

Chemical Engineering – An Introduction



Department of Chemical Engineering, BUET

Simple Questions



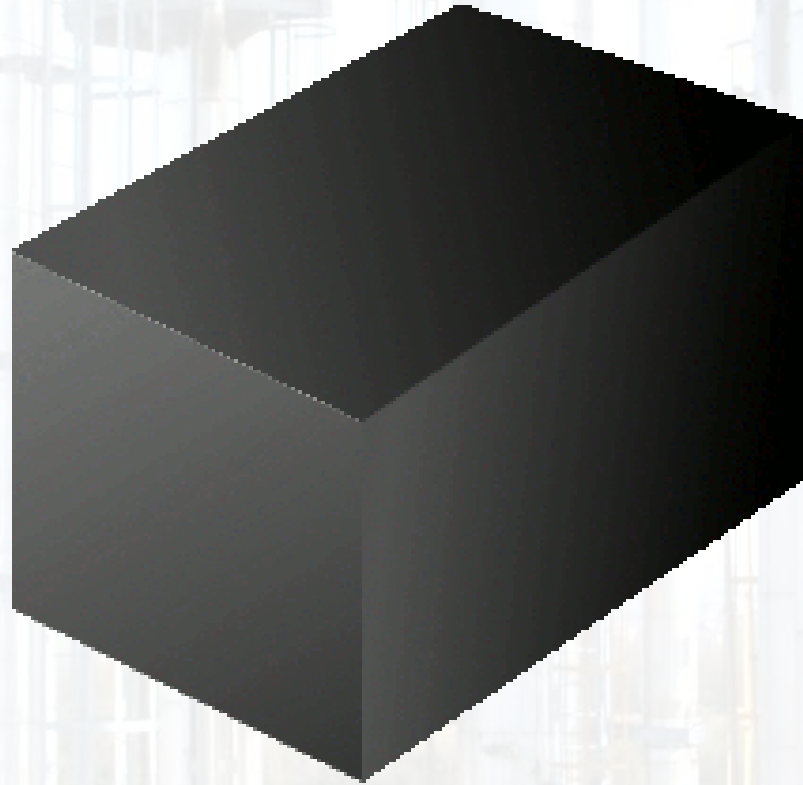
- If one person can do a work in 30 days, how many days will it take to do the same work by 30 people?
- One person intends to go from point 'A' to point 'B'. He can cover only half of the remaining distance at every step. How many steps will it take to reach point 'B' from point 'A'?

What is Chemical Engineering?

