Chapter 02, Simulation Examples in a Spreadsheet
Example 09: Replacing Bearings in a Milling Machine

Table 22 Distribution for Bearing Life

Distribution of Bearing-Life

Bearing Life	Probability	Cumulative Probability
1000	0.100	0.100
1100	0.130	0.230
1200	0.250	0.480
1300	0.130	0.610
1400	0.090	0.700
1500	0.120	0.820
1600	0.020	0.840
1700	0.060	0.900
1800	0.050	0.950
1900	0.050	1.000

Table 23 Distribution of Delay until Mechanic Arrives

Distribution of Delay Time

Delay Time	Proability	Cumulative Probability
5	0.600	0.600
10	0.300	0.900
15	0.100	1.000

Bearing 1				Bearing 2				Bearing 3			
Step	Random#	Life (Hours)	Delay (minutes)	Step	Random#	Life (Hours)	Delay (minutes)	Step	Random#	Life (Hours)	Delay (minutes)
1	0.674	1400	10	1	0.265	1200	5	1	0.749	1500	10
2	0.842	1700	10	2	0.724	1500	10	2	0.869	1700	10
3	0.597	1300	5	3	0.281	1200	5	3	0.521	1300	5
4	0.158	1100	5	4	0.068	1000	5	4	0.686	1400	10
5	0.663	1400	10	5	0.344	1200	5	5	0.899	1700	10
6	0.873	1700	10	6	0.506	1300	5	6	0.691	1400	10
7	0.760	1500	10	7	0.162	1100	5	7	0.048	1000	5
8	0.557	1300	5	8	0.371	1200	5	8	0.802	1500	10
9	0.897	1700	10	9	0.738	1500	10	9	0.295	1200	5
10	0.172	1100	5	10	0.711	1500	10	10	0.146	1100	5
11	0.085	1000	5	11	0.522	1300	5	11	0.424	1200	5
12	0.191	1100	5	12	0.786	1500	10	12	0.694	1400	10
13	0.399	1200	5	13	0.979	1900	15	13	0.819	1500	10
14	0.403	1200	5	14	0.440	1200	5	14	0.283	1200	5
15	0.778	1500	10	15	0.031	1000	5	15	0.876	1700	10
TOTAL		20200	110			19600	105			20800	120

Costs of Bearing= $ 32.00 per bearing

Downtime cost= $ 10.00 per minute

Mechanic cost= $ 30.00 per hour $ 0.50 per min

Replacement Time by Mechanic

1 Bearing 20 minute

2 Bearing 30 minute

3 Bearing 40 minute

The total life of all 45 bearings is = 60600

Hours / 10,000 Bearings = 6.060

The Total cost per 10,000 bearing - Hours is = $ 2,349.83

For Single Trial of the simulation, the cost of the current system is estimated as follows:

Cost of Bearing = $ 1,440.00

Cost of delay time = $ 3,350.00

Cost of downtime during repair = $ 9,000.00

Cost of Mechanics = $ 450.00

Total Cost = $ 14,240.00