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Planning preventive maintenance of textile machines in the woolen industries complex in Bani Walid

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Abstract Maintenance planning is one of the topics worthy of attention and study due to its importance and its connection to the production processes of the factory, given that the means of production are exposed to machines and equipment in the factory to a number of problems that reduce their production and efficiency and losses as a result of stopping work in production lines and frequent breakdowns that occur in the factory due to delay in preventive maintenance procedures or poor operation and negligence, so it has become necessary that these problems that hinder the production process in the factory .Maintenance work, in its modern scientific concept, relies on planning methods to ensure that these activities are implemented to the fullest, at the lowest cost, and in the shortest possible time. The problem of this research revolves around how the embarrassing path style is used to reduce the time required for maintenance and maintenance work (Textile machines) to improve the production process. Through studying the research, it is possible to reach the weaknesses of planning maintenance work in the factory and from them in particular by applying scientific methods in planning and scheduling maintenance work and benefiting from them and suggesting the best method, as well as the best method for planning maintenance work in the factory will be proposed, with the aim of reducing the time necessary For maintenance that includes lower costs.

Keywords: (critical path style, maintenance planning, maintenance workshops, preventive maintenance)

Introduction

Industrial institutions have invested in the construction of factories and production units in recent years, implemented the development strategies formulated by these institutions, and completed the procurement and installation phase of these factory equipment and started construction. It will continue to operate throughout the planned production period. We clarify that the time factor for maintaining this equipment is very important to avoid all kinds of serious losses due to the interruption of production line work, because this matter requires scientific planning methods, especially operations research methods to achieve the shortest possible time for plant equipment maintenance , and as already mentioned from the front, it is necessary to accompany the modern planning of the modern factory, the method of scientific development and

complexity, so the method (critical path) is adopted. This method requires less maintenance time. From this perspective, it is necessary for the remaining agencies to deal with these constraints and variables in the maintenance process in order to achieve their goals and effectively use the resources and opportunities available to them without breaking cost and time permitting. The process of planning and maintaining a project involves the following three factors: time (time), financial resources (cost), and human resources (workers), so the supervisor (decision-making) must combine these three combinations to ensure the success of maintenance at the lowest possible cost. Network planning method (Bert, critical path), an advanced scientific method for planning and organizing projects in the form of a network, reflecting the temporal and logical sequence of implementing project operations and activities and their interdependencies. It is also an effective organizational tool to control the progress of work and carry out work according to planned procedures, identification of procedures and scheduling of resources

1. Experimental Procedure

Maintenance work with its scientific and modern concept depends on planning methods to ensure full implementation at the lowest cost and time. And based on the data obtained from the factory, using the critical path method is the most appropriate way to plan the maintenance work of the factory according to the type and size of the errors that the machines face the factory. In order to plan the biannual preventive maintenance, the most important machines (fabric), were selected. One of the main lines of the mill (Spinning and Fabrics Department), consisting of (16), has been selected. A machine has been chosen as a model for scheduling semi-annual preventive maintenance [where the machine is maintained twice a year by taking the machine out of service for a period of 3 days (8 hours per day). Its purpose is to prepare a maintenance plan based on the manufacturer's specifications and the scope of the maintenance needs of the machine, on the basis of data received from the production department of the factory, and on the basis of the nature and extent of the failures to which the production machine is subjected, in order to provide the shortest possible completion of repair work time and to achieve accurate scheduling, he uses the critical path method as one of the scientific methods for planning maintenance work for the machine under study. For the purpose of applying the critical path style, the basic works (activities) for the maintenance of the machine must be determined in study with the logical sequence of it and the conditions for precedence, which can be clarified in the table (1), which shows the regular time for each activity, which depends on the basis of practical viewing.

Table1: The regular time for each activity that can be adopted to plan the maintenance process

Half yearly Activity		Quarterly Activity		Monthly Activity		Weekly Activity		Daily Activity	
Activity implementation time (MIN)	Activity Symbol	Activity implementation time (MIN)	Activity Symbol	Activity implementation time (MIN)	Activity Symbol	Activity implementation time (MIN)	Activity Symbol	Activity implementation time (MIN)	Activity Symbol
45	O	30	K	30	H	30	D	5	A
30	P	30	L	20	I	30	E	15	B
30	Q	15	M	30	J	20	F	15	C
30	R	60	N			20	G		
30	S								
45	T								
180	U								
12	V								

For the purpose of implementing the critical path style, basic activities must be represented with a network that shows the sequence of these activities, which can be adopted to plan maintenance work as shown in the figure (1).

