

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



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دانشجو تأیید می نماید که مطالب مندرج در این رساله نتیجه تحقیقات خودش می باشد و در صورت استفاده از نتایج دیگران مرجع آن را ذکر نموده است.

کلیه حقوق مادی مترتب از نتایج مطالعات ، آزمایشات و نوآوری ناشی از تحقیق موضوع این رساله متعلق به دانشگاه صنعتی شاهرود می باشد .

اسفند ۱۳۸۷

قله کرامت انسانی،
باب العلم
امام علی (ع)

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.($R^2 = 0.997$)

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فصل اول

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¹ Tumbling Mills
² Chipping
³ Charge

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فصل دوم

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Auto-genous

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. (Jones, Stuart M, 1997)

¹ (Full) Autogenous Mill

² Semiautogenous Mill

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.(Robinson, Bertrand, 1981)

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.(Weiss, Norman, 1985)

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.(Weiss, Norman, 1985)

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.(Hardinge, Harlowe,1985) (-)

¹ Tumbling Mills

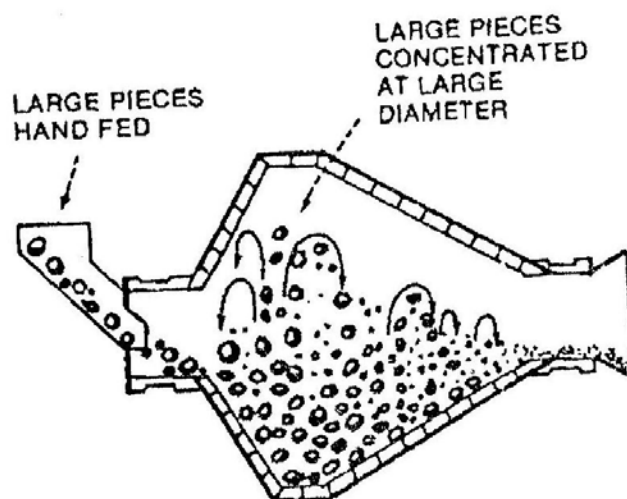
² Chert

³ Flint

⁴ Kenneth L. Graham

⁵ Harlowe Hardinge

⁶ American Institute of Mining and Metallurgical Engineers: AIME



(Jones, Stuart, 1987)

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(Weiss, Norman, 1985)

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(Weiss, Norman, 1985)

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¹ Alvah Denton Hadsel
² B.C.Crocker

(Weiss, Norman, 1985).

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(Napier-Munn,)

(et.al.,1996).

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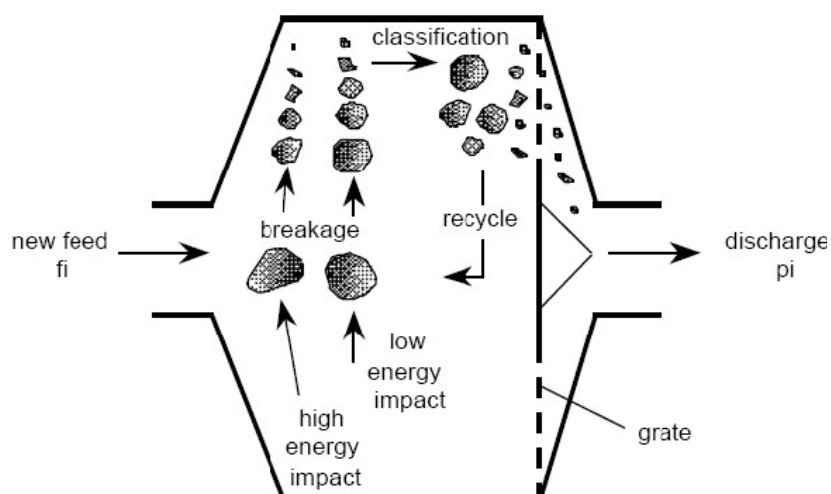
(Napier-Munn, et.al.,1996).

(Morrell, 1992).

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(Napier-Munn, et.al.,1996)

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$$p_i = f_i + \sum_{j=1}^i r_j s_j a_{ij} - r_i s_i \quad (-)$$

$$p_i = d_i s_i \quad (-)$$

:

i : p_i

i : f_i

i : s_i

i : r_i

(, i , j) : a_{ij}

i : d_i

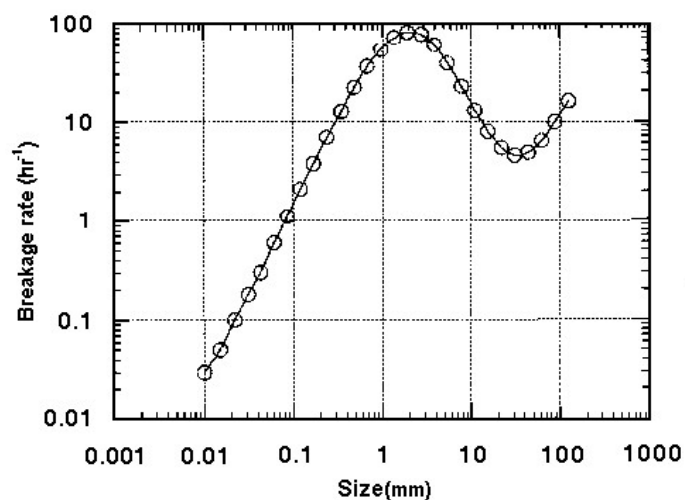
(Napier-Munn, et.al.,1996)

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(Morrell, Morrison, 1996)



(Leung, 1987)

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(Morrell, 1992).

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(Morrell, Morrison, 1989).

JKMRC

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¹ Stanley

² Gault

³ Duckworth

⁴ Leung

⁵ Julius Kruttschnitt Mineral Research Center

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(Morrell, Morrison, 1989).

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:(Napier-Munn, et.al.,1996)

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¹ Black box
² Fundamental

JKMRC

JKMRC

JKMRC

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¹ Morrell

² Shi

³ Stephenson

⁴ Morrison

⁵ Valery

⁶ Banini

⁷ Latchireddi

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(Delboni, Morrell, 2002):

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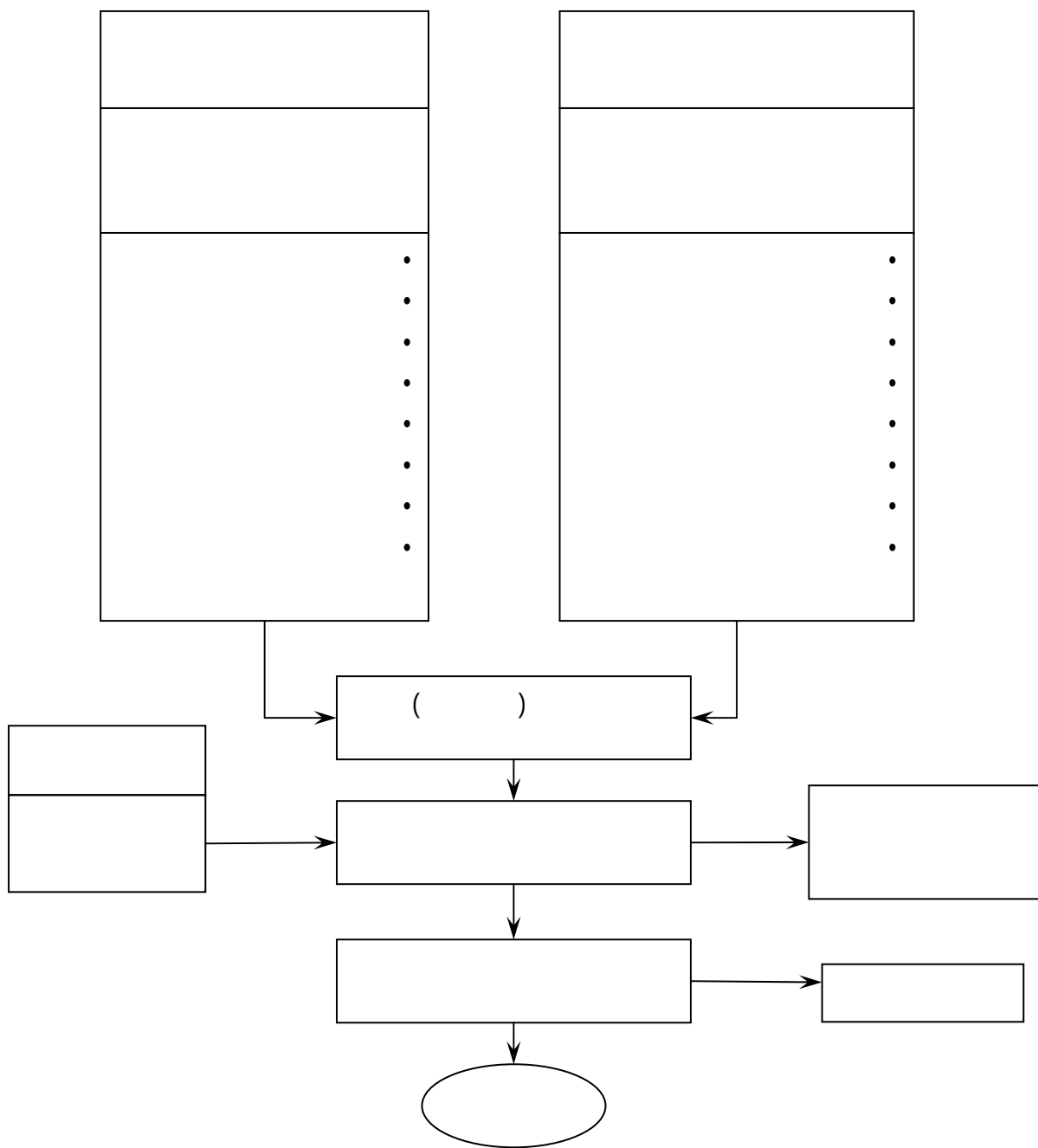
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(Delboni, Morrell, 2002)

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- (Barratt, 1989) (B_{wi}) •
- (Craig, 1996) •
- (Nordberg, 1998) •
- (Nordberg, 1998) •
- (Starkey, J., Dobby, G., 1996) (SPI) •

.

(Van Neiroop and Moys, 1997; Herbst and Pate, 1999, JKTech, 1994; Valery Jr. and Morrell, 1995; Napier-Munn et al., 1996; Valery Jr., 1998)

Fluor Metso Minerals FFE Minerals
 JKMRC Minproc Engineers Wright Daniel
 . USIMPAC ModSim JKSImMet

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¹ Bond Work Index
² SAG Power Index

- - -

(Austin, 1990)

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Durance, et.al.,)

USIM PAC 3.1

.(2006

$$P = 10.6 D^{2.5} L (1 - 1.03 J_C) \times \phi_C \left(1 - \frac{0.1}{2^{9-10\phi_C}} \right) \left[(1 - \phi) \left(\frac{\rho_R}{M_R} \right) J_C + 0.6 J_B \left(\rho_b - \frac{\rho_R}{M_R} \right) \right] \quad (-)$$

:

() :P

() :D

() :L

(%) :φ

() () :ρ_b

() :ρ_R

(%) + :M_R

(%) (+) :J_C

(%) :J_B

(%) () :φ_C

¹ L.G. Austin

- - -

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.(Barratt, 1979)

GRINDPOWER

$$P = 2\pi . N . \tau$$

(-)

:

() :P

() :N

:τ

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$$\tau = \frac{W . r_c . \sin \theta}{3403.5}$$

(-)

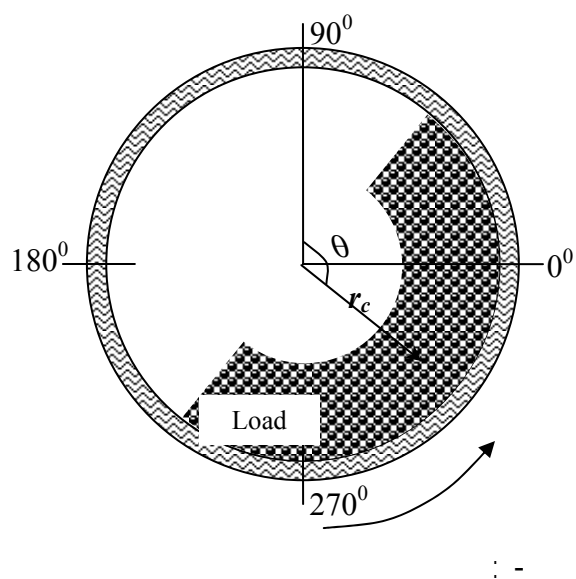
:

() :W

() :r_c

(-) :θ

¹ Barratt



$$P = \frac{2\pi \cdot N \cdot W \cdot r_c \cdot \sin \theta}{3403.5} \quad (-)$$

- - -

JK SimMet

JKMRC

(Morrison, Richardson, 2002)

.(Morrell, 1993)

· -

$$P_{(gross)} = P_{(no-Load)} + K \cdot D^{2.5} \cdot L_e \cdot \rho_c \cdot \alpha \cdot \delta \quad (-)$$

:

() P_{gross}

() $P_{no-Load}$

() D

() L_e

() ρ_c

α, δ

K

$$P_{(no-Load)} = 2.474.(D^{2.5}.L_e.N_c)^{0.861} \quad (-)$$

N_c

- / - $\delta \quad \alpha \quad K$

(Turner, 1982)

$$P_{(net)} = 2.208.\rho.D^{2.5}.L.N_c \quad (-)$$

¹ Turner

، - /

.(Loveday, 1997) (-)

$$P_{(net)} = P_N \cdot \rho_C \cdot D^{2.5} \cdot L \quad (-)$$

:

() : ρ_C

() : D

() : L

: P_N

K

-

$$\rho_C = \left[\frac{\% v/v \text{ balls}}{\% v/v \text{ total}} \times \rho(\text{balls}) + \frac{\% v/v \text{ ore}}{\% v/v \text{ total}} \times \rho(\text{ore}) \right] \times \left(1 - \frac{\% \text{ voids}}{100} \right) + \rho(\text{pulp}) \times \frac{\% \text{ voids}}{100} \quad (-)$$

P_N ، % v / v

$RPM_{Critical}$

:

¹ Loveday

$$RPM_{Critical} = \frac{60}{2\pi} \sqrt{\frac{g}{r_m}} \quad (-)$$

$$\phi_c$$

$$\phi_c = \frac{RPM}{RPM_{Critical}} \quad (-)$$

- - -

(Bond, 1952)

.(Barratt, 1989) -

.(King, 2001) MODSIM

$$E_{(SAG)} = [1.25(10WI_C.S_C + 10WI_R.S_R.k_r + 10WI_B.S_B.k_b)] - 10WI_B.S_B \quad (-)$$

:

$$() :E_{(SAG)}$$

$$:WI_{C,R,B}$$

$$((1/\sqrt{P}) - (1/\sqrt{F})) :S_{C,R,B}$$

.

$$:k_r$$

$$:K_b$$

¹ Bond

- - -

SPI

- *SPI* .

.(Starky, 1994)

$$P = (2.2 + 0.1 \text{ SPI}) . P_{80}^{-0.33} \quad (\quad - \quad)$$

() :*P*

:*SPI*

.() % :*P*₈₀

- - -

. (Sastri, Rao, 1997)

$$P_G = 2 \left[VD^{0.5} \right]^{0.8} + KV \rho_c D^{0.5} J_c^{0.8} \quad (\quad - \quad)$$

:

() :*P*_G

¹ Starkey
² SAG mill Power Index
³ Minnovex
⁴ Sastri

V : ()

D : ()

J_c : ()

ρ_c : ()

K : /

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Moly-Cop Tools

Hogg and Fuerstenau,)

.(1972

$$P_{net} = \eta P_{gross} = 0.238 D^{3.5} (L/D) N_c \rho_{ap} (J - 1.065 J^2) \sin \alpha$$
 (-)

:

P_{gross} : ()

P_{net} : ()

η : (%)

D : ()

L : ()

N_c : (%) ($N_{crit} = 76.6/D^{2.5}$)

J : ()

¹ Hogg and Fuerstenau

α :

ρ_{ap} :

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(Cleary, 1998)

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¹ Descrete Element method: DEM
² Lifter

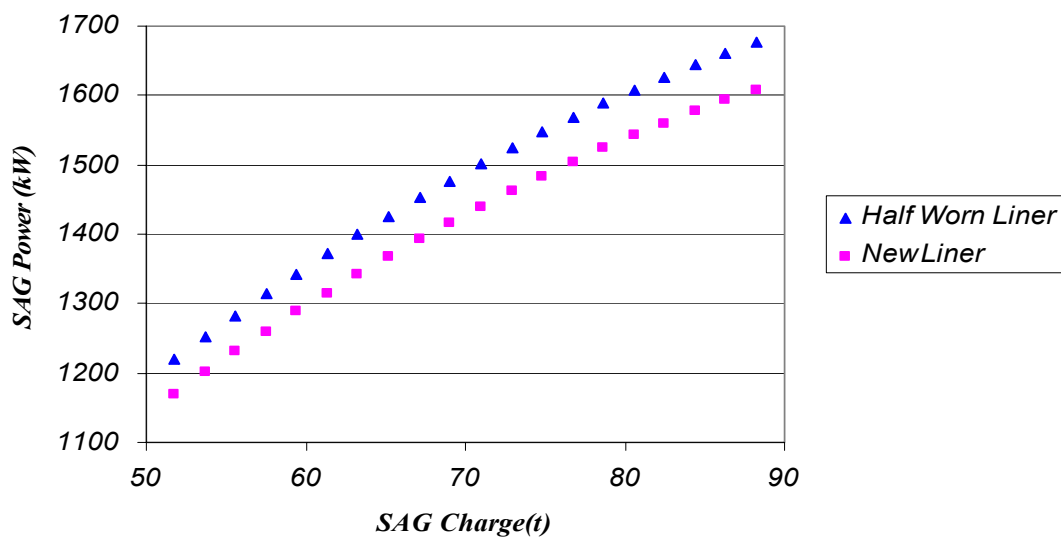
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		ModSim	
		Moly-Cop	
		GRINDPOWER	
		UsimPac	
		JKSimMet	(JK)
		Experimental	
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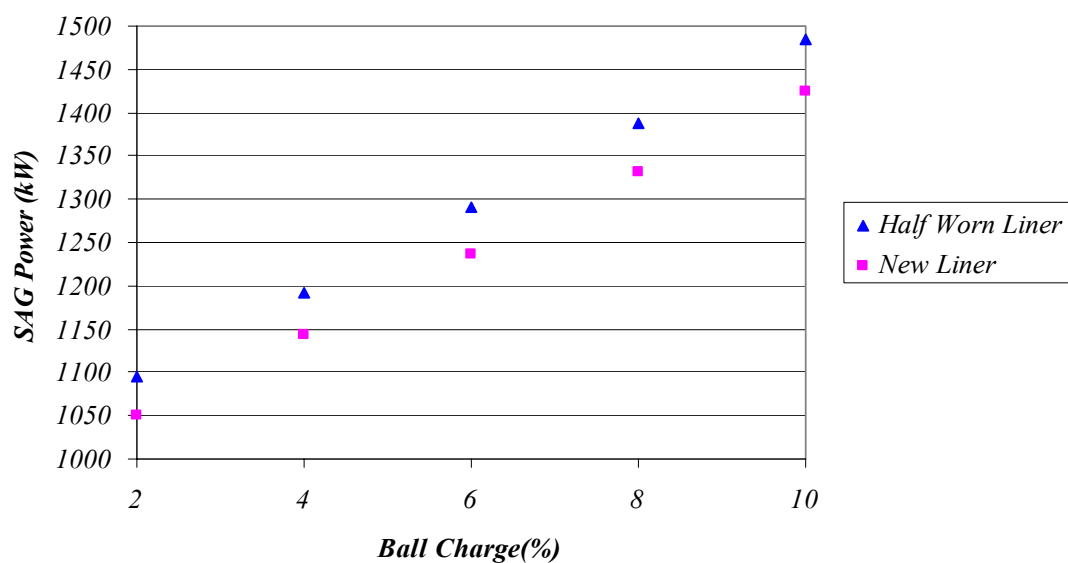
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(Fuerstenau, 1991).

