ChemE Chronicles

VOL.II No.5 FEBRUARY 2026 DEPARTMENTAL NEWSLETTER

FROM HOD'S DESK

PROF. ADITYA KUMAR

Dear friends and well-wishers,

I am delighted to present the February 2026 edition of *ChemE Chronicles*, the official newsletter of the Department of Chemical Engineering at IIT (ISM) Dhanbad. Over the past months, this platform has steadily grown into a vibrant channel connecting our students, alumni, faculty members, industrial partners, and well-wishers, and I am deeply grateful for your continued encouragement and enthusiastic participation.

This issue captures a particularly dynamic phase for the department. Our faculty and students are actively contributing to frontier areas such as sustainable energy, carbon capture, advanced materials, soft-matter engineering, waste-to-wealth technologies, and process systems engineering, reflecting our commitment to addressing pressing technological and environmental challenges at both national and global scales. The newsletter also highlights major academic activities including conferences, workshops, freshers' interactions, hackathons, industry-linked events, and research symposia that nurture interdisciplinary thinking, promote teamwork, and strengthen our culture of collaboration and innovation.

Alongside news and achievements, the ChemE Trivia and Feature Article sections in this and earlier issues continue to emphasise strong fundamentals while showcasing how core chemical engineering principles power modern innovations—from energy storage and fluidization to soft-matter processing and sustainable waste valorisation. Our flagship Alumni ChEnect series further illustrates the diverse pathways our graduates pursue in academia, industry, research, entrepreneurship, and public service, serving as a powerful source of inspiration and career guidance for our current students.

I extend my sincere appreciation to the editorial team, student volunteers, and all contributors whose dedicated efforts and creativity have shaped this edition and maintained the high standards set by previous issues. I hope you find the newsletter informative and motivating, and I warmly invite you to share your suggestions and feedback at the department email so that we can keep enriching this collective endeavour and ensure that *ChemE Chronicles* remains a meaningful platform for communication, reflection, and academic exchange for everyone.

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

What's Inside

Chemical Engineering News

Technip Energies Wins Major Sustainable Aviation Fuel Project in the Netherlands

Technip Energies has received an EPCC contract from SkyNRG to develop the DSL-01 Sustainable Aviation Fuel (SAF) facility in the Netherlands, which will be Europe's first standalone greenfield SAF production plant. The facility aims to produce nearly 100,000 tons of sustainable aviation fuel annually using waste-based feedstocks like used cooking oil through the HEFA process. It will also include an integrated hydrogen production unit for efficient, low-carbon fuel manufacturing.
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India to uphold equity while racing toward net zero, says Environment Secretary

Scientists have engineered an innovative electrode that captures CO_2 directly from exhaust and converts it to formic acid (a valuable industrial chemical) in a single integrated process — combining capture and conversion and potentially lowering costs for carbon utilization technologies
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Alumni ChEnect

SHIVANG SRIVASTAVA

B.TECH [2012-2016]

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

I am currently serving in the Indian Foreign Service (IFS), Government of India. I joined the service in 2024 after clearing the UPSC Civil Services Examination (CSE) 2023. At present, I am posted as a Third Secretary (TS) at the Embassy of India in Moscow, Russia. This is my first posting. As a Third Secretary, one of my primary responsibilities during the initial phase is to learn the local language. Accordingly, I am enrolled in a university here to study Russian. I attend my language classes during the day and, after the classes conclude, I go to the Embassy to carry out my official responsibilities.

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

I completed my entire schooling in my hometown, Gorakhpur, Uttar Pradesh. My formative years up to Class 5 were spent at St. Anthony's Convent School, Gorakhpur. Thereafter, I studied at St. Joseph's School, Gorakhpur, from where I completed my Class 12 in 2012. In 2012, I cleared the IIT-JEE examination and secured admission to IIT (ISM) Dhanbad. I pursued a four-year B.Tech in Chemical Engineering there. Although I received a placement offer from Vedanta Resources Limited after graduation, I chose not to join and instead decided to prepare for the CSE.

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 pass-out.