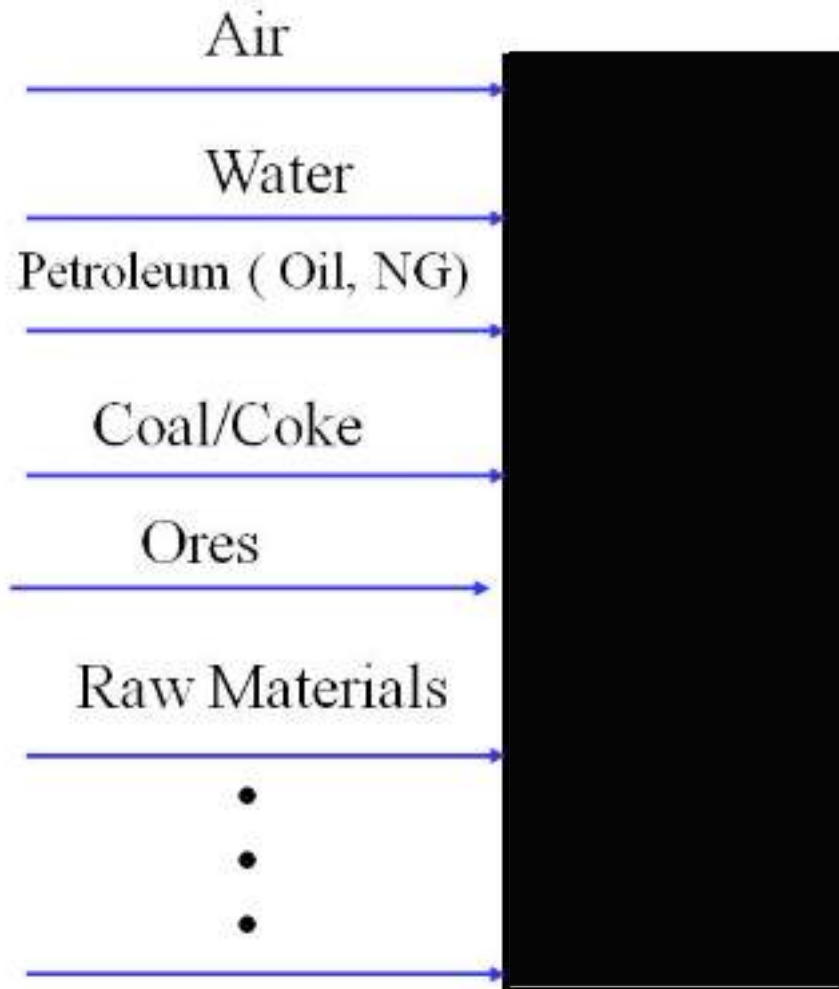


Chemical engineering is the branch of engineering that deals with the application of physical science (e.g., chemistry and physics), and life sciences (e.g., biology, microbiology and biochemistry) with mathematics, to the process of converting raw materials or chemicals into more useful or valuable forms. In addition to producing useful materials, modern chemical engineering is also concerned with pioneering valuable new materials and techniques - such as nanotechnology, fuel cells and biomedical engineering.^[1] Chemical engineering largely involves the design, improvement and maintenance of processes involving chemical or biological transformations for large-scale manufacture. Chemical engineers ensure the processes are operated safely, sustainably and economically. Chemical engineers in this branch are usually employed under the title of process engineer. **A CHEMICAL ENGINEER converts scientific discoveries into marketable products.**

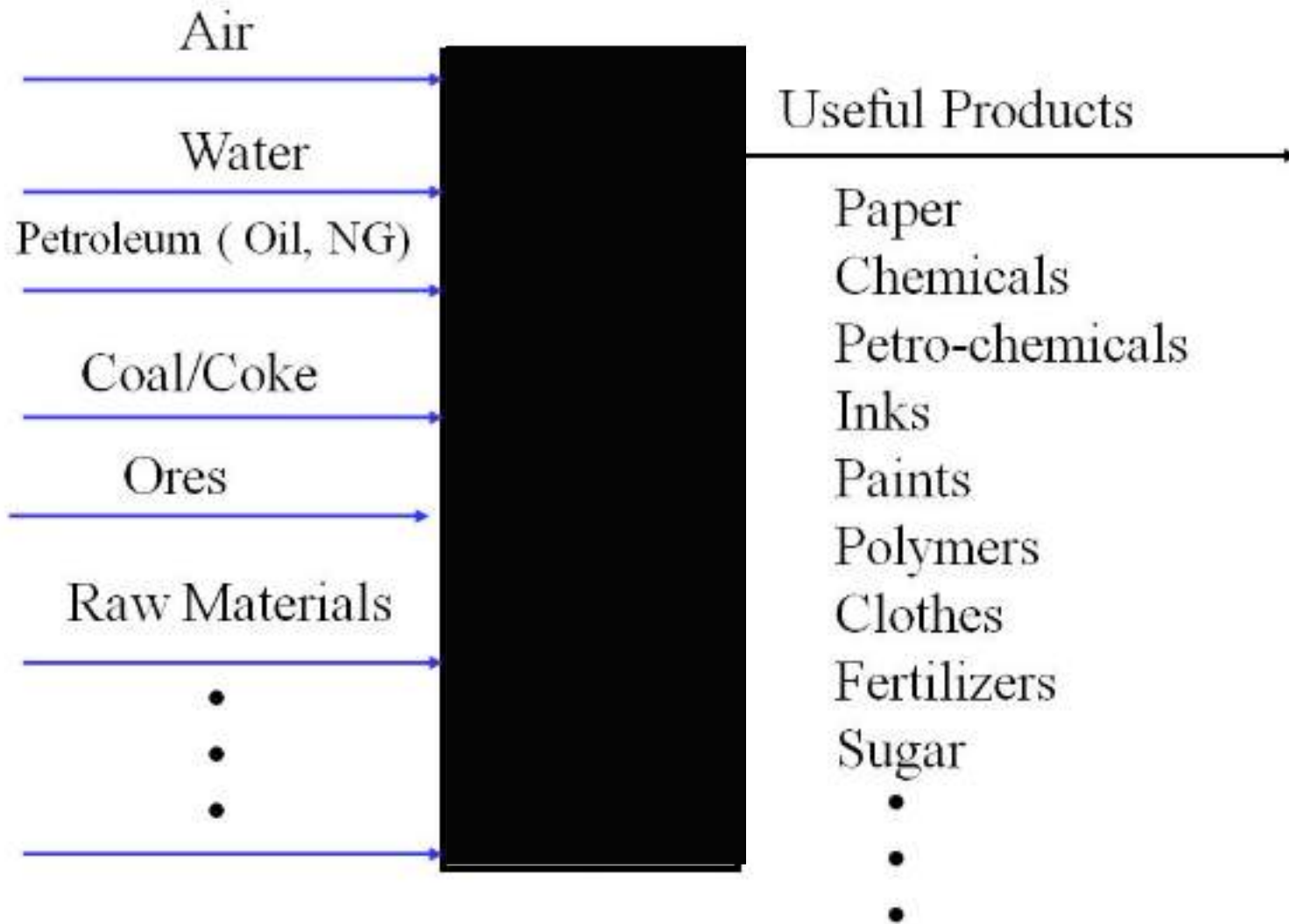
What is Chemical Engineering?



