DAIMSR

Param Pujya Dr. Babasaheb Ambedkar Smarak Samiti's

Dr. Ambedkar Institute of Management Studies & Research

Deeksha Bhoomi, Nagpur - 440010 (Maharashtra State) INDIA

NAAC Accredited with 'A' Grade

Tel: +91 712 6521204, 6521203 ,6501379

Email: info@daimsr.in

OPERATIONS mANAGEMENT
Sub Code- MBCII-IV

Unit II

PROGRAMME EDUCATIONAL OBJECTIVES: PEO

Our program will create graduates who:

1. Will be recognized as a creative and an enterprising team leader.
2. Will be a flexible, adaptable and an ethical individual.
3. Will have a holistic approach to problem solving in the dynamic business environment.

Course Objectives Of OM

- CO1:The student manager will be able to differentiate between the planning premises (MTO, MTS, ATO)based on the type of manufacturing processes (Mass, Batch, Job, Project).

- CO2:Given a facility establishment for a product or a service, the student manager will be able to identify/ enlist the factors that affect the facility location decisions.

- CO3:Given a facility establishment for a product or a service or the type of manufacturing processes (Mass, Batch, Job, Project), the student manager will be able to identify the type of layout and draw the layouts.

- CO4:Given the set of activities and their duration of completion, the student manager will be able to Construct a PERT network and identify the critical path and project completion time.

Course Objectives Of HROB

- CO5: Given the supplier's vendor rating criteria with weightages and the n number of vendors with their criteria weightages, the student manager will be able to identify the best vendor for the organization.

- CO6: The student manager will be able to enlist the types of inventory management tools based on the types of inventory.

- CO7: Given the levels or phases of operations in a manufacturing unit, the student manager will be able to identify the costs of quality and enlist various costs associated with the same.

UNIT 2 SYLLABUS

Facilities Plan and Production Planning:

Plant location, factors affecting Plant location. Types of Production systems, mass production, job-based production, batch production and assembly line production systems. Types of manufacturing layouts, product layout, process layout, group layout, fixed position layout. Types of service layouts. MPS (Master Production Schedule), MRP (Material Requirement Planning) and aggregate planning. Introduction to PERT/CPM, Network rules and network diagrams and calculation of critical path (with numerical); Introduction to Maintenance Management & Maintenance Types.

Plant/ Facility Location

Facility location is a place where men, material, machines, equipments are brought together for manufacturing products.

It is a strategic, long run decision that cannot change later.

Plant location is the function of determining location for a plant for maximum operating economy and effectiveness.

Unscientific and unplanned location is not only harmful for the industrial unit but also for the society .

Small scale industry

Large scale industry

Need for the selection of the location

1. When the business is newly started
2. The existing business unit has outgrown its original facilities and expansion is not possible.
3. The volume of the business or the extent of market necessitates the establishment of new branches
4. A lease expires and the landlord does not renew the lease.
5. Other social/ economic reasons for instance Political , social changes
6. To avail tax benefits.
7. Discovery of Raw material.

Factors in plant location

(i) Availability of Raw Materials

(ii) Proximity to Market

(iii) Transportation Facilities

(iv) Availability of Power, Fuel, Gas

(v) Water Supply

(vi) Climatic and atmospheric conditions

(vii) Availability of Labor

(viii) Competition

(ix) Political conditions, Local Laws, Regulations and Taxation

Plant Layout

Plant layout refers to the arrangement of machinery, equipment and other industrial facilities for achieving quickest and smooth production.

Principles of Layout

The Principle of Minimum Travel
Principle of Sequence
Principle of Usage
Principle of Compactness
Principle of Safety
Principle of Flexibility
Principle of Minimum Investment

Objectives of layout

Provide sufficient production capacity

Reduce material handling cost

Reduce personnel hazards, accidents

Increase employee moral

Utilize available space

Provide ease of production

Provide ease of maintenance

Provide ease of supervision

Improve productivity

Allow high machine utilization

Types of Layout

1. Product layout or line processing layout or flow-line layout
2. Process layout or functional layout or job shop layout
3. Fixed position layout or static layout
4. Cellular manufacturing (CM) layout or Group Technology layout
5. Combination layout or Hybrid layout.

Line/ Product Layout

Output of one machine becomes the input of another machine.

Used in continuous manufacturing. Long production runs for identical products.

Eg: Cement, Steel, Sugar, Cigarettes, Fertilizers, Automobiles etc.

1. Flow of production is smooth
2. Reduced material handling costs
3. Lesser WIP
4. Reduced time wastage
5. Continuity in production
6. Easy identification of faults
7. Effective supervision

Disadvantages

1. Rigidity
2. Expansion is difficult
3. Costly
4. Complete stoppage during breakdown
5. Monotony
6. High labour cost
7. Restricted utility of machines

Process Layout or Functional Layout or Job Shop Layout

In a process layout similar machines and equipment of the same functional type are arranged in one department.

Process are segregated and machines of each process are kept together.