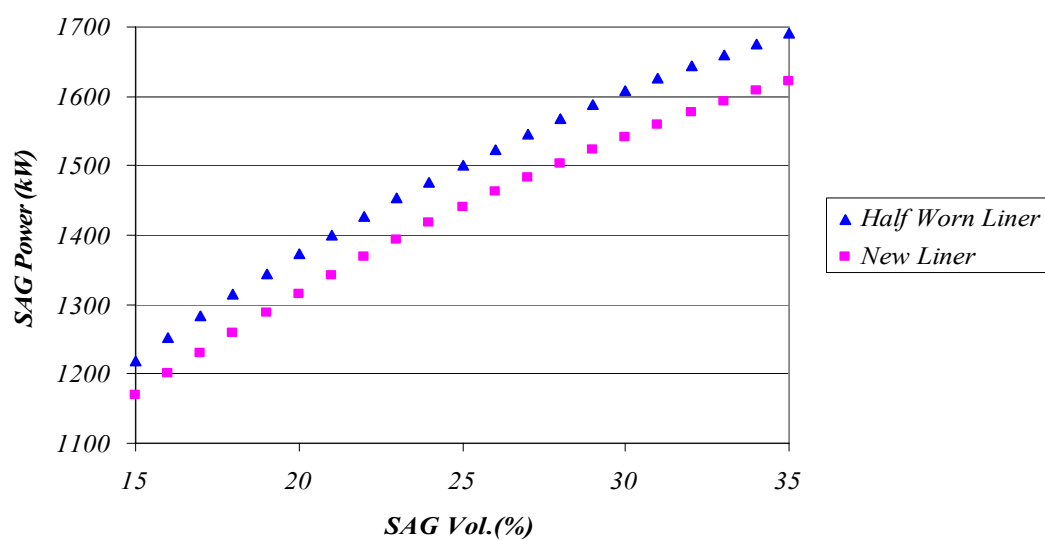
(Craig, Sams, 1996)



(Erickson, 1989)



(Erickson, 1989) : -

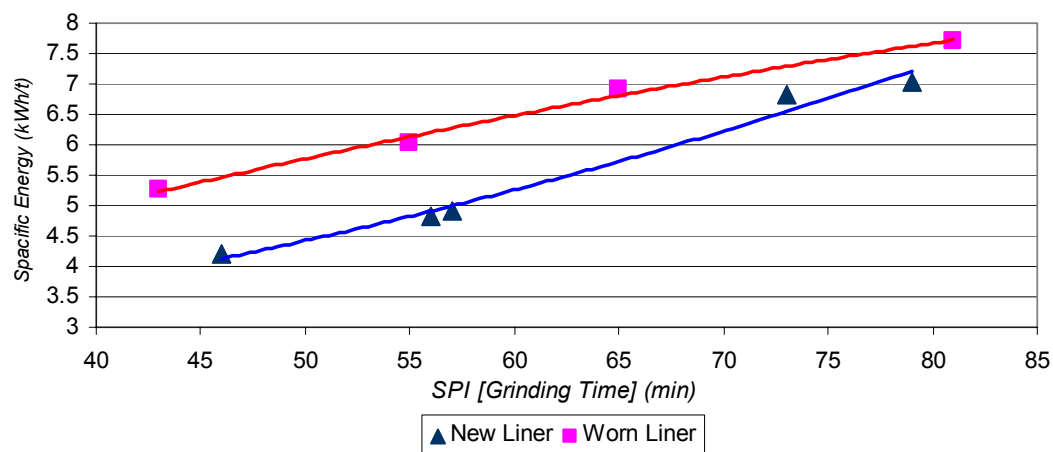


(Erickson, 1989) : -

(kWh/t) . (SPI)

.(Starkey, 1996) () %

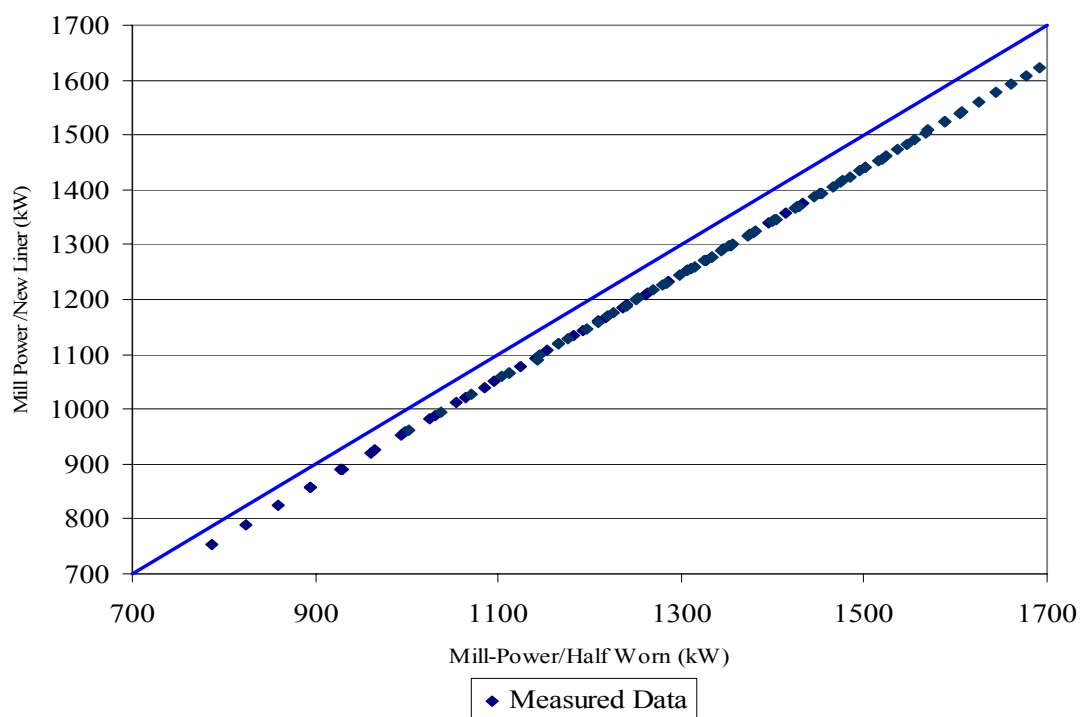
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(Paymard, 2007)

SPI : -

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(Erickson, 1989)

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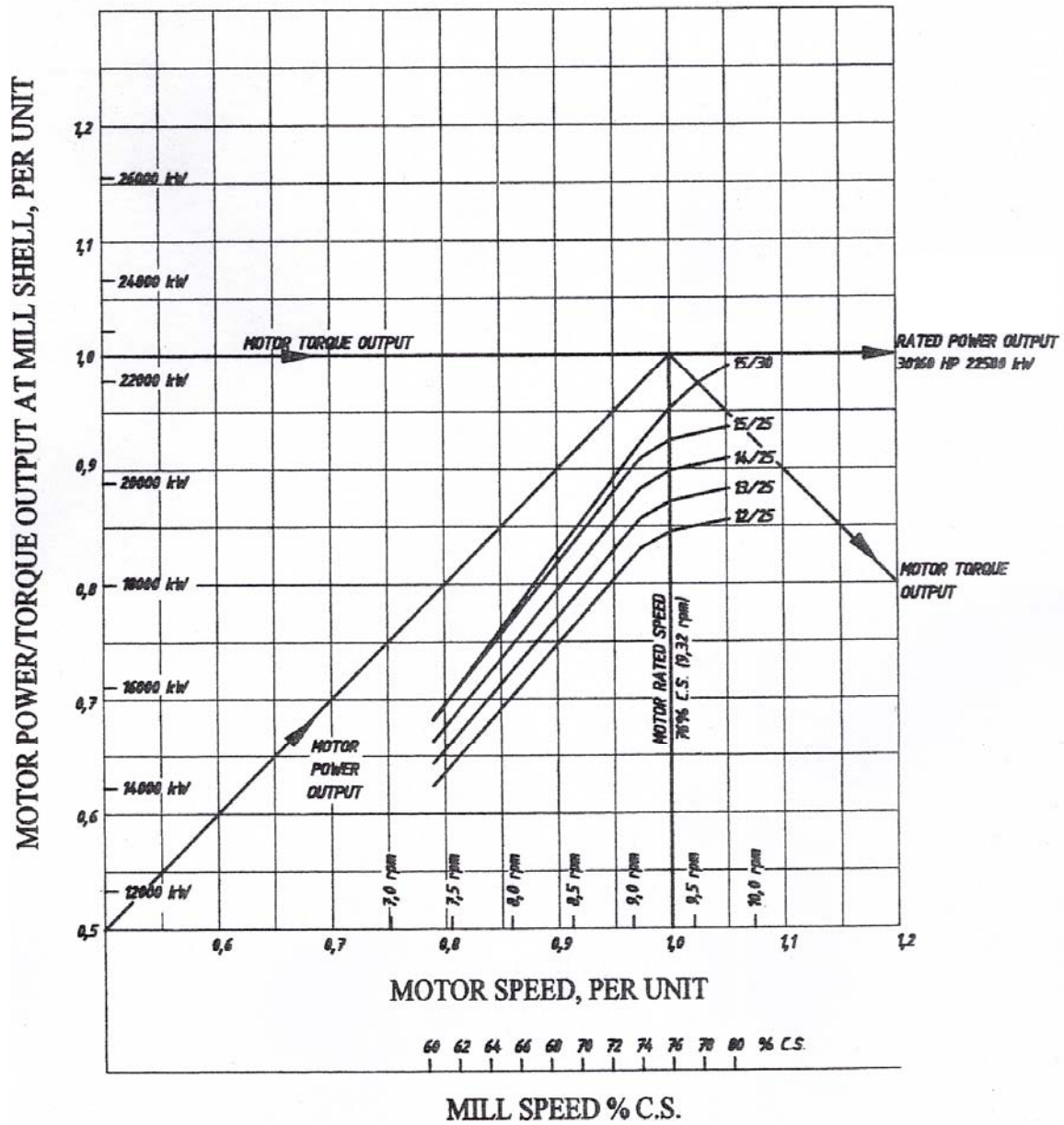
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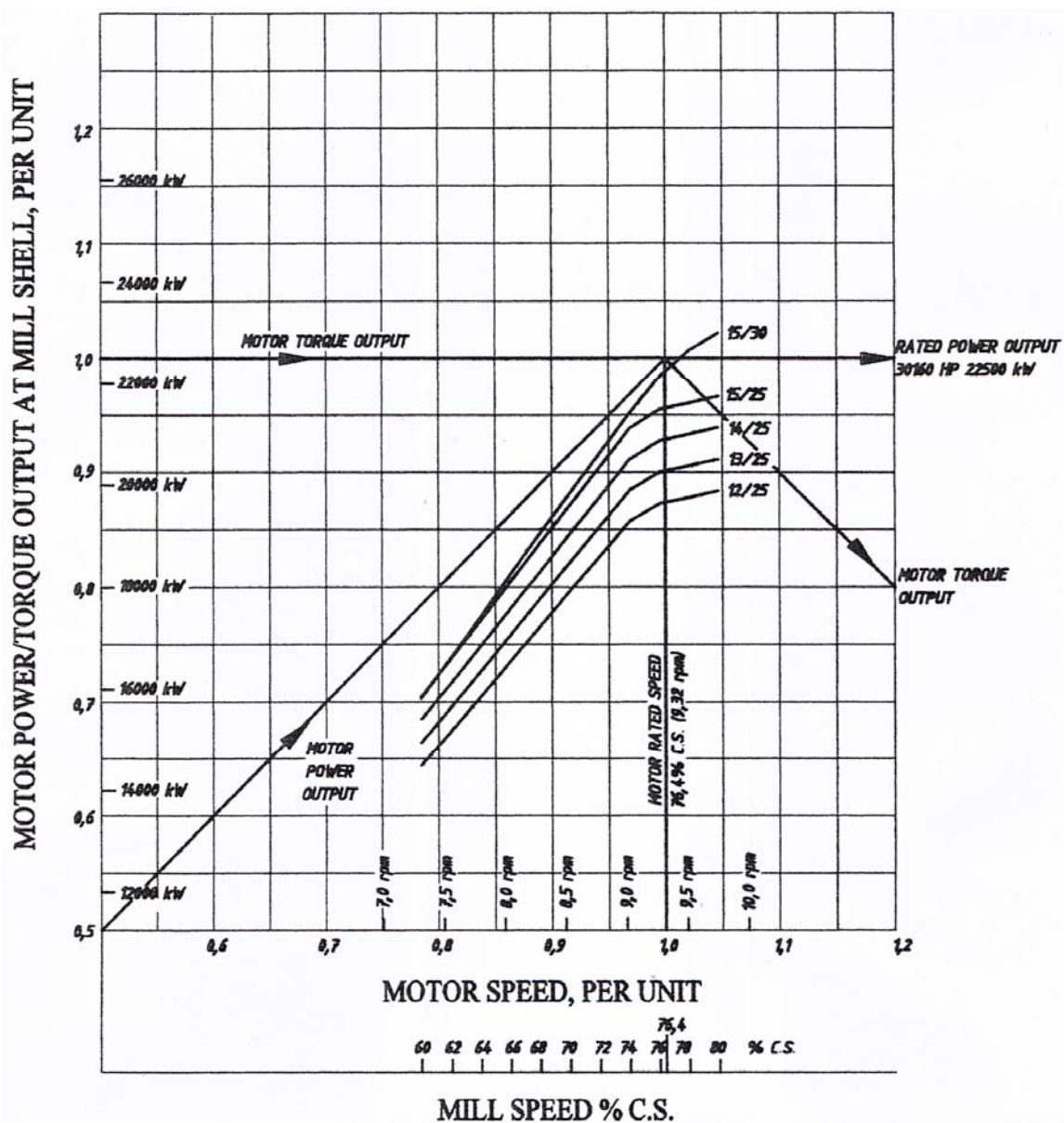
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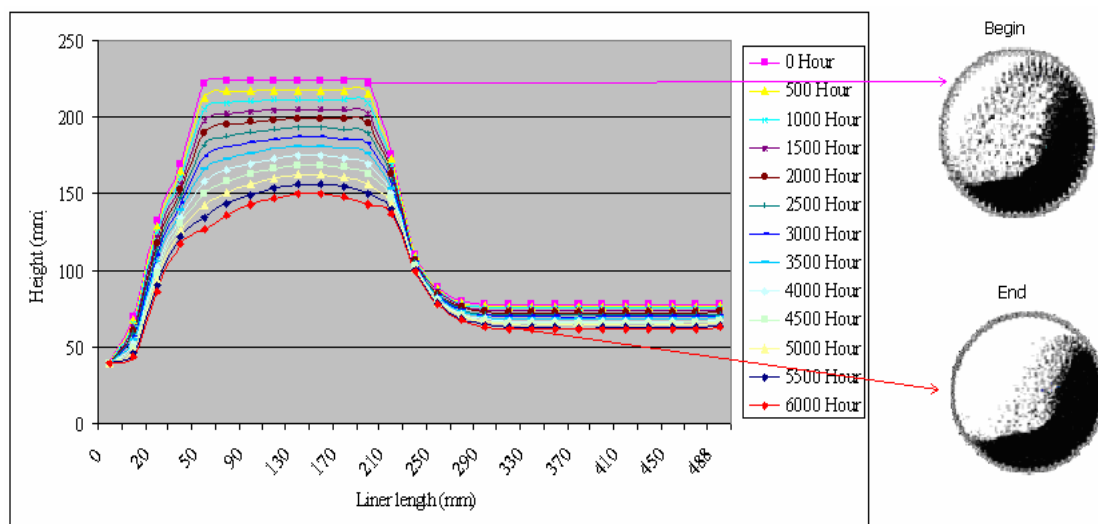
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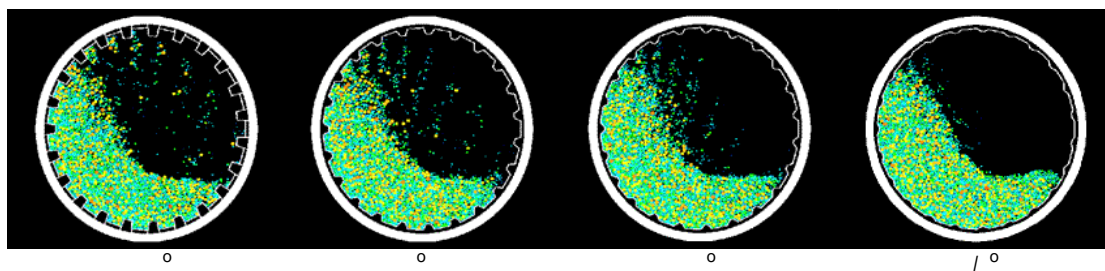
(Barratt and Brodie, 2001)



(Barratt and Brodie, 2001)



(Herbst, Nordell, 2002)

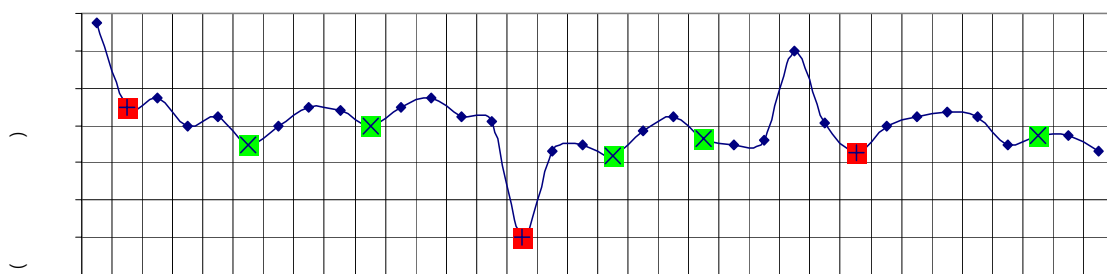


(Cleary, Tuzun, 2006)

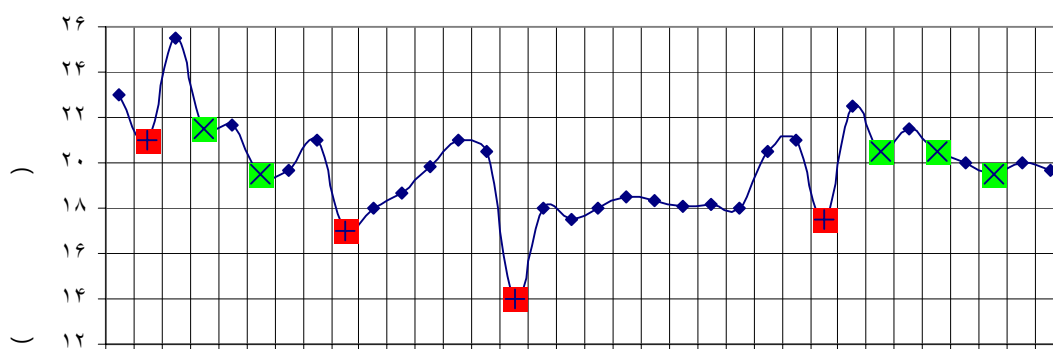
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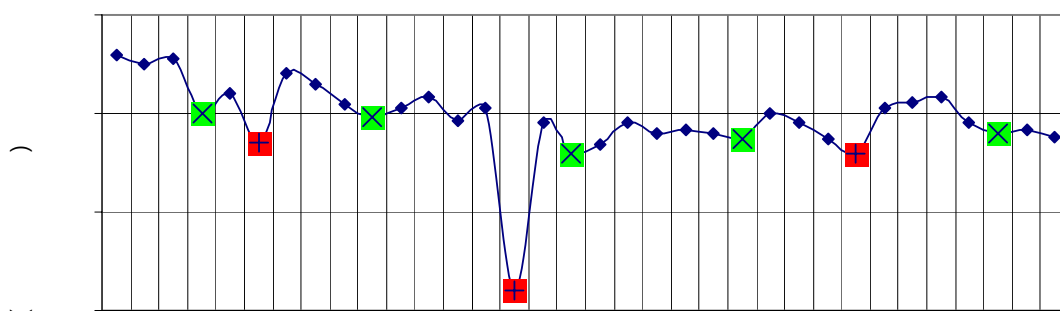
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:(Napier-Munn et.al., 1996)

$$Lc = M_{Charge} + M_{Shell} \quad (-)$$

:

$$() :Lc$$

$$() :M_{Charge}$$

$$.() M_{Shell}$$

Herbst, Pate,) M_{Charge}

:(1999

$$M_{Charge} = \rho_c V_{Charge} + M_{pulp} \quad (-)$$

:

$$() : \rho_c$$

$$() :V_{charge}$$

$$:M_{pulp}$$

morrell, et.al.,)

JKMRC

:(2001

$$Lc = C_2(H_R + H_P + H_W + H_B + W_L) + C_1 \quad (-)$$

:

() : Lc

() : H_R

() : H_P

() : H_W

() : H_B

() : W_L

: $C_2 C_I$

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(Kalala et.al., 2005).

