



ChemE Chronicles

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DEPARTMENTAL NEWSLETTER

FROM HOD's DESK

PROF. ADITYA KUMAR

Dear friends and well-wishers,



It is a pleasure to present the November 2025 issue of *ChemE Chronicles*, the departmental newsletter of the Department of Chemical Engineering, IIT (ISM) Dhanbad. With each issue, this initiative continues to strengthen engagement among our students, alumni, faculty, and well-wishers, and I sincerely thank all contributors for their efforts in bringing out this edition.

This issue captures several facets of academic, research, and student-centric activities within the department. The *Alumni ChEnect* section features an insightful interaction with one of our undergraduate alumni, highlighting diverse professional trajectories enabled by a strong foundation in chemical engineering. Such experiences serve as valuable guidance for our current students as they navigate their own academic and career paths.

The *ChemE Trivia* section discusses Liquid Medical Oxygen and its production methods, underscoring the critical role chemical engineers play in healthcare and essential services. The *Feature Article* in this issue focuses on process control and predictive control strategies, highlighting their importance in optimizing complex industrial processes and ensuring efficient, stable, and safe operation. This article reinforces how core chemical engineering principles continue to evolve alongside advances in computation and control methodologies.

This edition also showcases recently granted and filed *patents*, reflecting the department's growing emphasis on innovation, translational research, and intellectual property generation. In addition, we extend a warm welcome to the newly admitted undergraduate students and wish them a rewarding and enriching journey during their time at the department.

I invite you to read this issue and share your feedback and suggestions. Let us continue to work together towards strengthening learning, research, and innovation in chemical engineering.

What's Inside

- Alumni ChEnect.
- ChemE Trivia
- Feature Article
- Welcome to the Family: Address to the New Batch
- Patents

Chemical Engineering News

India flags off hydrogen mobility pilot, marking major push for clean transport

India took a decisive step towards hydrogen-powered mobility recently, with Union Minister for New and Renewable Energy Pralhad Joshi launching a pilot project to test the use of hydrogen in the mobility sector in a major milestone in the country's clean energy journey. He expressed confidence that the pilot project will contribute to wider adoption of hydrogen-based clean transportation, improved air quality and sustainable development, congratulating Toyota Kirloskar Motor and NISE for their roles in the initiative. [Read More..](#)

BPCL launches 'Elevate' cohort to back green tech & cybersecurity startups

Bharat Petroleum Corporation Limited (BPCL), a Fortune Global 500 company, has unveiled the 'Elevate' cohort under its BPCL Ankur Fund, aimed at accelerating startups in Green Technology and Cybersecurity & Resilience for Energy Operations. The initiative reinforces BPCL's commitment to innovation, sustainability, and digital excellence in India's energy sector.

Since launching the Ankur startup program in 2016, BPCL has supported 30 startups with grant funding totaling around ₹28 crore. [Read More...](#)



Alumni ChEnect

VASU GARG

BTECH [2017-2021]



Q. Welcome to the “Alumni ChEnect” interview series! Please tell us in detail about your current job.

I manage one of the most high-stakes and financially critical domains at Myntra: the entire Pricing, Promotions, Charges, and Coupons charter. As a Product Manager, I am responsible for defining the strategy and roadmap for the systems that govern how and when a customer sees a price modification, impacting millions of transactions daily. This involves defining the roadmap for our Dynamic Pricing System—which utilizes real-time data to optimize price elasticity—and the advanced Promotions Platform that handles millions of complex, combinatorial discounts daily while ensuring fraud prevention and budget adherence. On the execution side, I lead a cross-functional squad comprising engineers, analysts, and designers, prioritizing features and writing detailed product specifications for new logic governing fees and coupon lifecycle management. Ultimately, I am accountable for the P&L impact of these levers, translating strategic business objectives into highly optimized and measurable technological outcomes for the platform.

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

My academic journey began in Faridabad, Haryana, where I was born and brought up. The environment there was highly focused on education, and like many ambitious students, I was deeply aware of the transformative role institutions like the IITs play in shaping both individual careers and the nation's future. My father, being an engineer himself, was a constant source of motivation, inspiring me to pursue technical excellence at an IIT.

This ambition drove me to dedicate two years of focused hard work, which culminated in securing admission to the Chemical Engineering department at IIT (ISM) Dhanbad (2017-2021). The rigorous curriculum, coupled with my passion and commitment, allowed me to not only excel but also emerge as the Gold Medalist for the batch of 2021. The holistic environment at IIT (ISM) instilled in me immense confidence, a broad viewpoint, and robust problem-solving skills that have defined my subsequent career path.

Immediately following graduation, I sought a highly dynamic, fast-paced environment and joined PhonePe as a Strategy Manager, where I led various customer experience product charters. This role offered invaluable early exposure to strategic decision-making and business execution. Recognizing the need to further sharpen my commercial and leadership abilities, I subsequently cracked the GMAT and enrolled in the Indian School of Business (ISB), Hyderabad, for my MBA (2024-2025), aiming to enhance my business acumen and broaden my management perspective.

