ChemE Chronicles

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FROM HOD'S DESK

PROF. ADITYA KUMAR

It is with great pleasure that I present the July 2026 edition of ChemE Chronicles, the official newsletter of the Department of Chemical Engineering at IIT (ISM) Dhanbad. This edition brings together a diverse range of departmental activities, achievements, technical insights, and perspectives from our alumni. I extend my sincere appreciation to all the faculty members, students, alumni, and contributors whose efforts have made this issue possible.

The Chemical Engineering News section highlights recent developments in sustainable energy and environmental engineering, including Jindal Stainless' contribution to India's first hydrogen-powered train and the initiative by Oil India Limited and the Municipal Corporation of Delhi to establish compressed bio-gas plants using segregated organic municipal solid waste. These developments reflect the growing role of engineering innovation in advancing cleaner energy systems and sustainable infrastructure.

The Alumni ChEnect section features an inspiring interaction with Namita Dubey, an alumna of the department, whose journey from Chemical Engineering to facilities engineering, process simulation, digital twins, data analytics, and digital engineering offers valuable guidance to our students. The ChemE Trivia section explores the Biot number and its importance in transient heat transfer, while the Feature Article discusses sustainable engineering through advanced materials and processes, with emphasis on catalysis, photocatalysis, advanced oxidation processes, and functional materials.

This issue also highlights the Orientation Programme for the newly admitted PG Batch of 2026, marking the beginning of their academic and research journey in the department. The Publications section reflects the breadth of ongoing research and the department's continued emphasis on innovation and impactful scholarship. I warmly welcome our new students and encourage all readers to explore this issue and share their valuable feedback and suggestions. Let us continue to work together towards excellence in education, research, innovation, and sustainable engineering.

What's Inside

Chemical Engineering News

OIL and MCD join hands to turn Delhi's waste into clean energy with new bio-gas plants

Oil India Limited (OIL) has signed a Memorandum of Understanding (MoU) with the Municipal Corporation of Delhi (MCD) to establish Compressed Bio-Gas (CBG) plants using segregated organic municipal solid waste generated in Delhi. The MoU was signed on July 30, 2026, in the presence of Rekha Gupta, Chief Minister of Delhi, and Pravesh Wahi. Read More…

Jindal Stainless powers India's first hydrogen train push

Jindal Stainless has taken a key position in India's green mobility revolution by supplying around 40% of the total stainless steel requirement for the country's first hydrogen-powered train, marking a significant contribution to the future of sustainable rail transport. With hydrogen propulsion technology at its core, the train highlights India's growing focus on reducing carbon emissions while building next-generation infrastructure aligned with the vision of Atmanirbhar Bharat. Read More…

*Please send your suggestions to: che@iitism.ac.in

Alumni ChEnect

Namita Dubey

M.TECH [2020-2024]

1 Welcome to the "Alumni ChEnect" interview series! Please tell us in detail about your current job.

I would like to sincerely thank Department of Chemical engineering, IIT (ISM) Dhanbad for providing this wonderful opportunity to reflect on and share my academic and professional journey. I am currently working as a **Facilities Engineer** at **Chevron ENGINE (Engineering & Innovation Excellence Center)** in Bengaluru. Chevron is a multinational oil and gas company, focusing on exploration, refining, production and distribution of energy products safely to meet global demand. My role primarily focuses to support upstream oil and gas facilities of Chevron through process simulation, dynamic modelling, digital twin, engineering studies, and data analytics. I work with Houston Technical Cell on projects to support operating assets and capital projects across different business units. Recently I have been working with the assets at Richmond, Agbami and Dagger's Lake. My responsibilities involve improving facility design, operational reliability, decision-making and supporting the development of digital engineering solutions.

2. Please tell us about your academic journey, starting from school days.

My schooling was completed from **Gorakhpur (Uttar Pradesh),** my hometown. I was fond of science and mathematics since my schooldays. I passed my **matriculation (ICSE) in 2015 from Carmel School with 92% and intermediate (ISC) in 2017 from Little Flower School with 89%.** I decided to become an engineer to align my interest and keep up my late grandfather's legacy who was from electrical engineering background.

After 12th, I prepared for JEE for a year and then joined **Madan Mohan Malaviya University of Technology (MMMUT), Gorakhpur** and completed my **B.Tech in Chemical Engineering (8.12 CGPA)** in **2022**. Then, I joined as a **Graduate Engineer Trainee (GET)** in **Grasim Industries (Aditya Birla Group)** through campus placement. Here, I understood how engineering principles integrate with large-scale cellulosic fibre manufacturing processes. My quest for higher studies, led me to qualify **GATE 2023** and join M.Tech **in Chemical Engineering at IIT (ISM) Dhanbad**. These two years were toughest and most rewarding period in my academic journey. I graduated with a **CGPA of 9.4 and was awarded the Gold Medal** from **Hon'ble President of India**, an achievement that remains one of the proudest milestones of my academic career. Then, I joined **Chevron ENGINE** through campus placement.

