fluidics, Biosensors, Colloid and Interface science

Courses Taught :-

Chemical Engineering Drawing, Fluid & Particle Operation, Process Control

Prof. Manish Kumar

Assistant Professor

Academic Background :-

M-Tech in Chemical Engineering, IIT Roorkee
B-Tech in Chemical Engineering, BIT Sindri

Research Area :-

Computational Fluid Dynamics, Heat Transfer, Fluid Mechanics

Courses Taught :-

Computational Fluid Dynamics, Heat Transfer, Fluid Mechanics

FACULTY'S PROFILE

Dr. Diwakar Pandey
Assistant Professor

Academic Background :-

PhD in Chemical Engineering, IIT-BHU Varanasi
M-Tech in Chemical Engineering, IIT-BHU Varanasi
B-Tech in Chemical Engineering, B.I.E.T. Jhansi

Research Area :-

CO_2 capture, Bio-gas purification, Industrial Pollution Control

Courses Taught :-

Heat Transfer, Thermodynamics, Mass Transfer

Dr. Abhishek Anand Hembrom
Assistant Professor

Academic Background :-

PhD in Mineral Engineering, IIT-ISM Dhanbad
M-Tech in Mineral Engineering, IIT-ISM Dhanbad
B-Tech in Chemical Engineering, BIT Sindri

Research Area :-

Coal & Mineral processing & its Beneficiation, Coal Preparation, etc.

Courses Taught :-

Fine Particle Operation, Fluidization Engineering, Coal Preparation

Dr. Ashok Kumar Baranwal
Assistant Professor

Academic Background :-

PhD in Chemical Engineering, IIT Kanpur
M-Tech in Petroleum Engineering, IIT-ISM Dhanbad
B.Tech in Chemical Engineering, BIT Sindri

Research Area :-

Rheology of Complex Fluids, Modeling of Non-Newtonian Fluids, Computational Fluid Dynamics

Courses Taught :-

Fluid Mechanics, Heat Transfer, Multiphase Flow, Micro fluidics

FACULTY'S PROFILE

Dr. Nirupama
Assistant Professor

Academic Background :-
PhD in Chemical Engineering, IIT Roorkee
M-Tech in Chemical Engineering, IIT Roorkee
B-Tech in Chemical Engineering, Punjab Technical University

Research Area :-
Polymer composites, Risk assessment

Courses Taught :-
Safety & hazards in Chemical Industry, Industrial Chemical Processes

Prof. Pitho Hansda
Assistant Professor

Academic Background :-
M-Tech in Mineral Engineering, IIT-ISM Dhanbad
B-Tech in Chemical Engineering, BIT Sindri

Research Area :-
Mineral Beneficiation, Chemical Technology

Courses Taught :-
Fluidization, Fluid Mechanics, Process Dynamics

Dr. Ch. V. Raghunath
Assistant Professor

Academic Background :-
PhD in Chemical Engineering, IIT-BHU Varanasi
M-Tech in Chemical Engineering, SRM university, Chennai
B-Tech in Chemical Engineering, A.N University

Research Area :-
Air pollution control, Multi component absorption, Process Development

Courses Taught :-
Chemical Engineering Thermodynamics, Polymer Science & Technology

FACULTY'S PROFILE

Prof. (Ms.) Devina Ratnam

Assistant Professor

Academic Background :-

PhD (Pursuing) in Chemical Engineering, IIT-ISM Dhanbad
M-Tech in Chemical Engineering, IIT Gandhinagar
B-Tech in Chemical Engineering, BIT Sindri

Research Area :-

Nano technology (synthesis of boron based nanosheet)

Courses Taught :-

Transport Phenomena, Advanced Thermodynamics, Heat Transfer Operation

Prof. (Ms.) Poornima Pandey

Assistant Professor

Academic Background :-

PhD (Pursuing) in Chemical Engineering, IIT (BHU) Varanasi
M-Tech in Chemical Engineering, IIT (BHU) Varanasi
B-Tech in Chemical Engineering, U.P Technical university

Research Area :-

Air pollution control, Catalytic Separation Processes

Courses Taught :-

Fluidization Engineering, Fertilizer Technology, Separation Processes

Faculties Message

Prof. Manish Kumar,
Assistant Professor,
Chemical Engineering Department,
B.I.T. Sindri

"Empowering Chemical Engineering's Future Through Quimica's Commitment."

To foster a culture of all-round student development at the Department of Chemical Engineering so that graduates may compete in the global marketplace.

The valuable resource that all teachers have is each other. Without cooperation, development is limited by my perspective. The student is energetic while the teacher is experienced. As a teacher, it is our duty to channelize the energy of the students in the right direction by sharing our experience and knowledge. So that the students keep establishing new dimensions in life by making efficient use of the experience and knowledge with their hard work and energy.

All of the students' enthusiastic engagement and positive feedback are much appreciated.
This would not have made any of this feasible. In closing, I'd want to share my
Sincere thanks go out to everyone on the Quimica team, without whom this would only be a dream.

QUIMICA

Faculties Message

Dr. Amar Kumar
Assistant Professor,
Chemical Engineering Department,
B.I.T. Sindri

"Quimica: Shaping Chemical Engineering's Future with Knowledge and Passion."

The fact that Quimica is renewing its electronic publication for the third edition on behalf of the Department of Chemical Engineering at BIT Sindri, Dhanbad, is a joyful occasion. For years, Quimica has allowed our students to learn and exhibit various technical and soft skills. The Department and Quimica have made every effort to provide budding engineers with useful information and insightful direction, not just in the area of chemical engineering but also in a wider sense. A healthy and competitive environment has always been our goal to produce working professionals for the global market. The Department gives students the luxury of portraying themselves as prominent technocrats and corporation individuals. Our students have made a significant influence on the national as well as international levels. In numerous national-level competitive exams like the GATE and CAT, many of our students have once again performed exceptionally well. This year, five of our chemical engineering students were awarded the esteemed MITACS scholarship and completed their three-month research internships at various renowned Canadian institutions. Our students have grabbed tremendous placement offers and internships from some of the top organizations and companies of national and global importance. In this situation, Quimica's influence cannot be disregarded. It has been greatly aided by the collaboration of all chemical engineering undergraduate students, seasoned alumni, and esteemed professors. I extend my congratulations to the entire Quimica team, the esteemed professors, and our esteemed director, Dr. Amit Kumar Gupta, for this accomplishment. I yet again send Quimica my best wishes for their forthcoming endeavors.

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Faculties Articles

Sulphur Removal Plant from Naphtha

-Dr. Amit Kumar Gupta
Associate Professor, B.I.T. Sindri

Primary Sulphur Removal Plant:-

Sweet naphtha is processed naphtha with a Sulphur content of less than 50 ppm and sour naphtha is processed naphtha with a Sulphur content of more than 90 ppm.

- Sour naphtha is handled in the principal Sulphur Removal Plant
- Sweet naphtha is simply stored in overhead tanks.

This naphtha is now delivered to the vaporizer.

Vaporizer and hydrodesulfurizer (HDS) :-

- A mild steel vessel with refractory connecting serves as the vaporizer. Syngas is combined with the processed naphtha from the PSR plant before heating it from outside. Cr-Mo spiral tubes have temperatures under 625 °C. A crucial element for this unit's operation is the temperature of the effluent. This is managed by maintaining fuel flow at a constant pressure.

A basic calculation uses a temperature of 50 °C, a pressure of 35 kg/cm2 and a pressure drop of 2 kg/cm2.

