Gestão da Produção e Operações
2º Semestre 2020/2021

FORMULÁRIO

Gestão de Stocks

EOQ

$Q = \sqrt{\frac{2DS}{H}}$; N = D/Q ; ROP = d × L

$$TC = \frac{Q}{2} \times H + \frac{D}{Q} \times S + P \times D$$

POQ

$$Q = \sqrt{\frac{2DS}{H(1-\frac{d}{p})}}$$

$$TC = \frac{Q}{2}\left(1 - \frac{d}{p}\right) \times H + \frac{D}{Q} \times S + P \times D$$

$t_p = t_1 = \frac{Q}{p}$ $T = \frac{Q}{D}$ $I_{máx} = M = Q(1 - \frac{d}{p})$

Modelos probabilísticos

$$SS = Z_\alpha \sigma_{dLT}$$

$$ROP = \mu_{LT} \times \mu_d + SS$$

$$ROP = LT \times \mu_d + SS$$

$$ROP = \mu_{LT} \times d + SS$$

$$\alpha = P(X > ROP) = \text{probabilidade de ruptura}$$

$$TC = \left(\frac{Q}{2} + SS\right) \times H + \frac{D}{Q} \times S + P \times D$$

$$\sigma_{dLT} = \sqrt{\mu_d^2 \times \sigma_{LT}^2 + \mu_{LT} \times \sigma_d^2}$$

$$\sigma_{dLT} = \sqrt{LT} \times \sigma_d$$

$$\sigma_{dLT} = \sqrt{d^2 \times \sigma_{LT}^2}$$

Gestão de projetos

EF = ES + duração da actividade

LS = LF – duração da actividade

Folga = LS – ES = LF– EF

Custo de esmagamento por período de tempo = Crash cost per period = $\frac{CC - NC}{NT - CT}$

Duração esperada = t = $\frac{a + 4m + b}{6}$

Variância da duração = $\left[\frac{(b-a)}{6}\right]^2$

Modelos de Filas de Espera

$$L_q = \lambda \times W_q \;;\; L_S = \lambda \times W_S;\;\; L_S = L_q + \lambda/\mu;\;\; W_S = W_q + 1/\mu$$

M/M/1

$$L_q = \frac{\lambda^2}{\mu(\mu-\lambda)};\; L_S = \frac{\lambda}{\mu-\lambda}$$

$$W_q = \frac{\lambda}{\mu(\mu-\lambda)};$$

$$\rho = \frac{\lambda}{\mu};\quad P_0 = 1 - \rho \qquad P_n = P_0 \times \left(\frac{\lambda}{\mu}\right)^n$$

$$W_S = \frac{1}{\mu-\lambda}$$

$$P(n > k) = \rho^{k+1}$$

M/M/S

$$P_0 = \frac{1}{\left[\sum_{n=0}^{S-1}\frac{1}{n!}\left(\frac{\lambda}{\mu}\right)^n\right] + \frac{(\lambda/\mu)^S}{S!} \times \frac{S\mu}{S\mu-\lambda}} \; (S\mu>\lambda) \qquad Lq = \frac{\lambda\times\mu\times\left(\frac{\lambda}{\mu}\right)^S}{(S-1)!(S\mu-\lambda)^2} P_0$$

$$\rho = \frac{\lambda}{S\mu}$$

$$P_n = \frac{\left(\frac{\lambda}{\mu}\right)^n}{n!} P_0 \;\; (n \le S) \qquad P_n = \frac{\left(\frac{\lambda}{\mu}\right)^n}{S!\,S^{n-S}} P_0 \;\; (n > S)$$

M/D/1

$$L_q = \frac{\lambda^2}{2\mu(\mu-\lambda)}; \qquad W_q = \frac{\lambda}{2\mu(\mu-\lambda)}; \qquad \rho = \frac{\lambda}{\mu}$$