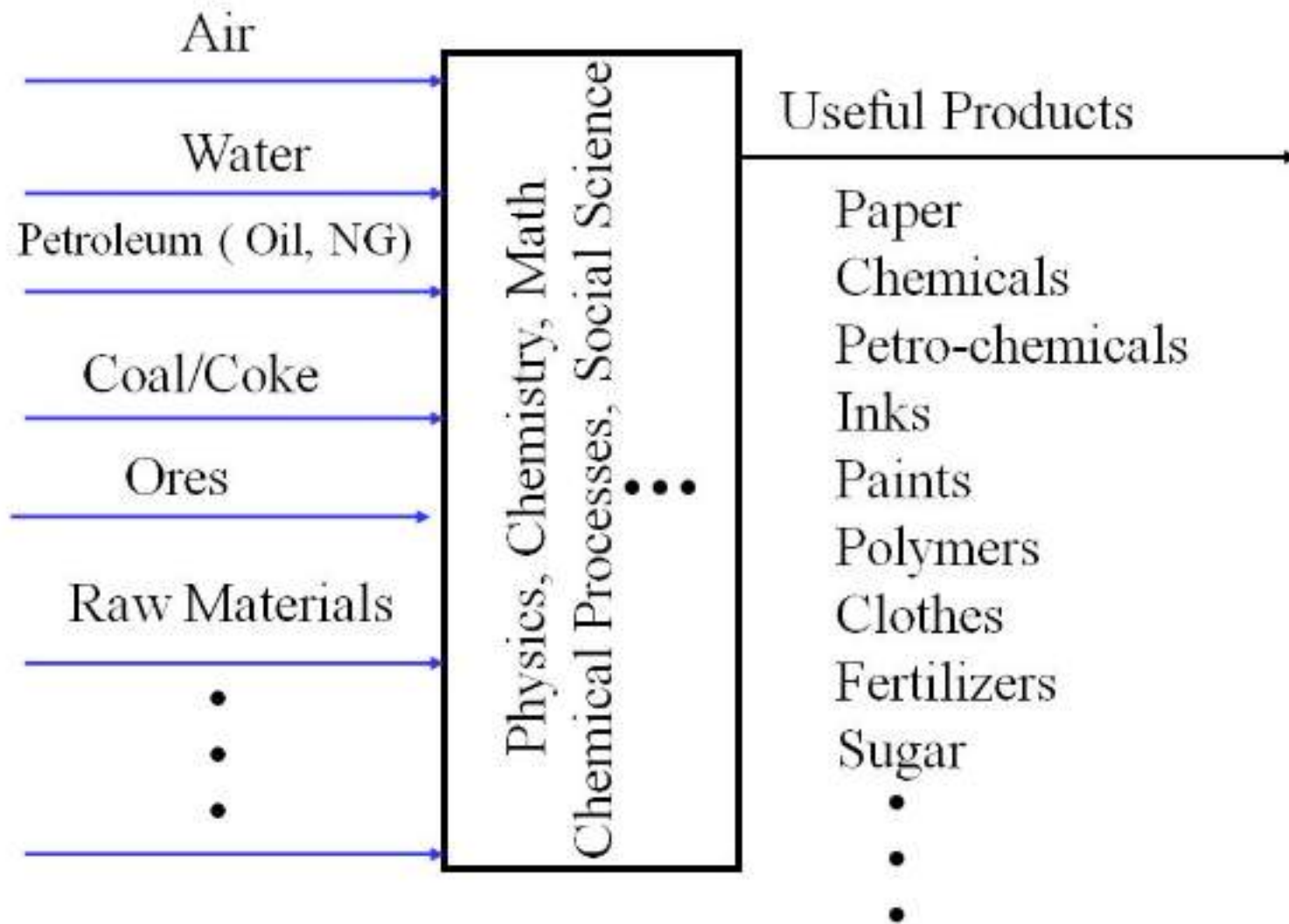
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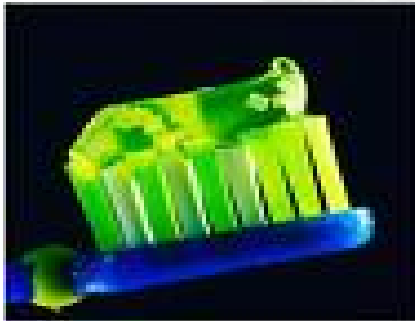
What is Chemical Engineering?



