Modern Approach To Chemical Industry

By

Prof. Rohit Muthe

Assistant Professor

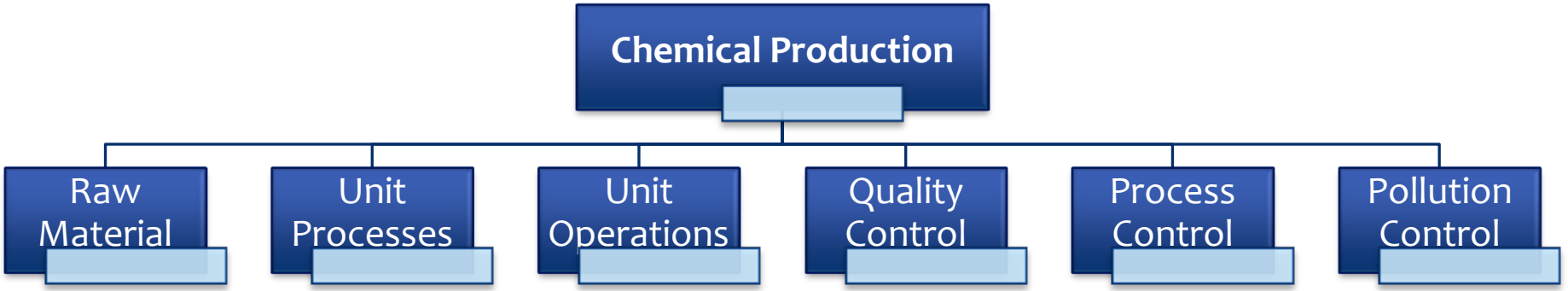
Department of Chemistry

Adv. M. N. Deshmukh Arts, Science and Commerce College Rajur

Basic Requirement of Chemical Industries

Chemical Production

Manufacture of chemical products requires raw materials and it involves various operations and processes

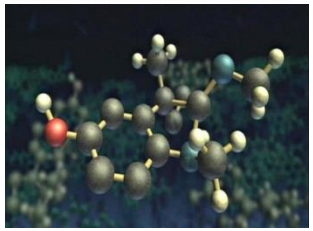


Raw Materials

* **Any substance or a chemical which can be processed to produce the desired product is called as raw material**