Q. 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.

My choice of Chemical Engineering was initially driven by a mix of choice and circumstances—specifically, securing the best possible branch at a well established IIT given my JEE rank. However, the decision quickly transitioned into one of strategic alignment once I recognized the discipline's extraordinary versatility. As a Class 12 passout, I saw it as the "Universal Engineering" branch, uniquely positioned to apply fundamental scientific laws (like Thermodynamics and Fluid Mechanics) to design, optimize, and scale complex industrial systems. It promised a robust, analytical toolkit focused on system-thinking, which could be applied far beyond traditional manufacturing into data analytics and finance. This realization that Chemical Engineering offered the most rigorous, analytical foundation and served as a gateway to diverse high-growth sectors solidified my commitment, providing the perfect training for my subsequent transitions into Strategy and Product Management roles.

Q. 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?

My four years at IIT (ISM) Dhanbad profoundly shaped my current career

trajectory by providing both an unshakeable foundation and crucial leadership skills. The B.Tech Chemical Engineering program instilled a discipline of system-thinking and first-principles problem-solving—skills critical for dissecting and optimizing complex e-commerce systems, which I now apply daily in Product Management. Chemical Engineering didn't just teach me science; it was an intensive four-year course in perseverance and resilience, fundamentally raising my threshold for hard work. Beyond academics, the demanding campus life and competitive environment taught superior time management, perseverance, and cross-functional leadership, enabling me to manage complex product roadmaps and thrive in the high-growth culture of Myntra and PhonePe. Ultimately, IIT (ISM) didn't just provide a degree; it furnished the comprehensive toolkit necessary to pivot successfully from core engineering to business strategy and management.

Q. What is your typical work-day like?

My workday as a Product Manager handling the Pricing and Promotions charter at Myntra is intensely focused on driving financial outcomes through product execution. It typically starts with a crucial analytical deep-dive into the previous day's performance dashboards, scrutinizing metrics like conversion lift and margin impact to identify optimization opportunities or potential leakages. The core of my day is split between product definition and cross-functional alignment. I spend significant time with the engineering squad, prioritizing the sprint backlog, reviewing technical design documents for new price testing logic, and ensuring the robust deployment of complex coupon and charge systems. Simultaneously, I engage in strategic meetings with Business Category Heads for sales planning, and collaborate closely with the Data Science team to refine predictive models for price elasticity and promotion efficacy. I continuously synthesize customer feedback and competitive trends, acting as the key interface between technology and business strategy, ultimately accountable for translating Myntra's growth objectives into measurable and scalable product features.

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

The role of a Product Manager, especially owning core monetization charters like Pricing and Promotions, is defined by its significant high leverage and intellectual breadth. The primary advantage is the high business impact, as my decisions directly influence the company's P&L and customer behavior, allowing me to see the tangible and data science teams. This intellectual

versatility and constant learning prevents stagnation and accelerates professional growth, justifying the pursuit of an advanced degree

However, the profession is demanding, primarily due to extreme accountability without direct authority. I am fully responsible for the product's success but must manage and motivate cross-functional teams entirely through influence, persuasion, and clarity of vision, which is a continuous challenge. Added to this is the frequent need for constant context switching and managing trade-offs—we often operate under ambiguity, making a high volume of critical decisions (e.g., Margin vs. Conversion) under pressure, which can lead to rapid decision fatigue.

Q. 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 evolution since graduating in 2021 has been a deliberate pivot from core engineering principles to high-growth strategy and leadership roles. I initially joined PhonePe as a Strategy Manager, applying my Chemical Engineering system-thinking rigor to solve complex customer experience challenges in a dynamic fintech environment. My recent pursuit of an MBA at ISB Hyderabad represents a strategic step, designed to solidify my commercial acumen and leadership skills, enabling me to transition to leading organizations & charters. This led to a Product Manager role at Myntra, where I own critical verticals, operating at the intersection of technology and monetization.

For current Chemical Engineering students aspiring to follow a similar path, my core advice is two-fold. Firstly, leverage Chemical Engineering & your wonderful time at IIT (ISM) Dhanbad to broaden your horizon and solidify your foundation. This background is the ultimate base for the business acumen crucial for high-impact roles. Secondly, seek cross-functional exposure early; actively build the soft skills of influence and stakeholder management through internships and campus roles, recognizing that your degree is a license to solve any complex problem at scale.