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Parks,)

(1989).

(Kalala et.al., 2005)

Tano et.al.,)

(2005).

(Kalala et.al., 2005)

(Moys et.al., 1996).

(Tano et.al., 2005).

Santarisi, Almomany,)

(2005).

¹ Moys
² Montini

(Qui, et.al., 2001 & Cleary, et.al., 2003)

(Djordjevic, 2003)

(Djordjevic et.al., 2004)

(Computational Fluid Dynamics; CFD)

(Herbest, Nordell, 2001)

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(Parks, 1989) ()

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(

Bird) (Parks, 1989 & Orford et.al., 2003 & Bustos et.al.,1996)

Miranda) (Miranda et.al.,1996) (et.al., 2001

Kendrick, Marsden,) (et.al.,1996 & Sherman, Rajamani, 1999

(2001) - (Meekel et.al., 2001).

(Miranda et.al.,1996).

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(Powell, 2001) ()

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.(Powell, 2001)

.(Radzisevski, 2001)

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:(Powell, 2001)

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¹ Radzisevski

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(Powell, 1991)

.(Powell, 2001)

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:(Powell, 2001)

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(Kalala et.al, 2005a, 2005b, .
2007; Augustine et al., 2006; Cleary, 1998, Sinnott, Morrison , 2006; Hlungwani et al.,
2005; Mishra, 2003).

(Herbst and Nordell,
.2001; Cleary 1998b; Kalaya et al., 2005)

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(Apelt, Asprey,
. Thornhill, 2002)

$$\frac{dSMIW}{dt} = -(wear \ rate) \quad (-)$$

wear rate

SMIW

$$SMIW = L_{sm} \cdot \rho_{liner} \cdot nl \cdot \frac{lbw}{1000} \cdot \frac{(lt - slt)}{1000} + \pi \cdot L_{sm} \cdot \rho_{liner} \cdot D_{sm0} \frac{slt}{1000} \quad (-)$$

$$\begin{matrix} (t/m^3) & \rho_{liner} \text{ (mm)} & L_{sm} \\ & slt \text{ (mm)} & () & lt \text{ (mm)} & lbw & nl \end{matrix}$$

slt

$D_{sm0} \text{ (m)}$

$wt \text{ (mm)}$

$$(W_{shell \text{ lining}})_0 - Wear \text{ rate} \cdot t - (W_{Worn \text{ shell lining}}) = 0 \quad (-)$$

W

$$\begin{matrix} - &) & - & slt & (slt - wt) & (wt) \\ & & & & & .(\end{matrix}$$

$$W_{Worn \text{ shell lining}} = L_{sm} \cdot \rho_{liner} \cdot nl \cdot \frac{lbw}{1000} \cdot \frac{(lt - slt - wt)}{1000} + \pi \cdot L_{sm} \cdot \rho_{liner} \cdot D_{sm0} \frac{slt - wt}{1000} \quad (-)$$

wt

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(Powell, 2001)

(Powell, 2001)

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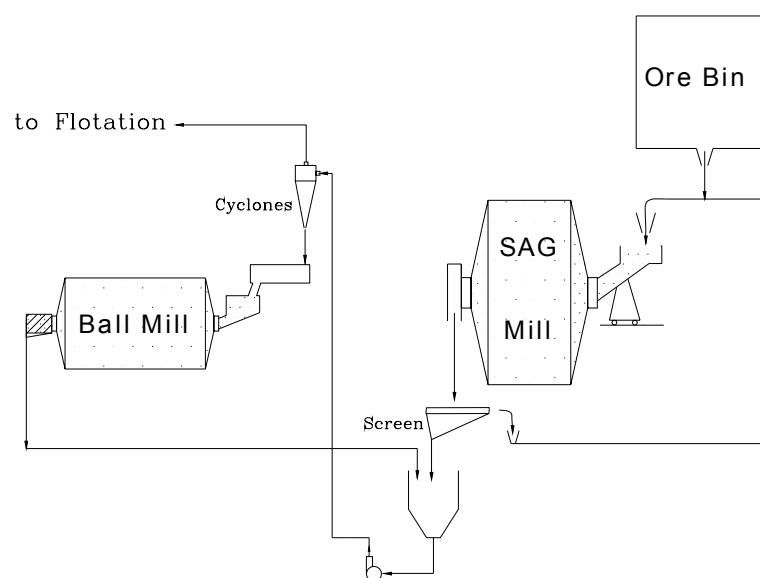
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- $P_{80} = \mu\text{m}$

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¹ Metso Minerals
² Synchronous

(Metso minerals, 2001)

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.(Metso minerals, 2001)

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(Metso minerals, 2001)

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(m)	(kg)	(mm)	(cm)		
/					

:(Metso minerals, 2001)

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(/ =) * :

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¹ Rail Type

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- () / :
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:(Metso minerals, 2001)

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- Sandwheel :
- ASTM A-36 :
- (mm) :
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- ASTM A-36 :
- (mm) / :
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	M48 :	•
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$$\left(\begin{array}{c} \text{ } \\ \text{ } \end{array} \right) \quad -$$

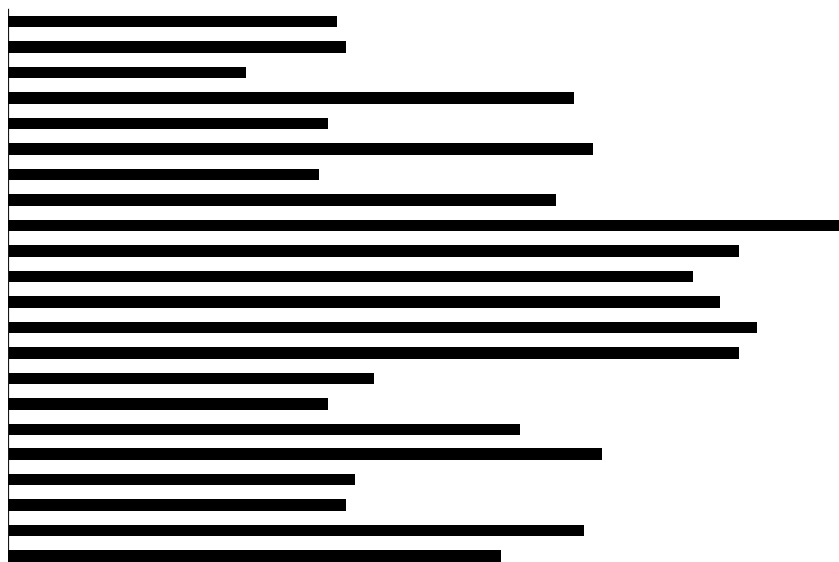
(- %)

(%) -

[illegible]

F_{80}

SPI

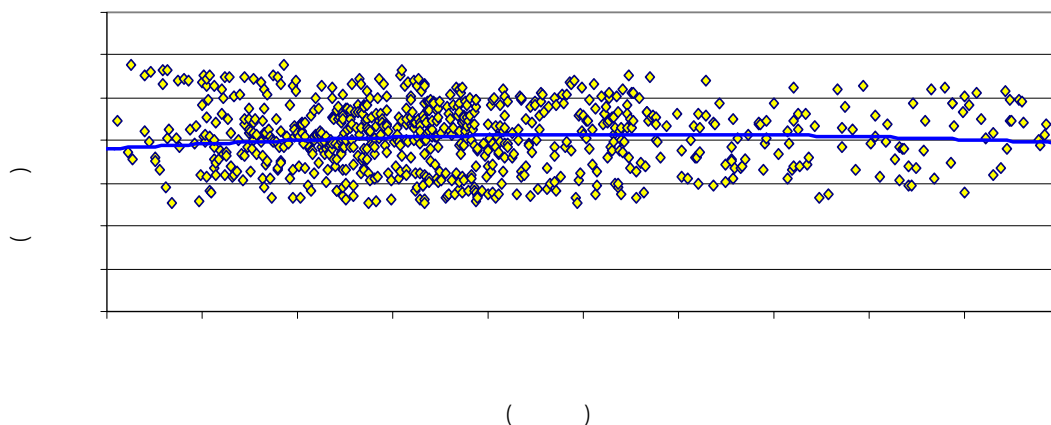


F80(mm)

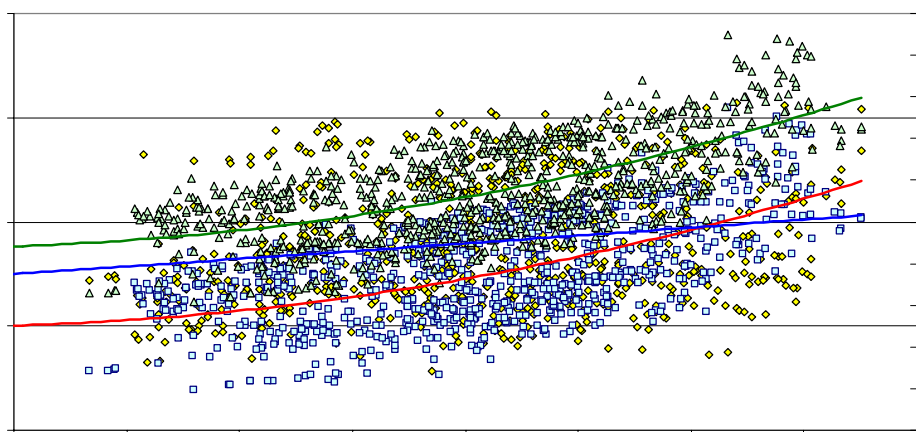
F_{80} : -

- - -

¹ Bond work index



- - -



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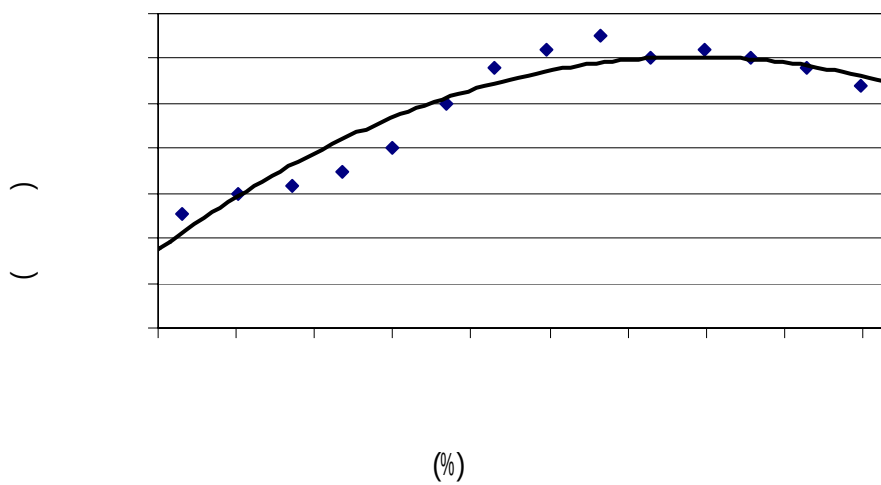
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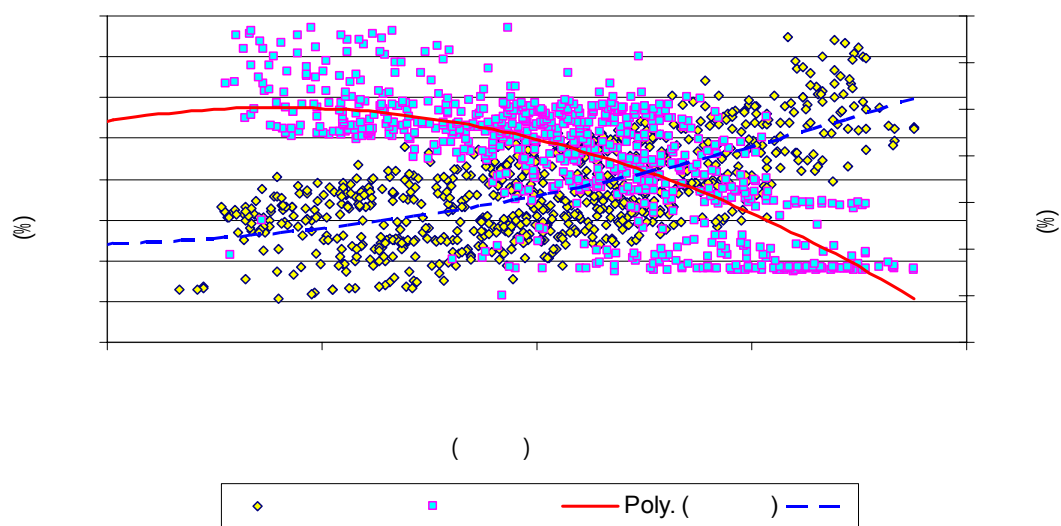
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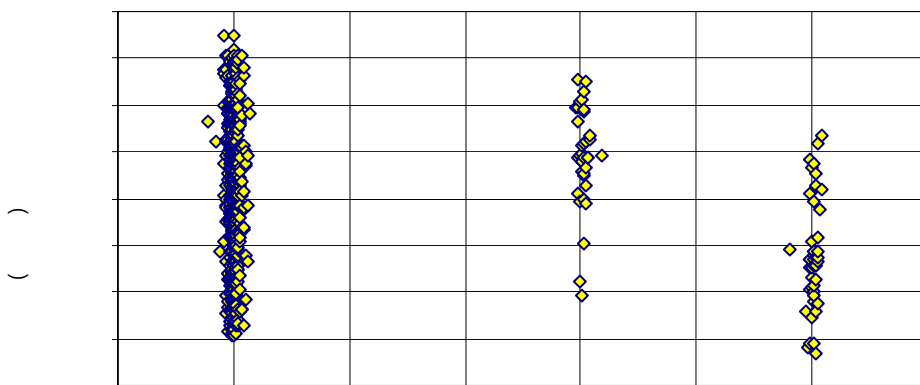


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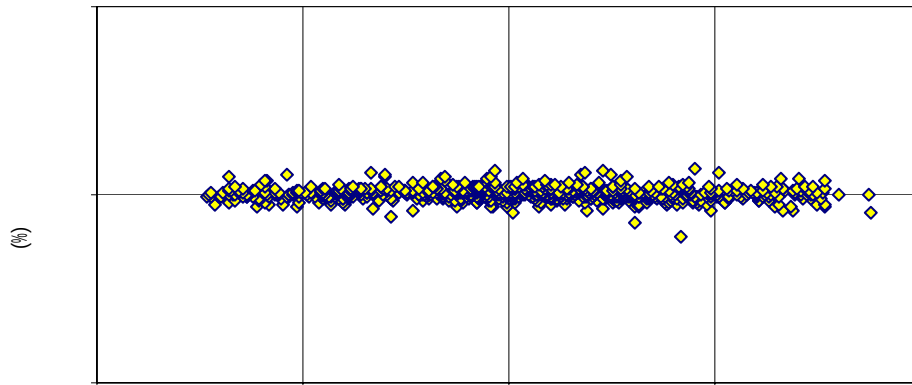


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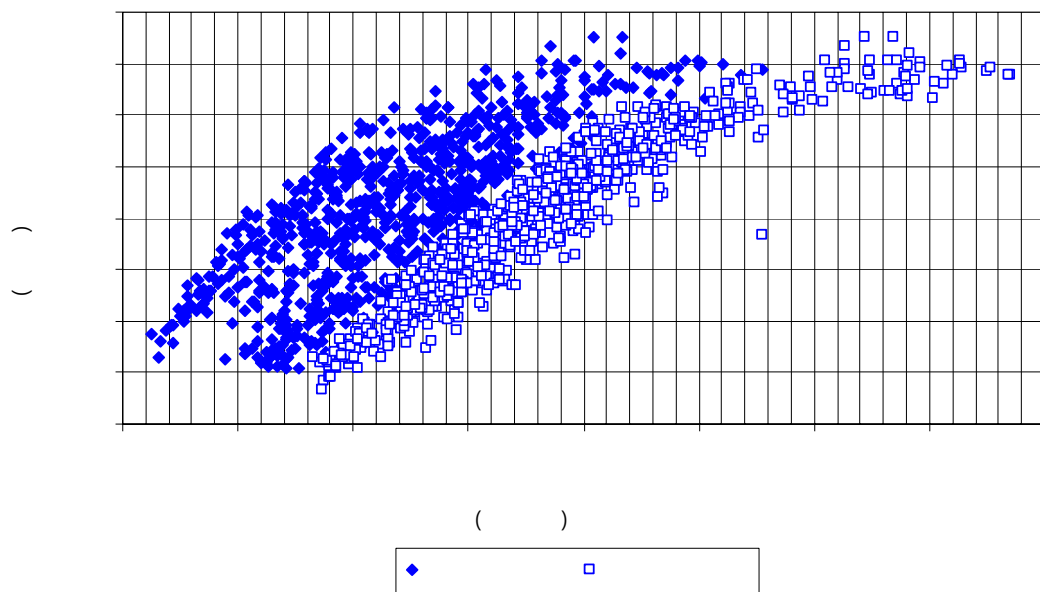
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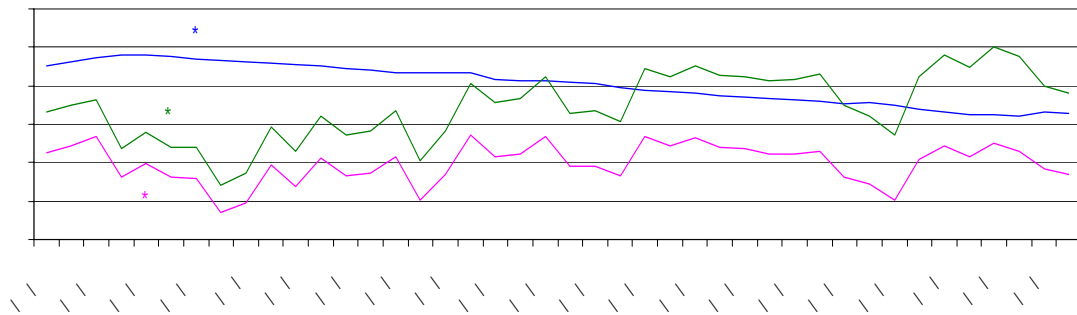
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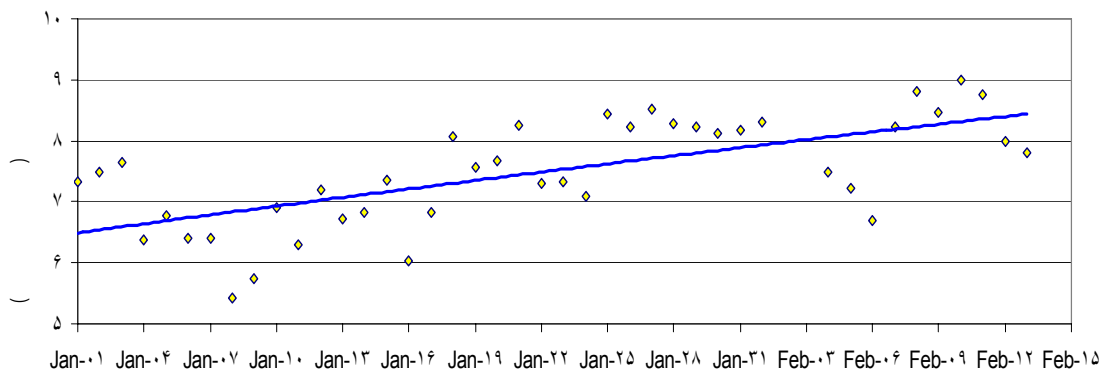
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:(Zuniga, 1935)

$$\frac{dC}{dt} = -kC^n \quad (-)$$

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$$\frac{dL_T}{dt} = -kL_T^n \quad (-)$$

