

Industrial Processes

Topics

- Factory planning and layout: types of plant layout; production techniques; automation; mass production, batch and one-off production
- Principles of industrial processes: material flow, process sequences, automation and process control
- Industrial processes: Normal processes, Methods of manufacture, Plant and machinery utilized, Flow diagrams and Inventory compilation for the following specific industries: Iron, Steel, Non-ferrous metal Production, Power, Cement, Petro-chemicals, Chemical and Pharmaceutical, Plastic and Rubber, Paper and paper Products, Printing, Binding and Publishing, Textiles, Dairy, Vegetable Oil, Food and Drink
- Nature and function of trade specific machinery in the above industries

Factory Planning & Layout

- Planning inside and out side the factory.
 - Logistics
 - inside the factory – delivery of material to the shop floor and finished good to ware house.
 - External – how will the trucks move from gate to ware house
 - Where will the trucks be parked, while waiting to take the good.
 - Operation Sequence
 - Flow of operations?
 - All operations at one place?
 - Inspection & Lab
 - Where, how, frequency of checks

Movement of material is the most time consuming and costly activity

- Stores
 - Consumables store, Maintenance store and other items.
- Maintenance
 - Office and workshop
- Utilities
 - DG Set, Transformer
- Offices
 - Purchase, Accounts, HR
- Canteen and welfare.

- *Value Stream Mapping is carried out to see the wasted activities / non activities.*
- *It is seen that only 25% or so, time the work is done on a product*

Layout

- Key measurement
 - Total Kg-Kms per day.
 - How many kgs are moving how many kms

Make a diagram of each material movement.

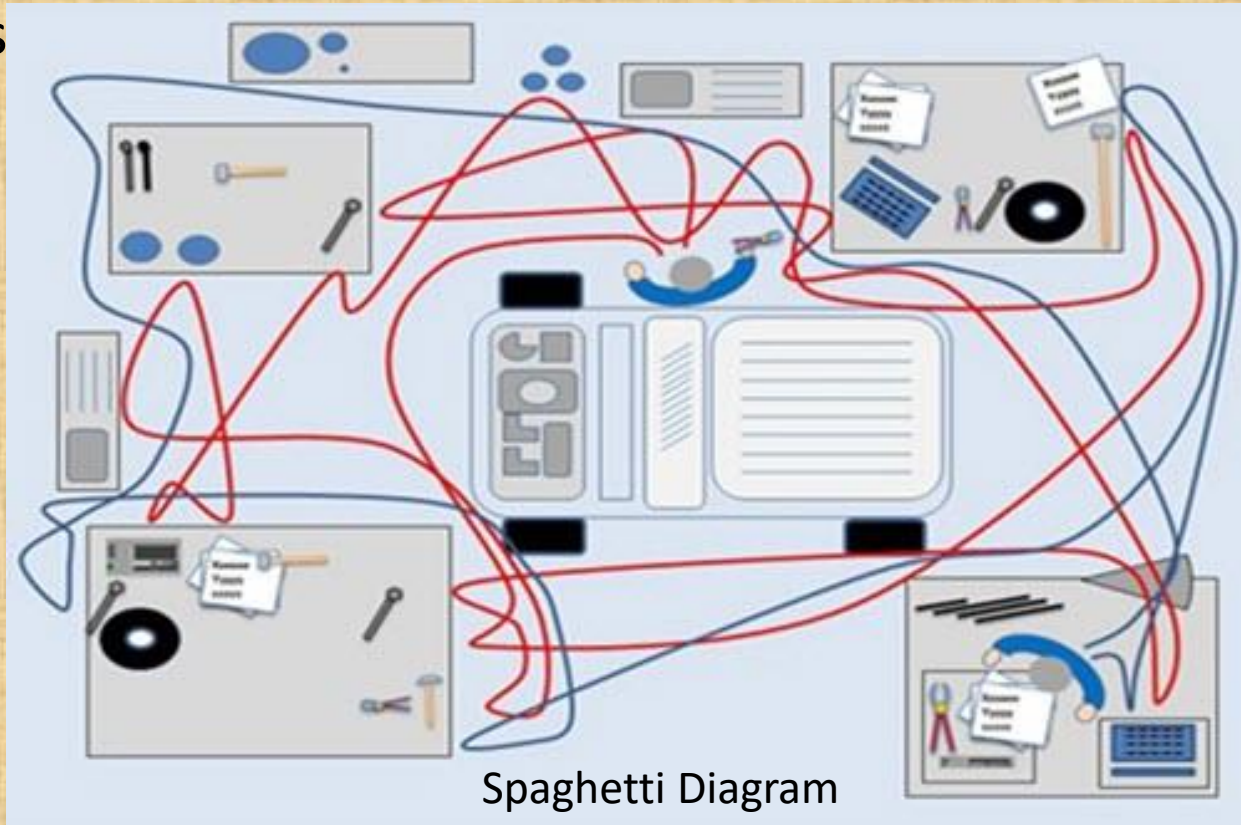
Weight of material

Meters that has moved.

$\text{Kg-Km} = \text{TOTAL (weight X distance) of ALL movement.}$

- How to optimise

- Reduction of Kg-Km
- Draw the lines of material transfer.
- There should be NO Criss Cross.



Type of Plant Layout

- Continuous process
 - Chemical plant
 - Cement
 - Material moves continuously

- Discreet
 - Tool room,
 - Cosmetics

Continuous process

- Multi layered
- Piping
- Pressure drops
- Safety
- Input / Output
- Material is moving regularly
- Working 24 X 7

Discreet

- Flexible
- Process based
- Cell based
- Products based
- Material movement as per need.
- Work even hourly
- All machines are not used

*Continuous plants have lower cost of production.
Auto industry to run as a continuous plant*



Continuous Plant - refinery

Discrete Plant – Tool room



Objectives of a Good Plant layout

- Material flow to be good.
- Line balancing
- Space optimization. (Output per sq mts)
- Minimum inventory (number of inventory turns per year)
- Safety
- Working environment
- Cleanliness
- Can stay flexible – where possible.

Fixed Position Layout

- Product is fixed
- Machines / process move around that.
- Reason
 - Very large product
 - Very delicate product
 - Working at site

Examples

- *Cranes*
- *Tunnelling machine.*
- *Conveyors*



Fixed Position Layout

- Product is fixed
- Machines / process move around that.
- Reason
 - Very large product
 - Very delicate product
 - Working at site

Process Layout

- Similar process are located together
 - Easy & convenient
 - Better utilization of machines
 - Flexibility of use of machine
- Not a good layout now a days
 - The number of processes are large.
 - Mix up happens
 - Usually done for special product – tool room