- The HDS unit is where the vaporized process naphtha goes to get its Sulphur removed. A manhole can be found on one side of the fully enclosed, high-pressure HDS. Manual insertion of the catalyst into the holding grids is required. The catalyst bed is a purple sandwich composed of two ZnO beds on either side of a CO-MO bed.
- The rapid ZnO bed, which is created by the reaction of hydrogen and reactive Sulphur in the processed naphtha, removes the H2S produced by the reaction between hydrogen and non-reactive Sulphur in the presence of CO-MO catalysis. When the initial ZnO bed reaches saturation, the ability to change the H2S inlet and outflow is offered and the bed is turned around.

- The HDS should not be heated above 390°C to prevent the catalyst from sintering and the generation of the unfavourable sooty carbon. On the other hand, the temperature at the inlet shouldn't be too low to prevent the need for additional fuel to heat the stream going to the main reformer.

- The process naphtha from the HDS is combined with steam before going into the primary reformer. For the steam-carbon ratio, the steam flow rate is roughly five times that of naphtha. The steam-carbon ratio is designed to be around 3.5.

The process naphtha from the HDS is combined with steam before going into the primary reformer. For the steam-carbon ratio, the steam flow rate is roughly five times that of naphtha. The steam-carbon ratio is designed to be around 3.5.

Primary Reformer:

In the primary reformer, the reforming of the process of naphtha occurs. Major reactions involved here are:

1. $2C_7H_{15} + 14H_2O \dashrightarrow 14CO + 29H_2$

2. $CO + H_2O \dashrightarrow CO_2 + H_2$

3. $CO + 3H_2 \dashrightarrow CH_4 + H_2O$

All of the above reactions are endothermic:

In the primary reformer, there are four rows of 33 tubes each, i.e., 132 tubes in all. The tubes are made of HKO, an alloy of Cr, Ni, and Ti additives. Pigtails are provided at the inlet and outlet of the primary reformer to release thermal stresses.
The catalyst filled inside the tubes is a Ni catalyst with a ceramic carrier (alumina). No promoter is used. Fuel naphtha is burnt to generate heat in the primary reformer.

Shift Converter and Carbon Dioxide Removal:

The gas stream coming from the MGG contains CO2, CO, H2, N2, and other inserts. CO and CO2 should be removed before entering into the synthesis loop due to their poisonous nature. The removal of CO is inefficient compared to the removal of CO2. Hence CO is first converted to CO2 and then removed. Any traces of CO left in the process stream is consumed by hydrogen in the Methanator step.

Faculties Articles

COAL TAR DISTILLATION

-By Dr. Amar Kumar
Assistant Professor, B.I.T. Sindri

The coal tar produced by coking coal is a dark, viscous liquid with distinctively foul odours. It was once seen as a nuisance in the production of coal gas in addition to being a waste product. However, it was discovered to be a secret treasure of numerous aromatic compounds that are currently used as the raw material for lovely dyes, medications, explosives, photographic developers, goods and many other items that are used in our everyday lives.

COAL TAR DISTILLATION:

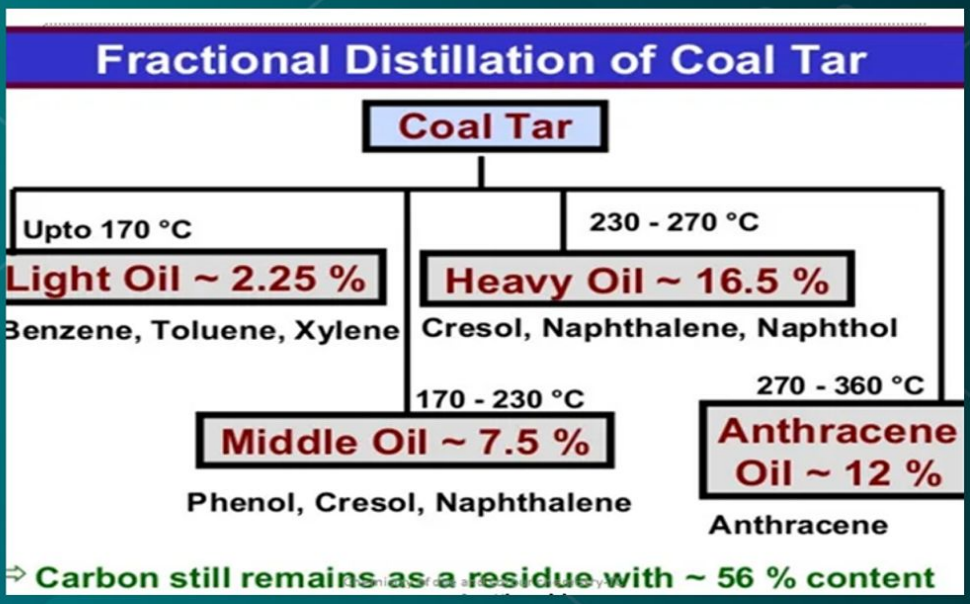
At least 200 aromatic compounds can be found in coal tar, but the following are the most significant ones:

· Benzene, toluene, xylene, naphthalene, anthracene and other hydrocarbons.
· Xylenols, cresols and other phenols.
· Quinoline and Pyridine are basic nitrogen compounds.

The fractional distillation process separates the components from coal tar. The initial feed from water is crude tar, which calls for gradual heating throughout the first stages of distillation. Following the removal, the real distillation is done in a sizable wrought-iron still with a steam pipe installed within that is heated below by fire. Connected to the still head is a condensing worm that is submerged in water. Process steam is introduced into the still toward the end of the steam to prevent the residue from caking. Condensed goods are transported into various receivers from the heated. The table below lists the cuts made to the typical technical distillation of tar:

Fraction	Distillation Temp (0 C)	SP.	Chief Constituents
Light Oil	Up to 170 C	0.9	Benzene, Toluene, Xylene, Naphthalene, Anthracene
Middle Oil	170-230	1.0 to 1.02	Phenols, Naphthalene
Heavy Oil	230-270	1.02 to 1.1	Cresols, Phenols
Anthracene Oil	270-360	1.1	Anthracene

Each fraction is worked and separated into its constituents:



1. First Fraction (Light Oil, up to 1700C):

It has benzene, toluene, and xylenes as well as some phenol and certain basic compounds, such pyridine, and is named by the fact that it is lighter than water. In order to eliminate bases and excess acid, the light oil is first washed with concentrated H2SO4 before being cleaned with NaOH. Three ingredients are recovered from the fractionally distilled, thusly purified oil:

Name of fraction	Temperature Range (^{0}C)	Chief Constituents
90% Benzol	Up to 110	Benzene, toluene, xylene
50% Benzol	110 to 140	Benzene toluene xylene
Solvent Naphtha or Benzene	140 to 170	Xylene, Mesitylene

All the 3 fractions are read under their commercial names as water of coal, solvents and for dry cleaning, 90% Benzol is fractionated again to yield Benzene (800 °C), Toluene (1100 °C) and Xylene (1400 °C).

2. Following Fraction (Middle Oil, 170°C -230 °C):

Its name, carbolic oil, refers to the fact that it mostly contains naphthalene and carbolic acid. Naphthalene crystals are formed when it cools, leaving behind crude liquid carbolic acid. NaOH and dilute H_2SO_4 are used to purify naphthalene before it is finally sublimed. In order to dissolve the phenols, the crude carbolic acid is stirred with a NaOH solution. In order to extract free phenols, the solution is runoff and treated with weak H_2SO_4, this produces crystals of carbolic acid upon distillation. It is possible to create explosives, medicines, and colours with naphthalene. Phenol is used to create colours, antiseptics, explosives, bakelite and other products.