What is Chemical Engineering?



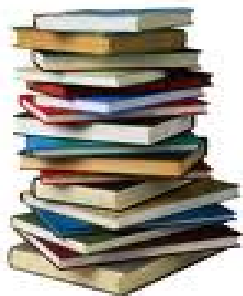
Chemical Products



From
Potato
chips



To
computer
chips



Chemical Engineering Curricula



- **General Science:** Physics, Chemistry and Mathematics
- **Social Science :** Sociology, political science, Economics, Accounting, English
- **Engineering Fundamentals:** Mechanics, Strength of Materials, Basic Electrical Engineering, Fluid Mechanics, Heat transfer, Engineering Thermodynamics, Material Science
- **Chemical Engineering Core Courses :** Material and Energy Balance, Solution Thermodynamics, Mass Transfer, Unit Operations, Reaction Engineering, Transport Phenomena, Engineering Economics and Management, Corrosion Engineering, Process Design, Process Control, Project Engineering
- **Specialization:** Biochemical Engineering, Petroleum Engineering, Chemical Technology



What is the difference Between a Chemist and a Chemical Engineer?

Preparation H₂ gas in the laboratory. Zn reacts with H₂SO₄ to produce ZnSO₄ and



Produce 1 kg or 20 kg ZnSO₄ per day

- Probably a chemist can make it

Produce 100 ton (100,000 kg) ZnSO₄ per day

- A chemist cannot handle or deal with it.
- Here comes, Chemical Engineering

Chemical Plants

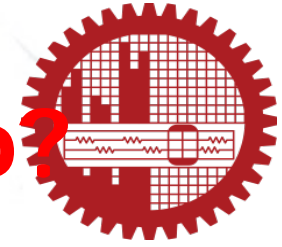


Difference Between a Chemist and a Chemical Engineer



- A Chemist is good in running a laboratory
- He feels comfortable working in a laboratory
- He does not know how to transfer a technology from Laboratory scale to Industrial scale
- He can't design and build an industrial plant

- A Chemical Engineer is capable of running a laboratory
- He is comfortable working in an industrial environment
- He knows how to transfer a technology from laboratory to industry
- He CAN design, build, operate and run an industrial process



What Can a Chemical Engineer Do?