Cell Layout

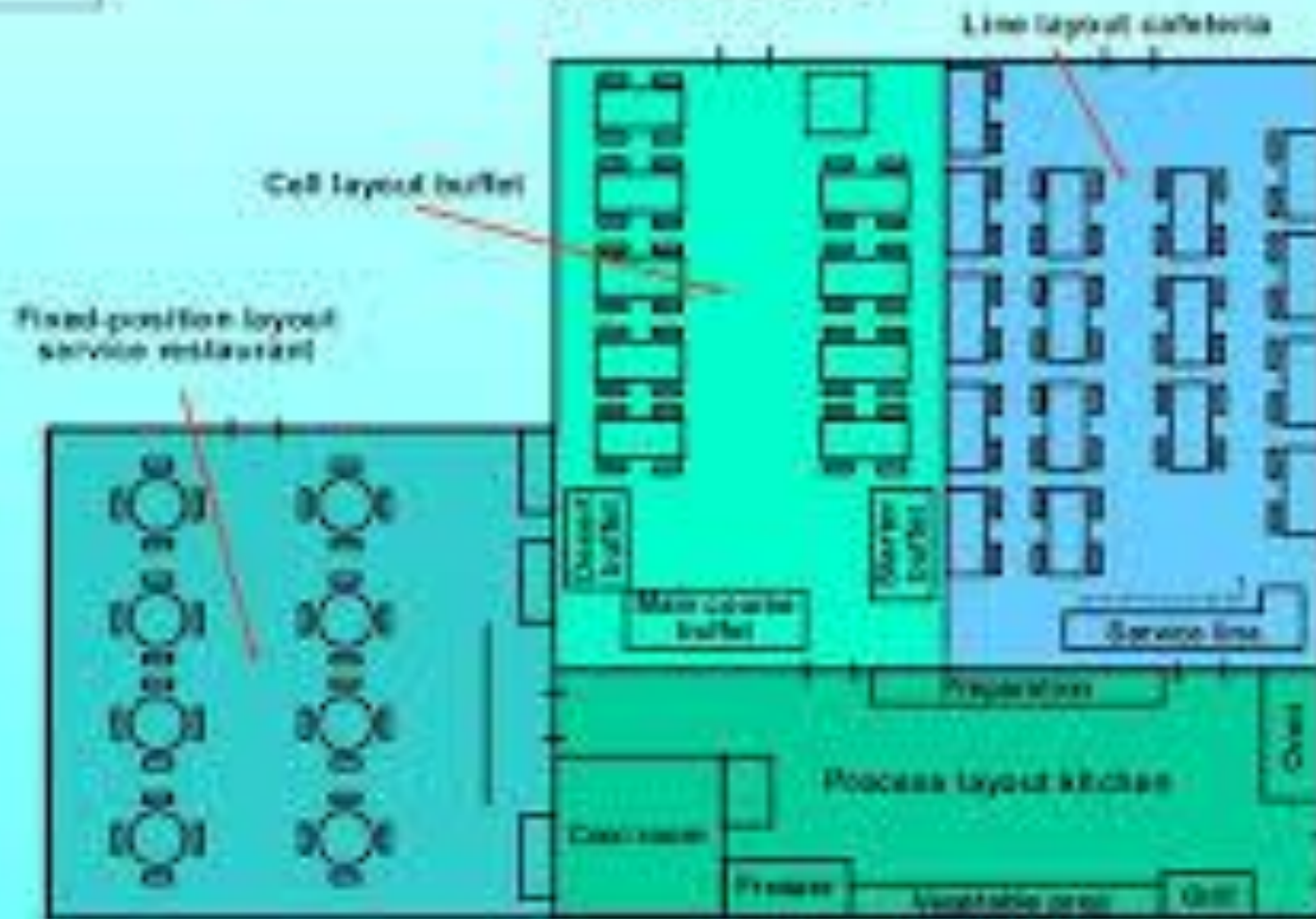
- One cell has all the operation to finish the product in one shot.
- Different set of processes may have different cells.
- Cell can be process or product based
- It makes complex flow become simple

Product Layout

- Conveyor type of production
- Easy
- High efficiency

7.11

A restaurant complex with all four basic layout types



Production Technique

- Processes, methods & Technique used to transform input to a output that has a commercial value.
- Has a Man-Machine-Material-Movement setup.
- Common techniques are
 - Mass Production
 - Batch Production
 - Job Production / One off
 - Lean production

Mass Production

- Flow Production. Discrete process done as a flow.
- Standardised product
- Standard process
- High Speed
- ConveyORIZED

Car / White goods /

Batch Production

- Different products
- Similar family
- Moves from one stage to other
- Small batch sizes as quantity is small
- Highly flexible products
- Can change fast

ONE OFF

Tool room – where all products are different.

Lean Production

- From Toyota production system
- Waste minimization principles
- 7 types of waste
 - Over production
 - motion
 - defects
 - Inventory
 - Waiting
 - Transport
 - Over processing

Automation

- Processes and operation are preformed without human
- Control
- Inspection
- Movement

Principle of Industrial Processes

- They are processes involving chemical, physical, electrical or mechanical steps to aid manufacturing of products.
 - General Processes
 - Chemical Processes
 - Heat process
 - Electrolysis
 - Cutting
 - Physical processes
 - Distillation
 - Iron & Steel
 - Petroleum & Organic processes

Material Flow

- From supplier to the customer
- Packing, mode of transport, inventory in transit,
- Process flow in the plant
- Final packing, ware house
- Whole seller
- Retailer
- Consumer
- Disposal

Process Flow / Process Sequence

- Visual display of the stages involving the process of business and manufacturing

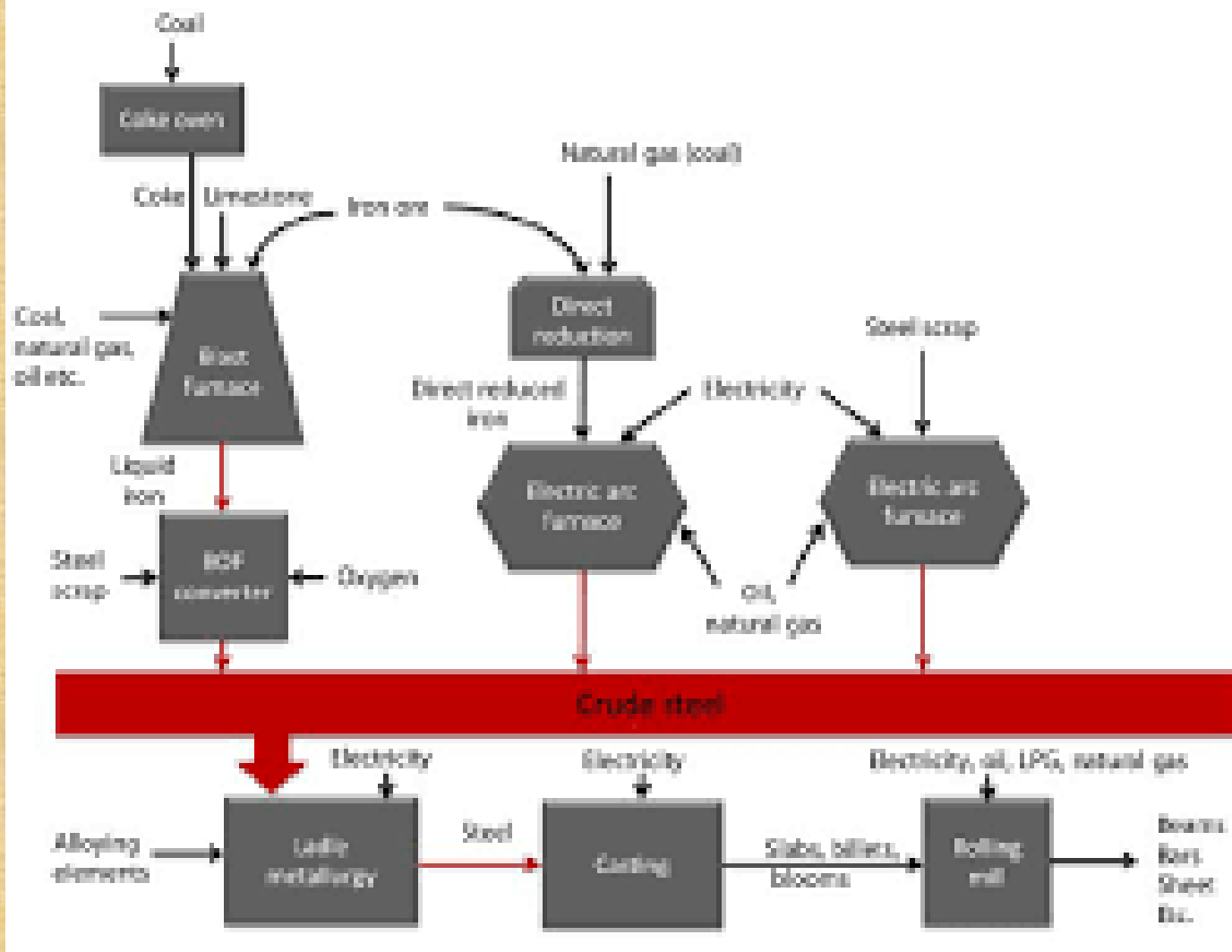
Process Control

- Making sure all process are working fine
- In case of an issue it is high lighted quickly
- Every one knows what is to be done, and does it
- Good Process control = better quality, lower cost

