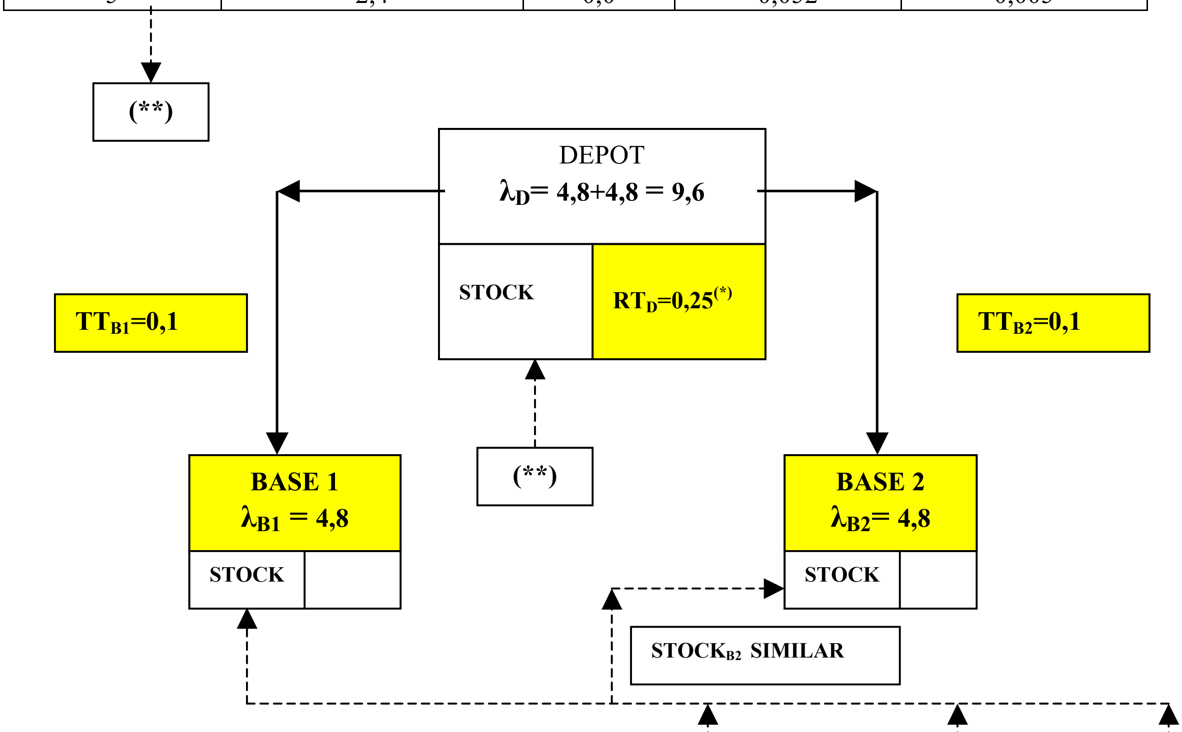
$STOCK_D$	PIPELINE= $\lambda_D \times RT_D$	BO_D	EBO_D	EBO_D/λ_D (time)
0	2,4	2,4	2,400	0,250
1	2,4	1,4	1,491	0,155
2	2,4	0,4	0,799	0,083
3	2,4	0,0	0,369	0,038
4	2,4	0,0	0,148	0,015
5	2,4	0,0	0,052	0,005



(*) Includes transit time from base to depot.

$STOCK_D$	$\lambda_{B1} \times TAT_{B1}$	$\lambda_{B1}(EBO_D/\lambda_D)$	$PIPELINE_{B1}$	$STOCK_{B1} = 0$	$STOCK_{B1} = 1$	$STOCK_{B1} = 2$
0	0,48	1,200	1,680	**EBO_{B1} =1,680**	**EBO_{B1} =0,866**	**EBO_{B1} =0,366**
1	0,48	0,745	1,225	**EBO_{B1} =1,225**	**EBO_{B1} =0,519**	**EBO_{B1} =0,172**
2	0,48	0,400	0,880	**EBO_{B1} =0,880**	**EBO_{B1} =0,295**	**EBO_{B1} =0,075**
3	0,48	0,184	0,664	**EBO_{B1} =0,664**	**EBO_{B1} =0,179**	**EBO_{B1} =0,035**
4	0,48	0,074	0,554	**EBO_{B1} =0,554**	**EBO_{B1} =0,129**	**EBO_{B1} =0,022**
5	0,48	0,026	0,506	**EBO_{B1} =0,506**	**EBO_{B1} =0,109**	**EBO_{B1} =0,017**