3. Third Fraction (Heavy Oil 230°C -270°C):

It is heavier than water. Its chief ingredients are carbolic acid and cresol. It is not purified further and is used as much under the name of cresol oil, for the preservation of timbers and for making disinfectants.

4. Fourth fraction:

"Green oil," which is primarily anthracene and ranges in temperature from 270 to 360 °C. When it cools, anthracene crystals,the raw ingredient for alizarin dyes,deposit themselves. Pitch is run out of the still while it is still hot. Still residue. It is used to create stoneware that is resistant to acids, tarred paper, roofing, and road surface. It also contains 92–94% carbon.

Alumni's Article

Management of Process Safety

Ujwal Ritwik
Principal
Center for Professional Excellence in Risk and Sustainability, USA

Life is precious. Any life. Workers, people around the factory or pipeline, all lives need to be safeguarded. Environment is important. For our immediate surroundings and for long term. So that we can breathe good air, drink clean water, and our future generations continue to enjoy the gifts of nature. Protecting the plant and facilities is required for the very survival of the business. We must also safeguard property of our neighbours and community.
Let's imagine a plant operator presses a button to start the pump. There comes out a spray of sulfuric acid from the pump discharge flange. His personal protective equipment (PPE) like gloves and goggles save him partially. But large part of his body gets acid burn. Possibly the worker is incapacitated for rest of his life. That is where importance of personal safety requirements come in picture.

Now let's imagine the above scenario, dealing with hydrocarbon like naphtha. On press of the start button huge spray of highly flammable liquid comes out. Could be due to gasket failure. The panicked operator runs away. The liquid pool vaporizes and travels a long distance. On the path of this vapor workers are doing some construction work and further on there is a crowded bazar. There is a high chance the vapor cloud would get ignited and result in fire and explosion. Lives of workers and public is at risk. Also, there could be large scale destruction of plant and public property. This is a major hazard scenario caused by operation of a chemical process plant.

Alumni's Article

Unexpected releases of toxic, reactive, or flammable liquids and gases in processes involving highly hazardous chemicals have been reported for many years, in various industries using chemicals with such properties. Regardless of the industry that uses these highly hazardous chemicals, there is a potential for an accidental release any time they are not properly controlled, creating the possibility of disaster.

Process safety management (PSM) system of Highly Hazardous Chemicals emphasizes the management of hazards associated with highly hazardous chemicals and establishes a comprehensive management program that integrates technologies, procedures, and management practices.

Major incidents have common theme

Let's recall some of the following infamous incidents.

Beirut, Lebanon – Warehouse Explosion

4 August 2020: This is a murky episode on Lebanese docks. A cargo of 2,750 tonnes of ammonium nitrate was stored in precarious conditions in a warehouse. The large amount of decaying material came in contact with fuel oil creating massive multiple explosions.

The blast claimed over 200 lives, with many bodies missing, and over 6,500 people injured. The blast, according to researchers, was equivalent to 1,155 tonnes of TNT. It detonated the immediate dockside area, leaving a crater of 140 meters wide.

The explosion was caused by improper storage of the ammonium nitrate within the storehouse, as well as negligence and mismanagement by authorities.

Alumni’s Article

Bhopal Gas Tragedy

The Bhopal disaster, was a gas leak incident on the night of 2–3 December 1984 at the Union Carbide India Limited (UCIL) pesticide plant in Bhopal. It is considered among the world's worst industrial disasters.Over 500,000 people were exposed to methyl isocyanate (MIC) gas. The highly toxic substance made its way into and around the slum towns located near the plant. The official immediate death toll was 3,787.

The Indian government and local activists argue that slack management and deferred maintenance created a situation where routine pipe maintenance caused a backflow of water into a MIC tank, triggering the disaster.
Seven UCIL employees, including the former UCIL chairman, were convicted in Bhopal of causing death by negligence and sentenced to two years imprisonment.

Texas City Refinery explosion

The Texas City Refinery explosion occurred on March 23, 2005, when a hydrocarbon vapor cloud was ignited and violently exploded at a process unit at BP's Texas City refinery in Texas City, Texas, killing 15 workers, injuring 180 others and severely damaging the refinery.

Alumni's Article

The heavier–than-air hydrocarbons originated from liquid overflow from the blowdown stack caused by overfilling and overheating of the tower contents and then combusted after coming into contact with an ignition source. The U.S. Chemical Safety and Hazard Investigation Board reports identified numerous technical and organizational failings at the refinery and within corporate BP.

Piper Alpha

Piper Alpha was an oil platform located in the North Sea approximately 190 km north-east of Aberdeen, Scotland. An explosion and resulting oil and gas fires destroyed Piper Alpha on 6 July 1988, killing 167 men. The accident is the worst offshore oil disaster in terms of lives lost and industry impact. Misjudged risk perception, lack of competence, improper work practices were some of the highlights of investigation findings.

All the above and similar other major incidents in process industries have highlighted the importance of having robust processes and systems in place.

What is process safety?

Process safety is a disciplined framework for managing the integrity of operating systems and processes that handle hazardous substances. It relies on good design principles, engineering and operating and maintenance practices. It deals with the prevention and control of events that have the potential to release hazardous materials and energy.

For the industry the emphasis of process safety and asset integrity is to prevent unplanned releases which could result in a major incident. A major incident is typically initiated by a hazardous release; it may also result from a structural failure or loss of stability that escalates to become a major incident.

Alumni's Article

Hazard Recognition

Hazardous chemical releases pose a significant threat to workers and public. The key provision of process safety management (PSM) is process hazard analysis (PHA), a careful review of what could go wrong and what safeguards must be implemented to prevent releases of hazardous chemicals. The following references help begin a PHA by recognizing process hazards.

Process safety focuses on preventing fires, explosions and accidental chemical releases in chemical process facilities or other facilities dealing with hazardous materials such as petroleum refineries, and oil and gas (onshore and offshore) production installations, fertilizer plants, nuclear installations etc.

Occupational safety and health primarily cover the management of personal safety. Well-developed management systems also address process safety issues. The tools, techniques, programs etc. required to manage both process and occupational safety can sometimes be the same (for example a work permit system) and in other cases may have very different approaches. Hazard and Operability Studies (HAZOP) for example focus on process safety whereas PPE (Personal Protective Equipment) is very much an individual focused occupational safety issue.

Process safety generally refers to the prevention of unintentional releases of chemicals, energy, or other potentially dangerous materials (including steam) during the course of chemical processes that can have a serious effect to the plant and environment. Process safety involves, for example, the prevention of leaks, spills, equipment malfunction, over-pressures, over-temperatures, corrosion, metal fatigue and other similar conditions. Process safety programs focus on design and engineering of facilities, maintenance of equipment, effective alarms, effective control points, procedures and training. It is sometimes useful to consider process safety as the outcome or result of a wide range of technical, management and operational disciplines coming together in an organised way.

Alumni's Article

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Alumni's Article

A process is any activity or combination of activities including any use, storage, manufacturing, handling or the on-site movement of highly hazardous chemicals (HHCs) as defined by applicable legal bodies.
Process Safety Management System (PSMS) refers to a set of interrelated approaches to managing hazards associated with the process industries and is intended to reduce the frequency and severity of incidents resulting from releases of chemicals and other energy sources. These standards are composed of organizational and operational procedures, design guidance, audit programs, and a host of other methods.