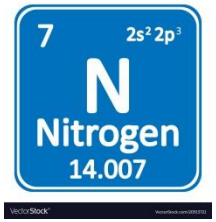
Natural Raw Materials

- Carbon Compounds



- Hydrogen

- Nitrogen and Oxygen

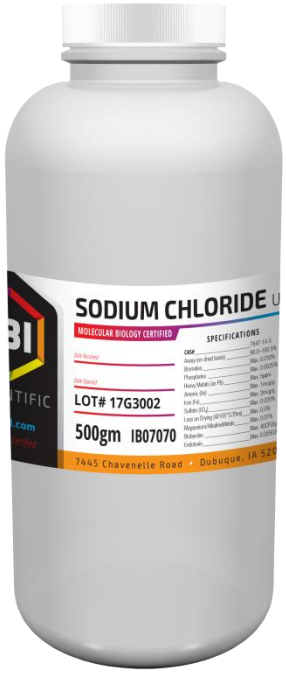


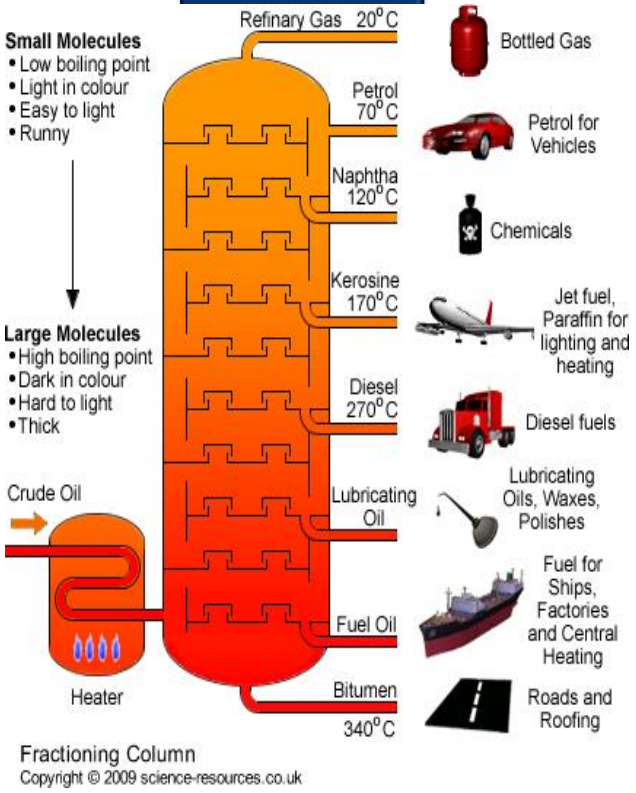
- Chlorine and NaOH

- Sulphur, Phosphorous, Fluorine and other inorganic compounds

Raw Materials from other Industries

- Sodium chloride
- Caustic Soda
- Molasses
- Benzene
- Petroleum fractions
- Naphthalene
- Non-edible Linseed oil





Unit Processes

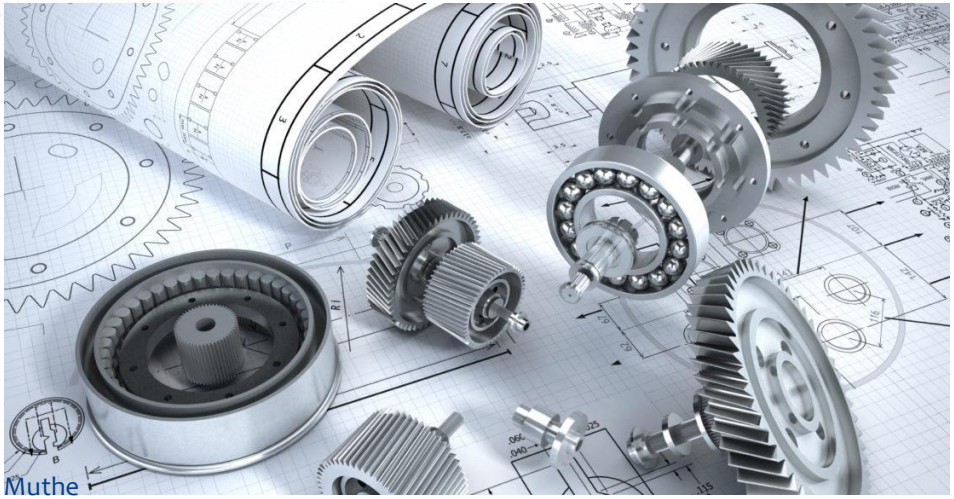
The commercialization of a chemical reaction under such conditions which prove to be economically profitable is called as Unit Processes

Some important unit processes

- **Alkylation**
- **Amination by ammonolysis**
- **Esterification**
- **Hydrolysis**
- **Halogenation**
- **Nitration**
- **Oxidation**
- **Cyclisation**
- **Isomerisation**
- **Dehydration**
- **Sulphonation**
- **Electrolysis**

Unit Operations

The operations carried out for designing involves an engineers work with a specific purpose and with the help of a special type of equipment used in a chemical reaction is called as unit operation.



Some important unit operations

- **Adsorption**
- **Centrifugation**
- **Crystallisation**
- **Distillation**
- **Dissolution**
- **Drying**
- **Evaporation**
- **Filtration**
- **Heat Transfer**
- **Mixing**
- **Screening**
- **Sedimentation**
- **Solvent extration**

Quality Control (QC)

- System of routine technical activities, to measure and control the quality of the record.
- Involves the analysis or testing of raw material and finished products for their standard specification.
- Technical grade, analytical grade, reagent grade, spectroscopic purity etc. are used to denote the degree of purity and quantity of compounds.

