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## -: Plant day out and operation method:-

* General considerations:-

* 2.1 Plant layout:-

Plant layout is the design of a manufacturing industry. Where people and machine work together safely.

It is recognized movement of material people and (WIP) work in progress In a manufacturing industry.

Requirment of plant layout:-

1 Introduction of New product
2 Expansion or contraction of existing business.
3 Adjustment within adjusting unit
4 Techanical Progress
5 Safety purpose.

Minimum two resion of requirment for the plant layout :- In the IIIrd point we can improve over adjusting layout reduce cost, save space.

Other Resion can be replace of out modal or worn out equipment.

* Technical progress:

In the technical progress New equipment, material and technic all of which have to be consider for manufacturing facility. With the technical progress we can improve efficiency, capabilitiyes and operating method.

* Safety Purpose :-

A harmfull effect in working environment on help mainly due to dust, noise, and fume, hazard.

Industry should use Some standard for employee Safety.

* Introduction of new product:-

The introduction of a new product invariably brings with it Some change in working method and may require new handling and ancillary.

* Expansion or contraction of existing business:-

The expansion and contraction of existing business pose their own problems.

- Expansion can take two main routes. More requipment, people, and the buidings to accommodate them can be introduced.

- Contraction of a manufacturing unit often takes place in conditions of economic stringency.

## * 2.2 Transport and Storage in manufacture unit :-

Raw material and machine movement in WIP (Work in progress) and Storage of raw material, Inprocess material and final product in industry.

* Assessment of Requirements :-

- Storage method and the movement of powder, liquid, and unit items from storage to WIP (Work in progress) will be consider.

- We have three type of method for material handling and movement of material.

(1) Vehicle - for handling over a varible path.

Example :- fork Lift.

(2) Equipment :- for fixed path.
Example :- over head crane

(3) Conveyor belt :- conveyor belt use for the fixed path.

Different stape are as following :-

=>
- Off loading material from vehicle generally we used track and conveyor belt rubber is delivery in bale which are off loading by fork lift track.

- Process Supply product such as a dust mast filter, mould relising agent and degressing fluids are consumable items.

- mould changing during process is done by over head crane.

- Transport of semi finished artical between work Station can be acheved by chain conveyor, rollar conveyor, belt conveyor and head crane.

- Sub component and consumable items distribution should be manage

by proper inventory.

- Goods are supply on a FIFO system.
- Some compound should be storage in cold storage room.
- Textile material covered with polyethylene for preventing moisture absorption.
- Storage condition for WIP are very important for Example - Cliness, dry, proper light, etc.
- A warm and dry Enviroment prevent corrosion.

* Bulk filler and liquid material handling and Transport :-

- filler can be stored, Convered and wait by Standard method.
- Mechnical handling is desirable for bulk filler.
- Most of companyes consion with the manufacturing of powder

handling equipment and service.

- The some basic powder property for powder storage are bulk density, flowability and floodability.
- Bulk density is depend on partical size, particle shape and size distribution.
- After detrimine the bulk density we have to findout material angle which is define by the slop of a storage cone for powder storage it is also known as a angle of shear.
- Powder comes to rest after following condition which impart minimum kinetic energy to the powder mass.
- The flowability depend on angle of fall.
- filler is stored in totebins and big bag in flash of the hopper.
- The traditional is to used gravity discharge from the

tanker. tanker.

- oil should be stored in storage tank with proper heating system.

- Storage area should be clean, dry, proper light, ventillation and availble area for moving for fork Lift.

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2.3 Handling Methods and operations at Work Stations.

Mixing :-

The operation in mixing are as following.

1 Cutting and manual weighing of Rubber
2 manual weighing of minor particulate ingredients.
3 Automatic weighing of bulk fillers.
4 manual mixer feeding and operation
5 manual two-roll milling and sheeting-off.
6 Cooling and loading sheets.