Elements of process safety management system

Thus, the process safety management system program is divided into several elements.

- Process Risk Management
- Process Safety Knowledge
- Process Hazard Analysis
- Operating Procedures
- Competency and Training
- Contractors and Suppliers Management
- Asset Integrity
- Safe Work Practices
- Management of Change
- Incident Investigation
- Compliance Audits
- Pre startup safety review
- Emergency planning & Response
- Employee Participation

All of those elements mentioned above are interlinked and interdependent and are necessary to make up the entire PSM picture.
What is the role of engineers particularly chemical engineers?
Process safety management of highly hazardous facilities require a truly multi-discipline approach. Design and construction engineers deliver a safe facility to work. Mechanical, instrument/control and electrical engineers ensure the systems are kept well maintained. A chemical engineer operates the plant, but most importantly leads building a safe culture among operational and support personnel. They follow safe work practices. So whatever branch of engineering you pursue once in a hazardous industry you have extremely important responsibilities on your shoulders.

Students' Blogs

USE OF NANOPESTICIDES IN MODERN DAY AGRICULTURE

By ASHISH KUMAR SAHA
Batch 2021
Department. of Chemical Engineering, B.I.T Sindri

Without harming the biodiversity in the area, nanotechnology has provided excellent alternatives for insect pest management in agriculture, allowing for a more harmonious environment.

Nano Pesticides are nanostructures used to transport agricultural components that have two to three dimensions and range in size from 1 to 200 nm. When opposed to free insecticides, the loading of agrochemical ingredients into nanoparticles offers advantages due to their special features. However, a new category of environmental trash is being generated due to the rapid development of novel designed nanoparticles for pest management. Innovative nanopesticides are nanoparticles created to protect plants, minimize application losses, improve stability, boost leaf coverage, and decrease the amounts of formulation components. Formulations for nanopesticides can be split into active encapsulating components such nano emulsion, polymeric nanoparticles, lipide nanoparticles, and nanotubes, as well as self-organized systems like liposome, dendrimers, metallic and bimetallic nanoparticles.

Production has also been negatively impacted by the indiscriminate use of pesticides applied against harmful insects and pests. This has led to increased environmental imbalance, disease and insect resistance. This increased need for new agrochemicals to ensure the protection of the crops from various pests (pathogens, harmful insects, parasitic weeds) thus increasing production and productivity.

Students' Blogs

Benefits of Nano pesticides: -*
To strike a dynamic balance between agricultural production and environmental sustainability, nanotechnology most likely offers a novel platform. Numerous studies have demonstrated that the application of nanopesticides in agriculture can significantly reduce costs, enhance shelf life, and improve nutritional value of agricultural products.

They are designed specifically to increase the solubility of insoluble or poorly soluble active ingredients and to release the biocide in a controlled and targeted manner, in contrast to conventional pesticide formulations. As a result, the application only requires a smaller amount of an active ingredient per area. Producing costs, non-target effects, and phytotoxicity are all reduced as a result of the reduced dose. Additionally, it is essential that controlled-release formulations remain inactive until the active ingredient released.
For e.g.: -Different nanopesticides like atrazine, that is mostly sprayed on sugarcane and maize crops, can induce DNA damage by a chemical reaction with adenine and guanine bases of the DNA.

–

Students' Blogs

The lunch box approach: -

The lunch box approach is mainly inspired from the mechanism of the" fake promises" and to attract the prey such as, predator spiders providing same sex signals as of moth to attract them and making of silk wrapped gifts by male spiders in order to mate with the female spider. Nanopesticides should, ideally, kill a target without harming other species or organisms by luring it. By combining a semio-chemical with a nano-delivery system, the nano lunch-box strategy eliminates the described randomness of encountering the pesticide. Here, we present such an approach, called the "lunch-box" or "deadly-goodies" approach.

It consists of three main steps:-

(1) the lure

(2) the box and

(3) the kill.

The aim is to make the pest organism wish to approach the encapsulated pesticide, i.e., using the attract-to-kill approach at the nanoscale.

The lure: -_

The lunch-box method requires that the pest organism be seduced into this "belief" that it perceives an advantage in locating or being close to the "lunch". According to studies pheromones can be embedded in nanogels or polymer fibers by anchoring highly appealing chemicals on the surface of a nanocarrier. Semiochemicals, are the volatile compounds that indicate attraction and mating, food, or more broadly host-detecting chemicals, are potential attractants. Even at very low concentrations, these chemicals can be detected by organisms and induce a response that overrides many of an organism's natural "fears". These chemicals can be highly species-specific.

Students' Blogs

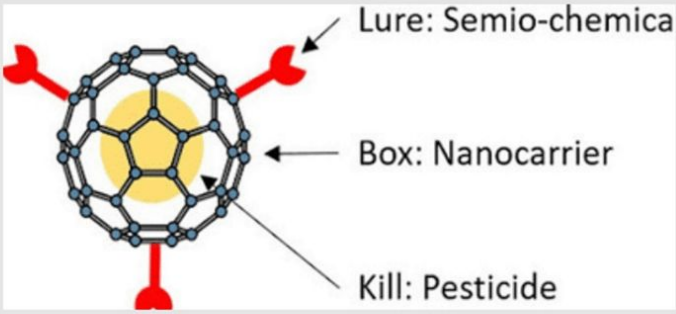
The box: -

In this method, if a pest organism is drawn to the lunchbox, it must "open". The carrier must be made of something that can be eaten or digested, like cellulose or pectin. Gut digestive enzymes or physical–chemical factors may initiate the "opening". The stability of the carrier, its ability to be opened, and especially the timing of the box's opening is all dependent on the material properties. Numerous natural materials can be broken down by enzymes found in living things, making them suitable for use in nanocarrier systems. As a result, site-specific pest control could get benefitted from their promotion of the release of active ingredients. Drug delivery and food science research served as inspiration for the majority of these site-specific release systems, whereas agricultural release applications-promoting systems are still in their infancy. Site-specific nanoparticle-based pesticide delivery methods are very interesting because they allow for precise effects on an organism while avoiding ineffective release.

The kill: -

The pesticide can begin working at the intended location without harming any other organisms once the lunchbox is opened. The method allows for the use of more gentle and sophisticated methods in addition to conventional chemicals. For example, Bt (Bacillus thuringiensis) can be used against various pest species, within the nanocarriers, novel natural or biosynthetic “compounds” can also be employed, e.g., natural chemicals, small-molecule agonists, or novel synthetic RNAi virus like strings.

Students' Blogs



Because the carrier system can protect and ensure proper functioning, the pesticides are more precise and generally cause less harm than conventional pesticide chemicals when used with this system. The "lunchbox" may even be designed to target specific tissues prior to release because nanocarriers can cross the midgut membrane however, development of this feature may take longer. It is possible to adjust what can be contained within the carrier as well as to enhance or inhibit cellular internalization by controlling the size of the carrier, such as between the nano and micro sizes. In conclusion, the lunch-box concept appears to be extremely promising for the creation of precision nanopesticides that enable targeted release, increased efficiency, and the avoidance of widespread pesticide-related negative effects. The interaction between ecological, nanotechnological, and chemical sciences benefits the approach.