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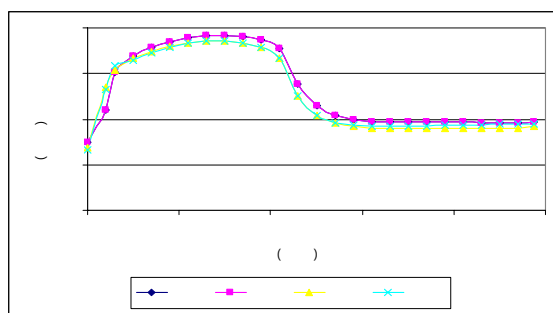
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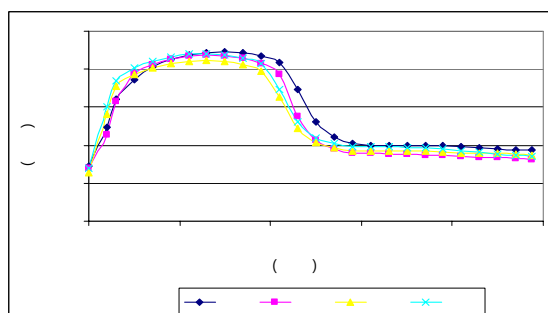
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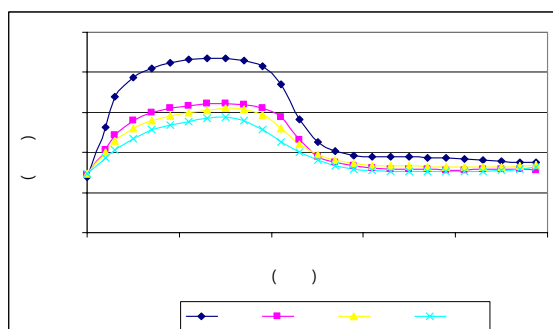
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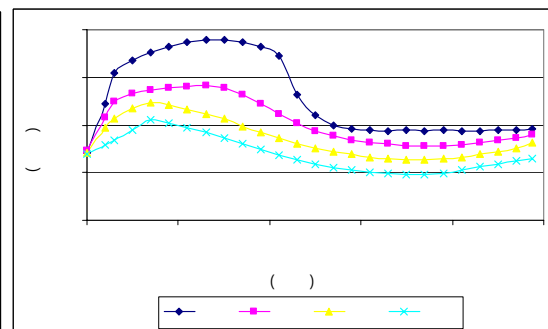
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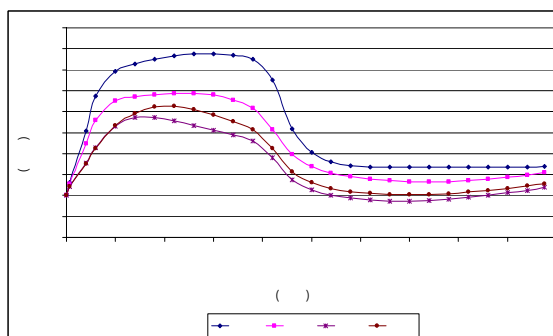
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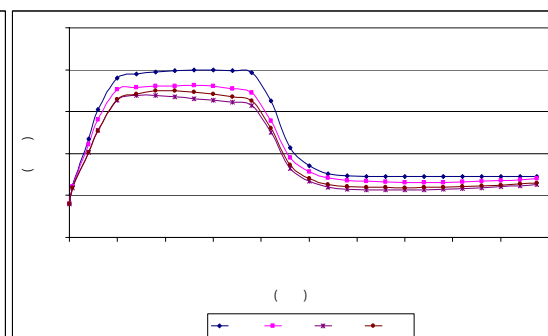
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SPSS

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$$k = A_1 \cdot F + A_2 \cdot B + A_3 \cdot S + A_4 \cdot L + A_5 \cdot SPI + A_6 \cdot C + A_7 \cdot H + A_8 \quad (-)$$

:

(h^{-1}) : k

() : F

(%) : B

(%) : S

(%) : L

: SPI

(%) : C

¹ Multiple Regression

² Residual Analysis

() . H

A_8 A_1

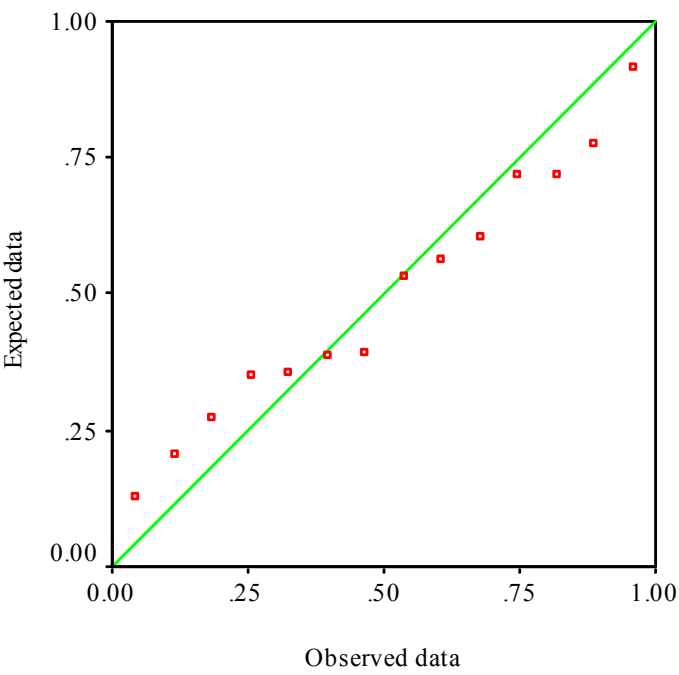
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A_8	A_7	A_6	A_5	A_4	A_3	A_2	A_1	
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:- (Metso minerals, 2001).

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$$\frac{dL_T}{dt} = -kL_T^0 \quad (-)$$

$$\frac{dL_t}{dt} = -kL_T^1 \quad (-)$$

$$\frac{dL_t}{dt} = -kL_T^2 \quad (-)$$

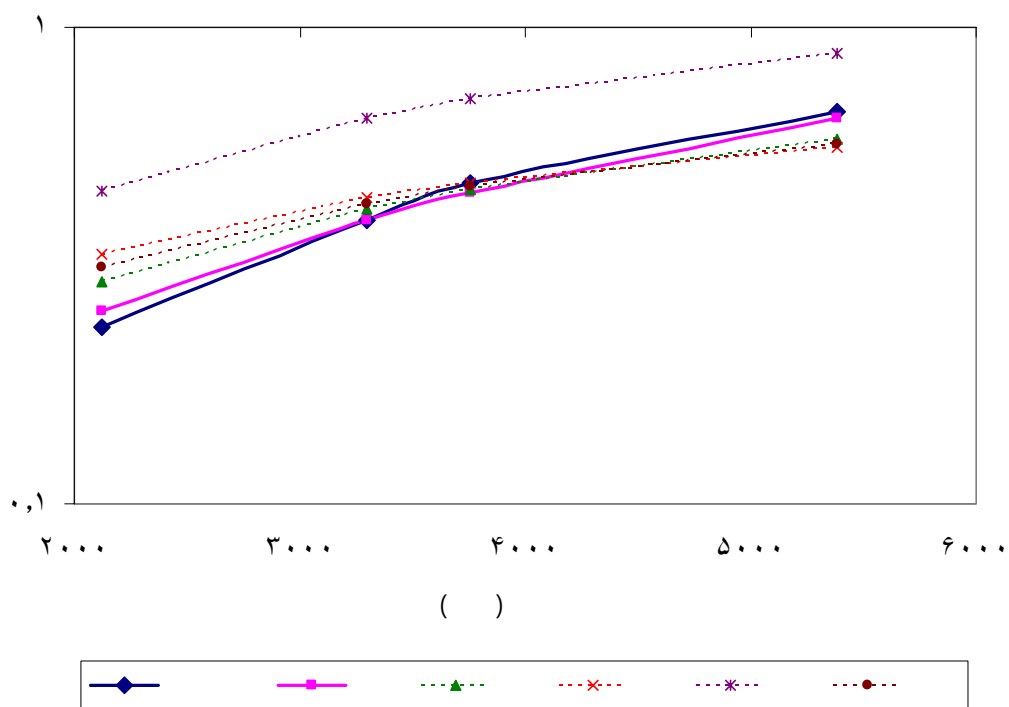
$$\frac{dL_t}{dt} = -kL_T^{0.5} \quad (-)$$

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$$\frac{dL_t}{dt} = -kL_T^{1.5} \quad (-)$$

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(n=0)



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$$L_T = L_{T_0} - kt \tag{ - }$$

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(L_T)

$$Log \left(\frac{L_T}{L_{T_0}} \right) = -k \cdot \log t \tag{ - }$$

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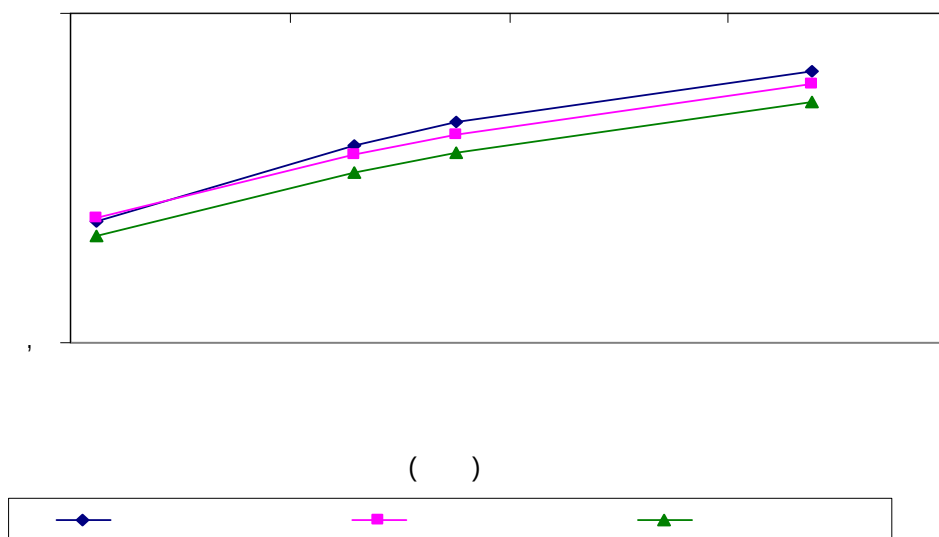
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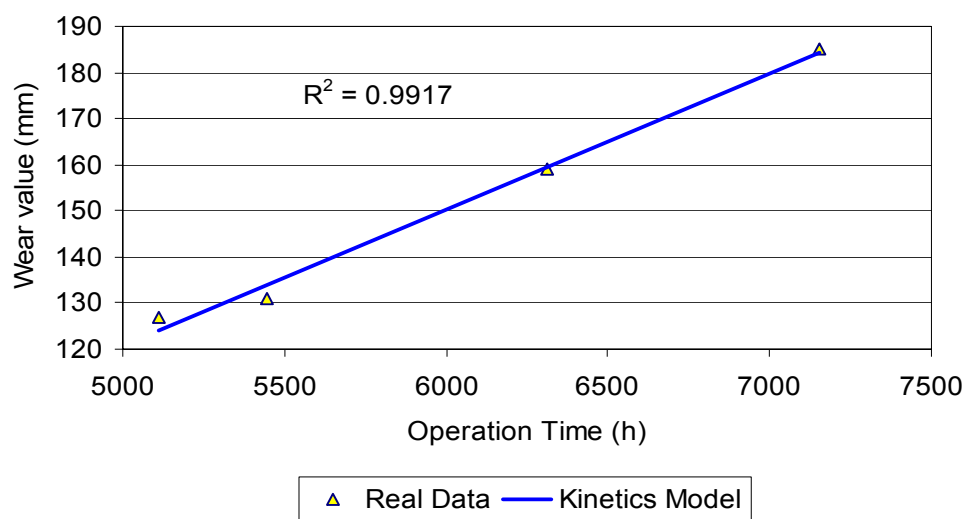
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(Metso minerals, 2001)

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l	$\rho_{liner} (t/m^3)$	
	nl	
	-	
	$lbw (mm)$	
	$lt (mm)$	
	$slt (mm)$	
	$l(mm)$	
	$w(mm)$	
	$pw(cm^2)$	
l	$V(m^3)$	
l	$L_{sm} (m)$	
l	$D_{sm0} (m)$	

l



(McBride and Powell, 2006 :) -

TC2D

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$y=a+bx$	/	/	
$y=a+b\exp(-cx)$	/	/	
$y=a+bx^{(1.5)}+ce^{(-x)}$	/	/	
$y=a+bx^{(2.5)}+cx^3$	/	/	
$y=a+b/(1+2b^2cx)^{(0.5)}$	/	/	
$y=a+bx^2+ce^{(-x)}$	/	/	
$y=a+b/\ln x+c/(\ln x)^2$	/	/	
$y=a\exp(-bx)$	/	/	
$y=a+bx^{(2.5)}+ce^{(-x)}$	/	/	
$y^{(0.5)}=a+bx^2$	/	/	
$y=a+bx^{(0.5)}\ln x$	/	/	
$\ln y=a+bx^{(2.5)}$	/	/	
$y=a+bx^3+ce^{(-x)}$	/	/	
$y=a\exp(-bx)+c\exp(-dx)$	/	/	
$y=ab/(b+x)$	/	/	
$y=a+bx^{(0.5)}$	/	/	
$y^{(-1)}=a+bx$	/	/	
$y=a+bx^2\ln x$	/	/	
$y^2=a+bx^{(1.5)}$	/	/	
$\ln y=a+bx^3$	/	/	
$y=ab/((b+ac)\exp(bx)-ac)$	/	/	
$y^{(0.5)}=a+bx^{(0.5)}$	/	/	
$y=a/(1+2a^2bx)^{(0.5)}$	/	/	
$y=a+bx^{(2.5)}$	/	/	
$y^{(0.5)}=a+bx^3$	/	/	
$\ln y=a+bx^{(0.5)}$	/	/	
$y=a/(1+abx))+c/(1+cdx))$	/	/	
$y=a(b-a)/(b\exp(cx(b-a))-a)$	/	/	
$y^2=a+bx^2$	/	/	
$y=a+bx^3$	/	/	
$y^2=a+bx^{(2.5)}$	/	/	
$y^{(-1)}=a+bx^{(0.5)}$	/	/	
$y^2=a+bx^3$	/	/	
$y=ax^b$	/	/	
$y=a+b\ln x$	/	/	

Apelt et.al.,)

(Kalala et.al., 2007)

(Cleary, 2001)

(2002

.(Deng, 1996)

.(Tseng et.al., 1997)

¹ Grey theory

(Lee, 1986; Tien, 1996; Lin, 2003)

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GM(1,1)

GM(1,1)

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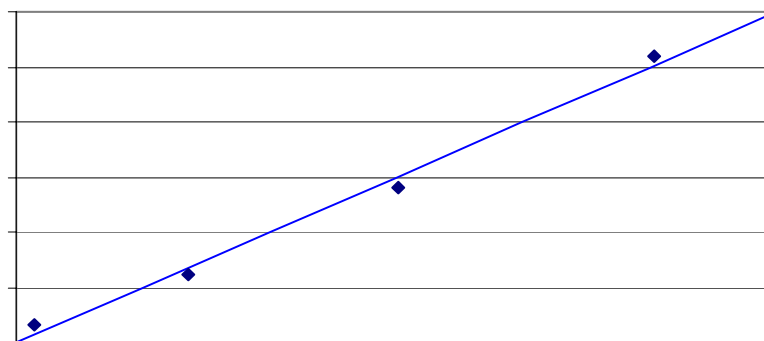
$\hat{x}^{(1)}(k + 1) = (x^{(0)}(1) + 190.172)e^{-0.9636 k} - 190.172$ (-)

$$\hat{e}_i^{(1)}(k+1) = (\hat{e}_i^{(0)}(1) + 0.099) e^{-0.4641 \cdot k} - 0.099 \quad (-)$$

$$C \leq 0.09 \quad P=1 \quad (C) \quad (P)$$

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.(Noaparast and Fotoohi, 2006)

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$$(D_{sl}+L_{T0}+kt) \quad D$$

$$.(\quad - \quad)$$

k

L_{T0}

D_{sl}

t

$$Critical\ speed = \frac{76.63}{\sqrt{D_{sl} - (L_{T0} - kt)}} \quad (-)$$

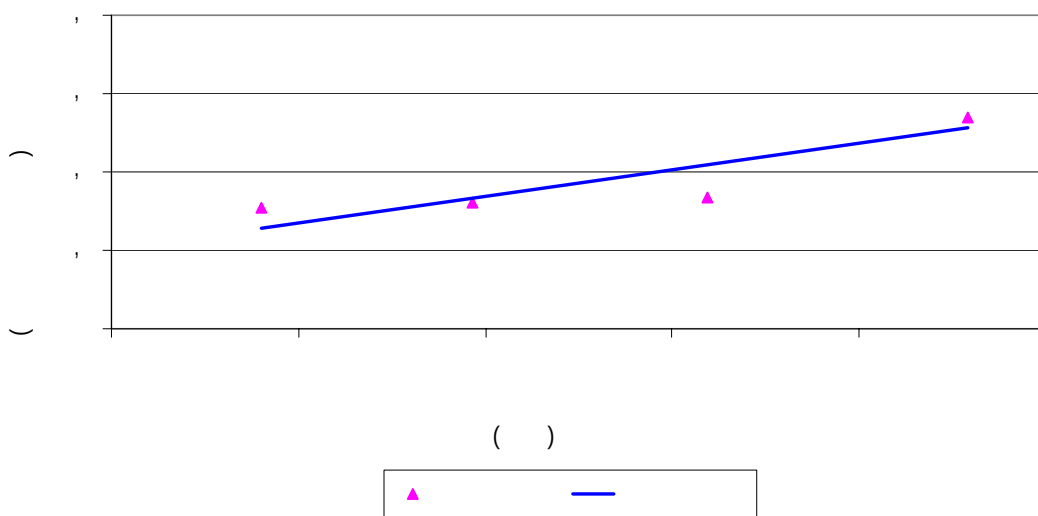
$$P_M = 10.6(D_{sl} - (L_{T0} - kt))^{2.5} L(1 - 1.03J_C)\phi_c^* \left(1 - \frac{0.1}{2^{9-10\phi_c^*}}\right) \times$$

$$\left[(1 - \phi) \left(\frac{\rho_R}{M_R} \right) J_C + 0.6J_B \left(\rho_b - \frac{\rho_R}{M_R} \right) \right] \quad (-)$$

$$\phi_C^* = RPM / \frac{76.63}{\sqrt{D_{sl} - (L_{T0} - kt)}} \quad (-)$$

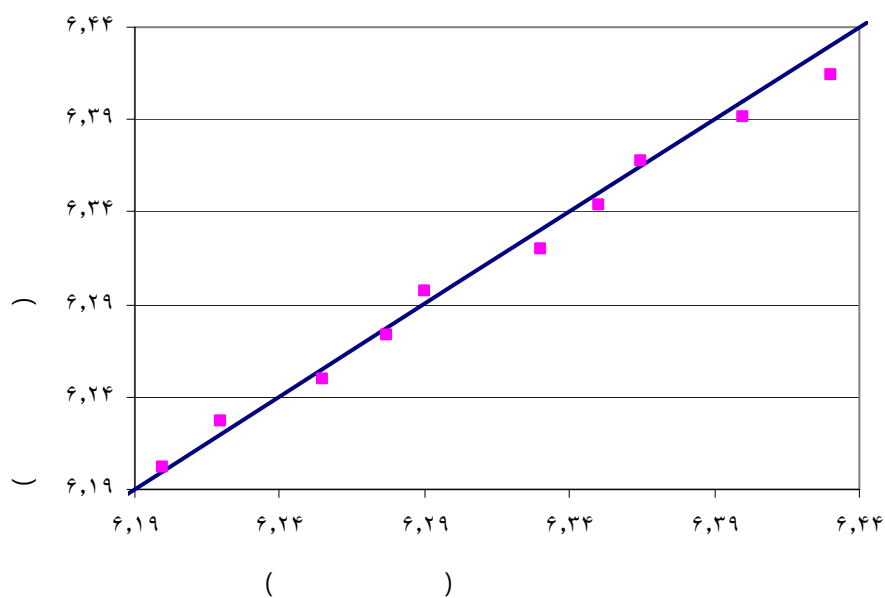
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:(Xiao and Vien, 2003)