* Cutting and manual weighing of Rubber

The rubber ↓ deliver in 25-35 kg bag which is cut in small Picess pieces through bel cutter.

- Bel cutter operated by hydrolic pressure for cutting rubber.

* manual weighing of minor Particulate ingredients :-

Can be weighing by machine in The minor ingredients

- A sack machine is feeding to a Number of bins containing different

polyethylene sack.

additives.
- for the ensuring weighing accuracy is maintained by computer aided manual weighing

* Automatic weighing of bulk filler:

- The carbon black is weight machine is consist of a weight hopper, with flexible side to ensure powder discharge into the mixer.
- It is mounted load sensing device.
- which provide a signal for a accurate weight the load sensing device can be a mechanical lever arm system.
- The rate of discharge from a weight hopper via a screw feeder.
- The liquid Additives can be weight manual and feed into a internal mixer via hopper or injected direct from large volume transfer direct storage tank by heated pipe line and Automatic weighted.

* Manual feeding in operation in Mixer:

Rubber and rubber ingredient

feed into the banbury via conveyor belt, hopper is throughout throw hot pipe line.

* Manual two roll milling :-

- The rubber compound dump to rubber compound one gee night two roll mill proper masticated by reputation process.
- The rubber sheet stack off from two roll mill throw conveyor belt.
- The sheet dipped into the mica powder or slarry to prevent to take to eitch other.

* Cooling and loading Sheet :-

- A sheet is called by cooling rake with consist of cooling fan which reduce the temp. of sheet for storage purpose.

* Extrusion and calendering :-

- They are both continuous process.
- The feed must be replenished and output remove without any interfering.

- This is provide by close loop control System.

## * Molding :-

- molding machine is need for operator or handling System to feed the material and remove from the mould.
- Shuttle molds or swinging cores are use for operating process fume hazard associated with high temp. moulding operation.
- It is necessary to protect personnel from fumes hazard determine by monitering by atmosphere of the opened process
- The tyre industry has few problems with automatic loading & unloading of process to out come from.
- These problems industry used robert for flexible manufacturing cell.

| press - 1 | | press - 2 | | press - 3 |
|---|---|---|---|---|

operator's work area

| Supplies and Molding | | Supplies and Molding | | Supplies and Molding |
|---|---|---|---|---|