Inception



Feasibility Study



Site Selection



Design and construction



Make Money



Manage, operate and troubleshoot



Built and commission

Today's ChE Department, BUET



People

- Twenty qualified faculty members with 14 PhDs



- Twenty technical and non-technical supporting staff

Laboratories of ChE Dept , BUET



Computational lab
Unit operation Lab
Kinetics lab
Fluid mechanics lab
Fuel lab
Corrosion lab
Mass transfer lab
Control lab
Analytical lab
Environmental lab

10 Laboratories

Analytical Laboratory



Gas Chromatography



Micromatrices

Environment Monitoring Unit



Mobile Environmental Monitoring Unit

Unit Operation Laboratory



Evaporator



Spray Dryer

Process Control Laboratory



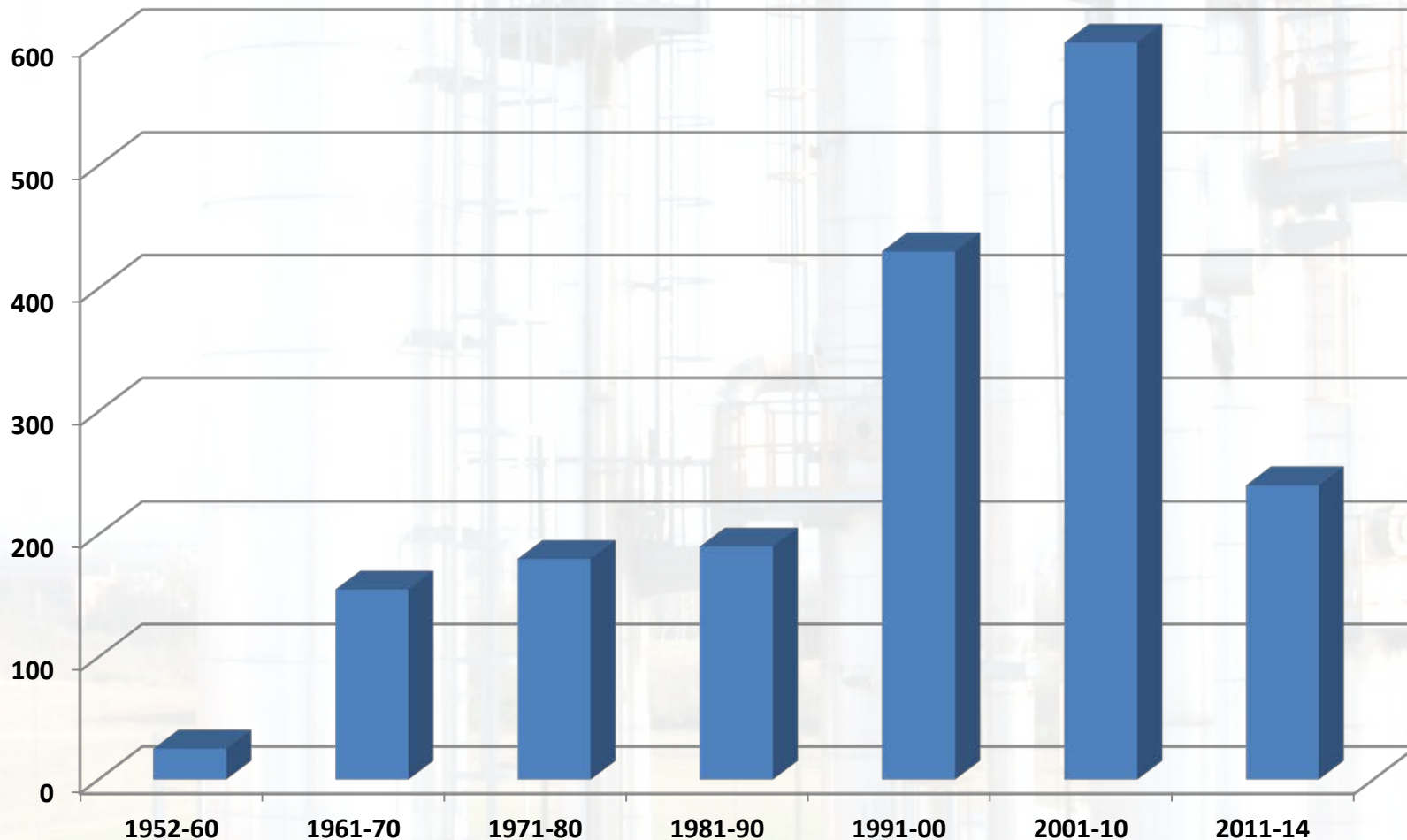
ChE Library



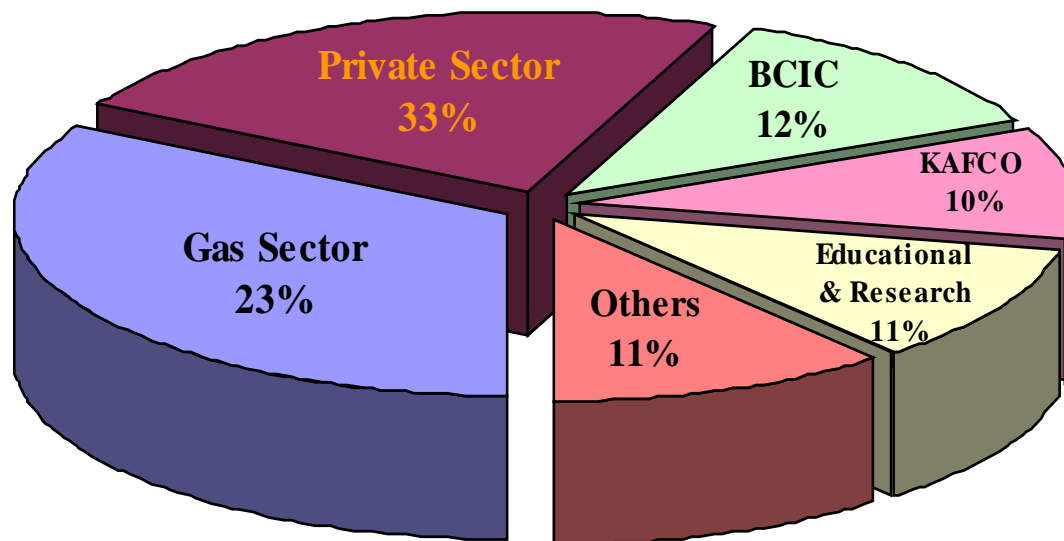
Graduates of ChE, BUET



Total number of graduates from 1952-2014: **1820**

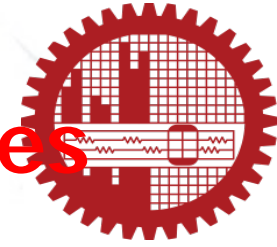


National Employment Profile



**A Graphical View of the
Employment Profile of Chemical Engineers in Bangladesh, December 2006**

Achievements of ChE, BUET Graduates



- **Chemical Engineers:** Successful at home and abroad