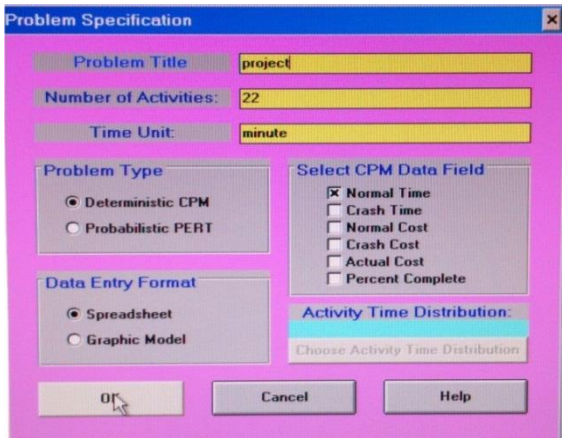

Fig. 1: Win QSP Program

1.1 Solve the problem using the program (WIN QSB)

Based on the study of the problem and to reach accurate results in calculating the times for the activities and determining the critical path and its time, the program (WIN QSB) was used, which contains a package of ready-made programs, one of which is a program for network diagrams (CPM-PERT), which was used in planning maintenance operations. After opening the program window and entering the data of the basic works (activities) for maintaining the machine under study shown in (Table 2), which shows the activities code, previous activities and the usual time. The time calculations for the activities were obtained as shown in Table (3), and the critical path and its time were determined as shown in Table (4).

Table2: symbols of activities, previous activities, and the usual time

Activity number	Activity name	Immediate predecessor (list number/name, separated by ',')	Normal time
1	A		5
2	B	A	15
3	C	A	15
4	D	B,C	30
5	E	D	30
6	F	D	20
7	G	E,F	20
8	H	G	30
9	I	G	20
10	J	H,I	30
11	K	J	30
12	L	J	30
13	M	K,L	15
14	N	K,L	60
15	O	M,N	45
16	P	M,N	30
17	Q	O,P	30
18	R	O,P	30
19	S	Q,R	30
20	T	Q,R	45
21	U	S,T	180
22	V	U	120

Table3: Calculating times for activities

-10-02 2012 04:39:05	Activity name	On Critical Path	Activity Time	Earliest start	Earliest finish	Latest star	Latest finish	Slack (LS-ES)
1	A	5	5	0	5	0	5	0
2	B	15	15	5	20	5	20	0
3	C	15	15	5	20	5	20	0
4	D	30	30	20	50	20	50	0
5	E	30	30	50	80	50	80	0
6	F	20	20	50	70	60	80	10
7	G	20	20	80	100	80	100	0
8	H	30	30	100	130	100	130	0
9	I	20	20	100	120	110	130	10
10	J	30	30	130	160	130	160	0
11	K	30	30	160	190	160	190	0
12	L	30	30	160	190	160	190	0
13	M	15	15	190	205	235	250	45
14	N	60	60	19	25	19	25	0

				0	0	0	0	
15	O	45	45	250	295	250	295	0
16	P	30	30	250	280	265	295	15
17	Q	30	30	295	325	295	325	0
18	R	30	30	295	325	295	325	0
19	S	30	30	325	355	340	370	15
20	T	45	45	325	370	325	370	0
21	U	180	180	370	550	370	550	0
22	V	120	120	550	670	550	670	0
	project	completion	Time	-	670	minutes		
	number of	critical	Paths	-	8			

Table3: Determine the critical path and its time

-04-10 2012	CP 1	CP 2	CP 3	CP 4	CP 5	CP 6	CP 7	CP 8
1	A	A	A	A	A	A	A	A
2	B	B	B	B	C	C	C	C
3	D	D	D	D	D	D	D	D
4	E	E	E	E	E	E	E	E
5	G	G	G	G	G	G	G	G
6	H	H	H	H	H	H	H	H
7	J	J	J	J	J	J	J	J
8	K	K	L	L	K	K	L	L
9	N	N	N	N	N	N	N	N
10	O	O	O	O	O	O	O	O
11	Q	R	Q	R	Q	R	Q	R
12	T	T	T	T	T	T	T	T
13	U	U	U	U	U	U	U	U
14	V	V	V	V	V	V	V	V
Completion Time	670	670	670	670	670	670	670	670

Conclusion

We review the most important conclusions reached by this study, depending on the theoretical side and the applied side:

1. Through the study and practical application of the critical path method for planning maintenance work in the factory, it was found that it is possible to reduce the time taken to perform maintenance work on the machine from (24 hours - 11.17 hours) and thus increase production in the factory.
2. The study provided a scientific example of the effectiveness of the critical path method as one of the scientific methods for planning maintenance work in the factory.
3. Despite the good results obtained through the application of the critical path method for planning maintenance work in the factory, it remains very sensitive to the accuracy of the information and data provided by the factory.
4. Non-application of scientific methods in planning maintenance in the factory has led to an increase in the time spent on preventive maintenance, and thus an increase in costs.
5. The study that was carried out reinforced the hypothesis, which was adopted in the methodology of the study, which states that (there is a weakness in the efficiency of planning maintenance work in the factory, including through the application of scientific methods in planning and scheduling maintenance work, making use of it, and suggesting the best method)

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