Students' Blogs

GREEN HYDROGEN – A BOON

By SAHITYA SUMAN
Batch 2020
Department of Chemical Engineering, B.I.T Sindri

We know that due to our heavy reliance on fossil fuels, we produce over 830 million tons of carbon annually, which contributes to global warming, and we want to control/reduce this. For years, scientists and technocrats have been working to develop alternative fuels. The most recent studies by a group of scientist delegates from 195 countries have revealed the worst climate situation, particularly for Asian countries. The upcoming 26th UN Conference of Parties on Climate Change (COP 26) which is scheduled to take place on November 11, 2021, will make action plans to control greenhouse gases and climate change.

> Hydrogen is one of the most abundant elements on Earth, but we require the purest form of hydrogen, which is rare.
> On comparing the energy density of diesel with that of hydrogen, it is found that the energy density of hydrogen is three times that of diesel.
> 'Green Hydrogen' is a zero-carbon fuel. We can make this fuel by splitting water into oxygen and hydrogen using renewable energy from the sun and wind, a process known as electrolysis.

Students' Blogs

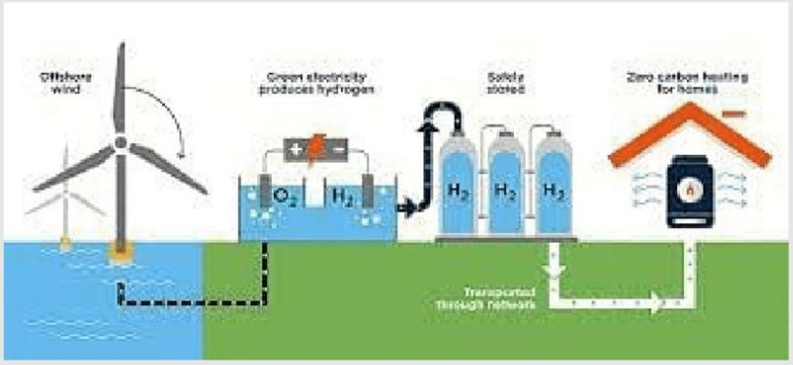
It is best to keep the temperature below 1.5 degrees Celsius. According to the International Energy Agency (IEA), the additional power demand will be between 25% and 30% by 2040.

> To meet the goal of expert guidelines on global warming of less than 1.5 degrees Celsius, power generation with 'net zero' emissions will be the best solution.

Challenges:-

Technical: The main issue is that in order to compress or liquefy the LH2 (liquid hydrogen), it must be kept at a constant temperature of minus 253 degrees Celsius (which is much lower than the temperature of minus 163 degrees Celsius at which liquefied natural gas (LNG) is stored).

The cost factor: According to studies by the International Renewable Energy Agency (IREA), the manufacturing cost of a green source of energy is nearly 1.5 dollar per kg (for countries with constant sunlight and vast unused land) by 2030, taking various conservative measures into account.



Students' Blogs

What does Green Hydrogen Mean?

> Green hydrogen is a zero-carbon fuel produced by electrolysis using renewable wind and solar energy to split water into hydrogen and oxygen.

> This 'Green Hydrogen' could be used to generate power using natural resources such as wind or solar systems and would be a critical step toward achieving the goal of 'net zero emissions. In the current scenario, less than 0.1 percent, or 75 million tonnes of hydrogen per year, is produced, generating 284 GW of power.

More About Hydrogen:-

> Black hydrogen is produced using fossil fuels, whereas pink hydrogen is produced using electrolysis but with energy from nuclear power sources.

> Brown hydrogen is produced using natural gas, and the emissions are released into the atmosphere.

> Grey hydrogen is produced using natural gases, and the emission is released into the atmosphere.

> Blue hydrogen is produced using natural gas, and the emission is captured using carbon capture and storage..

Green Hydrogen, a thriving new concept, is a zero-carbon fuel produced by electrolysis using renewable energy from solar and wind to separate water into oxygen and hydrogen.

The issue with green hydrogen:-

> One of the major challenges that the industry faces in commercializing hydrogen or green hydrogen is economic sustainability.

> For transportation fuel cells, hydrogen must be cost-competitive with conventional fuels and technologies on a per-mile basis.

> Green hydrogen production is prohibitively expensive, and the necessary infrastructure is unavailable.

> Fuel cells, which convert hydrogen fuel into usable energy for automobiles, are extremely expensive.

> The infrastructure for hydrogen stations is woefully underdeveloped.

Students' Blogs

Indian Plans:-

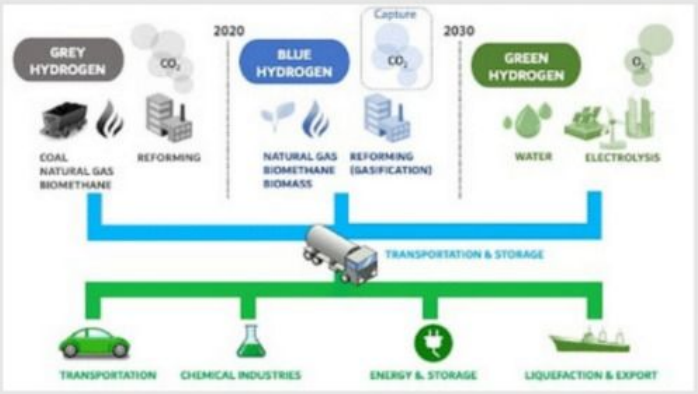
> The India Railways has revealed that the country's first trial of a hydrogen fuel cell technology-based train will run under Northern Railway on the 89-kilometer stretch between Sonepat and Jind by retrofitting an existing diesel engine.

> The project will not only save a few lakhs in diesel engine costs each year, but it will also reduce the release of 0.72 kilotons of particulate matter and 11.12 kilotons of carbon per year.

> The National Hydrogen Energy Mission aims to produce hydrogen from natural energy resources.

> At the moment, India requires approximately 5.5 million tonnes of hydrogen, the majority of which is produced from imported fossil fuels.

> At the moment, India generates grey or blue hydrogen, which is produced using fossil fuels.



Conclusions:-

Hydrogen power generation will be a viable option for meeting the target of net-zero emissions while keeping global warming below 1.5 degrees Celsius. It will also be a significant step toward reducing reliance on conventional fossil fuels. It is past time for hydrogen to catch up with the rest of the world by embracing clean energy, decarbonizing the economy, and adopting 'Green Hydrogen' as an environmentally friendly and safe fuel for the next generation.

Our Achievers

Our another gem, **Mr. Sahil Khan**, of batch 2019, secured an **internship in one of the biggest public sector undertakings -Indian Oil Corporation Limited.**

Mr. Md. Amir of batch 2019, who is pursuing a career in **UI-UX ,graphic designing has got a chance of working with some of the big global firms and companies,** enhancing our pride.

Mr Saurabh Mishra, of batch 2019, has grabbed an internship at one of the **top energy resource company 'Technip' as a process design intern.**

Our Achievers

Our Achievers this year...

This year, our five students from our Chemical Engineering Department, **Sakshi Gupta, Harsha Sinha, Lakshmi Sharma, Mugdha Singh, and Iysha Kumari**, 2019 batch, excelled in the **Mitacs Globalink Research Internship.** They conducted diverse research projects at renowned Canadian universities:

- Sakshi Gupta researched biomass pyrolysis for contaminant removal at the University of Saskatchewan.
- Harsha Sinha focused on Nitride Nanoparticles for Battery Electrode Optimization at McMaster University.
- Lakshmi Sharma aimed to produce alcohols and acids economically and sustainably at the Royal Military College of Canada.
- Mugdha Singh explored Brackish Water Treatment using Freeze Desalination at Western University.
- Iysha Kumari delved into Heavy Oil Phase Behavior and Viscosity Correlation in Mixed Solvents at Cape Breton University.