- **Administrators:** Vice Chancellors (3 Vice Chancellors (former) at BUET and one at DUET), Chairman/Managing Directors/CEO (Zia Fertilizer Co. Ltd. , Urea Fertilizer Factory Ltd, Padma Oil Company Limited, Barapukuria Coal Mining Company Ltd. Bakhrabad Gas Systems Ltd.), Unilever Nepal, Sylhet gas fields, BCIC, BCSIR
- **University faculties:** Singapore, Malaysia, Denmark, UK, USA, Oman, Saudi Arabia, Qatar, Bangladesh
- **Working in reputed Companies:**
Honeywell, Saudi ARAMCO, ASPEN, Unilever, BOC, Shell, Chevron, Cairn-Energy, AES, Alfa-Laval, Exxon-Mobile, IBM, Microsoft and Intel ... **As Graduate Students** – All our graduates are performing superbly all over the world

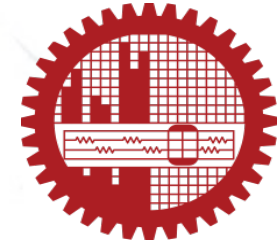


Achievements of ChE, BUET Graduates

- **Consultants:** UNDP, UNESCO, WB, BCIC, SABIC
- **Entrepreneurs:** Ceramics, Basic chemicals, Plant equipment , supply/erection, Textile industries, Garments industries, ETP
- **Gov't officers:** magistrate, TNO, Income Tax
- **Software engineers:** Microsoft, Intel and IBM
- **TV, Bank, School**

Rather ask the easier one:

Where does a chemical Engineer not work?