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¹ Variance propagation low
² Monte Carlo simulation

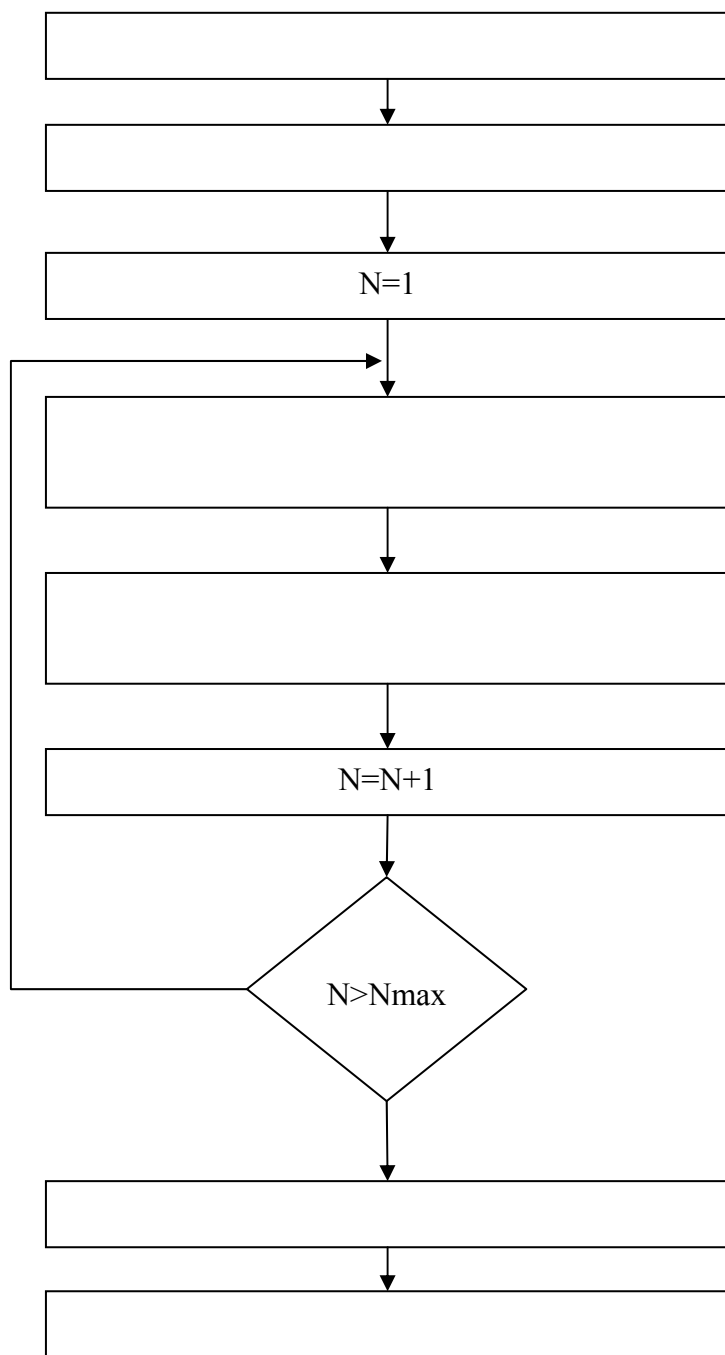
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(Xiao and Vien, 2003)

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¹ Latin Hypercube

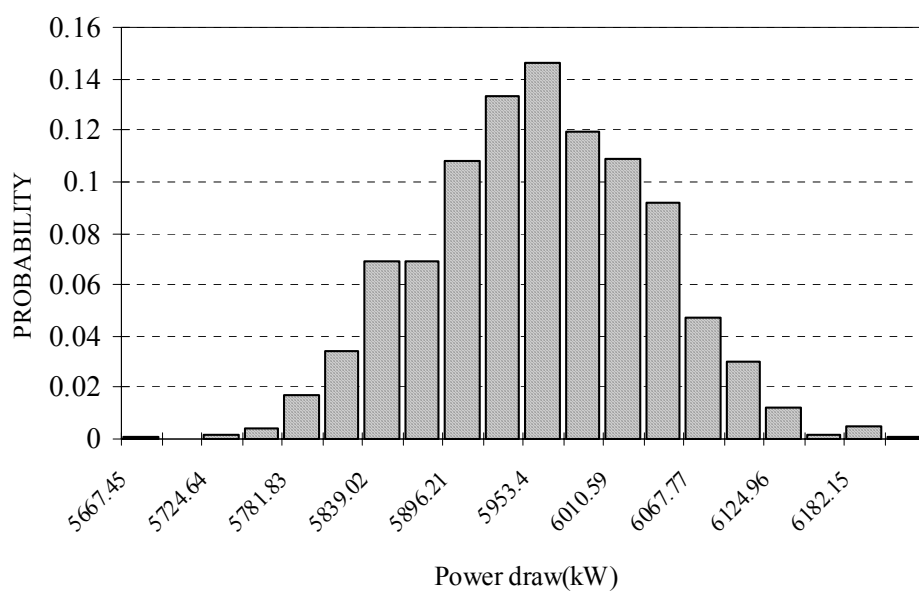
BestFit

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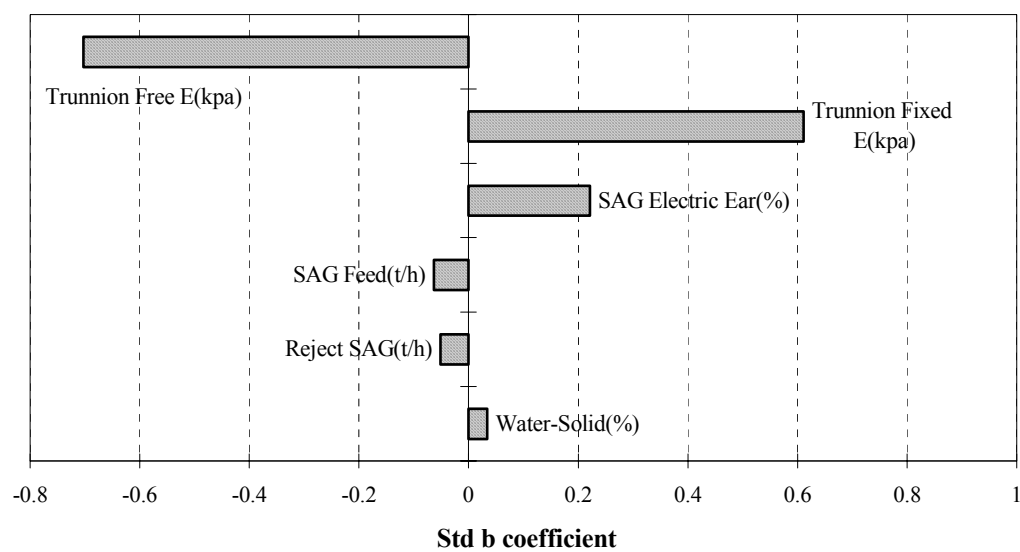
Weibull (21.88; 1000)	()
Gamma (1420; 3.46)	()
Gamma (28.66; 3.57)	()
Inverse Gaussian (5120; 5770000)	()
Logistic (46.26; 8.96)	(%)
Weibull (24.16; 56.06)	(%)

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@Risk



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(Flintoff, 1996)

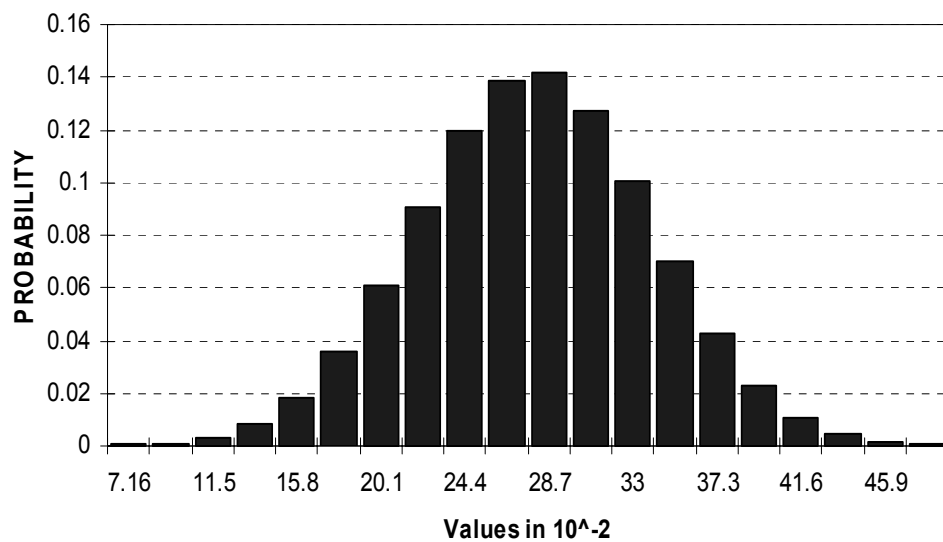
$$\left(\begin{matrix} - \\ \end{matrix} \right)$$

$$M_R \quad J_C, J_B$$

$$M_R \quad J_C, J_B$$

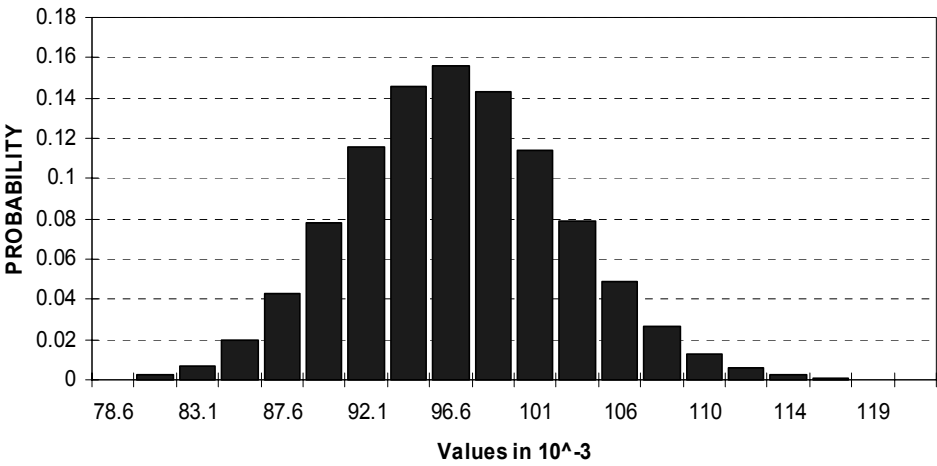
$$\left(\begin{matrix} - & - & - \\ \end{matrix} \right) \quad \left(\begin{matrix} \end{matrix} \right)$$

$$\left(\begin{matrix} - \\ \end{matrix} \right) \quad \left(\begin{matrix} \end{matrix} \right)$$

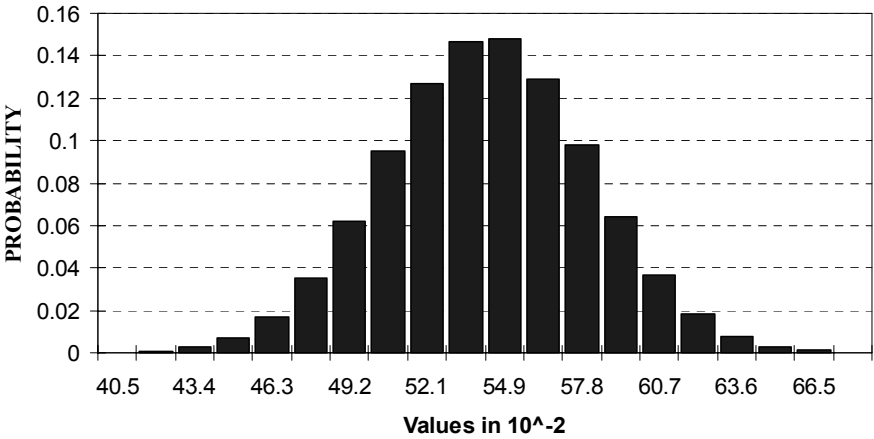


$$J_C \quad \vdots -$$

$$\left(\begin{matrix} \end{matrix} \right)$$



J_B : -



M_R : -

. - M_R J_B , J_C : -

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[illegible]

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$$- \quad M_R \quad J_C, J_B \quad (P)$$

$$Var(P) = \left[\frac{\partial P}{\partial J_C} \right]^2 \times Var(J_C) + \left[\frac{\partial P}{\partial J_B} \right]^2 \times Var(J_B) + \left[\frac{\partial P}{\partial M_R} \right]^2 \times Var(M_R) \quad (-)$$

:

$$\frac{\partial P}{\partial J_C} = 10.6 \cdot D^{2.5} \cdot L \cdot \phi_C \left(1 - \frac{0.1}{2^{9-10\phi_C}} \right) \left[\left(1 - \phi \right) \left(\frac{\rho_R}{M_R} \right) - 1.03 \times 2 \times \left(1 - \phi \right) \left(\frac{\rho_R}{M_R} \right) J_C - 1.03 \times 0.6 \times J_B \left(\rho_b - \frac{\rho_R}{M_R} \right) \right] \quad (-)$$

$$\frac{\partial P}{\partial J_B} = 10.6 \cdot D^{2.5} \cdot L \cdot \phi_C \left(1 - \frac{0.1}{2^{9-10\phi_C}} \right) \left[0.6 \left(\rho_b - \frac{\rho_R}{M_R} \right) - 1.03 \times 0.6 \times J_C \left(\rho_b - \frac{\rho_R}{M_R} \right) \right] \quad (-)$$

$$\frac{\partial P}{\partial M_R} = \frac{10.6 \cdot D^{2.5} \cdot L \cdot \phi_C \left(1 - \frac{0.1}{2^{9-10\phi_C}} \right)}{M_R^2} \left[(\phi - 1) \rho_R J_C + 0.6 J_B \rho_R + 10.3 (1 - \phi) \rho_R J_C^2 - 1.03 \times 0.6 J_B \rho_R J_C \right] \quad (-)$$

$M_R \quad J_C, J_B$

- :

	(%)	(%)	
$\pm$	/	/	J_C
$\pm$ /	/	/	J_B
$\pm$ /	/	/	M_R

- (P)

$Var(P)=$ / %

$P=$ / % $\pm$ / %

- - -

kW)

(kW) (

()

(kW)

%

(kW)

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(Magne, Titichoca, and Campi, 2001)

(Hornik, Stinchcombe, and White,

.1989 & Cubillos, Lima, 1997)

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MATLAB

(Hecht-Nielsen,1990)

(SEE)

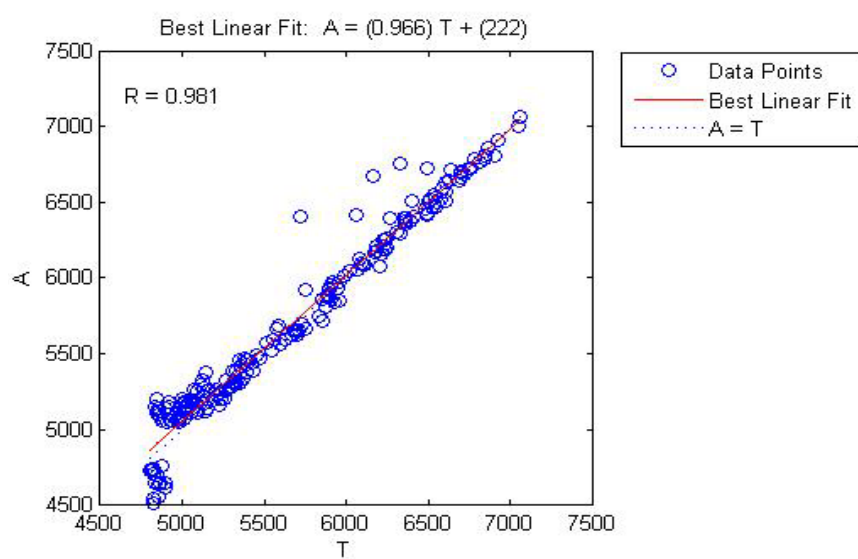
(r)

¹ Perceptron

Cross

$r=\sim 0.981; SEE= 65.3kW$

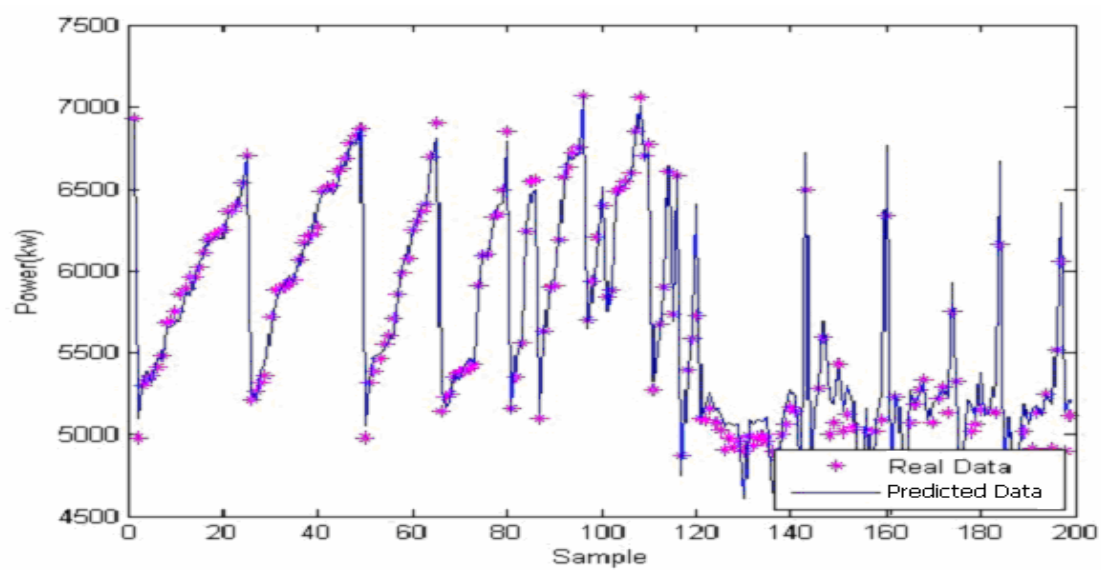
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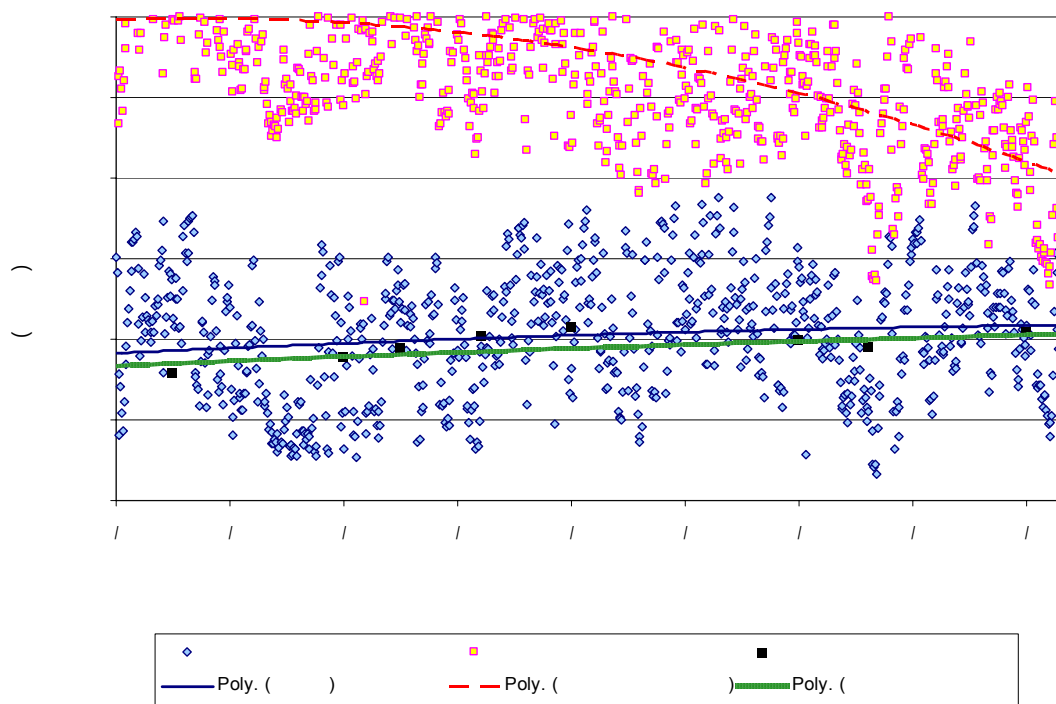
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پروست فا