These students spent 12 weeks in Canada, making our institution proud with their remarkable achievements.

Workshop

Placement Workshop

An online session was held having the primary guest - Mr. Saurabh Rai who is Operations and Community Head and co-founder of Mentor Plus. It covered the aspects from about the placement theory of companies to the formula for cracking tough GDs. It was a great experience for the students.

Webinar

Webinar on Career Guidance

Mr. Ankur Bansal, the Head of chemical engineering faculty at Unacademy Plus, and an IIT DELHI graduate gave guidance regarding various competitive exams like GATE, ESE, and CSE as well as on life skills and career goals.

Webinar

Webinar on Profile Building and Placement Plans

A webinar with Miss. Riya Singh and Mr. Birendra Kumar, 2016 grads, on profile building and a plan for placements and internships organized. Both gave insightful information on resume writing, placements, and internships.

Seminar

Alumni Interaction

"Alumni Interaction Session" with alumni Dr. Santosh Kumar Sir and Sir Dr. Rajesh Ranjan Sir. They shared insights about their personal experiences, views on the need for further education, and their mantra of success.

Seminar

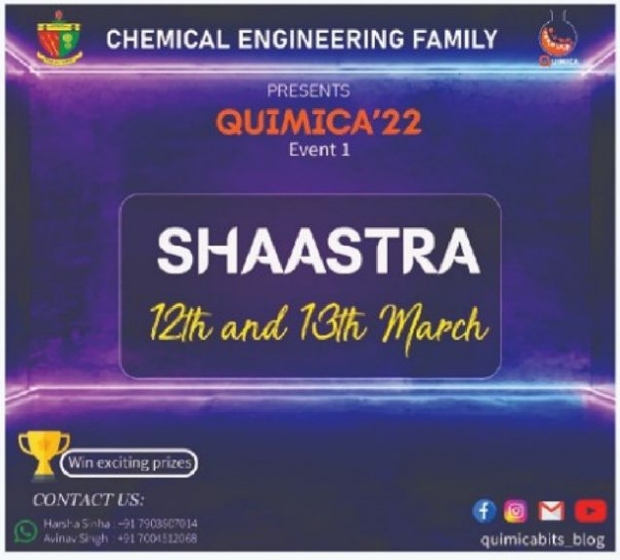
HOW TO GET INTO MITACS?

MITACS-qualified seniors namely Miss Sakshi Gupta, Mr. Harsha Sinha, Miss Laxmi Sharma, Miss Mugdha Singh, and Miss Iysha Kumari answered queries regarding this Research Internship through the seminar. They answered all the questions about the Mitacs Globalink Research Internship.

Recent Events

SHAASTRA

It was a three-tier event. An enthralling quiz followed by problem-solving rounds ended up with a mind-blowing competition among entrants. Industrial knowledge and interest of the participants were tested through this event among the four domains: Oil and Petroleum, Automobile, Telecommunication, and Artificial intelligence. The quiz levels entailed the search for quick-witted and action-takers. The three candidates from each domain resulting from the first round qualified for the second round. The 4 finalists were provided with immediate situational based problems, which they had to solve instantly within the limited time frame.



Recent Events

ADVAITA

The captivating "ADVAITA- In search of wisdom" was an event organized on the eve of Independence Day which comprised of a welcome celebration for our guests and a three-tiered quiz competition with a strong emphasis on the application of science and technology which was an incredible and exciting experience for the students. The participants grasped this opportunity to sparkle and showed the gleam of their understanding and intelligence. This event was intended for all the young people out there who have creativity like our freedom fighters.

Recent Events

SCINTILLA

It was based on the idea of balancing the pros and cons of different products related to the chemical industry. The event was useful in developing the debating sense which is a key in many GD sessions. The event opened up to the varying degrees of outlook on the rigorous subjects and gave the chance to critically analyse the 360 perspective on a take, to show the skills of participants' thought-provoking and well-percieving minds. The event exhilarated their imagination and provided an exposure to vivid colorful ideas. It fostered an environment conducive to innovation and unconventional thinking. Students from other prestigious universities of the country also participated in this event.

Recent Events

TECH-KRITI

A technical event with a two-tier brainstorming competition and exciting adventures. It was an event where the participants were provided an opportunity to show their creativity. It gave the students a chance to explore themselves and showcase their aptitude. Participants gave their innovative solutions as an abstract after selecting any one problem statement from the basket. The second round was a face-off paper presentation round in front of our juries. A Question & Answers session was organised which was based on their presentation part.

From the Alumni

Mr Sumit Anand

Chemical Engineering,2015

I still remember locating my college on Google Map and juggling through images on the internet to find out what B.I.T Sindri and its surroundings looked like! That was 6 years ago and still feels like it happened not a long time back. I joined B.I. T in mid 2015s for pursuing B. Tech in Chemical Engineering. I was proud to be a part of the institution which stood there for glorious 66 years, shining in all its pride.I had a great learning experience in college, be it related to the technical knowl edge in my domain or other valuable lessons of life.I was part of several clubs and committees - LEO Club led by Dr Amar Kumar Sir, Professor BIT Sindri and Training and Placement Cell led by Dr Ghanshyam Prasad Sir, Professor BIT Sindri which helped me in my overall personality development. Starting as a newbie in Leo Club in 2015 and learning from my seniors, I went on to become the Vice President of the club in 2018 and took charge. It greatly helped me understand what responsibility and accountability meant.I was also part of the Training and Placement Cell in 2018-2019, which was a very crucial role for me.

From the Alumni

The cell took care of inviting companies for campus hire and carrying out related activities to ensure maximum placement ofthe batch. While being in all these roles, I had the pleasant opportunity of hosting several events, developing my communication skills, interacting with people from all walks of life, meeting our great base of alumni/-professionals/artists and learning about their success and also building life-lasting friendships. I also qualified for CAT in 2019 and then did my MBA from IIM Kashipur-thanks to the greatly accommodating college routine. Had it not been for the com- bined impact of all the meaningful experiences, it would not have been possible for me to do so. I am extremely privileged to be an Alumnus of B.I.T.

Alumnus of B.I.T Sindri.I believe it has played a very critical role in shaping my future to the best. I would love to see the recent batches join in and pass out with the same wonderful memories I had, or even better ones. Wishing higher growth and opportunities for upcoming students.

From the Alumni

Mr Keshu Ranjan

Chemical Engineering,2018

Quimica has provided me with a wonderful environment and opportunity to learn and grow myself academically as well as to secure a place in the corporate world. This is the time for all of you to understand the importance of any society with a vision of interacting more and more Chemical Engineers across the country. This college and my department has always guided and supported me for reaching my goal. The professors and seniors left no stones unturned to develop my communication and soft skills.Today, students from our department and our college are present almost in every corner of the world from various reputed institutions and research organisations to big shot corporate set ups.Such efforts have inspired our current lot of students. These clubs and societies enhance the student's interactive skills on professional level and help in personality development.

I always cherish the memories and the favourite past times I had with working as a part of the Quimica family. I feel immense felicity to have worked together as a team to convert every single opportunity. I always look forward to keep in touch with all my fellow members. B.I.T. Sindri and my department will always be an inseparable part of my life for sure.