Chemical Engineering was not my first choice, so it would be fair to say that the decision was driven more by circumstances than by passion. As a Class 12 pass-out, I did not have much clarity about the opportunities different fields had to offer. In hindsight, I feel that the intense focus on clearing the JEE examination often turns the exam into an end in itself rather than a means to an end. In that process, many students, including myself at the time, do not get the opportunity to reflect deeply on what they truly wish to pursue or where their genuine interests lie.

4 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 played a significant role in shaping my personality. For me, the most striking aspect of joining the institute was the exposure to an immensely talented cohort of peers, juniors, and seniors. Being surrounded by such capable individuals constantly inspired me to push my boundaries across academic and creative domains. Although I did not pursue Chemical Engineering as a profession, my training as a Chemical Engineer instilled in me a scientific temperament, an objective approach to problem-solving, and a disciplined way of thinking. These qualities proved invaluable during my preparation for the CSE. The CSE journey was long and demanding. It required immense patience and grit. I believe that the resilience and perseverance I developed during my time at IIT (ISM) Dhanbad played a crucial role in helping me navigate that challenging phase.

5 What is your typical work-day like?

My typical day begins with attending Russian language classes at the university. Learning Russian is my primary responsibility for the first year of my posting, after which my training period in the service concludes. The classes usually end around 3 PM, after which I proceed to the Embassy for work. Currently, I am working as part of the Press and Information Wing within the Embassy. The advantages of serving as a diplomat in the IFS include the opportunity to develop strong professional competence and assume meaningful leadership responsibilities. The role also helps cultivate essential skills such as articulation, negotiation, and networking. Additionally, it provides the unique experience of living in different parts of the world, offering deep exposure to diverse cultures and global perspectives. Most importantly, it allows one to serve the nation directly by contributing to international relations and safeguarding national interests. On the other hand, one of the primary challenges of this profession is the extended periods spent outside India. This can make it difficult to remain close to family and to be present for important personal and social occasions back home.

6. 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?

After graduation, I began preparing for the UPSC CSE. For me, the preparation journey was long and challenging. During this period, I joined Vision IAS as a faculty member in 2019. Working there gave me a valuable perspective on the examination process. Viewing the exam from a faculty's standpoint helped me identify and correct some of the mistakes I had previously made in my own preparation. Thereafter, my career transitioned to diplomacy. I believe that one's graduation education should serve as an enabler, not a constraint, and should not prevent one from pursuing diverse career pathways if one is truly determined. For those aspiring to join public services, I would suggest beginning preparation during college itself. In my opinion, the second or third year is an ideal time to start. Rather than treating the CSE as merely a knowledge gathering exercise, try to understand it in a practical and focused manner, aligned closely with the syllabus. Pay special attention to developing essential skills, particularly answer writing, which ultimately determines performance in the examination. At the same time, I would caution aspirants that this examination involves a significant degree of uncertainty. Even sincere and well-prepared candidates may not succeed. Therefore, it is important not to put all your eggs in one basket. Always keep a backup option and be prepared to return to your career path if you feel that the examination is disproportionately draining your time and effort.

Departmental freshers' welcome for UG students

The Department of Chemical Engineering organized a vibrant welcome party for the newly admitted students to help them settle comfortably into the academic environment and feel at home in the department. The freshers, along with seniors, faculty members, students and staff members, gathered together for informal interactions, friendly talks and engaging discussions about the department and campus life. The programme began with a warm welcome of the Head of the Department and the newly admitted batch by presenting bouquets, followed by a brief address highlighting the purpose of the gathering and the expectations from the students.

A series of fun events, ice-breaking games and group activities created a lively and friendly atmosphere wherein students and teachers interacted freely, exchanged experiences and formed friendships with classmates and seniors they might not otherwise have met. Later, the Head of the Department addressed the gathering and described the breadth of chemical engineering, emphasizing its importance in solving complex problems in energy, environment, materials, biotechnology and many other emerging areas. He also highlighted the opportunities available to students in terms of research, higher studies and industry careers, and motivated them to work hard, uphold ethical values and make full use of the institute's facilities. The event proved to be an excellent way to introduce the new freshers to the department with a strong sense of community, belonging and excitement, and it served as a wonderful start to their journey and future endeavors in the Department of Chemical Engineering.