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

Date	Time	Kw	t/h	kpa	t/h	kpa						
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ارائه مدل بهینه عملکرد آسیای نیمه خودشن

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ارائه مدل بهینه عملکرد آسیای نیمه خودشن

1/16/2007	07:25:35 AM	6129.75	749.81	4936.94	60.32	5122.50	39.31	55.00	86.12	8.95	24.64	33.59
1/16/2007	08:32:43 AM	6156.56	803.38	4954.96	72.44	5143.13	37.90	55.00	87.47	8.93	25.22	34.16
1/16/2007	09:28:39 AM	5951.86	880.25	4904.39	74.53	5081.56	38.87	55.03	91.53	9.51	21.48	30.99
1/16/2007	10:24:35 AM	6598.45	882.88	5054.16	83.23	5244.38	35.87	54.99	88.62	9.49	25.77	35.25
1/16/2007	11:31:43 AM	7270.83	699.44	5272.13	60.44	5558.75	34.97	55.00	89.01	9.47	31.97	41.43
1/16/2007	12:27:39 PM	7410.05	592.94	5312.82	58.52	5630.31	34.61	55.09	87.61	9.45	33.19	42.64
1/16/2007	01:34:47 PM	7066.64	641.94	5099.11	63.90	5326.25	35.57	54.99	91.31	9.43	27.27	36.70
1/16/2007	02:30:43 PM	6969.70	750.25	5100.66	81.97	5316.88	35.56	55.00	87.54	9.41	27.39	36.80
1/16/2007	03:37:51 PM	7071.28	799.88	5143.48	74.81	5374.69	35.13	54.99	91.62	9.39	28.68	38.06
1/16/2007	04:33:47 PM	7472.44	696.06	5400.78	67.94	5762.19	34.37	55.00	91.86	9.37	35.98	45.35
1/16/2007	05:29:43 PM	7493.06	653.75	5441.86	64.44	5853.44	34.92	55.02	89.08	9.52	36.53	46.05
1/16/2007	06:25:39 PM	7515.23	652.50	5404.08	60.86	5784.06	34.75	54.98	82.38	9.50	35.55	45.05
1/16/2007	07:32:47 PM	7530.19	630.69	5397.29	53.96	5729.69	34.85	54.95	68.99	9.48	35.44	44.92
1/16/2007	08:28:43 PM	7330.13	597.75	5201.61	55.93	5477.81	35.16	55.03	61.73	9.46	30.03	39.49
1/16/2007	09:35:51 PM	5593.50	585.19	4779.81	55.06	4923.44	51.30	55.00	59.89	9.44	18.27	27.71
1/16/2007	10:42:58 PM	5537.30	729.69	4794.73	55.07	4928.13	51.75	54.92	47.33	9.42	18.77	28.19
1/16/2007	11:38:55 PM	5430.05	590.75	4771.67	47.14	4892.81	64.28	54.88	58.88	9.40	18.20	27.60
1/17/2007	08:54:17 PM	5383.13	707.69	4998.56	63.01	5061.25	56.45	55.04	91.89	9.38	24.65	34.03
1/17/2007	09:50:14 PM	5168.63	831.75	4915.44	63.12	4982.50	59.02	55.02	89.89	9.36	22.40	31.76
1/17/2007	10:57:21 PM	5727.56	845.50	4978.79	62.47	5073.75	43.04	55.05	84.73	9.34	24.26	33.60
1/17/2007	11:53:18 PM	6212.25	849.38	5079.74	72.45	5190.94	41.72	54.98	77.34	9.32	27.17	36.49
1/18/2007	12:49:14 AM	6218.95	848.94	5067.34	70.42	5184.69	41.84	55.00	84.26	9.30	26.90	36.20
1/18/2007	01:45:10 AM	6081.80	850.69	5028.59	70.75	5151.88	41.77	55.00	87.86	9.28	25.90	35.17
1/18/2007	02:52:18 AM	5704.88	902.69	4952.44	79.40	5073.44	43.01	54.99	89.06	9.26	23.84	33.10
1/18/2007	03:48:14 AM	5159.86	901.00	4842.59	78.48	4935.63	48.67	54.98	88.41	9.24	20.84	30.07
1/18/2007	04:55:21 AM	5309.91	917.44	4874.94	77.04	4978.44	43.80	54.98	85.85	9.22	21.83	31.04
1/18/2007	05:51:18 AM	5816.25	925.25	4977.05	73.61	5097.81	43.35	55.02	86.56	9.20	24.77	33.97
1/18/2007	06:58:25 AM	5867.81	918.19	4979.57	68.09	5097.81	43.12	55.03	87.82	9.18	24.92	34.10
1/18/2007	07:54:21 AM	6042.09	929.38	5024.71	74.55	5152.81	42.20	55.07	89.57	9.16	26.27	35.43

ارائه مدل بهینه عملکرد آسیای نیمه خودشن

1/18/2007	09:01:29 AM	6483.47	921.63	5118.49	86.06	5270.00	39.16	55.02	89.11	9.46	27.69	37.15
1/18/2007	10:08:36 AM	6784.08	849.00	5183.20	86.76	5352.81	37.86	55.00	86.53	9.44	29.59	39.03
1/18/2007	11:15:44 AM	6726.33	839.94	5194.83	79.31	5344.06	38.63	54.99	89.81	9.42	29.99	39.41
1/18/2007	12:11:40 PM	6678.38	806.44	5179.52	75.96	5327.19	39.16	55.01	88.75	9.40	29.65	39.04
1/18/2007	01:18:48 PM	6099.84	808.44	5054.36	72.95	5189.38	41.90	55.02	87.53	9.38	26.21	35.59
1/18/2007	02:25:55 PM	5505.84	845.63	4930.55	68.28	5038.75	43.44	55.01	84.24	9.36	22.82	32.18
1/18/2007	03:21:52 PM	5344.45	853.06	4890.06	61.28	4988.13	49.93	55.00	71.01	9.34	21.76	31.10
1/18/2007	04:28:59 PM	5910.61	810.00	4988.09	59.25	5108.75	42.17	54.97	56.76	9.64	23.30	32.94
1/18/2007	05:36:07 PM	5564.11	844.44	4888.70	61.21	5003.44	43.58	55.00	69.29	9.62	20.59	30.21
1/18/2007	06:43:14 PM	5406.33	854.44	4856.73	70.09	4981.25	44.23	55.00	82.94	9.60	19.77	29.37
1/18/2007	07:39:10 PM	5195.44	897.63	4810.42	63.29	4917.19	51.90	54.98	91.34	9.58	18.55	28.13
1/18/2007	08:35:07 PM	5862.66	895.25	4938.49	61.27	5071.25	42.73	55.04	91.01	9.56	22.23	31.79
1/18/2007	09:42:14 PM	6341.67	898.94	5046.99	87.72	5211.56	38.96	54.97	88.04	9.54	25.36	34.90
1/18/2007	10:38:11 PM	6463.36	903.13	5055.91	78.55	5218.75	39.46	55.00	90.71	9.52	25.69	35.21
1/18/2007	11:34:07 PM	6514.92	901.63	5061.14	77.29	5223.13	39.50	55.01	83.29	9.50	25.91	35.41
1/19/2007	12:30:03 AM	6669.09	854.88	5087.10	76.35	5255.00	38.51	54.96	78.94	9.48	26.72	36.20
1/19/2007	01:37:11 AM	6401.48	854.75	5046.41	78.89	5218.75	38.64	55.01	90.55	9.46	25.66	35.12
1/19/2007	02:33:07 AM	5385.19	904.94	4855.96	94.01	5013.44	42.77	55.03	89.83	9.44	20.39	29.84
1/19/2007	03:40:14 AM	4809.75	951.69	4744.74	74.12	4859.69	58.93	55.01	86.32	9.42	17.35	26.77
1/19/2007	04:47:22 AM	5034.56	980.63	4818.37	84.79	4924.06	45.58	55.01	87.04	9.40	19.50	28.90
1/19/2007	05:43:18 AM	5234.63	976.19	4861.77	77.40	4964.06	42.89	55.03	89.18	9.38	20.80	30.18
1/19/2007	06:50:26 AM	5947.22	975.44	5022.19	89.53	5153.44	39.60	54.98	89.60	9.36	25.38	34.74
1/19/2007	09:04:41 AM	6293.72	111.50	4954.96	38.26	5103.13	42.64	20.43	93.39	9.79	21.77	31.56
1/19/2007	10:45:22 AM	5672.91	803.00	4910.98	64.07	5048.44	42.64	55.00	86.79	9.77	20.62	30.39
1/19/2007	12:59:37 PM	5282.58	866.94	4849.37	63.60	4955.94	52.60	55.00	88.22	9.75	18.97	28.72
1/19/2007	01:55:33 PM	5330.02	905.13	4836.00	67.89	4951.88	45.45	55.03	81.30	9.73	18.68	28.41
1/19/2007	02:51:30 PM	5121.70	896.13	4767.80	66.41	4882.19	52.49	54.99	90.67	9.71	16.84	26.55
1/19/2007	03:58:37 PM	5121.19	899.00	4771.48	69.25	4880.63	51.11	54.99	90.86	9.69	17.03	26.71
1/19/2007	04:54:33 PM	5327.44	907.56	4823.02	69.52	4934.69	43.48	55.01	84.87	9.67	18.55	28.22

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

1/19/2007	05:50:30 PM	5335.17	895.56	4822.44	73.19	4932.19	42.75	54.93	89.65	9.65	18.62	28.27
1/19/2007	06:57:37 PM	5579.58	899.00	4876.69	74.10	4998.44	42.79	54.97	89.03	9.63	20.22	29.85
1/19/2007	07:53:33 PM	5610.00	916.63	4881.14	76.78	5012.81	42.29	55.00	90.20	9.61	20.43	30.04
1/19/2007	09:00:41 PM	5918.86	931.13	4941.98	74.04	5086.56	40.71	55.04	90.72	9.59	22.22	31.80
1/19/2007	10:07:48 PM	5938.97	905.63	4950.89	70.59	5121.56	39.57	55.00	91.50	9.57	22.55	32.11
1/19/2007	11:14:56 PM	6152.95	902.69	5006.69	71.89	5186.56	37.31	55.03	92.04	9.55	24.19	33.74
1/20/2007	12:10:52 AM	6166.36	902.44	5011.15	66.44	5199.06	36.74	55.02	82.18	9.53	24.39	33.92
1/20/2007	01:18:00 AM	6906.80	897.63	5163.83	87.55	5352.50	36.64	55.13	83.02	9.51	28.76	38.27
1/20/2007	02:25:07 AM	6989.30	824.44	5212.84	93.52	5427.81	35.72	55.00	85.48	9.49	30.21	39.70
1/20/2007	03:32:15 AM	5988.98	828.38	4979.76	60.29	5166.56	38.37	54.99	88.18	9.47	23.75	33.22
1/20/2007	04:28:11 AM	5629.59	854.31	4903.62	66.37	5044.69	42.26	55.01	91.21	9.45	21.69	31.14
1/20/2007	05:57:41 AM	5216.06	943.69	4827.28	71.80	4947.19	42.43	54.99	88.96	9.43	19.63	29.06
1/20/2007	08:56:41 AM	6466.45	894.81	5071.99	84.65	5238.44	38.43	54.98	77.87	9.87	24.73	34.60
1/20/2007	11:10:56 AM	5450.67	910.00	4908.66	66.64	4999.69	43.53	55.04	87.55	9.85	20.23	30.08
1/20/2007	12:06:53 PM	6111.70	949.94	5028.59	84.57	5168.75	39.67	54.99	87.23	9.83	23.68	33.51
1/20/2007	01:12:27 PM	5800.27	948.38	4922.61	77.36	5067.50	41.08	55.01	76.24	9.81	20.78	30.59
1/20/2007	02:08:23 PM	5992.08	947.44	4943.53	83.34	5093.13	40.63	55.00	82.06	9.79	21.45	31.24
1/20/2007	03:15:31 PM	5171.72	944.00	4775.74	60.50	4881.88	52.36	55.06	92.10	9.77	16.82	26.59
1/20/2007	04:22:38 PM	5223.80	970.06	4779.04	76.71	4904.38	43.82	55.00	74.68	9.75	16.99	26.74
1/20/2007	05:18:34 PM	5327.95	987.75	4795.89	81.40	4939.38	42.13	55.02	81.65	9.73	17.55	27.28
1/20/2007	06:25:42 PM	5087.16	1002.94	4734.48	79.88	4861.88	44.76	55.01	89.00	9.71	15.90	25.61
1/20/2007	07:21:38 PM	4887.61	1001.19	4684.68	74.81	4805.94	52.84	55.02	88.48	9.69	14.59	24.28
1/20/2007	08:28:46 PM	4953.61	999.75	4702.89	83.24	4831.56	47.15	55.01	84.09	9.67	15.18	24.85
1/20/2007	09:24:42 PM	4837.08	1006.31	4682.74	89.43	4813.75	49.04	54.95	89.52	9.65	14.69	24.34
1/20/2007	10:31:50 PM	4707.14	1011.50	4650.19	74.74	4766.56	61.60	55.03	85.91	9.63	13.86	23.49
1/20/2007	11:38:57 PM	4711.27	1013.88	4659.11	88.83	4780.00	52.28	54.99	85.82	9.61	14.19	23.80
1/21/2007	12:46:05 AM	4753.55	1026.13	4672.28	90.07	4797.19	49.60	55.02	88.10	9.59	14.64	24.23
1/21/2007	01:42:01 AM	4727.77	1022.81	4666.27	86.51	4784.38	51.47	55.00	91.21	9.57	14.55	24.12
1/21/2007	02:37:57 AM	4609.17	1019.13	4639.15	79.92	4755.00	62.94	55.01	85.24	9.55	13.87	23.42

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

1/21/2007	03:33:53 AM	4823.16	1023.56	4683.91	88.61	4808.13	46.76	55.07	89.06	9.53	15.21	24.74
1/21/2007	04:41:01 AM	4663.31	1023.19	4655.81	85.62	4769.38	53.08	55.00	90.42	9.51	14.50	24.01
1/21/2007	05:36:57 AM	3192.75	644.06	4701.73	57.00	4870.00	44.12	42.14	91.34	9.49	15.87	25.36
1/21/2007	06:44:05 AM	4727.77	1033.13	4697.86	91.07	4814.06	47.68	54.99	91.11	9.47	15.84	25.31
1/21/2007	07:40:01 AM	4709.20	1049.69	4692.04	85.77	4805.31	48.38	55.02	82.78	9.45	15.76	25.21
1/21/2007	11:57:20 AM	4886.06	944.44	4834.26	66.44	4898.75	50.92	55.00	88.05	9.43	19.83	29.26
1/21/2007	12:53:16 PM	5315.06	964.25	4865.06	74.75	4976.88	42.25	55.02	83.51	9.41	20.78	30.19
1/21/2007	01:49:12 PM	4979.39	999.19	4758.50	96.47	4887.19	42.41	54.98	80.98	9.39	17.87	27.25
1/21/2007	02:45:09 PM	5163.47	997.44	4774.58	93.53	4911.88	41.81	55.01	78.61	9.37	18.40	27.77
1/21/2007	03:41:05 PM	5034.56	995.38	4743.77	97.06	4877.50	42.34	55.05	76.38	9.35	17.61	26.96
1/21/2007	04:48:12 PM	4668.47	998.19	4658.33	88.90	4762.50	53.42	55.00	78.24	9.33	15.30	24.62
1/21/2007	07:02:27 PM	4690.13	959.94	4752.11	75.91	4837.81	58.43	55.03	89.77	9.31	18.01	27.32
1/21/2007	08:09:35 PM	4544.72	1017.56	4705.80	77.46	4808.44	58.80	55.00	89.61	9.29	16.79	26.08
1/21/2007	09:05:31 PM	4568.95	1026.38	4678.87	78.31	4792.19	58.56	54.95	89.61	9.27	16.11	25.38
1/21/2007	10:01:28 PM	4655.06	1028.88	4677.32	70.25	4790.63	57.38	55.03	88.22	9.25	16.15	25.40
1/21/2007	11:08:35 PM	4636.50	1030.00	4682.36	82.85	4794.38	51.38	54.96	73.12	9.23	16.37	25.60
1/22/2007	12:04:31 AM	4556.06	1026.88	4666.86	83.40	4771.25	54.88	55.02	78.73	9.21	16.02	25.23
1/22/2007	01:11:39 AM	4832.44	1051.69	4714.33	82.35	4820.94	45.20	54.98	87.25	9.19	17.43	26.62
1/22/2007	02:07:35 AM	5220.19	1047.31	4790.86	85.54	4935.31	42.25	54.98	88.18	9.17	19.66	28.83
1/22/2007	03:03:31 AM	5191.83	1049.00	4781.17	88.20	4925.00	42.09	54.95	87.68	9.15	19.47	28.62
1/22/2007	04:10:39 AM	5223.80	1048.44	4774.00	82.85	4913.44	42.53	55.01	88.17	9.13	19.35	28.48
1/22/2007	05:06:35 AM	4859.25	1041.81	4704.06	96.13	4833.13	42.14	55.00	87.56	9.11	17.46	26.57
1/22/2007	06:02:31 AM	4859.25	1051.50	4703.09	95.31	4826.88	42.83	55.01	84.54	9.09	17.52	26.61
1/22/2007	07:09:39 AM	4686.52	1049.31	4665.69	94.37	4776.88	45.03	55.01	83.01	9.07	16.55	25.62
1/22/2007	08:16:46 AM	4829.86	1046.13	4696.69	97.08	4825.31	42.43	55.00	67.40	9.05	17.50	26.55
1/22/2007	09:12:43 AM	4761.80	1051.81	4678.48	92.98	4794.06	43.25	54.98	60.73	9.03	17.07	26.10
1/22/2007	10:08:39 AM	4819.03	1033.69	4682.74	87.95	4797.19	42.96	54.96	56.35	9.01	17.27	26.28
1/22/2007	11:04:35 AM	4641.66	991.94	4635.08	69.45	4730.94	55.77	55.03	71.58	8.99	16.01	25.00
1/22/2007	03:55:28 PM	4787.06	951.00	4819.92	90.41	4893.13	43.14	54.98	63.42	8.97	21.28	30.25