Recent Advancements in Chemical Industry

Blockchain: Wave of Substance in the chemical industry.
By: Saurabh Mishra, 2019 Batch.
Co-Convenor, Quimica.

Blockchain is a decentralized peer-to-peer digital network technology that can assist the chemical industry across its breadth, from building a coherent trading model to the development of client-centric products.

Trustless trust

In its "2018 Technology Vision", Accenture reported that 77% of chemical industry executives anticipated a timespan of one to three years for the integration of blockchain into company systems and 71% agreed to the gravity of blockchain in their company over the next three years. Largely known as the "trustless trust" setup, it shifts the trust factor from the participant to the system itself. The integral-cum-static design pushes further the exigency of blockchain integration in industry operations. Pioneers from various sectors viz. O&G, Chemical and Pharma, have started implementing this technology at different levels to avail industry-specific benefits like reducing workflow process, tokenizing the recycle value of its end products and legal improvements in its supply chain.

Recent Advancements in Chemical Industry

Nanotechnology for Water Purification.

By: Akash Deep, 2019 Batch.

There is only 0.5% freshwater which is portable. The need is being felt to filter the impure water for human consumption. There are various technologies that we have encountered in our life like Reverse Osmosis (RO), UV filtration and many more. Scientists have discovered nanotechnology to purify water from contamination and unwanted minerals (RO) and make it portable. Nanotechnology is the process of manipulating atoms on a nanoscale.

Effectiveness

Nanotechnology is more effective than conventional ways like-Boiling, filtration, distillation, sedimentation, chlorination and oxidation. In this mechanism, two membranes are used for softening water; removing physical, biological and chemical impurities. This highly effective method has also been commercialized for safe-drinking water like Nanoceram, NanoH20, etc.

Recent Advancements in Chemical Industry

Main features

(a) More Surface and Small volume.

(b) Membrane material may change electrical, physical, chemical, optical, or biological properties at the Nano level.

(c) Chemical and biological reactions are easier. Under Nanotechnology, Nanocellulose based filtration is renewable and has high potential in water purification technology. Different materials are available such as Cellulose Nanocrystals (CNC) and Cellulose Nanofibrils (CNF). The Nanocellulose material is prepared by sulphuric acid hydrolysis and mechanical grinding method. The general water purification system is based on absorption. Though the nanotech method is highly efficient but has limitation in commercial production and incur high cost.

The field of nanotechnology in water purification is an important area of research. The degrading quality of fresh water for human consumption has made it a vital source for future water purifying systems.

Recent Advancements in Chemical Industry

Quantum Computing.
By: Anjali Shah, 2019 Batch.

The chemical industry is prepared to start to be an early beneficiary of the vastly expanded modeling and computational capabilities of quantum computing. Over the past years, quantum computing has been the subject of a lot of hype.

Work underway within the field at tech giants like IBM and Google has been extensively reported, and this interest has been mirrored by investments within the quantum-computing field by players from a wide range of industries including the chemical industry.

Adoption

This industry has been a comparatively late adopter of this digital innovation and practices moving across business and society. Quantum computing, uses the laws of quantum physics to extend the speed of certain calculations far beyond the capabilities of classical computers.

Recent Advancements in Chemical Industry

Future Aspects

For the industry, the new quantum-computing capabilities expose the likelihood of modeling quantum-mechanical systems, like molecules, polymers and solids, at a completely different level of precision. It would be possible to identify the most effective molecular designs or structures to accomplish specific tasks and achieve the required effects before synthesizing a single molecule in the lab.

Access to this kind of computation resource could exponentially boost the effectiveness of R&D departments and change the way new products are developed, with ramifications across the entire chemical industry.

Nobel Prize in Chemistry

Carolyn R. Bertozzi

Carolyn R. Bertozzi was jointly awarded the 2022 Nobel Prize in Chemistry in 2022.

Bertozzi is recognized for founding the field of biorthogonal chemistry, a set of chemical reactions that allow researchers to study molecules and their interactions in living things without interfering with natural biological processes. Bertozzi's development of biorthogonal chemistry – a term Bertozzi coined, which means "not interacting with biology" – grew out of an interest in complex carbohydrate molecules, called glycans. Along with proteins and nucleic acids such as DNA, they are one of the key building blocks of life and also one of the least well understood. Looking for a way to speed up her biorthogonal process, Bertozzi saw potential in a reaction Sharpless and Meldal (co-prize winners) is covered independently, called copper-catalysed azide-alkyne cycloaddition. This reaction, already the crown jewel of click chemistry, required modification for use in living cells because it would introduce copper into a cell, which is toxic. Inspired by chemistry from classic textbooks, Bertozzi's lab modified the reaction, resulting in copper-free click chemistry. This faster version of biorthogonal chemistry allowed Bertozzi to track the activity of glycans in cells over time.

Since their development, Bertozzi's biorthogonal reactions and derivatives have been used to study how cells build proteins and other molecules, to develop new cancer medicines, and to produce new materials for energy storage, among many other applications.

Nobel Prize in Chemistry

Morten Peter Meldal

Morten Peter Meldal is a Danish chemist. He is currently providing his services as a professor of Chemistry at the University of Copenhagen in Copenhagen, Denmark. This year, he is bestowed with the Nobel prize in Chemistry "for developing click chemistry and bioorthogonal chemistry". He has made some major development in the chemical technology industry and sciences. He had a particularly strong impact on peptide and combinatorial chemical techniques. His areas of expertise include molecular immunology, cellular assays, combinatorial chemistry, click chemistry, polymer chemistry, organic synthesis, automation in synthesis, artificial receptors and enzymes, nano assays, biomolecular recognition, enzyme activity, and encoding. He along with Carolyn R. Bertozzi and Karl Barry Sharpless won the Nobel prize for their work focused on 'developing a way of ‘snapping molecules together’ that can be used to design better medicines, including ones that target diseases such as cancer more precisely.’

In other words, Morten Meldal laid the foundation for a functional form of chemistry called 'Click Chemistry', in which molecular building blocks snap together quickly and efficiently. His field of excellence mainly includes the domains of organic chemistry - like Click chemistry, Nanochemistry, Nanoscience, Material science, Solid-Phase Organic Chemistry, and Enzymatic Reaction. He is also the company founder and CSO of Betamab, a company that conducts biotechnology and pharmacological research, diagnostics, and pharmaceutical development.

Nobel Prize in Chemistry

Karl Barry Sharpless

Karl Barry Sharpless is an American chemist and a two-time Nobel laureate in Chemistry known for his work on stereoselective reactions and click chemistry.

While at Stanford, Sharpless discovered Sharpless asymmetric epoxidation, which was used to make (+)-disparlure. He was awarded the 2022 Nobel for works he began about two decades ago when he coined the concept of click chemistry, which is a form of simple and reliable chemistry, where reactions occur quickly and unwanted by-products are avoided.

He won the Nobel in 2001 for his work on chirally catalysed oxidation reactions. "The Laureates have opened up a completely new field of research in which it is possible to synthesise molecules and material with new properties. Today the results of their basic research are being used in a number of industrial syntheses of pharmaceutical products such as antibiotics, anti-inflammatory drugs, and heart medicines," the Nobel announcement of the 2001 Chemistry award read. Sharpless discovered CuAAC (the copper-catalyzed azide-alkyne cycloaddition), now known as a quintessential “click chemistry”. Recently the Sharpless group discovered SuFEx, another near-perfect click reaction. In concert with the thiol-ene reaction, these three make click chemistry a far-reaching method for drug discovery, chemical biology and materials science.