Feature Article

Role of chemical engineering in converting waste to wealth

Who does not like snacks such as potato chips, onion pakora, french fries, samosa, poha chivda, murukku, crispy fish fry, and fried chicken? And the list goes on! Have you ever wondered how these yummy treats are made? Yes, you are right! All these food items are usually prepared using deep–fry method in a rich pool of hot edible vegetable oil. After a batch of deep–fried food items is done, the left over oil is known as the used cooking oil (UCO). Ideally, edible oil must be used only once for cooking purposes. If the same batch of oil is used more than once for frying food (i.e., several rounds of cooking with the same oil), the residual oil is called the waste cooking oil (WCO). The reuse of UCO and WCO for cooking would cause severe health problems to humans, viz. raising bad cholesterol, causing cancer, and damaging liver functioning, etc. The hazardous UCO/WCO must be disposed–off in a safe manner so that our environment is not polluted. If proper care is not taken, UCO/WCO can potentially choke the drainage and sewage systems.

UCO/WCO could be transformed into useful products such as laundry soaps, industrial lubricants, surfactants, bioplastics, and polyurethane foam (used in furniture cushioning), to name a few. Also, is a potential feedstock (starting raw-material) to produce biodiesel, a sustainable substitute for the conventional petroleum-derived automobile fuel or renewable aviation fuel. Each transformation of UCO/WCO into either a valuable product or a fuel requires the meticulous design of a chemical process with the presence of a suitable catalyst. Chemical engineers design such processes with the goals of optimizing operating conditions, minimizing total cost, reducing waste generation, maintaining process safety, and ensuring less pollution following stringent government policies. Chemical engineering researchers around the globe continue to innovate so as to benefit the mankind by means of providing solutions to such socio-environmental issues.

Prof. D.K Sandilya

ChemE Trivia

Fuidization

Fluidization occurs when a fluid (gas or liquid) flows upward through a bed of solid particles at a sufficient velocity to suspend them, causing the particles to move freely and the bed to behave like a fluid rather than a rigid solid. The transition from a fixed bed to a fluidized bed takes place at the minimum fluidization velocity, where the drag force exerted by the flowing fluid just balances the effective weight of the particles, and the particles begin to lift and move relative to one another. At this point, the pressure drop across the bed equals the weight of the particles per unit cross-sectional area, marking the onset of fluidization. Once the bed is fully fluidized, it exhibits liquid-like properties, such as the ability to flow, maintain a nearly level surface, and allow objects of different densities to float or sink depending on their effective density relative to the bed.

Beyond the minimum fluidization point, the pressure drop across the bed typically remains almost constant over a wide range of velocities, in contrast to fixed beds where the pressure drop continues to increase with fluid velocity. This plateau in pressure drop is a characteristic design feature that enables stable operation of fluidized bed systems. Fluidized beds are highly efficient contactors for heat and mass transfer because of vigorous particle motion, large interfacial area between phases, and good temperature uniformity throughout the reactor volume, making them ideal for catalytic reactions involving solids. Depending on particle properties and gas velocity, various fluidization regimes can be observed, including particulate (homogeneous), bubbling, slugging, turbulent, and fast fluidization, each displaying distinct flow patterns, bubble behavior, and mixing characteristics.
Fluidized bed reactors find widespread industrial use in petroleum refining (fluid catalytic cracking), solid fuel combustion and gasification, polymerization processes, drying and coating in the pharmaceutical and food industries, and many other chemical manufacturing operations. The design and successful operation of these reactors depend on parameters such as particle size and density, fluid properties, distributor design, superficial fluid velocity, and bed geometry, all of which strongly influence fluidization quality, residence times, and overall reactor performance.

Publications

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13. Yasmin, S., & Chandra, B. (2026). Drag reduction in the flow of dilute polymer solutions through a rectangular microchannel. *Physics of Fluids*, *38*(2).

14. Chandra, A., Pathak, A., & Nandanwar, M. N. (2025). A Zero-Dimension Model in Integrated Form for Real-Time Performance Prediction of the Lead–Acid Battery. *Journal of The Electrochemical Society*, *172*(12), 120528.

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Editorial Board