$STOCK_D$	$STOCK_{B1}$	$STOCK_{B2}$	EBO_D	EBO_{B1}	EBO_{B2}	COST	EBO	ORDER
0	0	0	2,400	1,680	1,680	0p	5,760	
0	0	1	2,400	1,680	0,866	1p	4,946	
0	0	2	2,400	1,680	0,366	2p	4,446	
0	1	0	2,400	0,866	1,680	1p	4,946	
0	1	1	2,400	0,866	0,866	2p	4,132	
0	1	2	2,400	0,866	0,366	3p	3,632	
0	2	0	2,400	0,366	1,680	2p	4,446	
0	2	1	2,400	0,366	0,866	3p	3,632	
0	2	2	2,400	0,366	0,366	4p	3,132	
1	0	0	1,491	1,225	1,225	1p	3,941	
1	0	1	1,491	1,225	0,519	2p	3,235	
1	0	2	1,491	1,225	0,172	3p	2,888	
1	1	0	1,491	0,519	1,225	2p	3,235	
1	1	1	1,491	0,519	0,519	3p	2,529	
1	1	2	1,491	0,519	0,172	4p	2,182	

METRIC EXAMPLE (JFUKUDA APRIL2007)

ORD	DEPOT QTY	BASE1 QTY	BASE2 QTY	DEPOT EBO	BASE1 EBO	BASE2 EBO	COST	TOTAL EBO
1	0	0	0	2,400	1,680	1,680	**0**	**5,760**
2	0	0	1	2,400	1,680	0,866	1	4,946
4	0	1	0	2,400	0,866	1,680	1	4,946
10	1	0	0	1,491	1,225	1,225	**1**	**3,941**
3	0	0	2	2,400	1,680	0,366	2	4,446
7	0	2	0	2,400	0,366	1,680	2	4,446
5	0	1	1	2,400	0,866	0,866	2	4,132
13	1	1	0	1,491	0,519	1,225	2	3,235
11	1	0	1	1,491	1,225	0,516	2	3,232
19	2	0	0	0,799	0,880	0,880	**2**	**2,559**
6	0	1	2	2,400	0,866	0,366	3	3,632
8	0	2	1	2,400	0,366	0,866	3	3,632
12	1	0	2	1,491	1,225	0,172	3	2,888
16	1	2	0	1,491	0,172	1,225	3	2,888
14	1	1	1	1,491	0,519	0,516	3	2,526
22	2	1	0	0,799	0,295	0,880	3	1,974
20	2	0	1	0,799	0,880	0,295	3	1,974
28	3	0	0	0,369	0,664	0,664	**3**	**1,697**
9	0	2	2	2,400	0,366	0,366	4	3,132
15	1	1	2	1,491	0,519	0,172	4	2,182
17	1	2	1	1,491	0,172	0,516	4	2,179
21	2	0	2	0,799	0,880	0,075	4	1,754
25	2	2	0	0,799	0,075	0,880	4	1,754
23	2	1	1	0,799	0,295	0,295	4	1,389
37	4	0	0	0,148	0,554	0,554	4	1,256
31	3	1	0	0,369	0,179	0,664	**4**	**1,212**
29	3	0	1	0,369	0,664	0,179	**4**	**1,212**
18	1	2	2	1,491	0,172	0,172	5	1,835
24	2	1	2	0,799	0,295	0,075	5	1,169
26	2	2	1	0,799	0,075	0,295	5	1,169
34	3	2	0	0,369	0,035	0,664	5	1,068
30	3	0	2	0,369	0,664	0,035	5	1,068
46	5	0	0	0,052	0,506	0,506	5	1,064
38	4	0	1	0,148	0,554	0,129	5	0,831
40	4	1	0	0,148	0,129	0,554	5	0,831
32	3	1	1	0,369	0,179	0,179	**5**	**0,727**
27	2	2	2	0,799	0,075	0,075	6	0,949
39	4	0	2	0,148	0,554	0,022	6	0,724
43	4	2	0	0,148	0,022	0,554	6	0,724
47	5	0	1	0,052	0,506	0,109	6	0,667
49	5	1	0	0,052	0,109	0,506	6	0,667
33	3	1	2	0,369	0,179	0,035	6	0,583
35	3	2	1	0,369	0,035	0,179	6	0,583
41	4	1	1	0,148	0,129	0,129	**6**	**0,406**
48	5	0	2	0,052	0,506	0,017	7	0,575
52	5	2	0	0,052	0,017	0,506	7	0,575
36	3	2	2	0,369	0,035	0,035	7	0,439
42	4	1	2	0,148	0,129	0,022	7	0,299
44	4	2	1	0,148	0,022	0,129	7	0,299
50	5	1	1	0,052	0,109	0,109	**7**	**0,270**
45	4	2	2	0,148	0,022	0,022	8	0,192
51	5	1	2	0,052	0,109	0,017	**8**	**0,178**
53	5	2	1	0,052	0,017	0,109	**8**	**0,178**
54	5	2	2	0,052	0,017	0,017	**9**	**0,086**