Some terms

- Normal Process
 - A process of manufacturing that is normally followed in the industry
 - It is the dominant process of the industry.
- Methods of Manufacture
 - Material joining, metal removal, chemical reactions, material forming, Property modifications, (heat treatment), Packing, disposal
- Plant & machine utilized
 - How much time the plant is running?
 - Is the plant running at the best capacity.
 - What is the cost per unit?
 - Is the end product – as per the present social norms and acceptability.
 - Can the plant produce – goods that may change with the market?
 - Can it be used for alternate products?

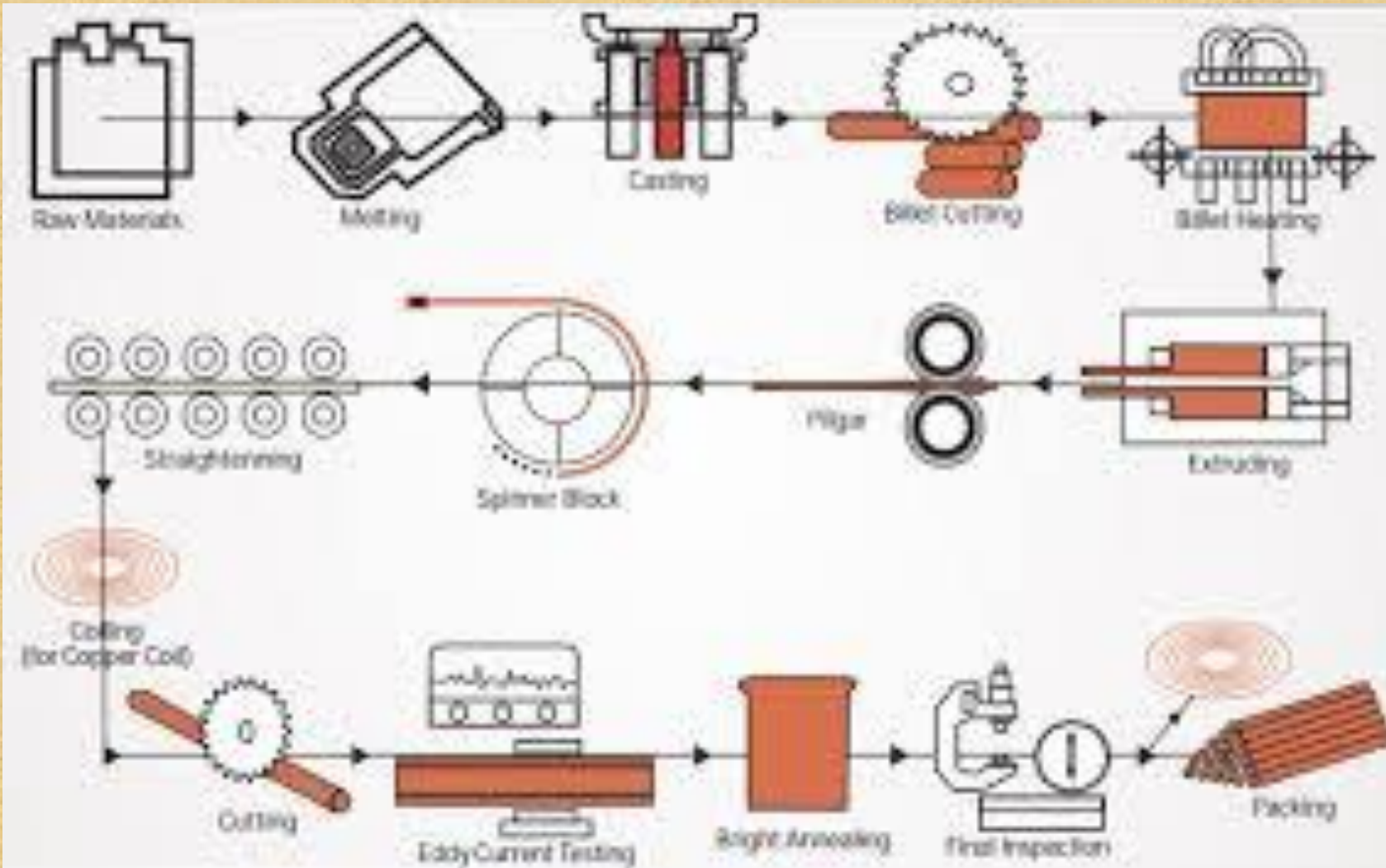
Iron & Steel



Key Words

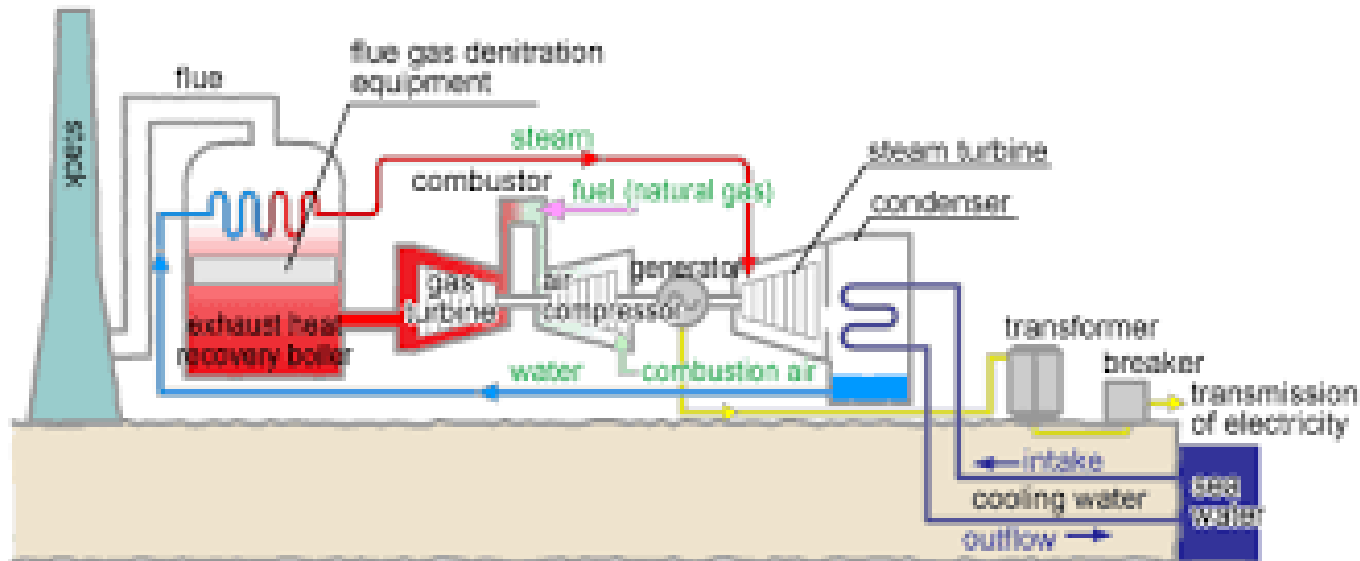
Blast Furnace
Reduction
Ladle
Electric Arc furnace
Moulds
Rolling mills
Heat Treatment