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

1/22/2007	04:40:13 PM	5497.59	901.75	4921.06	72.17	5049.69	39.76	55.01	71.78	8.95	24.20	33.15
1/22/2007	05:36:09 PM	4894.83	903.75	4746.29	82.48	4860.94	42.60	54.98	66.43	8.93	19.37	28.30
1/22/2007	06:32:05 PM	5010.33	885.63	4734.28	73.05	4848.13	42.44	55.02	57.04	8.91	19.12	28.03
1/22/2007	07:28:02 PM	4600.41	926.19	4649.81	75.07	4743.75	52.92	54.99	61.05	8.89	16.83	25.72
1/22/2007	08:35:09 PM	4551.94	939.69	4651.94	99.38	4758.13	47.67	54.99	70.79	8.87	16.97	25.84
1/22/2007	09:31:06 PM	4671.05	956.31	4669.57	90.86	4780.31	44.43	55.04	71.56	8.85	17.54	26.39
1/22/2007	10:38:13 PM	5425.41	945.38	4815.66	75.90	4975.63	39.89	54.98	71.44	8.83	21.72	30.55
1/22/2007	11:34:09 PM	5903.91	952.25	4944.89	73.56	5155.63	35.32	54.99	78.00	8.81	25.43	34.24
1/23/2007	12:30:06 AM	6630.94	960.63	5156.46	99.61	5403.44	35.31	54.98	84.87	8.79	31.45	40.24
1/23/2007	01:26:02 AM	6784.59	952.19	5216.52	94.49	5505.31	34.99	54.97	83.28	8.77	33.22	41.99
1/23/2007	02:21:58 AM	7165.64	888.38	5409.69	83.02	5806.25	34.68	55.01	85.27	8.75	38.72	47.47
1/23/2007	03:29:06 AM	7078.50	21.44	5041.96	31.93	5390.94	36.08	10.66	90.56	8.73	28.48	37.21
1/23/2007	04:36:13 AM	5535.23	812.13	4787.95	66.81	4975.00	40.41	55.06	89.81	8.71	21.43	30.14
1/23/2007	05:32:09 AM	5053.64	910.88	4723.04	86.22	4896.88	42.59	54.99	89.41	8.69	19.69	28.38
1/23/2007	06:39:17 AM	4644.75	1020.88	4654.84	99.24	4784.06	44.07	55.00	87.58	8.67	17.85	26.52
1/23/2007	07:35:13 AM	4591.64	1044.50	4641.67	88.76	4755.63	47.88	54.99	81.05	8.65	17.56	26.21
1/23/2007	08:31:10 AM	5850.80	1059.88	4981.89	92.09	5205.63	36.00	56.13	71.99	8.57	27.42	35.99
1/23/2007	09:27:06 AM	6919.69	802.75	5152.01	83.66	5395.94	36.23	54.94	70.72	9.36	29.04	38.40
1/23/2007	10:23:02 AM	6546.38	854.75	5031.49	81.97	5223.13	37.24	55.07	75.09	9.34	25.74	35.08
1/23/2007	11:30:10 AM	5833.27	886.88	4895.67	75.51	5113.13	37.92	55.03	74.02	9.32	22.01	31.32
1/23/2007	12:37:17 PM	5532.14	925.19	4809.26	76.78	4984.06	42.88	55.02	66.02	9.30	19.66	28.96
1/23/2007	01:33:13 PM	6523.17	927.94	5030.33	74.81	5224.38	37.32	54.97	72.89	9.28	25.95	35.23
1/23/2007	02:29:10 PM	6292.17	899.38	4996.42	76.21	5216.88	37.71	54.99	78.62	9.26	25.08	34.33
1/23/2007	03:36:17 PM	5988.47	848.06	4940.82	67.48	5159.69	37.94	54.94	74.17	9.24	23.60	32.83
1/23/2007	04:32:13 PM	6965.06	736.50	5137.86	60.71	5345.00	36.67	54.94	62.40	9.22	29.21	38.43
1/23/2007	05:39:21 PM	7014.56	625.25	5153.75	62.24	5369.38	36.12	54.98	53.68	9.20	29.74	38.93
1/23/2007	06:35:17 PM	6199.36	536.69	4936.94	49.46	5106.56	42.47	54.95	57.05	9.18	23.73	32.91
1/23/2007	07:31:13 PM	4921.64	828.19	4702.31	56.19	4824.69	79.17	55.11	55.52	9.16	17.22	26.38
1/23/2007	08:38:21 PM	5089.22	799.25	4751.33	64.27	4881.25	52.88	55.00	52.24	9.14	18.68	27.82

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

1/23/2007	09:34:17 PM	4643.72	927.00	4685.46	67.30	4800.94	83.38	55.09	58.91	9.12	16.91	26.03
1/23/2007	10:30:14 PM	5102.11	946.38	4769.74	78.08	4908.13	43.29	54.99	66.45	9.10	19.36	28.45
1/23/2007	11:37:21 PM	5669.30	906.19	4879.21	74.66	5055.63	41.79	55.01	64.01	9.08	22.51	31.59
1/24/2007	12:33:17 AM	5994.14	902.69	4966.98	65.43	5173.13	37.86	55.01	62.52	9.06	25.06	34.11
1/24/2007	01:29:14 AM	6536.06	854.63	5084.77	87.77	5270.00	37.16	55.00	59.71	9.04	28.44	37.48
1/24/2007	01:51:36 AM	6401.48	803.75	5042.34	74.59	5228.44	37.74	55.03	60.41	9.21	26.57	35.78
1/24/2007	02:36:21 AM	6107.58	807.50	4992.16	60.81	5204.38	36.89	55.02	59.78	9.02	25.92	34.94
1/24/2007	03:32:17 AM	5800.27	804.50	4955.74	71.26	5158.13	37.06	55.01	58.65	9.00	24.98	33.98
1/24/2007	04:39:25 AM	5095.92	800.63	4778.46	67.12	4893.75	44.76	55.01	57.56	8.98	20.09	29.06
1/24/2007	05:35:21 AM	4811.81	804.69	4727.69	60.84	4823.44	63.43	55.02	57.37	8.96	18.74	27.70
1/24/2007	06:31:17 AM	4793.25	876.31	4734.86	60.98	4825.31	61.52	55.06	61.54	8.94	19.02	27.96
1/24/2007	07:27:14 AM	4533.89	849.81	4684.29	56.76	4770.00	96.47	54.99	64.45	8.92	17.68	26.60
1/24/2007	08:34:21 AM	4977.33	905.00	4786.01	75.05	4892.19	45.12	54.96	66.44	8.90	20.62	29.52
1/24/2007	09:30:18 AM	5763.66	898.25	4930.94	61.92	5054.69	42.63	54.97	65.30	9.32	22.97	32.29
1/24/2007	10:24:35 AM	6191.63	851.94	5000.69	62.98	5172.81	39.40	55.02	71.56	9.30	25.01	34.31
1/24/2007	11:31:42 AM	6132.33	166.00	4864.09	41.46	5019.06	43.39	25.18	83.29	9.28	21.25	30.54
1/24/2007	12:27:39 PM	5992.08	810.75	4921.64	67.33	5083.44	41.58	54.99	84.43	9.26	22.95	32.21
1/24/2007	01:23:35 PM	6184.92	811.56	4957.29	72.59	5125.94	40.23	55.00	85.83	9.24	24.03	33.27
1/24/2007	02:30:42 PM	318.66	40.38	4086.77	6.07	4243.75	1.83	9.76	92.70	9.22	-0.33	8.89
1/24/2007	03:26:39 PM	5086.64	862.44	4773.03	77.60	4915.00	48.51	50.08	87.65	9.20	19.02	28.22
1/24/2007	04:33:46 PM	4820.06	943.00	4717.42	71.39	4862.50	72.44	55.04	77.26	9.18	17.54	26.72
1/24/2007	05:29:42 PM	5110.36	950.06	4766.44	80.62	4922.81	46.72	55.00	84.88	9.16	18.99	28.16
1/24/2007	06:25:39 PM	5181.00	970.56	4775.36	81.49	4941.56	43.51	55.03	86.76	9.14	19.32	28.47
1/24/2007	07:32:46 PM	5807.48	969.63	4900.71	84.01	5087.50	42.11	54.98	81.87	9.12	22.92	32.05
1/24/2007	08:28:42 PM	6265.88	922.38	4993.71	95.34	5199.06	39.63	54.98	90.42	9.10	25.61	34.72
1/24/2007	09:24:39 PM	5872.45	900.88	4905.56	87.48	5101.88	41.47	55.01	85.35	9.08	23.22	32.30
1/24/2007	10:31:46 PM	5616.19	948.63	4866.81	81.85	5048.13	42.50	55.00	89.01	9.06	22.21	31.28
1/24/2007	11:27:43 PM	5100.05	950.81	4774.19	83.75	4928.13	44.15	54.98	84.73	9.04	19.69	28.74
1/25/2007	12:34:50 AM	5135.11	952.94	4793.57	89.84	4939.38	43.28	54.99	86.23	9.02	20.32	29.34

ارائه مدل بهینه عملکرد آسیای نیمه خودشن

1/25/2007	01:30:46 AM	4928.86	953.06	4753.85	83.18	4881.88	48.59	55.00	88.24	9.00	19.28	28.29
1/25/2007	02:26:43 AM	5099.53	972.06	4797.83	84.68	4926.25	43.91	55.01	89.42	8.98	20.60	29.58
1/25/2007	03:33:50 AM	4773.66	968.88	4736.99	87.34	4860.31	50.61	54.94	89.26	8.96	18.97	27.93
1/25/2007	04:29:46 AM	4927.31	948.94	4757.92	75.87	4882.50	48.67	55.00	85.57	8.94	19.64	28.58
1/25/2007	05:36:54 AM	5227.92	960.31	4804.03	79.45	4959.06	42.72	54.99	82.13	8.92	21.01	29.94
1/25/2007	06:32:50 AM	5959.08	948.75	4931.33	80.56	5103.75	42.66	55.00	82.22	8.90	24.67	33.57
1/25/2007	07:28:46 AM	6170.48	928.25	4988.48	92.49	5176.88	39.95	55.01	80.78	8.88	26.35	35.24
1/25/2007	08:35:54 AM	6500.48	900.38	5045.06	81.51	5244.06	39.54	55.02	73.56	8.86	28.02	36.89
1/25/2007	09:09:28 AM	6574.73	895.63	5071.60	86.77	5270.94	37.94	55.10	70.06	9.61	25.76	35.37
1/25/2007	09:43:02 AM	6961.97	907.94	5168.28	100.62	5389.38	37.05	55.01	69.75	9.59	28.55	38.14
1/25/2007	10:38:58 AM	7018.17	900.44	5161.89	91.76	5390.94	37.28	54.99	70.98	9.57	28.45	38.03
1/25/2007	11:46:05 AM	6287.53	898.56	5004.76	91.74	5212.50	38.63	55.00	68.42	9.55	24.12	33.67
1/25/2007	12:42:02 PM	6327.23	892.94	4993.91	78.19	5182.19	40.57	55.01	73.16	9.53	23.90	33.43
1/25/2007	01:37:58 PM	6491.20	904.13	5035.56	94.01	5236.88	38.32	54.99	82.12	9.51	25.15	34.66
1/25/2007	02:45:05 PM	5874.00	927.19	4891.61	77.91	5071.56	42.24	55.03	70.76	9.49	21.19	30.68
1/25/2007	03:41:02 PM	6481.92	932.69	5029.36	87.41	5237.50	38.16	54.99	56.15	9.47	25.14	34.61
1/25/2007	04:36:58 PM	6372.09	877.88	4987.32	81.43	5188.75	38.42	55.11	54.25	9.45	24.04	33.49
1/25/2007	05:44:05 PM	6602.58	877.06	5043.89	88.05	5249.38	36.89	54.98	60.92	9.43	25.70	35.14
1/25/2007	06:40:02 PM	6679.41	896.56	5083.81	106.63	5297.19	36.95	54.98	68.02	9.41	26.91	36.32
1/25/2007	07:35:58 PM	6869.16	900.88	5127.01	114.22	5347.19	36.43	55.03	74.63	9.39	28.20	37.59
1/25/2007	08:43:05 PM	6465.94	901.75	5038.86	105.27	5254.69	37.43	55.01	83.79	9.37	25.80	35.18
1/25/2007	09:39:02 PM	6204.52	902.06	4978.60	99.92	5180.00	40.13	54.99	84.97	9.35	24.19	33.55
1/25/2007	10:46:09 PM	6380.86	892.25	5003.01	81.92	5196.25	40.76	55.00	88.67	9.33	24.96	34.29
1/25/2007	11:42:06 PM	6671.67	788.56	5072.18	88.49	5285.31	38.36	54.98	88.84	9.31	26.98	36.29
1/26/2007	12:49:13 AM	6693.33	801.50	5067.53	83.89	5275.94	39.94	55.03	86.97	9.29	26.93	36.22
1/26/2007	01:45:09 AM	6356.11	804.19	5004.95	82.00	5199.69	40.86	54.99	90.01	9.27	25.26	34.53
1/26/2007	02:41:06 AM	5856.98	803.69	4899.94	74.71	5080.31	42.48	54.98	80.67	9.25	22.39	31.64
1/26/2007	03:37:02 AM	6172.55	845.69	4963.49	74.91	5147.19	42.44	55.03	71.88	9.23	24.25	33.48
1/26/2007	04:44:09 AM	3539.77	322.69	5079.74	46.36	5348.44	26.11	30.48	85.69	9.21	27.60	36.81

ارائه مدل بهینه عملکرد آسیای نیمه خودشن

1/26/2007	05:40:06 AM	6310.22	779.06	5022.19	82.20	5207.19	41.47	54.99	89.83	9.19	26.06	35.25
1/26/2007	06:47:13 AM	6159.66	820.00	4984.02	64.97	5154.38	42.06	54.96	86.23	9.17	25.07	34.24
1/26/2007	07:43:09 AM	6421.59	810.94	5035.17	70.44	5217.19	41.45	55.02	87.23	9.15	26.59	35.74
1/26/2007	08:39:06 AM	6251.95	804.19	4991.58	69.74	5170.94	41.23	54.98	85.23	9.13	25.44	34.57
1/26/2007	09:01:28 AM	6002.91	824.31	4947.79	75.13	5125.00	41.58	55.04	84.33	9.45	22.92	32.37
1/26/2007	09:35:02 AM	5831.20	837.06	4901.88	64.81	5069.69	42.20	55.04	82.15	9.43	21.71	31.14
1/26/2007	10:30:58 AM	4723.13	44.63	4816.82	33.95	5000.63	33.02	53.36	78.71	9.41	19.40	28.82
1/26/2007	05:58:28 PM	5684.25	900.31	4986.35	91.06	5100.31	41.45	54.98	86.27	9.39	24.24	33.64
1/26/2007	06:54:25 PM	5407.36	913.50	4874.75	90.05	5001.88	41.92	55.03	89.63	9.37	21.19	30.56
1/26/2007	08:01:32 PM	4762.83	973.88	4723.04	85.87	4845.63	58.18	55.02	78.08	9.35	17.01	26.37
1/26/2007	08:57:28 PM	5111.91	993.19	4782.72	110.97	4916.88	42.53	56.19	85.63	9.33	18.77	28.10
1/26/2007	09:53:25 PM	5156.25	990.38	4775.16	97.65	4920.94	42.80	56.01	86.52	9.31	18.64	27.95
1/26/2007	10:49:21 PM	5432.11	951.38	4809.26	90.45	4960.63	42.35	54.97	89.00	9.29	19.67	28.97
1/26/2007	11:45:17 PM	5762.63	996.00	4896.45	103.74	5082.50	40.03	56.82	81.53	9.27	22.20	31.48
1/27/2007	12:41:14 AM	6433.45	962.00	5067.92	118.36	5261.88	36.05	58.88	90.07	9.25	27.10	36.35
1/27/2007	01:37:10 AM	5979.70	951.50	5003.59	104.27	5242.81	35.16	58.03	86.69	9.23	25.37	34.61
1/27/2007	02:33:06 AM	6457.17	953.69	5065.98	122.12	5271.88	36.25	58.18	86.62	9.21	27.20	36.42
1/27/2007	03:29:02 AM	6074.58	943.75	4947.79	84.68	5169.38	36.58	57.25	90.39	9.19	23.97	33.16
1/27/2007	04:24:59 AM	5946.70	949.31	4946.83	91.79	5179.38	36.17	57.17	84.95	9.17	24.02	33.19
1/27/2007	05:20:55 AM	6543.28	917.69	5040.02	107.64	5241.56	36.32	56.53	88.72	9.15	26.72	35.87
1/27/2007	06:16:51 AM	6295.27	913.63	4975.69	104.62	5171.88	37.48	55.01	83.90	9.13	24.99	34.12
1/27/2007	07:12:47 AM	6304.03	926.81	4999.33	112.25	5196.56	37.19	55.01	81.08	9.11	25.74	34.85
1/27/2007	08:08:44 AM	6880.50	901.81	5084.97	97.96	5310.63	37.48	55.01	73.98	9.09	28.22	37.31
1/27/2007	09:04:40 AM	7010.95	905.31	5113.64	105.81	5352.50	37.45	55.00	69.90	9.52	27.30	36.82
1/27/2007	10:00:36 AM	6948.56	854.00	5074.12	93.51	5309.06	37.96	55.01	68.08	9.50	26.27	35.78
1/27/2007	10:56:33 AM	6430.36	844.19	4970.27	94.63	5177.19	39.64	55.02	57.61	9.48	23.44	32.92
1/27/2007	11:52:29 AM	5190.28	770.94	4683.52	62.41	4849.06	69.98	56.35	68.93	9.46	15.47	24.93
1/27/2007	12:48:25 PM	5460.98	819.19	4755.01	68.29	4924.38	48.85	59.81	79.57	9.44	17.56	27.00
1/27/2007	03:13:51 PM	3061.78	519.13	4809.84	28.12	4950.00	16.83	39.02	79.57	9.42	19.18	28.60