Fig :- A typical layout for manual moldi

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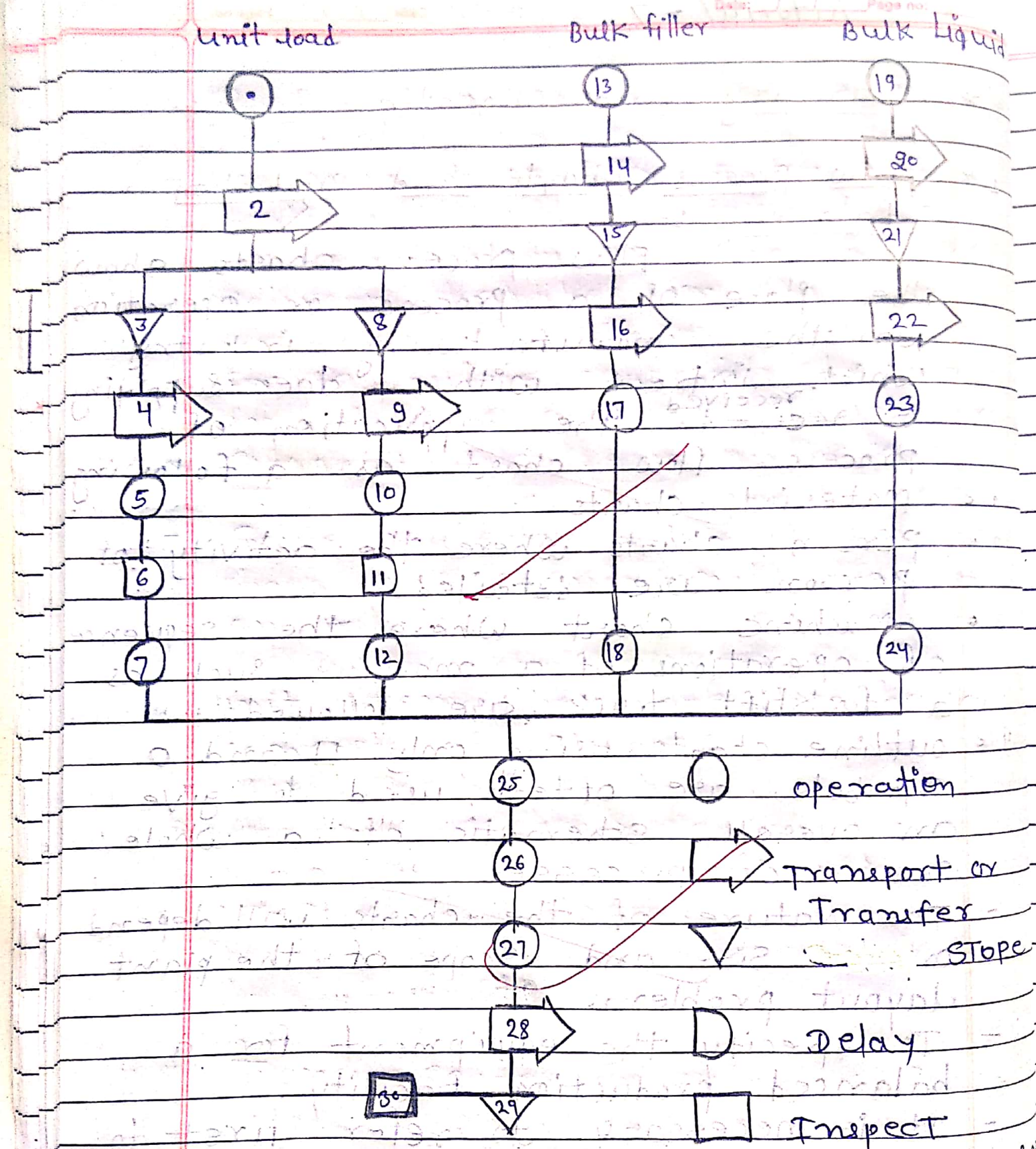
## 4 * Planning and Allocating Space:-

### 1 * Flow process charts and production Balancing :-

Flow process charts show the place of a process or operation in the manufacturing industry which intrect with does supplying or received the application of process flow chart as a following.

1. Material charts
2. person charts where the activity of persons are detailed.
3. Machine chart where the sequence of operations of a machine, such as a forklift truck, are followed.
4. outline charts, using only □ and ○ symbols, are often used to give an overall schematic of a whole series of processes

- The Nature of the charts will depend on the Size and scope of the plant layout problem.
- To specify the equipment for a balanced production facility.
- It is necessary to refer first to the planned pattern and volume of manufacture.




∴ A flow process chart for rubber mixing from receipt of raw materials to storage and testing of mixed compound

2* Processes and operation :-

- It is associated with demands and supply
- Each process has a define the shape and volume of the region required for function
- These include weight, access, services and operating environment.

- The weight of the floor loading per unit area, indicate. Special foundations are necessary for very large machine.
- The Access to a machine is concerned with the limitation position loaded and unloaded work.
- For the each process there will be distance for processing.

3* Storage Areas :-

- The capacities stores for raw materials, subcomponents, process, supply work in progress and complete work is difficult due to the lake of

Storage area.

- The provision of storage for raw materials should be forward to buying strategy and the standard delivery quantities

- For particulate materials delivered in takers and stored in fixed silos.

- Some materials delivered in big bags and conventional small bags on pallets.

unit item there are two basic concepts of storage :-

i Fixed position

ii Random location → Random location can resulting 15 - 30 % less storage.

- Random location storage can lead long transit.

