Process Development

1) Conceptual stage
2) Basic engineering
3) Feasibility economics: - Suppose we want to create a agro product from chemical A or Chemical B. So we have to decide which starting material to choose on the basis of input cost

CONCEPTUAL STAGE

- How to come with a new process?

Bulk chemicals vs. Specialty chemicals

BULK CHEMICALS	SPECIALTY CHEMICALS
Large volume production E.g. 3Rs/kg	Low volume production E.g. 500Rs/kg
Product lifecycle <30 years	Product lifecycle <10 years
PROCESS improvement	Product improvement
1-2 reaction steps	Multiple steps
Process patents	product patents

- Product lifecycle: Cycle of life of plant, For low product lifecycle we do not invest entirely on chemical that only works on one product
- Equilibrium limited Reaction
  A+D <-> E+B

SCALE UP

Lab scale ->pilot scale->commercial scale

Why can't we start from beaker and directly scale up to commercial plant?
Reduce the risk of failure
Why there is risk of failure:

- Due to safety reasons : - Suppose we have a reactor on commercial scale and one on a lab scale. The major difference between both of them would be temperature gradient means to maintain a temperature of 60 degrees at the center of the reactor we have to maintain temperature of 80 degrees at the surface depending on the mixing capacity
- If we have a temperature gradient of 80 degrees it could ****lead to formation of impurities which can be difficult to separate****
- Retro Fitting :- Instead of starting from the lab scale we could just modify the commercial plant

Marginal rate of return

Scale up

- What are the issues in scaling up?
- Dimensional similarity