Feature Article

- Process control mechanism plays a pivotal role in attaining products of desired specifications from any system. Traditionally, this is achieved by feedback Proportional-Integral-Derivative controllers that correlate the controller output with the error signal as a function of controller parameters, tuned as per some set rules such as the techniques by Ziegler-Nichols, and Cohen-Coon.
- While this standard mechanism is easy to use and works perfectly for the purpose of regulation as the control objective, it does not provide satisfactory performance for instances involving constraints on output variables and more importantly, for cases where the control goal is optimization rather than simple regulation. Inclusion of process dynamics in the control strategy is essential for such cases. When the optimization of constrained multivariable complex industrial processes started becoming a challenging problem, predictive control algorithms were postulated – specifically in the 1970s.
- With the gradual advent of increasingly powerful computational infrastructure, solution strategies of the predictive control algorithms got a significant boost. Predictive control is a model-based strategy to optimize a sequence of control actions by optimizing a cost function subject to system behaviour, predicted by a properly formulated process model.
- As per the choice of process model and specific design of control mechanism, there has been numerous kinds of predictive controllers. For predictive control, among other important factors, stability of such controllers, i.e., ensuring the convergence of the state of the controllers to a desired equilibrium is a critical consideration. Over the last three-four decades, predictive control literature has become quite mature and is viewed as the most efficient advanced process control scheme.



Prof. Soumyajit Sen Gupta

ChemE Trivia

- Oxygen is crucial for the treatment of patients with severe COVID-19, since the disease affects lung functioning. Shortness of breath or difficulty of breathing is one of the most common symptoms in patients with severe COVID-19. It also hampers the supply of oxygen to various parts of the body. They hence need oxygen therapy, to be supplied through medical oxygen..
- One of the ways in which this oxygen can be supplied is through Liquid Medical Oxygen (LMO). LMO is nothing but high purity oxygen used for medical treatment, And is developed for use in the human body.
- Due to its low melting and boiling points, oxygen is in a gaseous state at room temperature. Liquification enables storage in larger volume and easier transportation.
- There are several methods. The most common production method is separation of oxygen in what are known as Air Separation Units or ASUs. ASUs are basically plants that separate large volumes of gases. They use a method called Fractional Distillation Method to produce pure oxygen from atmospheric air, which consists mostly of nitrogen and oxygen - 78% nitrogen, 21% oxygen and remaining 1% other gases including argon, carbon dioxide, neon, helium, and hydrogen.
- Oxygen can also be produced non-cryogenically, in gaseous form, using selective adsorption. This method leverages the property that under high pressure, gases tend to be attracted to solid surfaces. The higher the pressure, the more the adsorption of gas.
- If a gas mixture such as air is passed under pressure through a vessel containing an adsorbent bed of 'zeolite' that attracts nitrogen more strongly than oxygen, a part or all of the nitrogen will stay in the bed, and the gas exiting the vessel will be richer in oxygen, relative to the mixture entering the vessel.
- Hospitals can also opt for on-site generation of oxygen by this method, where oxygen is produced from ambient air by concentrating it.

Welcome to the Family: Address to the New Batch



The Department of Chemical Engineering organized a warm and engaging get-together to welcome the new batch of undergraduate students. The event commenced with an introduction of the faculty members, followed by an interactive session where students introduced themselves, sharing their interests and hobbies. The programme culminated in a series of fun activities that provided students with an opportunity to showcase their talents and interact with peers in an informal setting. On this occasion, the Head of the Department addressed the students and provided an overview of the vast scope and interdisciplinary nature of chemical engineering, emphasizing its role as a service-based discipline that interfaces closely with multiple engineering and scientific domains.

Faculty members also shared their experiences and offered valuable guidance, helping students gain insights into academic expectations, research opportunities, and campus life. The event served as an excellent platform to foster a sense of belonging and enthusiasm among the incoming students, marking the beginning of their academic journey at the Department of Chemical Engineering, IIT (ISM) Dhanbad.

Patents

- Title: Synthesis method and apparatus for carbon dioxide capture using functionalized fabric cloth
Name of Inventors: A. Samanta, B. Prasad, S.K. Das, S. Sen Gupta
Patent No.: 202431032179
Granted on: 28.07.2025
- Title: An adsorbent/catalyst support material from the byproduct of hydrolysis of aluminium waste or scrap and a process for the preparation thereof
Name of Inventors: A. Samanta, B. Prasad, S.K. Das, S. Sen Gupta
Patent No.: 202431092364
Granted on: 29.07.2025
- Title: A Process for the preparation of Nitrogen-Doped Multilayer Graphene Nanopowder
Name of Inventors: Afaq Ahmad Khan, Aakash Rajpoot, Ejaz Ahmad
Patent No.: 568599
Granted on: 11.07.2025
- Title: Development of Metal Stoichiometrically Tuned $\text{Fe}_5\text{-Co-Zn/y-Al}_2\text{O}_3$ Nanocatalyst for Methane to Turquoise Hydrogen Production
Name of Inventors: Aakash Rajpoot, Afaq Ahmad Khan, Ejaz Ahmad
Patent No.: 567781
Granted on: 24.06.2025
- Title: A Process for the Preparation of Butyl Butyrate as an Aviation Fuel Additive Using Sulfonated-Graphene Oxide Catalysts
Name of Inventors: Shariq Farhan Elahi, Afaq Ahmad Khan, Ejaz Ahmad
Patent No.: 571441
Granted on: 30.09.2025

Editorial Board

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