All milling eq in milling dept

Large space is required

Job order production (small orders)

Eg: Refining of crude oil, rolling mills, chemical plants

Advantages

1) Flexibility
2) Lower investment.
3) No stoppage of production.
4) Scope of expansion
5) Less utilization of machines.
6) Better supervision.

Disadvantages

1) Inefficient material handling
2) High space requirement
3) Less investment in inventory
4) High supervision costs
5) Longer production time
6) Skilled labor required

Fixed Position Layout or Static Layout

This layout is used to assemble products that are too large, bulky, or fragile to safely or effectively move to a location for completion.

In a fixed position layout, personnel, supplies, and equipment are brought to the site where the product will be assembled, rather than the product being moved through an assembly line or set of assembly stations

Cellular layouts

Cellular layouts attempt to combine the flexibility of a process layout with the efficiency of a product layout Based on the concept of group technology (GT), dissimilar machines are grouped into work centers, called *cells*, to process parts with similar shapes or processing requirements

The layout of machines *within* each cell resembles a small assembly line

Advantages

- Lower production cost (time and material handling)
- Reduced work-in-process inventory
- Better use of human resources
- Easier to control
- faster processing time
- Flexibility

Disadvantages

- Poorly balanced cells
- Expanded training and scheduling of workers
- Increased capital investment

PERT

The **program** (or **project**) **evaluation and review technique**, commonly abbreviated **PERT**, is a statistical tool, used in project management, designed to schedule, organise and coordinate the tasks involved in completing a given project.

Devloped by project office of the US Navy in 1958.

Three time estimates of PERT:

Optimistic time – minimum possible time required to accomplish an activity, assuming everything proceeds better than normally expected.

Pessimistic time **-** maximum possible time required to accomplish an activity, assuming everything goes wrong.

Most likely time – Best estimate of time required, assuming everything goes normal. The completion time having the highest probability. Note that this time is different from the *expected time*.

Expected time = (Optimistic + 4 x Most likely + Pessimistic) / 6

Other Time Estimates

1. **Earliest start time** is the earliest time at which an activity can start without affecting the total project time.
2. **Latest start time** is the latest possible time at which an activity can start without affecting the total project time
3. **Earliest finish time** is the earliest possible time at which an activity can finish w/o affecting the total project time
4. **Latest finish time** is the latest possible time at which an activity can finish without affecting the total project time

Rules for drawing network analysis

Each activity is represented by one and only one arrow in the network.

Now two activities can be identified by same beginning and end event. (Use dummy).

Dangling error: disconnected activity in the network

Looping error: endless loop in the network

Redundancy Error: when no dummy required

Avoid arrows that cross each other

Use straight arrows

Do not represent duration of activity in arrow length

Use arrows from left to right

Avoid redundant dummies

N/W has only one start event and one end event

PROBLEM 1

Draw the network.
Determine the expected time of the project.
Find the critical path.

ACTIVITY	PREDECESSOR ACTIVITY	Time in Min
A	--	2
B	--	3
C	A	4
D	A	5
E	B	6
F	C	7
G	D, E	2

PROBLEM 2

Draw the network.
Determine the expected time of the project.
Find the critical path.

Activity	Description of activity	Predecessor activity	Time (weeks)
A	Finish component development	--	5
B	Design marketing program	A	4
C	Design production system	A	7
D	Select advertising media	B	8
E	Initial production run	C	9
F	Release components to market	D, E	4

PROBLEM 3

A project consist of following activities and different time estimates

Event	Activity	Optimistic time	Most likely time	Pessimistic time
1-2	A	6	6	24
1-3	B	6	12	18
1-4	C	12	12	30
2-5	D	6	6	6
3-5	E	12	30	48
4-6	F	12	30	42
5-6	G	18	30	54

a. **Draw the network**
b. **Determine the expected time and their variances**
c. **Find the critical path and its variance.**

Calculation of expected time

Event	Activity	Optimistic time	Most likely time	Pessimistic time	Expected time
1-2	A	6	6	24	9
1-3	B	6	12	18	12
1-4	C	12	12	30	15
2-5	D	6	6	6	6
3-5	E	12	30	48	30
4-6	F	12	30	42	29
5-6	G	18	30	54	32

Calculation of Variance

Activity	Optimistic time	Most likely time	Pessimistic time	Expected time	Variance
A	6	6	24	9	9
B	6	12	18	12	4
C	12	12	30	15	9
D	6	6	6	6	0
E	12	30	48	30	36
F	12	30	42	29	25
G	18	30	54	32	36

Maintenance Management

A formal definition of maintenance is “that function of manufacturing management that is concerned with day to day problem of keeping the physical plant in good operating condition”. All activities involved in keeping a system’s equipment working is called maintenance management.

- Keep productive assets in working condition
- Minimize loss of productive time
- Minimize repair time & cost
- Minimize accidents
- Minimize total maintenance cost
- Improve quality of products
- Improves longevity of the machines

Reference

1. Production and Operations Management by K.Aswathappa & K.Shridhara Bhat, Himalya Publishing House.
2. Operations Research by P.K.Gupta & D.S.Hira, S.Chand Publication, Revised Edition