3. PERT/CPM FOR MAINTENANCE

INTRODUCTION

PERT/CPM is effective tool for project planning. PERT stands for critical path method. Even though these techniques were develop for defence applications they are useful for many maintenance projects. The conventional "Bat Chart" as given below is adequate for a small straight forward jobs having around 200 activities. But for larger maintenance projects such as plant shut down and overhaul jobs where activities are many PERT/CPM techniques help us to ascertain the logistics of different resources.

STEPS IN USING PERT

1. Plan in advance the a action to be taken to produce a desired result.
2. Predict/calculate the probable performance time required for the activities.
3. Improve the plan, when we find that predicted performance is not good enough.
4. Measure performance against the plan, after the plan is set in motion.
5. Control progress by using information, and replan the action as required.
6. Repeat the last two steps until the project is complete.

ADVANTAGES OF PERT

1. The net work process force definition of programme tasks and integration of planning.
2. The network highlights the relationships between activities and shows their significance to programme accomplishment.
3. Through the critical path approach, management attention is directed to those activities which are important from the stand point of timely completion of the programme.
4. Through PERT, schedule status information is integrated and effect on the overall programme is shown.
5. By analysing slack areas, tradeoffs in resources (taking resources from one activity to another) it becomes possible as a means of improving schedules of costs.

LIMITATIONS OF PERT

1. PERT is a management responsibility.
2. PERT is no automatic system and is not a substitute for management decision.
3. PERT often clashes with traditional organisation patterns in that it treats the project as an integrated programme.
4. PERT is not a rigidly standardized techniques.

BASICS OF NETWORK

Any maintenance project consists of number of activities. These activities are represented in a network by arrows.

ACTIVITY is clearly definable task to which a know quantity of resources will be applied and hence activities always take time. An activity is represented by an arrow.

DUMMY ACTIVITY are used to indicate a constraint and keep the logic correct or sometimes numbering system unique. Dummy activity are represented by broken arrow.

EVENT is the junction of arrow(s) and as such does not consume time. It represents that point of time when all activities ending at that point are done and all succeeding activities that begin at that point can start. It is represented by a circle.

INTERDEPENDENCY of activities indicate relationship between different activities.

For any project, the first event represents the starting point and the last event represents the completion point of a project.
Example:

TIME ANALYSIS

After the project has been divided into activities and the inter-dependencies have been established the network can be drawn. The activity elapsed timings are to be estimated simultaneously. At this stage the effect of holidays and vacations are excluded. Normally the time estimates are given by the maintenance engineers and industrial engineers. Single time estimates are possible for some activities where uncertainty exists in certain activities such as reconditioning. Assembly, Procurement of parts etc. the activity durations are decided based three time estimates.

Time Analysis computations can be grouped under two types

Project Duration

- Forward pass calculations
- Backward pass calculations

Float analysis

PROJECT DURATION

The forward pass computations decides the earliest time at which a particular activity can start or can completed, assuming that the project starts at Zeroeth time. As an activity cannot start until all its preceding activities are completed the early start is given by the highest of the early completion times of the proceeding activities. The backward pass computations decides the latest time at an activity can be allowed to be started/completed without affecting the project duration.

PROJECT COMPLETION TIME

The above computations help us to find out the expected project completion time. For intermediate activities also the completion timings can be found out.

FLOAT ANALYSIS

Slack or float signifies the free times available for an activity or event in the net work. Whenever the late completion time of an activity has more free time the project as a whole would not be delayed. If the early and late completion time are the same for an activity if means that there is no slack or free time. Such activities are called critical activities. For all the activities falling in the critical path the float is zero.

The network technique is basically a management tool. In addition to finding out the project duration the technique is can be used for planning and scheduling, cost optimisation and also resource allocation.

PERT/CPM

Preparation of Network Exercises 1 to 6

1. Activity C depends upon completion of A,B
   Activity D also depends upon completion of A,D
   (A & B are independent activities)

2. G depends on E,F
   H depends on F only

3.. P depends upon the completion of A,C,D
   Q depends upon completion of B,C
   R depends upon completion of D only.
4. A,B,C activities start at the beginning of the project.
   When B is complete, D and G may start. F succeeds A,
   and C depends on D,F. After G, H and L can start. K
   start after E and is succeeded by L J follows C.H, J

5. PUMP AND TURBINE OVERHAUL

Code	Activity	Duration days	Depends on
A	Check stand by pump	4	-
B	Calibrate all ganges	10	A
C	Dismantle pump cover and remove rotor	1	A
D	Dismantle turbine cover and remove rotor	2	A
E	Clean all ganges and line	4	B
F	Replace ganges	2	E
G	Repair lubrication system	4	C
H	Rebuild impeller	36	C
I	Clean pump casting	4	C
J	Fix pump bearings	2	G
K	Balance Impeller	4	H
L	Reinstall Impeller	2	I,J,K
M	Rebuild turbine rotor	40	D
N	Check turbine bearings	2	D
O	Balance turbine rotor	8	M
P	Fix turbine bearings	2	N
Q	Fix turbine rotor	3	O,P
R	Fix turbine cover	3	Q
S	Test components	2	R
T	Check clearance	2	R
U	Fix pump bearings	2	L
V	Fix pump cover	3	U
W	Install shaft packing	2	V
X	Final test	8	S,T,W,F

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