Non Ferrous



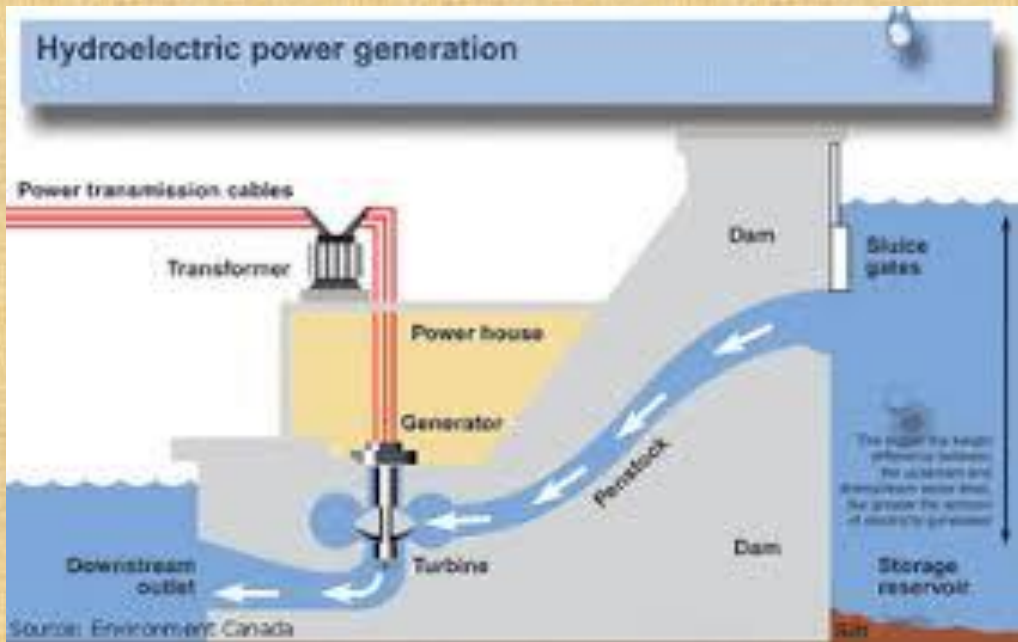
Key Words
Electrolysis
Induction furnace
Cleaning & palletization
Refining
Alloying