M/M/1/N- População finita

$$\bar{\lambda} = \sum_{n=0}^{N-1}(N-n)\lambda P_n = \lambda(N-L) \qquad L = L_q + \frac{\bar{\lambda}}{\mu}$$

$$L_q = \sum_{n=1}^{\infty}(n-1)P_n = N - \frac{\lambda+\mu}{\lambda}(1-P_0) \qquad W = W_q + \frac{1}{\mu} = \frac{L}{\bar{\lambda}}$$

$$P_0 = 1/\sum_{n=0}^{N}\left[\frac{N!}{(N-n)!} \times \left(\frac{\lambda}{\mu}\right)^n\right]$$

$$P_n = \begin{cases} \frac{N!}{(N-n)!} \times \left(\frac{\lambda}{\mu}\right)^n \times P_0 & se\;\; n = 1,2,3 \ldots\ldots N \\ 0 & se\; n > N \end{cases}$$

M/M/S/N

$$\bar{\lambda} = \sum_{n=0}^{N-1}(N-n)\lambda P_n = \lambda(N-L)$$

$$\rho = \frac{\bar{\lambda}}{s\mu}$$

$$L_q = \sum_{n=s}^{N}(n-S)P_n$$

$$P_0 = \frac{1}{\left[\sum_{n=0}^{S-1}\left[\frac{N!}{(N-n)!\,n!}\times\left(\frac{\lambda}{\mu}\right)^n\right]\right]+\left[\sum_{n=S}^{N}\left[\frac{N!}{(N-n)!\,S!\,S^{n-S}}\times\left(\frac{\lambda}{\mu}\right)^n\right]\right]}$$

$$P_n = \begin{cases} \frac{N!}{(N-n)!\,n!}\times\left(\frac{\lambda}{\mu}\right)^n \times P_0, & se\ \ n = 1, \ldots\ldots S \\ \frac{N!}{(N-n)!\,S!\,S^{n-S}}\times\left(\frac{\lambda}{\mu}\right)^n \times P_0, & se\ \ n = S, \ldots\ldots N \\ 0, & se\ \ n > N \end{cases}$$

$$L = L_q + \frac{\bar{\lambda}}{\mu}$$

$$W = W_q + \frac{1}{\mu} = \frac{L}{\bar{\lambda}}$$

Sequenciamento

CR = $\frac{Data\ prometida - Data\ actual}{Número\ de\ dias\ de\ trabalho}$

Utilização = $\frac{Tempo\ total\ de\ trabalho}{Soma\ \ flow\ time}$

Tempo médio de conclusão = $\frac{Soma\ Flow\ Time}{Número\ \ de\ \ trabalhos}$

Atraso médio = $\frac{Tempo\ total\ em\ atraso}{Número\ de\ trabalhos}$

Número médio de trabalhos no sistema = $\frac{Soma\ \ flow\ \ time}{Tempo\ total\ de\ trabalho}$

Controlo Estatístico do Processo

$LSC_{\bar{X}} = \bar{\bar{X}} + A_2 \times \bar{R}$ $LIC_{\bar{X}} = \bar{\bar{X}} - A_2 \times \bar{R}$ $LC_{\bar{X}} = \bar{\bar{X}}$ $LSC_R = D_4 \times \bar{R}$ $LIC_R = D_3 \times \bar{R}$ $LC_R = \bar{R}$ $C_{pk} = \min(C_{pki}; C_{pks})$ $C_p = \frac{LSE - LIE}{6 \times \sigma}$ $C_{pki} = \frac{\mu - LIE}{3 \times \sigma}\ \ e\ \ C_{pks} = \frac{LSE - \mu}{3 \times \sigma}$	$LSC_c = \bar{c} + 3 \times \sqrt{\bar{c}}$ $LIC_c = \bar{c} - 3 \times \sqrt{\bar{c}}$ $LC_c = \bar{c}$ $LSC_p = \bar{p} + 3 \times \sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$ $LIC_p = \bar{p} - 3 \times \sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$ $LC_p = \bar{p}$

Gestão da Capacidade e das Restrições

$$\text{Utilização da capacidade} = \frac{\text{Output atual}}{\text{Capacidade desenhada}}$$

$$\text{Eficiência} = \frac{\text{Output atual}}{\text{Capacidade efetiva}}$$

$$\text{Capacidade} = \frac{1}{\text{Tempo de ciclo}}$$