ChE Job Profile at USA

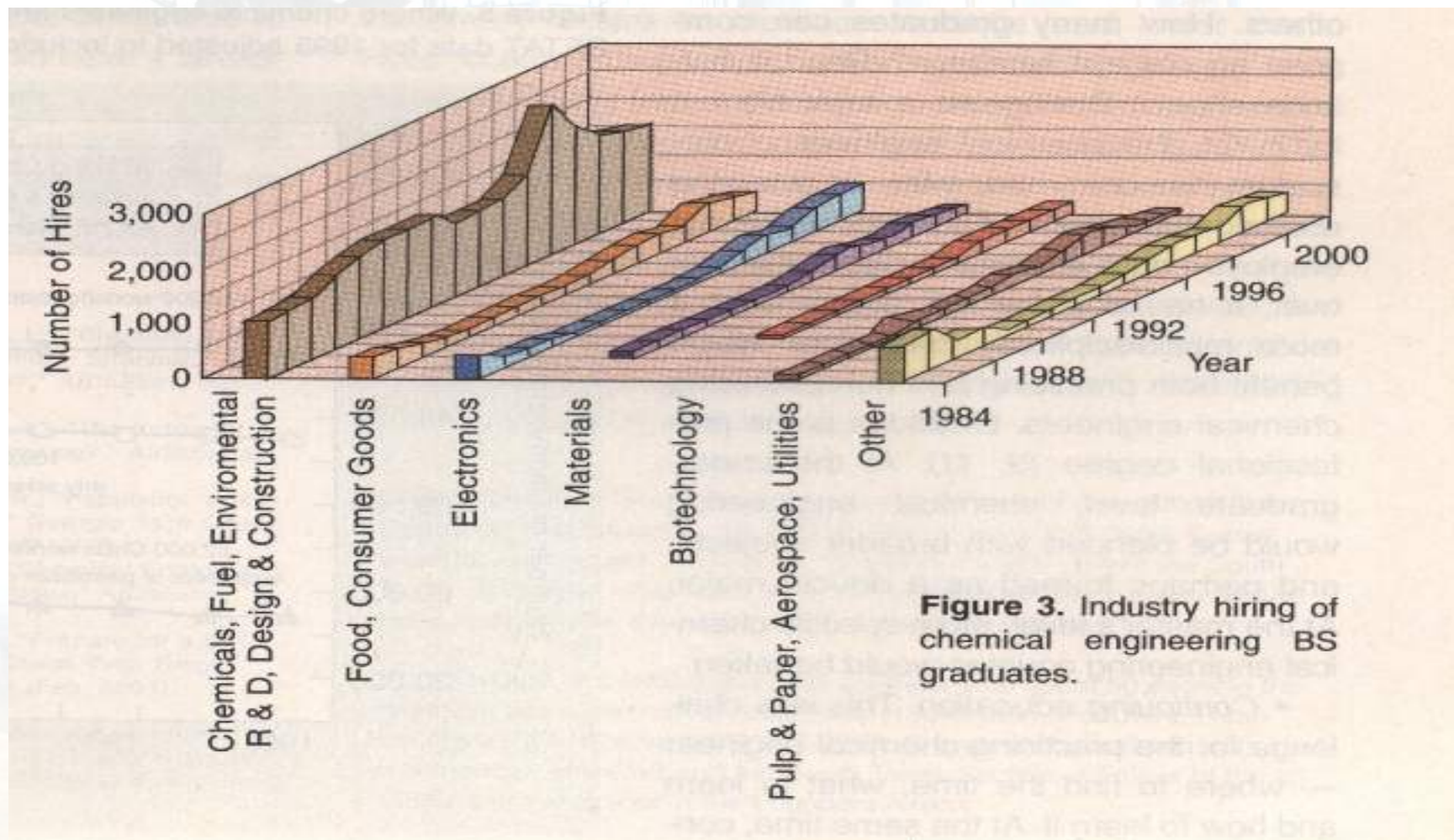


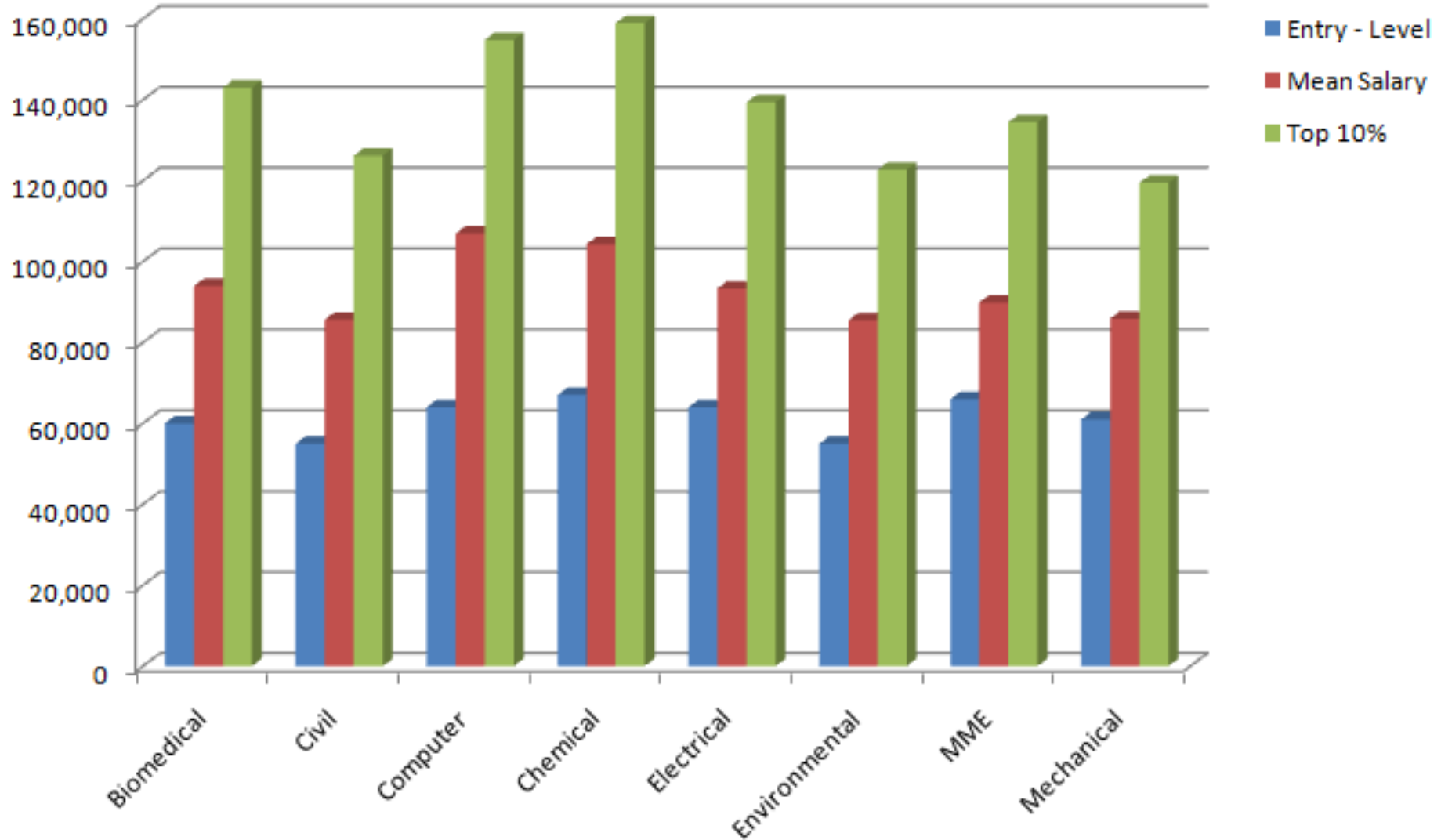
Figure 3. Industry hiring of chemical engineering BS graduates.

Chemical Engineering Survey at US



In 2006, the US Department of Labor estimated there were 30,000 chemical engineers in the United States. At the time of the survey, the average hourly wage for a chemical engineer was \$39.23 per hour, ranging from \$24.07 to \$57.05 per hour. The median annual salary for a chemical engineer was \$78,860. The middle 80 percent of chemical engineers made \$50,060 to \$118,670 annually

Salary of Engineers at USA





Qualifications – Employers look for

- Capable of working independently
- Capable of working under pressure
- Dynamic and proactive
- Creative decision maker
- Leadership quality
- Ability to work in a team
- Good analytical capability
- Sound technical knowledge
- Good in communicating
- Good in report writing
- Experience of xx years

Take Home Message



Keep up your expectations high
work hard

Prepare yourself for the 21st century
be a chemical engineer in 4 years
be a good human being with high
moral and ethical standards