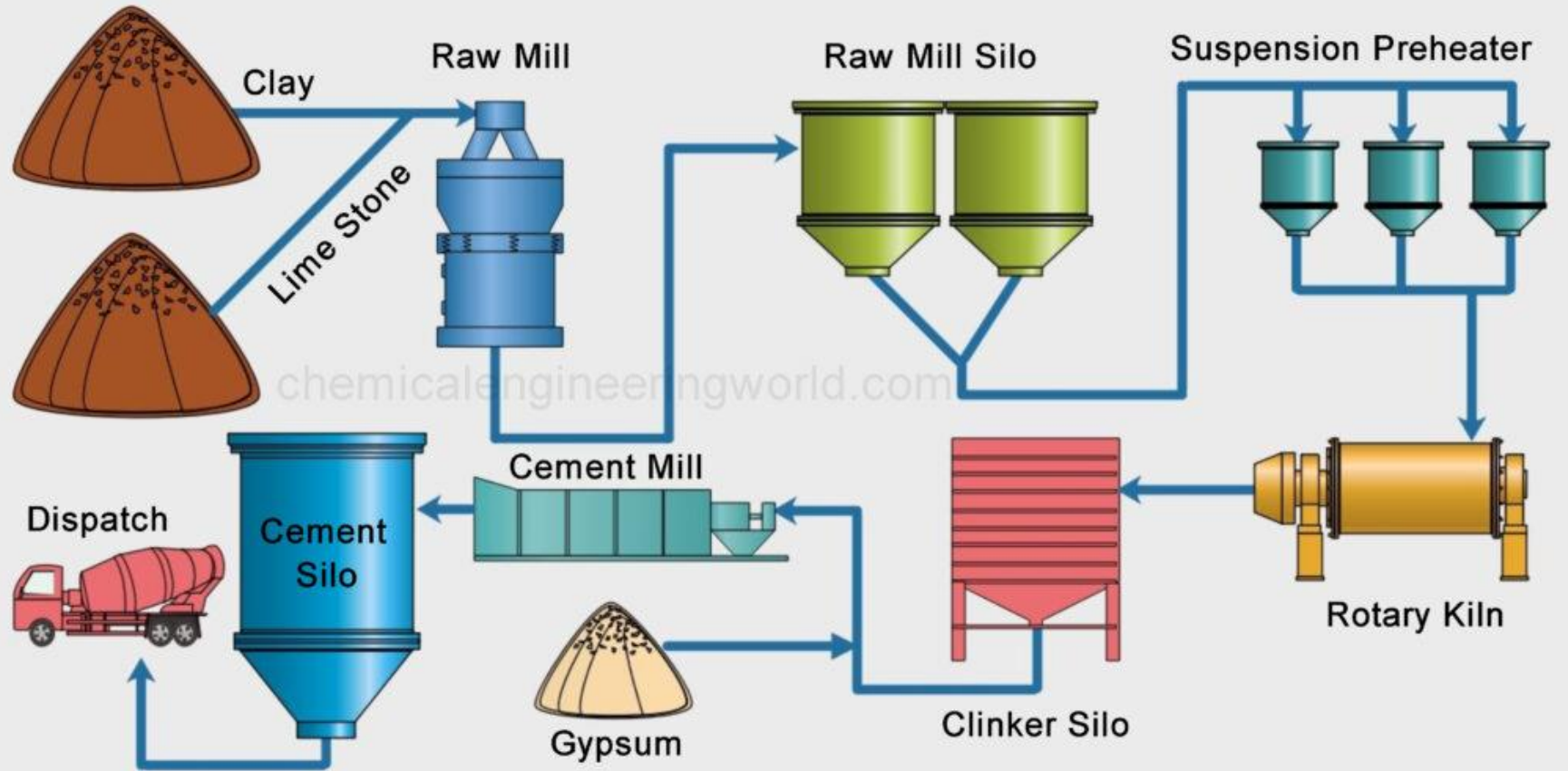
Combined Cycle Power Generation



Power

Key Words
 Turbine
 Generator
 Boiler
 Pelton Wheel
 Gas Turbine
 Sub station



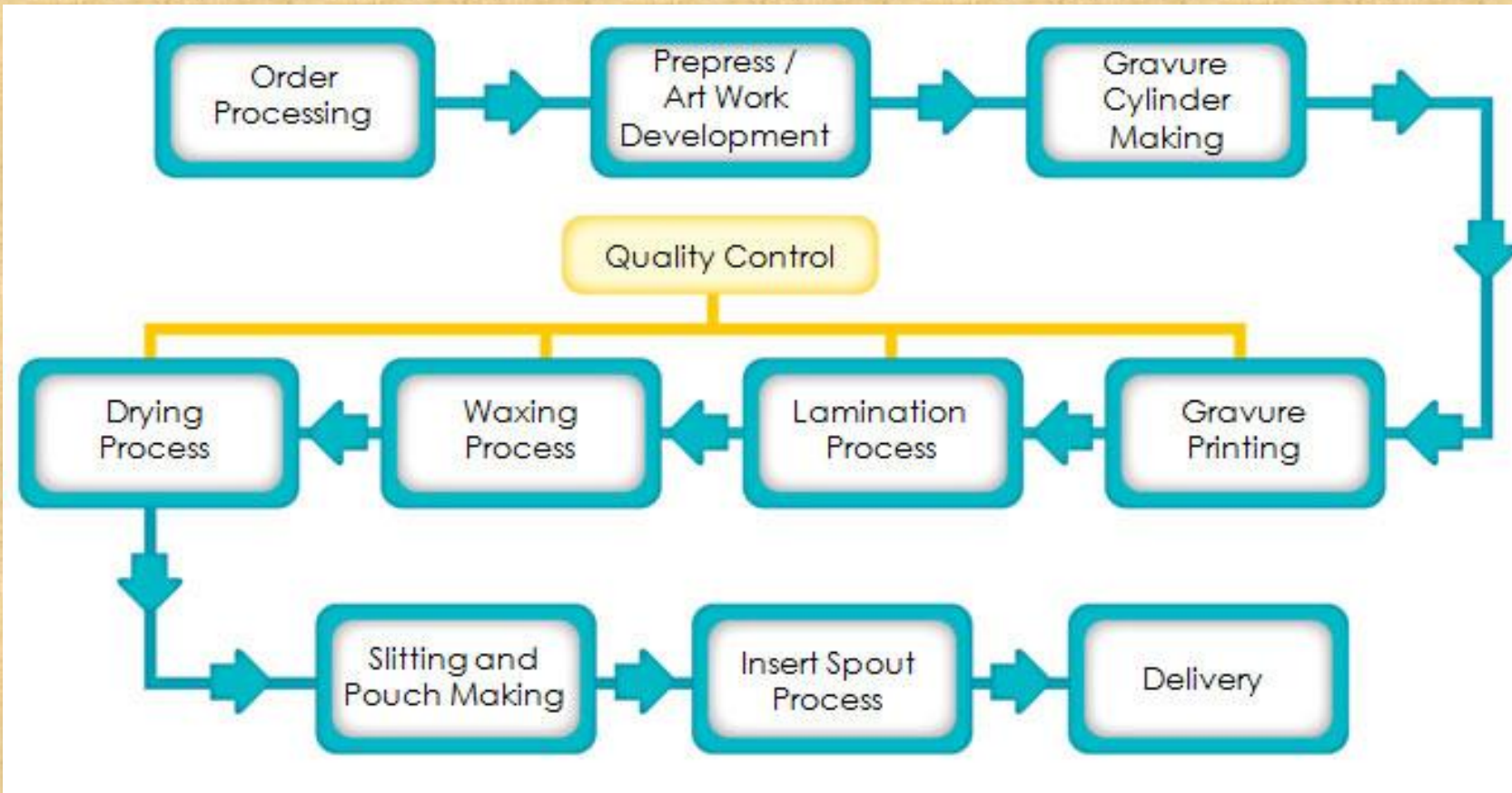


<https://chemicalengineeringworld.com>

Cement

Key Words