3 Why did you choose chemical engineering? Was it out of passion, or driven by circumstances? Please walk us through your thoughts as a Class 12

Being very honest, Chemical Engineering was not my passion. After class 12th, I wasn't even aware of engineering specializations. Unlike any student, I was exploring which branch would be the best fit for me. After discussing with family and considering various career options, I felt that Mechanical or Electrical Engineering aligned more closely with my interests. However, based on my entrance exam rank and the choice-filling process, I was allotted Chemical Engineering at MMMUT. Initially, I assumed Chemical Engineering was related to chemicals and chemistry but after joining the program I discovered its true scope. I understood how raw materials are transformed into valuable products, and the dynamic role of my discipline in energy sector and manufacturing industries. Looking back, being allotted Chemical Engineering turned out to be one of the best things that happened to me. What started as a branch assigned gradually became a field that I genuinely enjoy.

3 How has IIT (ISM) Dhanbad helped you in this journey? How did the BTech/MTech/PhD programme here help shape your career path? How did the academic environment and campus life contribute to your personal growth?

IIT (ISM) Dhanbad has a very crucial role in shaping both my professional career and personal growth. The M.Tech program made me think and dive deep into chemical I engineering. The coursework was very lengthy and rigorous, but professors made difficult topics way easier in classroom. I got the opportunity to learn from this field's finest scholars. They were always motivating, approachable, ready to guide and inspired me to push my own boundaries. Senior research scholars in my lab were very helpful-be it understanding research scope or revising paper comments. We had valuable discussions not only in lab but also over tea. Department conferences and seminars incorporated a collaborative platform to exchange ideas and learn. The Central Research Facility (CRF) had advanced testing instruments which enhanced my research quality and gave hands on exposure to characterization techniques. Besides, Student Activity Centre (SAC) played an important role amidst demanding schedules. Gym and badminton court helped me stay fresh, active and focused. For me, IIT (ISM) Dhanbad was not just a place where I earned a PG degree, it was a transformative phase that shaped me technically, boosted confidence and prepared me to take on complex engineering challenges.

4 . What is your typical work-day like?

As a Facilities Engineer, I am currently working in Design Engineering & Projects. Here, I analyse the process data, develop and validate simulation models, utilize Digital Twin and review P&IDs and PFDs. There are other tools like Aspen Hysys, UniSim, Seeq and Python that I use to support automation projects and data-driven workflows. I also collaborate with multidisciplinary teams here and across the globe to solve challenges in my work. All manufacturing industries abide with Safety. Similarly, Chevron has strong Operational Excellence culture, and I follow them to eliminate risk and hazard in my day-to-day decisions. The best thing about my role is that it provides opportunity to work on diverse technical challenges. I continuously learn from people across the globe and contribute to deliverables which have a meaningful impact on Chevron's global operations

4 . What are the pros and cons of the profession in your honest opinion?

In my opinion, the biggest advantage is its versatility and enabling continuous learning.Chemical Engineering is everywhere in our daily life. It offers opportunities across multiple industries such as energy, chemicals, pharmaceuticals, and sustainability. For me, it has given the opportunity to work on shopfloor, research, and digital engineering.

But sometimes this profession can be demanding. Engineers often deal with tight project timelines, complex technical problems and collaboration across multiple time zones and teams. At times, the learning curve can be very steep. You would require continuous upskilling to stay relevant in a rapidly evolving industry. However, I believe the pros outweigh the cons. The opportunity to contribute towards large-scale operations, solve meaningful problems, and groom technically and professionally makes it a highly promising career. Chemical Engineering is a field that offers endless opportunities to innovate, learn and make an impact on the entire world.

4 . How has your career evolved since you graduated, and what advice would you give to current chemical engineering students aspiring to follow a similar path?

My career so far has been a blend of industry, academics, and continuous learning. My advice to young Chemical Engineering students is to build a strong foundation in core subjects such as thermodynamics, fluid mechanics, reaction engineering, process control and heat and mass transfer. These are the backbone of our profession.
Simultaneously, keep learning emerging technologies such as process simulation, data analytics, digital engineering, programming, Machine Learning (ML) and Artificial Intelligence (AI). Today industries are becoming highly data-driven, skills in AI and automation are integrating with traditional engineering knowledge and creating exciting new opportunities. Robots are slowly replacing human interventions in critical plants. Here, chemical engineers are essential for troubleshooting complexities, making critical operational decisions and validating AI recommendations. The future belongs to engineers who can work alongside automation to improve safety, reliability, and efficiency. Most importantly, don't worry if your career path is not perfectly planned. I neither chose Chemical Engineering nor did I plan to join Chevron but over time I discovered how versatile and rewarding the field is. Step outside your comfort zone, stay curious and updated, keep learning and trust the process. Eventually your hard work must reward you one day or the other day.