Quality Assurance (QA)

The activities which include a planned system of review measures governed by personnel not directly involved in inventory compilation/ development process is called quality assurance.

QUALITY ASSURANCE JOB DESCRIPTION

Process Control

The control of variables such as temperature, concentration, pressure, time , flow rate of reactant etc. for getting the desired product in an economic way is called process control.

Process Control

- **Analysis of Raw material**
- **Analysis of Intermediate product during manufacturing**
- **Analysis of the End Product**

Research and Development

Creative work undertaken on a systematic basic in order to increase the stock of knowledge, including knowledge of man, culture an society and the use of this stock of knowledge to device new applications

Research- Develops new changes

Development- Modification of research

"I smell toffee!"

Pollution Control

- **Pollution Control**
  - **Dry Process** (Remove Solids Pollutants)
  - **Wet Process** (Remove Liquid Pollutants)

Human Resource

HR Functions

- Recruitment and selection.
- Organizational design and development.
- Business transformation and change in management.
- Performance, conduct and behavior management.
- Industrial and employee relation.
- Training and development.

"Sorry I'm late for this interview, but I was never early for lectures at university."

Safety Measures

Safety Measures

- Accountability.
- Process knowledge and Documentation.
- Process safety reviews for capital project.
- Process risk management.
- Management of change.
- Process and equipment integrity.
- Incident investigation.
- Training and performance.
- Human factors.
- Company standards, codes and regulations.
- Audit and Corrective actions.
- Enhancement of process safety knowledge.

Economics of a Chemical Process

Economics of a Chemical Process

Capital Investment

Building
Chemical plant
Material
Equipment
Storage facility

Working Capitals

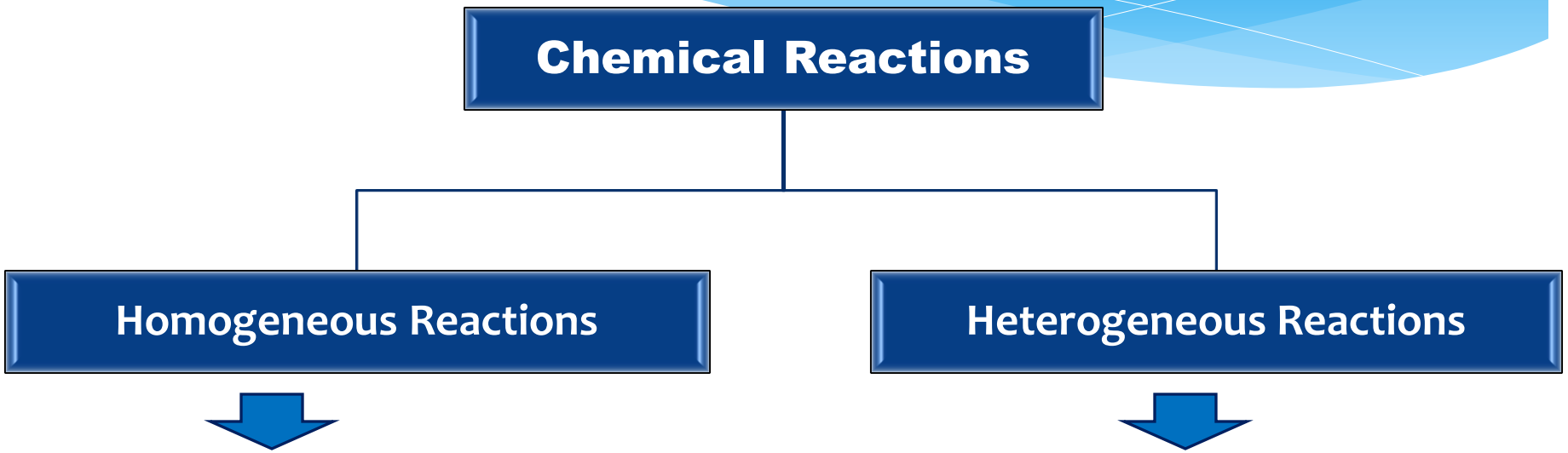
Maintenance
Testing of raw materials
Repairs
Cash reserves

