**Probability of success RTY = Y1 \* Y2 \* Y3 Rolled throughput yield / pass yield**

**Probability of a defect** = p = 1-Y = 1 - RTY

RTY = cumulative calculation of yield through multiple steps = 1 – probability of a defect = = 1- e –DPU

Total Defects per UNIT DPU = D **= - Ln ( RTY)**

**U**

Defects per unit OPPORTUNITY DPO = DPU = D **Defects per million MDPO = D / ( U \* O ) \* 1,000,000**

O U \* O

Determine the yield Y = e –DPU probability of defect free (yield) if DPU < 10%

The first pass yield for an operation is 95%

Probability of a defect 1 - 95% = 5% => Z = 1.645 (Z long term or Z equivalent)

Z short term = 1.645 + 1.5 = 3.145

Information of 100 units

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| DEFECTS | 0 | 1 | 2 | 3 | 4 | 5 |
| UNITS | 70 | 20 | 5 | 4 | 0 | 1 |

DPU = D = 0\*70 + 1\*20 + 2\*5 + 3\*4 + 4\*0 + 5\*1 = 47 = 0.47 We expect 0.47 **defects per unit**

U 100 100

If we have 6 opportunities for a defect DPO = 0.47 / 6 = 0.078 **MDPO = 78,333**

Throughput yield is determined by 1.00 –DPU = 1 – 0.47 => **RTY** = 53%

**RTY** = P ( X=0) = e – DPU = e – (0.47 ) = 62.5 % it is different from 53% because DPU is higher than 10%, the correct is 53%

1,000 units were examined for the possibility of 5 different defects. A total of 80 defects were found. How many defects would be expected in a million opportunities

**DPO = D**  = 80 = 0.016 DPMO = 16,000 Defects found = DPU .

**U x O** 1000 x 5 Units x Opportunities per unit Opportunities per unit

**In a sample of 5000 orders, 400 errors are found in 100 orders. DPMO is** *20,000*

O = No. Defects / Sample size



A process made 6 units, inspection found 8 defects in this process RTY? DPU = 8/6 = 1.33 ; **RTY = e-dpu = 0.264**

The p bar for a p chart is 0.00265, so DPMO = 2,650.

**Process is expected to be successful in 99.99966%. If the number of steps is 150,000 then,** Overall yield = (0.9999966)150,000 = 60.05%.

If a process is producing 80 defectives/million (**MDPO** = 80), what would be the 6 sigma quality level?



Using 6 sigma methodology, a company would have rate of: 5.3



DPU = D / U suppose DPU = 0.4495 then Z equiv (from Z table ) = 1.64

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Using Z table** | **ppm Using Table “S”** | **Close to** |
| Long term LT | Z LT = Z equiv = 1.64 | 440,000 | Close to Sigma 1.5 = 501,349 |
| Short term ST | Z ST = 1.5 + Z equiv = 2.14 | 274,412 | Close to Sigma 2 = 308,770 |



**Defects per normalized unit - Ln ( Y norm)**

Poisson P(x) = e – DPU DPU X DPU = D .

X ! U \* O

6 defects in 283 units, probability of units without any defect?

RTY = P ( X=0) = e – DPU = e – ( 6 / 283 ) = e – 0. 021 = 98% RTY = 1 – 0.021 = 98% (same number because DPU < 10%)

**Present value of $2,000.00 to be paid in 10 years interest rate of 7%?**

PV = FV/(1+I)n = $2,000/(1+0.07)10 = $1,017.00