Feature Article

Sustainable Engineering through Advanced Materials and Processes

Sustainable engineering is becoming increasingly important as society faces challenges related to environmental pollution, rising energy consumption, resource constraints, and the growing demand for efficient industrial processes. Modern engineering, therefore, goes beyond improving the performance of existing processes. It increasingly focuses on designing advanced materials and developing processes that minimize environmental impact while supporting sustainable industrial growth. This shift has driven research into functional materials, renewable energy technologies, environmentally benign processes, and computational approaches to understanding complex engineering systems. Among these developments, heterogeneous catalysis, particularly photocatalysis, has emerged as a promising route towards cleaner industrial processes. By tailoring the optical, structural, and surface properties of catalysts, researchers can harness solar energy to drive chemical reactions and degrade persistent pollutants.

The integration of engineered catalysts with advanced oxidation processes (AOPs) can facilitate the degradation and, in favorable cases, the mineralization of persistent organic contaminants. Such catalytic systems are also being explored for the production of hydrogen and ammonia, as well as for the conversion of carbon dioxide into value-added chemicals. At the same time, the development of smart and functional materials is opening new possibilities for chemical sensors capable of rapid and real-time detection of target species.

Prof. Lutukurthi D N V V Konda

ChemE Trivia

Biot Number

The Biot number (Bi) is a dimensionless parameter that plays an important role in the analysis of transient heat transfer and helps chemical engineers determine how temperature varies within a solid during heating or cooling. It is defined as Bi=khLc, where h is the convective heat-transfer coefficient, L_c=V/As is the characteristic length, and k is the thermal conductivity of the solid. Physically, the Biot number represents the ratio of internal conduction resistance to external convection resistance. When Bi < 0.1, heat can conduct rapidly through the solid compared with the rate at which heat is transferred from the surrounding fluid, resulting in an almost uniform temperature throughout the body. This condition allows engineers to use the lumped-capacitance method, which significantly simplifies transient heat-transfer calculations.

However, when Bi > 0.1, substantial temperature gradients develop inside the material, and conduction within the solid must be considered. For example, a small Biot number may be observed in a thin metal object with high thermal conductivity, whereas a large Biot number can occur in a thick insulating material or a catalyst pellet. The Biot number is therefore particularly useful in reactor design, drying, cooling of chemical products, heat treatment, food processing, polymer processing, and thermal management of industrial equipment. An interesting point is that the Biot number is named after Jean-Baptiste Biot, the French physicist who made significant contributions to heat-transfer theory. Overall, Bi provides a quick engineering criterion for deciding whether a solid can be treated as having a uniform temperature or whether internal temperature gradients need to be analyzed.

One important application is in determining the thermal response time of a material: objects with significant internal conduction resistance can develop hot and cold regions during heating or cooling, which may strongly influence product quality and process performance.

PG Batch 2026 Orientation Programme

The Department of Chemical Engineering, IIT (ISM) Dhanbad, organized an **Orientation Programme for the newly admitted Postgraduate Batch of 2026 on 5 August 2026**. The programme marked an important milestone in welcoming the new students and introducing them to the academic and research culture of the department. The orientation provided students with an overview of the department's academic programmes, research activities, laboratories, infrastructure, and the diverse areas of specialization pursued by faculty members. The programme also offered an interactive platform for the newly joined students to **connect with faculty members, senior students, and their peers**. Through these interactions, students gained valuable insights into postgraduate coursework, research opportunities, project work, seminars, and other academic activities. The importance of developing strong technical knowledge, research aptitude, communication skills, and professional competence was also emphasized as essential components of postgraduate education. The orientation further helped students understand the various opportunities available within the department for pursuing **innovative research and interdisciplinary collaboration**. Students were encouraged to actively participate in departmental events, workshops, conferences, technical activities, and research initiatives, thereby making full use of the resources and expertise available at IIT (ISM) Dhanbad. The event concluded with an enthusiastic and positive spirit, setting the stage for a productive academic journey for the PG Batch of 2026. The department extends its warmest wishes to all the newly admitted students and looks forward to their active participation and valuable contributions to the **academic, research, and innovation ecosystem of the Department of Chemical Engineering**.

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