4 * Transit Routes for materials product and Equipment :-

- Transit Routes Aim of providing cost effective solution to problem

- That material, product and equipment can be moved to the right time and safely.

- The transport method and transit - route requirements are depend on nature of the product and volume of production

- The space for loading and unloading at work stations should be also include.

* personnel Transit Routes :-

- The routes by which people move about within a company is known as personnel Transit routes.

- The separate doorways should be provide for machine and people.

- The routes should be proper identify for people and equipment movement.

* facilities for personnel :-

- facilities for personnel general toilet and washing facilities are usually provide by legislation code.

- The Company should also provide shower changing facilities are necessary lockers etc.

- The small company a minimum requirem room in bed, a few chairs, first-aid kit, car parking etc.

2.5 * Lay-out synthesis and evaluation

Layout synthesis

(1)

- The layout plan should be check before send to the Judgment of the group.

- The layout contant process flow chart and plant of the space.

- The type and number of item of equipment and the space should have define in flow chart.

- The plant should be features like building, steam line, ventilation ducts and drains.

- The requirements for ancillary equipt and the associated working envionmen Should be reported in plant lay-out

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(ii) * Physical Evaluation : models :-

- The best tool for physical evaluation of models is there dimensional physical model which can be usually easily.
- These model will avoid the problem which associated with working from drawing.
- model are usefull for understand movement of material of product & equipment.

(iii) * layout efficiency :-

- layout efficiency have been developed by "gantz" and "pettit" which can be used to assess the efficiency of layout.

Index of indirect materials handling = $\frac{A}{B}$

Where 'A' is → Sum of the distances that a part move automatically from operation area.
'B' is the total distance that a part travels from dispatch area.

Index of gravity utilization = $\frac{D}{E}$

Where 'D' → Sum of the vertical distance that gravity feed.
'E' → is the total vertical distance that that an item move up down

primary Index of automatic machine loading = $\frac{F}{100G}$

"F" = Sum of the percentages of machine down item from all cases.
"G" = Total No of operator of these machine.

Secondary index of automatic machine loading = $\frac{H}{100G}$

Where 'H' is the Sum of the percentages of m/c down time
'G" = Total No of operator of these machine.

Index of production line flexibility = $\frac{J_1}{K_1}$

where $I_1$ is the number of machines or work stations. operations

'$K_1$' → is the total number of machines or work in the production.

Index of work Station flexibility = $\frac{I_2}{K_2}$

where

$I_2$ = No. of machine which can be move another location

"$K_2$" = No of machine which in the Stationary phase.

Index of storage Volume utilization = $\frac{V}{W}$

Where

V = Volume of the Space occupied by materials

W = Total Volume of the Space available.

iv)* Cost-Benefit Analyses :-

Plant layout Should be profitabilitye this can be evalute by a cost benefit analysis which compare the cost of taking new layout

to a fully operational condition with the improvements Expected from it.

Fixed costs are as following:-

- Capital expenditure on equipment.
- civil engineering cost
- Municipal cost
- Wages and Salary
- Heating and light
- Training cost
- financial control policy
- Insurance
- Technical Services

Variable costs:

- material
- Subcomponents

- Energy used in manufacture
- Process Supplies
- Maintenance
- Employee bonuses
- Change in Sales price
- Cost of inspection.

2.6* Installing and Commissioning a layout :

(i)* planning the installation :-

- The finalized plant layout detailed drawings and lists of the production equipment materials can be produced Include with Specification and Stablised all based on the network analysis the name of some are as following :-

PERT = Program Evaluation Research Task
CPM = Critical path method
PEP = Program Evaluation procedure

(ii) * Commissioning and startup :-

- During commissioning and startup the plant layout Exercise subject assesment is most critical by people who will be responsible for operating.

- The man subject is to prevent feeling confused and inadiquate lack of guidance.

- The superior traning is essential for the technical maintenance staff who work on machine

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