EBO CALCULATION (Ref.: Diaz & Fu, Becker)

$$EBO = \sum_{k=s+1}^{\infty} (k-s) * POISSON(k, mean)$$ (definition expression)

$$E\left[B(s)\right] = E\left[B(s-1)\right] - \sum_{k=s}^{\infty} POISSON\ (k, mean\ )$$ or

$$E\left[B(s)\right] = E\left[B(s-1)\right] - \left[1 - \sum_{k=0}^{s-1} POISSON\,(k, mean)\right]$$ (recursive expression)

$$EBO\ = PL * POISSON\ (s, PL, FALSE\ ) + (PL - s) * \left[1 - POISSON\ (s, PL, TRUE)\right]$$ (general expression)

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Recursive expression deduction for Poisson distribution:

$$E\left[B(s)\right] = \sum_{k=s+1}^{\infty}(k-s)*POISSON(k,mean) =$$

$$= POISSON(k=s+1,mean) + \sum_{k=s+2}^{\infty}(k-s)*POISSON(k,mean)$$

$$E\left[B(s+1)\right] = \sum_{k=s+2}^{\infty}(k-s-1)*POISSON(k,mean) =$$

$$= \sum_{k=s+2}^{\infty}(k-s)*POISSON(k,mean) - \sum_{k=s+2}^{\infty}POISSON(k,mean)$$

$$E\left[B(s+1)\right] = E\left[B(s)\right] - POISSON(k=s+1,mean) - \sum_{k=s+2}^{\infty}POISSON(k,mean) =$$

$$= E\left[B(s)\right] - \sum_{k=s+1}^{\infty}POISSON(k,mean) =$$

$$= E\left[B(s)\right] - (1 - \sum_{k=0}^{s}POISSON(k,mean))$$

$$\boxed{E\left[B(s+1)\right] = E\left[B(s)\right] - \left(1 - POISSON\left(s;mean;TRUE\right)\right)}$$

(MS Excel notation)

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Recursive expression deduction for general distribution:

$$E[B(s)] = \sum_{k=s+1}^{\infty}(k-s)*P(k,mean,\mathrm{var})$$

$$E[B(s)] = 1*P(s+1,mean,\mathrm{var}) + 2*P(s+2,mean,\mathrm{var}) + 3*P(s+3,mean,\mathrm{var}) + \ldots$$

$$E[B(s+1)] = \sum_{k=(s+1)+1}^{\infty}(k-(s+1))*P(k,mean,\mathrm{var}) =$$
$$= 1*P(s+2,mean,\mathrm{var}) + 2*P(s+3,mean,\mathrm{var}) + 3*P(s+4,mean,\mathrm{var}) + 4*P(s+5,mean,\mathrm{var}) + \ldots$$

$$E[B(s)] - E[B(s+1)] = 1*P(s+1,mean,\mathrm{var}) + 1*P(s+2,mean,\mathrm{var}) + 1*P(s+3,mean,\mathrm{var}) + \ldots$$

$$E[B(s)] - E[B(s+1)] = \sum_{k=s+1}^{\infty}P(k,mean,\mathrm{var}) \Rightarrow E[B(s+1)] = E[B(s)] - \sum_{k=s+1}^{\infty}P(k,mean,\mathrm{var})$$

$$\boxed{E[B(s+1)] = E[B(s)] - \left(1 - \sum_{k=0}^{s}P(k,mean,\mathrm{var})\right)}$$

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General expression deduction (of EBO with Poisson distribution)

$$EBO(s)=\sum_{k=s+1}^{\infty}(k-s)*Poisson(k,pipeline)=$$

$$=\sum_{k=s+1}^{\infty}k*Poisson(k,pipeline)-s*\sum_{k=s+1}^{\infty}Poisson(k,pipeline)=$$

$$=\sum_{k=s+1}^{\infty}k*Poisson(k,PL)-s\left[1-PoissonAc\left(s,PL\right)\right]$$

$$\sum_{k=s+1}^{\infty}k*Poisson(k,PL)=(s+1)\frac{PL^{s+1}}{(s+1)!}e^{-PL}+(s+2)\frac{PL^{s+2}}{(s+2)!}e^{-PL}+(s+3)\frac{PL^{s+3}}{(s+3)!}e^{-PL}+...=$$

$$=PL*e^{-PL}\left[\frac{PL^{s}}{s!}+\frac{PL^{s+1}}{(s+1)!}+\frac{PL^{s+2}}{(s+2)!}+\frac{PL^{s+3}}{(s+3)!}+\frac{PL^{s+4}}{(s+4)!}+\frac{PL^{s+5}}{(s+5)!}+...\right]=$$

$$=PL\left[1-PoissonAc(s-1,PL)\right]=PL\left\{1-\left[PoissonAc(s,PL)-Poisson(s,PL)\right]\right\}$$

$$EBO(s)=PL\left[1-PoissonAc(s,PL)+Poisson(s,PL)\right]-s\left[1-PoissonAc(s,PL)\right]=PL\left[1-PoissonAc(s,PL)\right]+PL*Poisson(s,PL)-s\left[1-PoissonAc(s,PL)\right]$$

$$\boxed{EBO(s)=PL*Poisson(s,PL)+(PL-s)\left[1-PoissonAc(s,PL)\right]}$$

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