Manufacturing cost

Labor
Transport
Supervising staff
Electricity
Water
Fuel

Selection Parameters of Chemical Industry

Classification of Chemical Reaction



1) Catalytic reactions
2) Non- catalytic reactions

1) Gas- Liquid reactions
2) Gas- Solid reactions
3) Liquid- Solid reactions
4) Gas- Liquid- Solid reactions

Batch and Continuous Operations

Batch Operations	Continuous Operations
Raw material is fed in one lot	Raw material is fed continuously
Apparatus is idle during charging and discharging	Apparatus is never idle during charging and discharging
Requires more labor	Do not requires more labor
Rate of reaction does not remain constant	Rate of reaction remain constant
Require more energy	Require less energy
Quality control is difficult	Quality control is obtained
Less profitable	More profitable

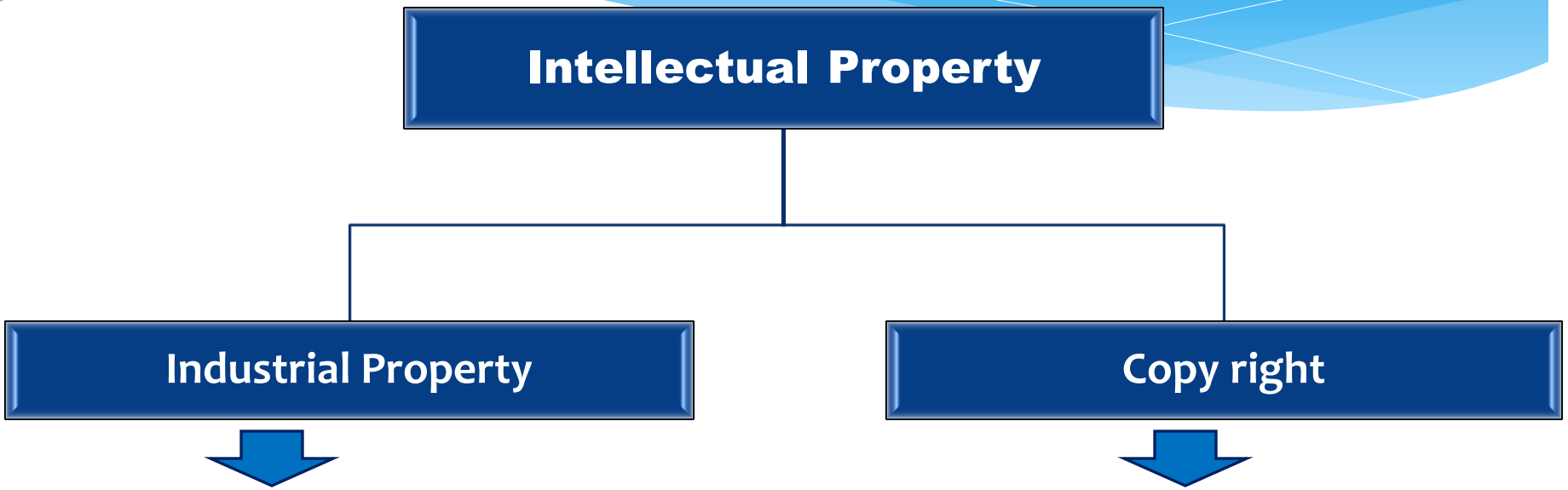
Conversion, Selectivity and Yield

Conversion: It is expressed as a percentage and is related to the amount of reactant that is chemically converted to the another substance.

Selectivity: It refers to increasing the percentage of one of the products by keeping conditions favorable to the formation of that product.

Yield: It refers to the actual amount of product formed in the reaction.

Intellectual Property (IP)



i) Patents
ii) Trademarks
iii) Industrial design
iv) Geographic indications

i) Literary works- novels, poems, films etc.
ii) Artistic works- drawing, painting

Copyright

Patent

Trademark


THANK
YOU


Be HAPPY