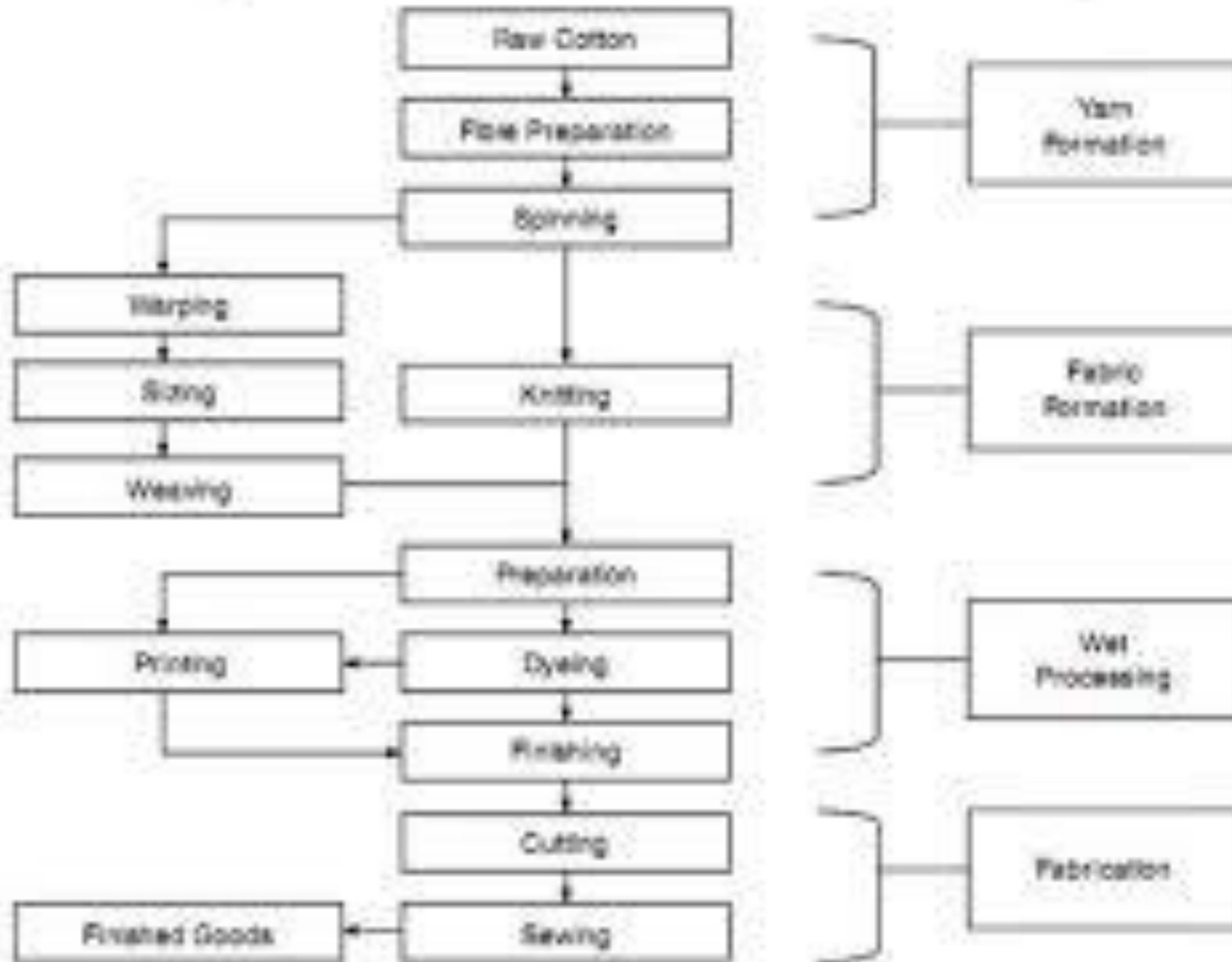
- Klin
- Clinker
- Raw Mill



Printing

Key Words
Lamination
4 color
Impressions

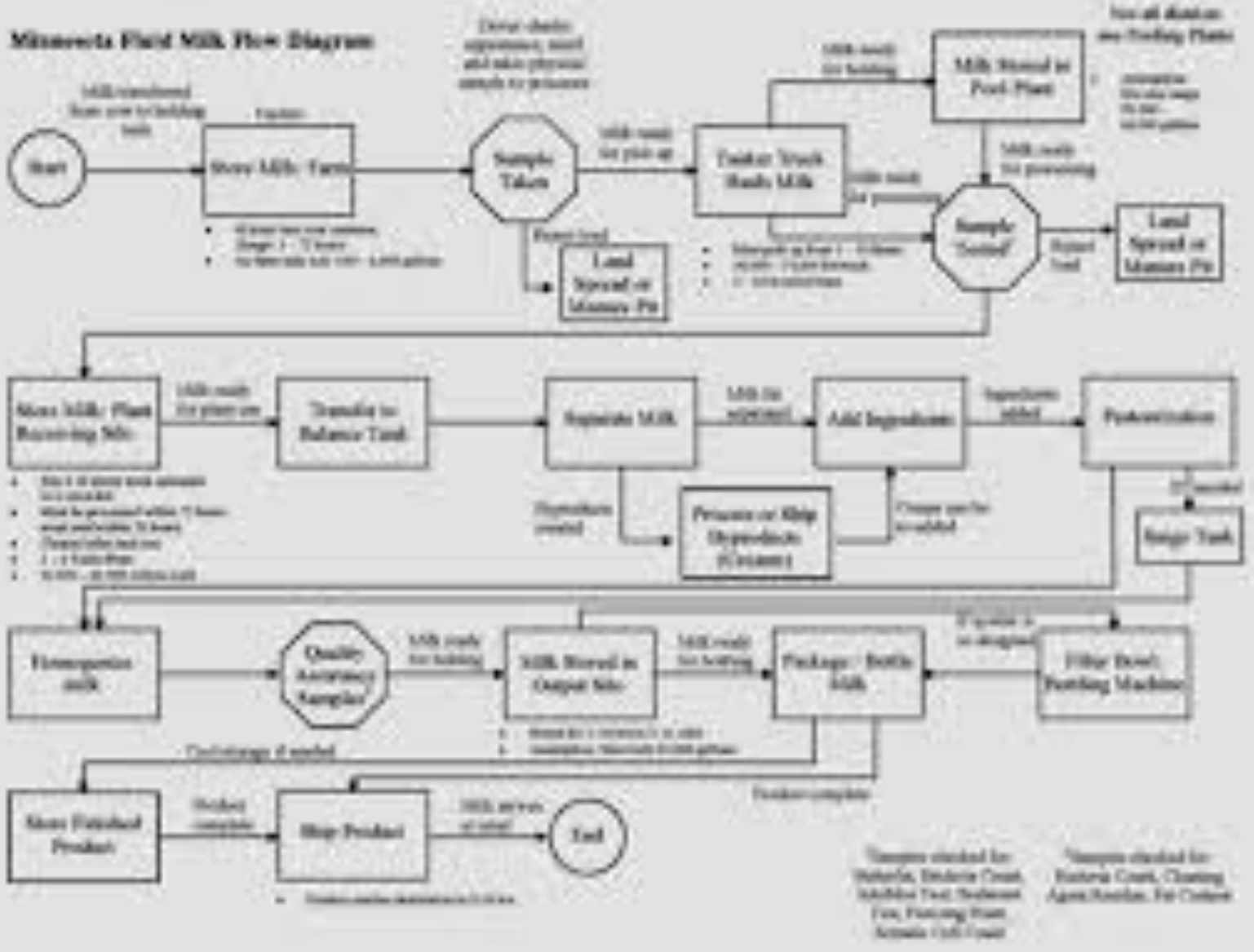
Cotton to Fabric



Key Words

Ginning
Baling
Spinning
Warping
Dyeing
Weaving
Priming
Knitting
Bleaching
Stitching