BIT SINDRI

CHEMICAL ENGINEERING DEPERTMENT

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'23

बीआईटी सिंदरी में हम क्विमिका परिवार का इंडक्शन सेशन संपन्न

सिंदरी। हम क्विमिका परिवार ने बैच 2022 के लिए इंडक्शन सेशन का आयोजन किया, जिसका संचालन सभी त्वरित सदस्यों की उपस्थिति में किया गया। इसकी शुरूआत इंट्रो सेशन से हुई। इंटरएक्टिव क्विज राउंड के बाद बहुत ही आनंददायक वीडियो प्रस्तुत किया गया। सही जवाब देने वाले प्रतिभागियों को चॉकलेट देकर सम्मानित किया गया। फिर मिथ बस्टर्स सत्र हुआ, जिसमें केमिकल इंजीनियरिंग के बारे में विभिन्न मिथकों को दूर किया गया। इसके बाद प्रश्नोत्तर सत्र हुआ, जिसमें 2020 के सम्मानित सीनियर्स ने फ्रेशर्स के विभिन्न सवालों के जवाब दिए। इसके बाद सम्मानित वरिष्ठ ने सत्र का संचालन किया, जिन्होंने एआईसीएचई के बारे में जानकारी प्रदान की। कई इच्छुक उम्मीदवारों ने पोर्टल पर पंजीकरण किया। जनरल वार्डन आरके वर्मा के निदेर्शानुसार सभी ने 132वें संविधान दिवस के अवसर पर राष्ट्र की गरिमा और अखंडता को बनाए रखने की शपथ ली। कार्यक्रम के अंत में फोटो सेशन का आयोजन कर कार्यक्रम का समापन हुआ।

सिंदरी बीआईटी एलिमेंट एक्स फिनाले आकर्षण का केंद्र

नई पत्रवार्ता प्रतिनिधि

सिंदरी/ बलियापुरः मंगलवार को क्विमिका की मुख्य विशेषताएं एलिमेंट एक्स फिनाले और मशीन लर्निंग अंतर्दृष्टि। कार्यक्रमों की एक आकर्षक श्रृंखला में, बीआईटी सिंदरी के केमिकल इंजीनियरिंग विभाग द्वारा आयोजित क्विमिका'23, तीसरे दिन के अंत तक पहुंच गया है, जिससे प्रतिभागी और उपस्थित लोग उत्साह से भर गए हैं। दूसरे दिन, डॉ. संदीप पाटिल ने क्विमिका के यूट्यूब चैनल के माध्यम से रणनीतिक उद्यमिता पर एक लाइव वेबिनार का नेतृत्व किया। धन्यवाद ज्ञापन में प्रोफेसर डॉ. सुनील कुमार सिंह ने आभार व्यक्त किया। तीसरे दिन एलीमेंट एक्स का गतिशील राउंड 2 देखा गया। जो एक महत्वपूर्ण कार्यक्रम था। जिसमें पीपीटी प्रस्तुतियों और चुनौतीपूर्ण प्रश्नोत्तरी राउंड का मिश्रण था। जब प्रतिभागियों ने मैदान में अपनी प्रतिभा का प्रदर्शन किया तो माहौल बौद्धिक

उत्साह से भर गया। इस कार्यक्रम को मुख्य अतिथियों की गरिमामयी उपस्थिति से सम्मानित किया गया। डॉ. अभिषेक आनंद हेम्ब्रम, डॉ. दिवाकर पांडे, और प्रो. पिथो हांसदा। छह उत्कृष्ट टीमों ने उल्लेखनीय प्रतिभा का प्रदर्शन करते हुए अंतिम एलीमेंटा एक्स राउंड में अपना स्थान अर्जित किया। चौथे दिन का समापन एलिमेंट एक्स के रोमांचक समापन के साथ हुआ। छह असाधारण टीमें गहन ऑडियो-वीडियो प्रश्नोत्तरी दौर में शामिल हुईं, जो अंतिम पुरस्कार के लिए प्रतिस्पर्धा कर रही थीं। इसके साथ ही, आईआईटी कानपुर के सहायक प्रोफेसर डॉ. राजेश रंजन ने कैसे मशीन लर्निंग सीएफडी विश्लेषण और डिजाइन में सहायता कर सकती है, विषय पर एक व्यावहारिक वेबिनार का नेतृत्व किया। संक्षिप्त सत्र में मशीन लर्निंग और कम्प्यूटेशनल तरल गतिकी के अंतर्संबंध का पता लगाया गया।

QUIMICA

Chemical Engineering Department, BIT Sindri Dhanbad(JH)

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WITH OUR DEEPEST GRATITUDE...

QUIMICA

BIT SINDRI

WE'RE EXCITED TO INTRODUCE, QUIMICABITS, OUR OFFICIAL NEWSLETTER, WHICH WOULD HELP YOU ALL TO FOSTER A FEELING OF COMMUNITY AND ATTACHMENT TOWARDS OUR CHEMICAL DEPARTMENT.

WE OWE A HUGE DEBT OF GRATITUDE TO EVERYONE WHO PUT IN COUNTLESS HOURS TO CREATE THIS MAGAZINE AND MAKE IT A PERFECT WORK OF ART.

WE WOULD LIKE TO THANK OUR DIRECTOR PROF (DR.) D.K.SINGH SIR AND HOD CHEMICAL ENGINEERING - PROF (DR.) AMIT KUMAR GUPTA WHOSE EXCEPTIONAL TECHNICAL SUPPORT AND LOGISTICAL ASSISTANCE ACTED AS A BEACON OF GUIDANCE FOR US.

THE GREATNESS OF OUR INSTITUTE AND PUBLICATION HAS BEEN EXCLUSIVELY ATTRIBUTED TO OUR DISTINGUISHED FACULTY, WHO HAVE MADE IT POSSIBLE FOR US TO PUBLISH THIS MODEL OF EXCELLENCE. WE WOULD LIKE TO SHOW OUR SINCERE GRATITUDE TOWARDS THEM.

ALSO, WE WOULD LIKE TO EXPRESS OUR GRATITUDE TO THE SHREWD AND INVENTIVE ALUMNI, WHO GAVE US HOPE THROUGHOUT THIS ROUGH ROAD, WHICH WOULD HAVE PREVENTED US FROM GETTING THIS FAR. WE SINCERELY THANK EVERY ONE OF THEM FOR THEIR EXTRAORDINARY WORK AND COMMITMENT.

ADDITIONALLY, WE WOULD LIKE TO SHOW OUR THANKS TO THE POST-BEARERS OF THE CHEMICAL ENGINEERING SOCIETY FOR INSPIRING US TO GO ABOVE OUR BOUNDARIES AND FOR HELPING US TO DEVELOP THIS PIECE OF EXCELLENCE. WE ARE LUCKY TO HAVE STUDENT COORDINATORS WHO ARE SO BRILLIANT AND COMPETITIVE AND WHOSE EXCEPTIONAL ACCOMPLISHMENTS ARE AN INSPIRATION TO US.

AFTER GOING THROUGH THIS MAGAZINE, YOU WILL COMPLETELY COMPREHEND THE POTENTIAL OF THE CHEMICAL ENGINEERING DEPARTMENT, WHICH YOU WILL ALL ADMIRE IN THE FOLLOWING YEARS.