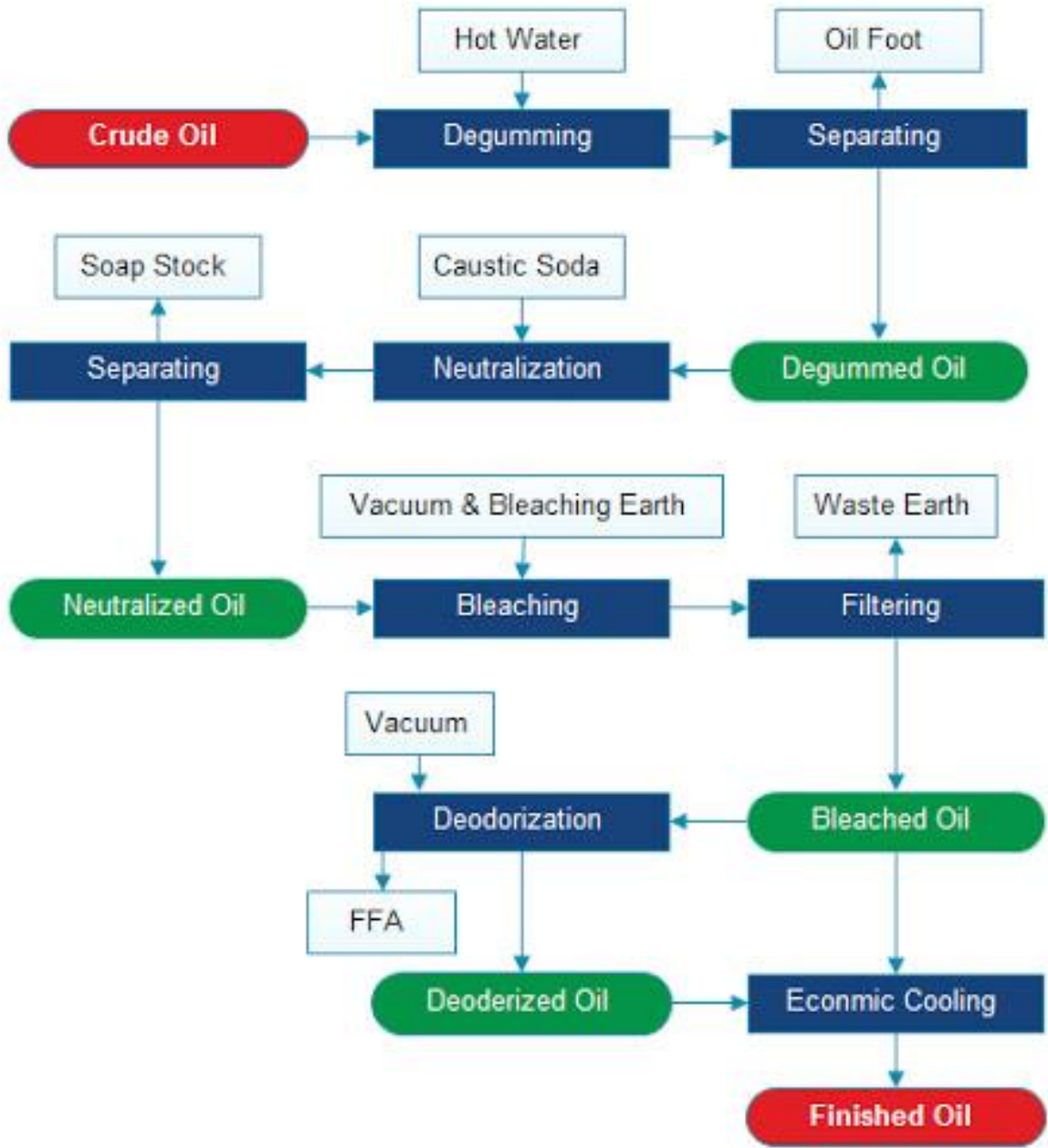
Milk Processing



Key Words

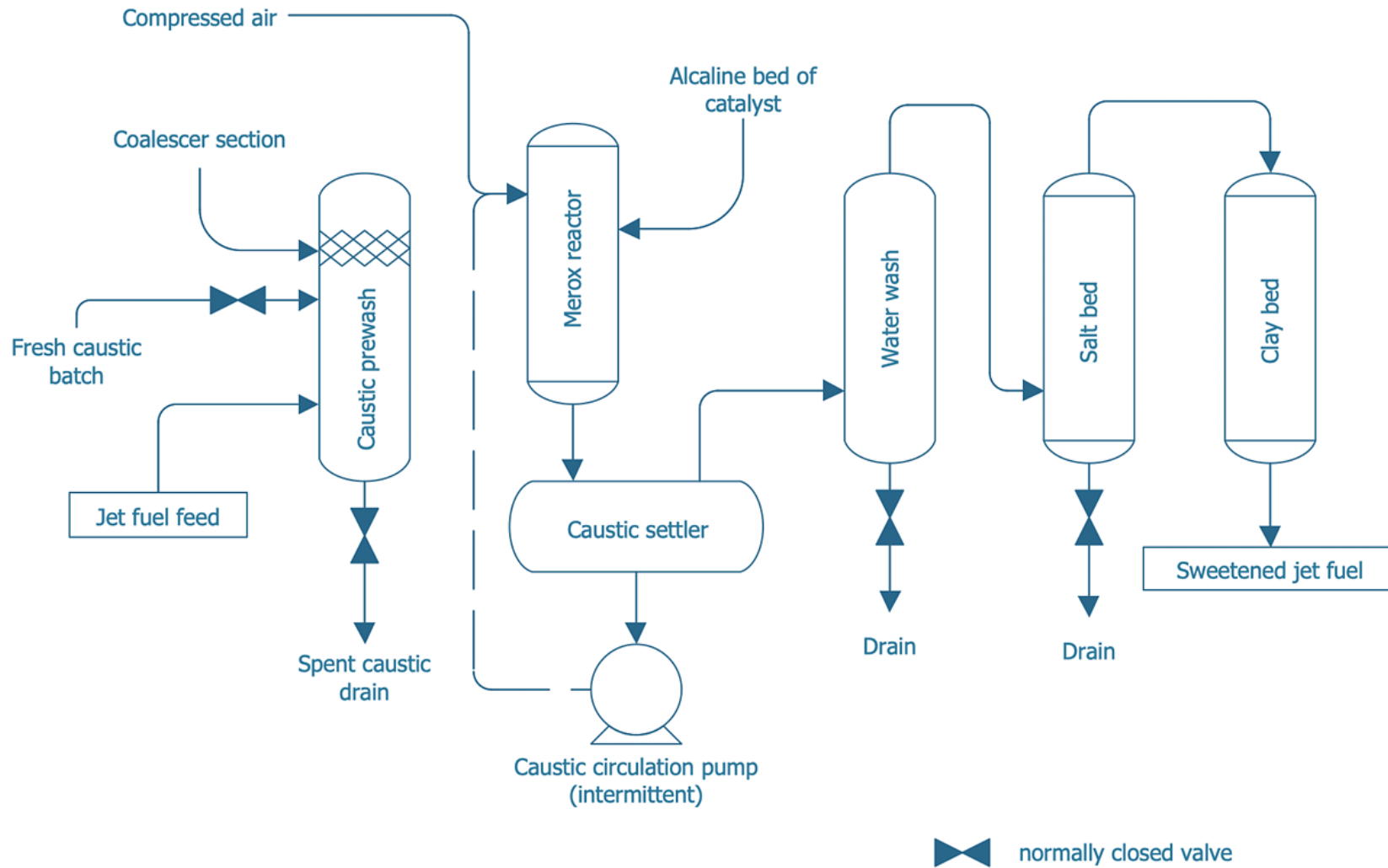
- Mixer
- Pasteurization
- Standardization
- Skimming
- Homogenization

Vegetable Oil

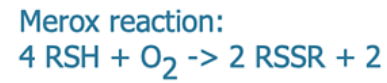
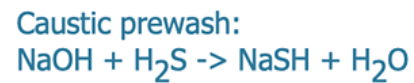


Key Words
Degumming
Separating
Neutralization
Bleaching
Deodorization
Filtering

Chemical Process



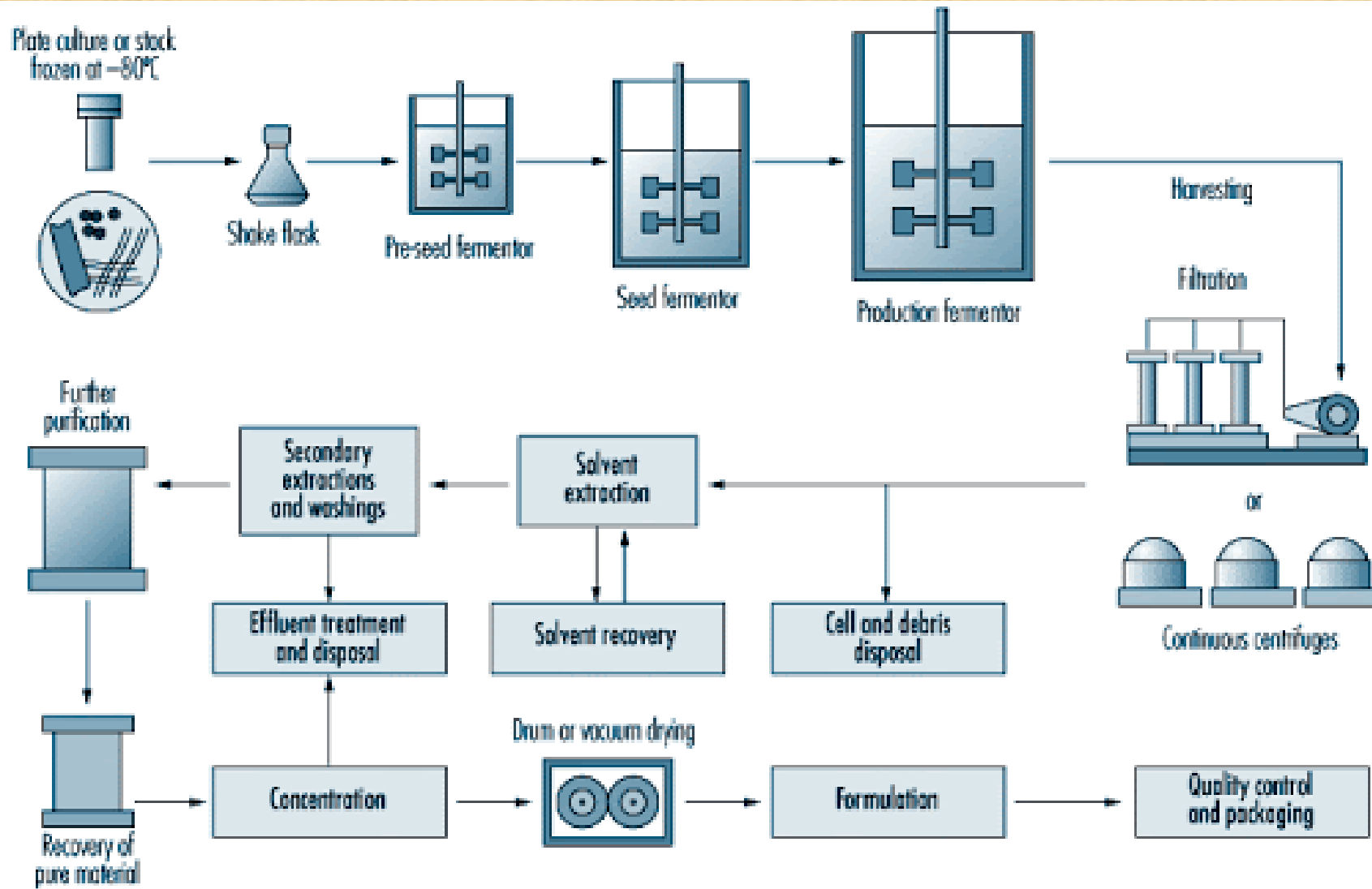
CHEMICAL REACTIONS IN JET FUEL MERCAPTAN OXIDATION TREATING



H_2O
 SRAGRAWAL 9873592082

Key Words

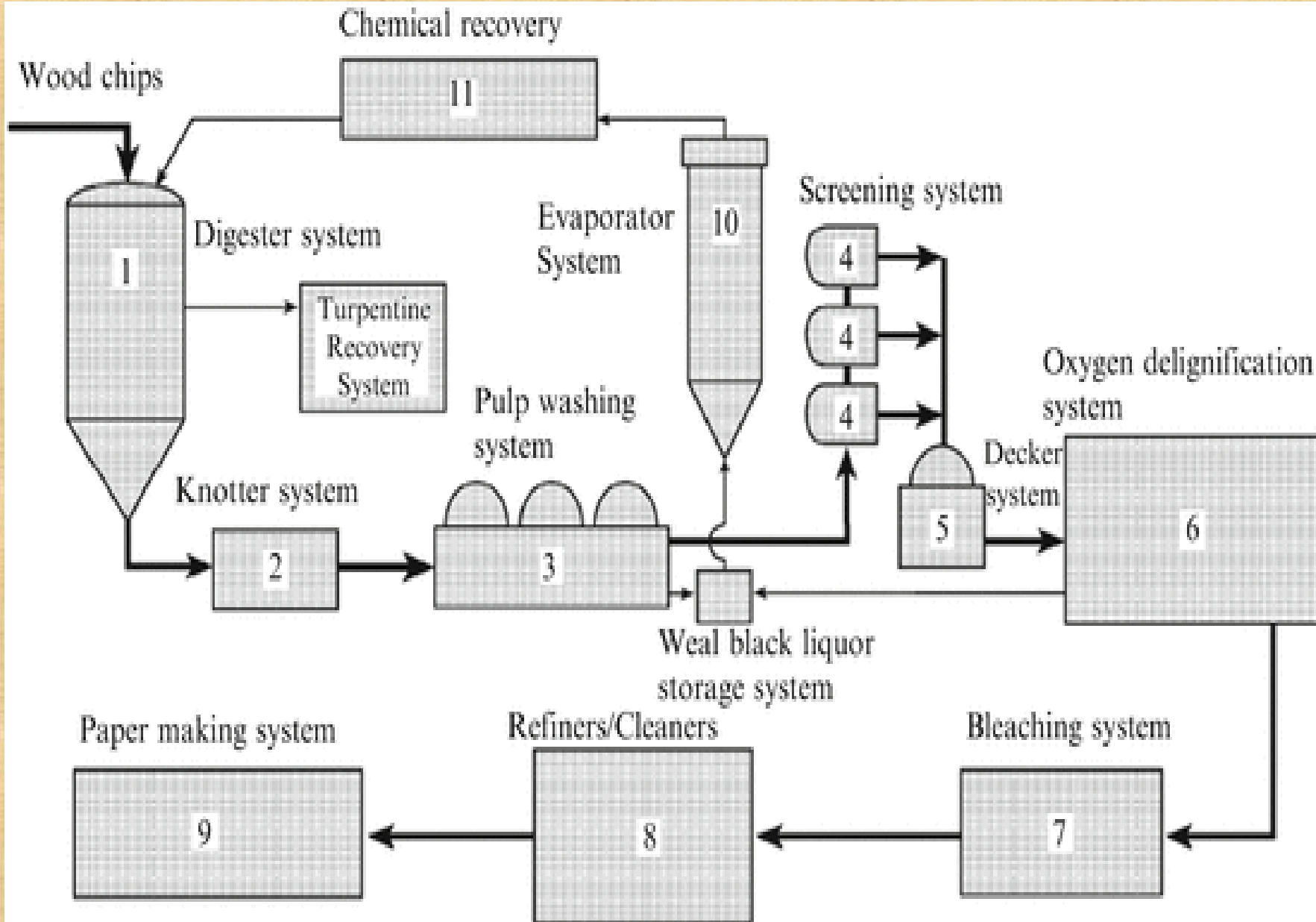
Filter
 Mixer
 Washer
 Pumps



Source: Kroschwitz 1992.

Key Words

Fermentation
 Mixer
 Tablet maker
 Solvent
 Formulation
 API
 Filterization



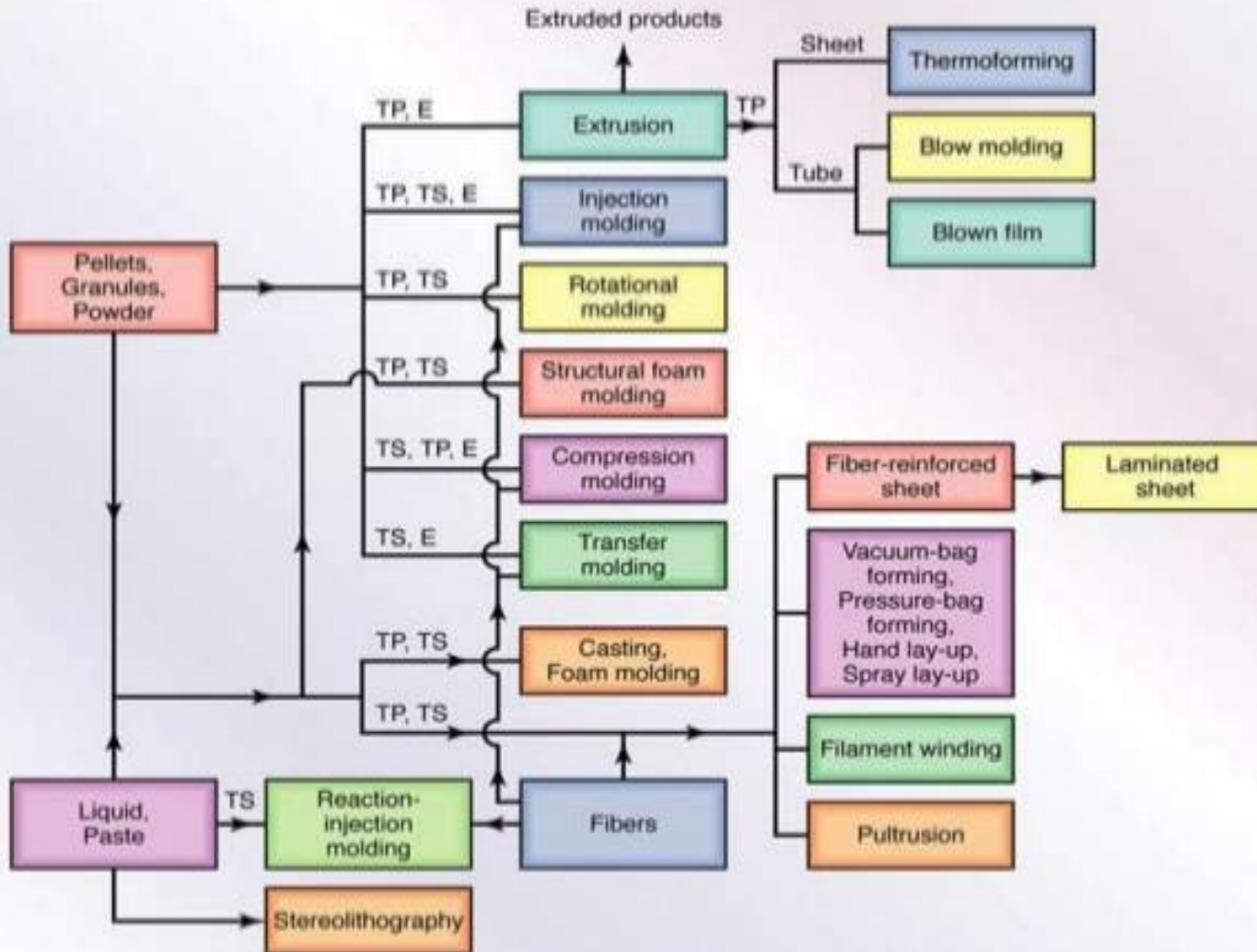
Key Words

- Knotter
- Pulp
- Delignification
- Screener
- Turpentine
- Decker

PLASTICS, ELASTOMERS AND COMPOSITE MATERIALS

Plastic & Rubber

Key Words
 Moulding
 Fabric Separator
 Injection moulding



Thanks

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