ارائه مدل بهینه عملکرد آسیای نیمه خودشن

1/27/2007	04:09:48 PM	5177.39	740.56	4740.48	61.48	4872.50	63.52	57.60	79.57	9.40	17.31	26.71
1/27/2007	05:05:44 PM	5200.59	901.81	4735.83	83.28	4884.06	45.86	54.95	79.51	9.38	17.26	26.64
1/27/2007	06:01:40 PM	4969.08	952.44	4684.88	91.43	4826.25	51.56	55.02	41.77	9.36	15.91	25.27
1/27/2007	06:57:36 PM	4921.13	973.50	4670.92	88.57	4808.13	54.48	54.99	54.59	9.34	15.60	24.94
1/27/2007	07:53:33 PM	5019.09	968.69	4683.91	87.06	4819.38	50.13	55.00	61.24	9.32	16.04	25.37
1/27/2007	08:49:29 PM	4929.89	969.75	4674.80	101.41	4813.44	49.50	54.98	67.63	9.30	15.87	25.17
1/27/2007	09:45:25 PM	5234.11	996.38	4735.83	99.71	4883.44	42.16	55.02	74.46	9.28	17.66	26.94
1/27/2007	10:41:21 PM	5748.19	965.81	4847.43	110.32	5018.75	40.47	54.93	79.41	9.26	20.88	30.14
1/27/2007	11:37:18 PM	5602.27	955.38	4810.81	102.54	4983.13	41.42	54.99	72.35	9.24	19.93	29.17
1/28/2007	12:33:14 AM	5832.75	877.19	4842.59	90.80	5003.75	40.94	55.01	74.56	9.22	20.90	30.12
1/28/2007	01:40:22 AM	6477.80	947.13	5022.58	119.28	5214.69	36.31	55.01	78.14	9.20	26.03	35.24
1/28/2007	02:36:18 AM	6634.03	959.25	5072.18	122.61	5285.31	36.07	54.99	83.17	9.18	27.51	36.69
1/28/2007	03:32:14 AM	6232.88	947.44	4985.38	121.43	5200.63	36.54	55.02	90.02	9.16	25.15	34.31
1/28/2007	04:39:22 AM	5858.02	943.94	4898.97	96.91	5125.31	38.14	54.98	89.66	9.14	22.81	31.95
1/28/2007	05:35:18 AM	5782.22	952.63	4878.82	98.69	5080.31	39.94	55.01	86.53	9.12	22.32	31.44
1/28/2007	06:42:25 AM	6125.63	956.19	4953.41	103.12	5145.31	38.26	55.05	87.95	9.10	24.50	33.60
1/28/2007	07:49:33 AM	6363.84	951.50	4997.39	107.69	5190.00	38.51	55.04	86.24	9.08	25.81	34.89
1/28/2007	09:07:52 AM	6223.59	927.06	4961.94	91.51	5140.94	40.48	54.98	77.86	9.51	23.09	32.60
1/28/2007	10:14:59 AM	6522.14	898.00	5006.89	104.85	5211.88	38.23	55.00	73.15	9.49	24.44	33.93
1/28/2007	11:22:07 AM	5927.63	946.13	4873.01	94.32	5060.31	40.58	55.13	72.06	9.47	20.76	30.23
1/28/2007	12:29:14 PM	5773.97	928.81	4839.88	102.98	5036.88	40.38	55.03	84.38	9.45	19.91	29.36
1/29/2007	07:39:31 PM	5133.05	957.06	4800.16	83.42	5026.88	47.94	54.94	76.63	9.43	18.87	28.30
1/29/2007	08:35:27 PM	5171.72	984.81	4773.61	87.23	4984.69	45.52	55.02	82.78	9.41	18.21	27.62
1/29/2007	09:31:23 PM	4967.02	1029.38	4722.08	113.69	4928.75	45.44	55.02	89.13	9.39	16.84	26.23
1/29/2007	10:38:31 PM	4758.19	1082.38	4671.31	125.72	4860.94	47.16	56.11	83.08	9.37	15.50	24.87
1/29/2007	11:45:39 PM	5126.34	1082.25	4724.79	121.49	4919.69	42.71	55.81	69.94	9.35	17.08	26.43
1/30/2007	12:41:35 AM	5379.00	1086.63	4765.86	122.63	4993.13	45.59	56.57	67.28	9.33	18.31	27.64
1/30/2007	01:48:42 AM	5395.50	1083.63	4760.63	122.02	4990.63	44.97	56.62	59.22	9.31	18.25	27.56
1/30/2007	02:55:50 AM	5171.20	1049.63	4735.83	166.25	4982.50	42.03	57.38	61.37	9.29	17.63	26.92

ارائه مدل بهینه عملکرد آسیای نیمه خودشن

1/30/2007	03:51:46 AM	4635.98	965.63	4578.51	83.38	4749.06	81.53	55.02	68.20	9.27	13.30	22.56
1/30/2007	04:47:42 AM	4731.89	1001.50	4610.86	103.99	4784.38	46.89	54.99	75.94	9.25	14.28	23.53
1/30/2007	05:54:50 AM	4674.14	1006.75	4612.22	105.51	4784.38	49.71	54.97	79.47	9.23	14.40	23.63
1/30/2007	07:01:57 AM	4977.33	1051.31	4674.41	103.65	4862.81	44.25	55.02	83.63	9.21	16.23	25.44
1/30/2007	08:09:05 AM	5836.88	996.25	4829.99	84.81	5057.19	42.56	55.02	62.80	9.19	20.68	29.87
1/30/2007	09:05:01 AM	5910.09	789.88	4816.63	69.01	5079.38	45.55	54.94	52.29	9.64	18.50	28.14
1/30/2007	09:27:24 AM	5652.28	800.25	4760.24	76.40	5008.13	44.63	55.03	51.76	9.62	17.00	26.62
1/30/2007	10:34:31 AM	5467.17	863.00	4714.13	61.40	4931.25	43.54	55.04	45.48	9.60	15.78	25.38
1/30/2007	11:41:39 AM	5817.80	895.94	4803.45	76.91	5095.31	37.67	55.00	57.02	9.58	18.37	27.95
1/30/2007	12:59:58 PM	6607.73	917.63	4992.36	102.16	5315.94	27.80	54.94	62.99	9.56	23.76	33.31
1/30/2007	01:55:54 PM	5898.75	946.94	4856.73	88.54	5210.00	27.87	54.97	68.65	9.54	20.03	29.57
1/30/2007	03:03:01 PM	5873.48	941.56	4833.09	90.44	5183.75	28.07	55.01	77.00	9.52	19.45	28.96
1/30/2007	04:10:09 PM	6026.63	946.00	4851.31	88.26	5207.50	27.95	54.96	76.47	9.50	20.04	29.53
1/30/2007	05:17:16 PM	6330.33	905.94	4880.95	88.26	5202.50	29.77	55.05	66.55	9.48	20.95	30.43
1/30/2007	06:24:24 PM	6533.48	868.06	4927.84	87.52	5265.63	27.89	55.02	72.48	9.46	22.35	31.80
1/30/2007	07:20:20 PM	6548.44	868.50	4917.96	77.75	5255.31	28.34	55.02	72.65	9.44	22.15	31.59
1/30/2007	08:27:28 PM	6360.75	870.38	4898.39	88.55	5238.75	28.31	55.03	84.61	9.42	21.68	31.10
1/30/2007	09:34:35 PM	5667.23	899.31	4735.64	72.90	5046.56	40.59	55.00	85.19	9.40	17.19	26.59
1/30/2007	10:30:31 PM	5796.14	952.44	4783.49	88.97	5093.75	41.42	55.02	81.84	9.38	18.62	27.99
1/30/2007	11:37:39 PM	5818.31	948.38	4820.31	100.70	5161.25	30.37	54.98	78.87	9.36	19.73	29.09
1/31/2007	12:44:47 AM	6007.03	955.81	4864.87	111.23	5190.94	30.77	55.01	84.82	9.34	21.06	30.40
1/31/2007	01:51:54 AM	5682.70	950.50	4776.52	78.13	5099.06	45.91	55.01	84.30	9.32	18.66	27.98
1/31/2007	02:59:02 AM	5970.42	976.75	4821.47	80.21	5121.56	39.33	54.99	89.06	9.30	20.00	29.30
1/31/2007	03:54:58 AM	6278.25	976.63	4920.09	104.05	5254.69	29.77	55.00	87.80	9.28	22.85	32.13
1/31/2007	04:50:54 AM	6459.23	953.81	4944.89	102.76	5286.25	28.74	54.98	85.06	9.26	23.63	32.89
1/31/2007	05:46:50 AM	6650.53	954.25	4984.80	103.73	5336.88	28.68	55.01	87.96	9.24	24.83	34.07
1/31/2007	06:53:58 AM	6582.98	947.00	4962.33	100.05	5309.38	29.94	54.97	89.34	9.22	24.28	33.50
1/31/2007	08:01:05 AM	7151.20	915.94	5150.84	77.28	5597.81	27.73	55.00	75.40	9.20	29.65	38.85
1/31/2007	09:19:24 AM	7308.47	802.94	5255.27	76.68	5742.81	27.87	54.99	71.21	9.64	30.78	40.43

ارائه مدل بهینه عملکرد آسیای نیمه خودشن

1/31/2007	10:15:20 AM	7239.89	802.19	5237.64	86.73	5732.81	27.87	55.00	73.65	9.62	30.37	39.99
1/31/2007	11:22:28 AM	6675.80	803.25	4956.13	95.94	5345.63	28.02	55.04	86.09	9.60	22.55	32.15
1/31/2007	12:18:24 PM	6014.77	828.88	4812.94	75.79	5186.88	32.27	55.03	81.34	9.58	18.61	28.19
1/31/2007	01:25:32 PM	6222.05	898.69	4870.68	87.00	5241.56	30.43	55.65	88.97	9.56	20.31	29.87
1/31/2007	02:21:28 PM	5923.50	899.56	4815.66	90.50	5184.69	31.00	54.94	82.91	9.54	18.84	28.39
1/31/2007	03:17:24 PM	6336.00	921.00	4882.50	90.85	5237.50	29.43	55.01	90.65	9.52	20.80	30.33
1/31/2007	04:35:43 PM	6745.92	913.31	4988.29	101.34	5375.63	27.89	54.98	75.48	9.50	23.85	33.36
1/31/2007	05:42:51 PM	7046.02	900.00	5108.02	103.49	5575.31	28.18	54.96	76.97	9.48	27.29	36.78
1/31/2007	06:49:58 PM	7381.69	657.13	5471.50	66.25	5941.25	28.00	54.92	75.28	9.46	37.58	47.04
1/31/2007	07:57:06 PM	7387.36	594.31	5339.94	69.81	5841.88	27.95	55.01	89.96	9.44	33.97	43.41
1/31/2007	09:04:13 PM	7298.16	628.81	5263.02	82.58	5824.38	27.73	55.04	87.32	9.42	31.89	41.31
1/31/2007	10:00:10 PM	7260.52	639.19	5092.52	72.54	5595.00	27.95	54.97	90.76	9.40	27.18	36.59
1/31/2007	10:56:06 PM	7420.88	607.81	5151.81	48.99	5695.00	27.95	55.02	87.05	9.38	28.93	38.31
1/31/2007	11:52:02 PM	7455.94	607.75	5291.31	58.11	5785.63	27.95	55.03	81.18	9.36	32.92	42.29
2/1/2007	12:59:10 AM	7120.27	432.94	4970.46	45.50	5428.13	27.78	54.99	91.87	9.34	24.00	33.34
2/1/2007	01:55:06 AM	5734.78	563.25	4665.89	52.17	5011.88	44.51	55.03	83.20	9.32	15.53	24.85
2/1/2007	03:02:13 AM	5184.09	801.25	4592.26	59.84	4873.75	46.01	55.03	66.19	9.30	13.54	22.84
2/1/2007	04:09:21 AM	5987.95	843.19	4789.11	73.51	5111.88	41.98	54.99	65.57	9.28	19.15	28.43
2/1/2007	05:05:17 AM	5847.70	856.56	4777.88	72.47	5117.19	41.87	55.01	63.24	9.26	18.91	28.18
2/1/2007	06:01:13 AM	6189.56	857.88	4864.48	85.14	5203.75	34.89	55.02	70.79	9.24	21.42	30.67
2/1/2007	07:08:21 AM	6797.48	851.50	4996.23	96.30	5383.75	29.20	54.99	79.38	9.22	25.20	34.43
2/1/2007	08:15:28 AM	151.08	4.63	5286.47	1.65	5668.13	0.00	9.89	73.69	9.20	33.43	42.63
2/1/2007	09:00:14 AM	6461.30	847.19	4986.16	77.16	5339.38	34.36	55.03	73.13	9.80	22.59	32.40
2/1/2007	09:56:10 AM	6586.08	852.13	5000.11	91.72	5355.00	32.14	54.99	81.22	9.78	23.07	32.85
2/1/2007	11:03:17 AM	6776.34	849.13	5042.73	85.77	5407.81	27.91	55.06	75.12	9.76	24.34	34.11
2/1/2007	11:59:14 AM	7255.36	812.50	5217.30	73.69	5682.81	27.94	55.01	80.78	9.74	29.33	39.07
2/1/2007	12:55:10 PM	6231.84	838.56	4930.36	86.05	5338.75	27.96	54.98	86.33	9.72	21.35	31.07
2/1/2007	01:51:06 PM	6573.70	811.06	4950.31	74.76	5321.56	28.60	55.03	88.96	9.70	21.99	31.69
2/1/2007	02:58:14 PM	6929.48	775.44	4997.98	84.86	5359.38	28.27	55.00	85.16	9.68	23.41	33.09

ارائه مدل بهینه عملکرد آسیای نیمه خودشن

2/1/2007	04:05:21 PM	6555.66	752.38	4917.18	73.67	5294.69	29.37	55.02	88.56	9.66	21.22	30.88
2/1/2007	05:12:29 PM	6174.09	824.50	4827.86	70.46	5152.50	39.45	55.07	77.84	9.64	18.80	28.44
2/1/2007	06:19:36 PM	6615.98	834.06	4953.22	85.90	5308.75	29.28	55.03	87.77	9.62	22.39	32.02
2/1/2007	07:26:44 PM	6282.38	826.88	4900.33	77.37	5281.88	28.31	55.00	85.85	9.60	20.99	30.59
2/1/2007	08:33:51 PM	6800.58	835.13	5011.54	88.71	5380.31	27.93	54.98	87.85	9.58	24.19	33.77
2/1/2007	09:40:59 PM	6452.53	835.44	4947.41	84.15	5328.44	29.53	54.93	87.44	9.56	22.47	32.04
2/1/2007	10:48:06 PM	6602.06	850.88	4966.01	74.78	5326.88	28.99	54.97	89.91	9.54	23.08	32.62
2/1/2007	11:44:03 PM	6469.03	841.31	4938.88	66.43	5309.38	29.24	54.98	81.65	9.52	22.39	31.92
2/2/2007	12:51:10 AM	6839.77	798.13	5013.09	76.33	5372.50	27.92	55.04	87.44	9.50	24.56	34.06
2/2/2007	01:47:06 AM	6205.03	800.06	4934.62	87.54	5328.13	27.91	54.98	88.09	9.48	22.44	31.92
2/2/2007	02:54:14 AM	5673.94	888.75	4782.14	87.15	5107.19	41.84	55.08	89.32	9.46	18.24	27.70
2/2/2007	04:01:21 AM	4950.52	956.94	4633.92	71.06	4890.00	53.66	55.00	87.70	9.44	14.16	23.60
2/2/2007	05:08:29 AM	6033.33	918.88	4883.27	78.13	5218.13	32.11	55.00	83.91	9.42	21.24	30.66
2/2/2007	06:15:36 AM	6295.78	900.75	4960.97	86.42	5331.88	28.55	55.02	78.91	9.40	23.50	32.90
2/2/2007	07:22:44 AM	6906.28	855.44	5078.19	94.91	5434.06	27.73	54.99	80.42	9.38	26.87	36.25
2/2/2007	08:18:40 AM	6709.31	860.31	5029.75	83.61	5389.06	28.46	55.02	76.95	9.36	25.59	34.95
2/2/2007	09:25:48 AM	6878.44	847.75	5047.19	86.93	5411.56	29.98	55.07	79.48	10.09	23.15	33.24
2/2/2007	10:32:55 AM	6859.88	855.94	5017.74	84.34	5373.13	30.33	55.00	79.62	10.07	22.40	32.47
2/2/2007	11:40:03 AM	6502.55	855.31	4933.65	83.33	5273.13	40.09	55.04	89.38	10.05	20.12	30.17
2/2/2007	12:47:10 PM	6099.33	944.44	4845.11	84.47	5154.38	42.38	55.00	85.90	10.03	17.72	27.75
2/2/2007	01:54:18 PM	6543.28	957.63	4966.59	107.21	5309.69	33.90	55.01	87.63	10.01	21.21	31.22
2/2/2007	03:01:25 PM	6238.55	945.44	4864.48	77.42	5167.50	41.47	55.02	74.01	9.99	18.42	28.41
2/2/2007	04:08:33 PM	7106.86	901.19	5086.91	95.53	5448.44	27.87	55.02	85.39	9.97	24.75	34.72
2/2/2007	05:15:40 PM	7436.86	851.19	5511.80	76.50	6025.63	27.88	55.04	87.14	9.95	36.76	46.71
2/2/2007	06:22:48 PM	5492.44	734.13	4652.13	44.53	4902.19	62.90	55.03	92.67	9.93	12.70	22.63
2/2/2007	07:18:44 PM	5332.08	829.56	4645.93	55.62	4897.50	53.35	55.01	86.99	9.91	12.61	22.52
2/2/2007	08:25:52 PM	5641.45	851.19	4720.33	64.52	4976.88	42.76	55.04	85.16	9.89	14.78	24.67
2/2/2007	09:32:59 PM	5272.78	877.88	4653.68	65.09	4877.81	51.11	55.01	83.68	9.87	12.99	22.86
2/2/2007	10:40:07 PM	5974.03	867.88	4795.12	67.78	5045.63	45.33	55.01	91.04	9.85	17.04	26.89

ارائه مدل بهینه عملکرد آسیای نیمه خودشن

2/2/2007	11:47:14 PM	6113.77	846.31	4824.76	70.10	5081.88	41.61	55.03	80.26	9.85	17.87	27.72
2/3/2007	12:54:22 AM	6700.55	851.13	4952.83	74.14	5240.63	30.77	55.00	89.40	9.81	21.63	31.44
2/3/2007	02:01:29 AM	6902.67	849.69	5035.56	92.06	5368.75	27.87	54.99	84.14	9.79	24.03	33.82
2/3/2007	02:57:26 AM	6988.78	747.69	5034.40	78.37	5385.63	27.99	55.01	77.28	9.77	24.08	33.85
2/3/2007	03:53:22 AM	6404.58	748.50	4872.04	61.35	5194.69	39.61	54.99	66.33	9.75	19.60	29.35
2/3/2007	05:00:29 AM	6730.97	798.50	4948.18	66.48	5277.19	31.00	55.04	82.60	9.73	21.82	31.55
2/3/2007	05:56:26 AM	7005.80	803.06	5059.98	77.56	5435.00	27.87	55.00	88.50	9.71	25.04	34.75
2/3/2007	07:03:33 AM	7174.92	805.50	5136.12	69.84	5577.19	28.10	55.02	90.29	9.69	27.26	36.95
2/3/2007	08:10:41 AM	7385.30	745.56	5241.91	57.46	5698.44	28.06	55.00	88.35	9.67	30.31	39.98
2/3/2007	09:06:37 AM	7466.25	651.50	5350.02	62.78	5855.31	29.15	54.98	89.62	10.27	30.94	41.21
2/3/2007	10:02:33 AM	7597.73	569.38	5262.83	54.57	5764.69	28.03	55.00	91.00	10.25	28.57	38.82
2/3/2007	11:09:41 AM	6455.11	540.06	4800.35	51.11	5135.63	44.77	55.13	88.64	10.23	15.67	25.90
2/3/2007	12:16:48 PM	6200.91	753.13	4772.26	53.99	5074.06	42.98	55.01	88.23	10.21	14.96	25.17
2/3/2007	01:23:56 PM	6501.52	801.69	4845.11	62.63	5162.50	42.18	55.05	88.88	10.19	17.08	27.27
2/3/2007	02:19:52 PM	6423.66	794.94	4827.67	70.84	5162.50	39.06	54.97	90.81	10.17	16.68	26.84
2/3/2007	03:15:48 PM	6780.47	803.06	4913.50	76.94	5262.50	32.78	55.02	87.58	10.15	19.17	29.31
2/3/2007	04:22:56 PM	6976.41	800.00	4927.06	73.69	5272.81	30.47	55.02	87.60	10.13	19.63	29.75
2/3/2007	05:30:03 PM	7213.59	795.69	5014.25	66.56	5420.00	27.99	54.97	91.72	10.11	22.16	32.26
2/3/2007	06:37:11 PM	7260.52	705.19	5016.38	61.22	5450.94	28.03	54.99	87.87	10.09	22.30	32.38
2/3/2007	07:33:07 PM	6830.48	703.81	4864.09	59.96	5208.44	41.10	55.03	91.93	10.07	18.10	28.17
2/3/2007	08:29:03 PM	6021.98	748.69	4713.16	63.82	5025.63	44.99	54.98	87.47	10.05	13.94	23.99
2/3/2007	09:36:11 PM	5630.11	893.56	4659.88	62.57	4934.38	43.43	55.04	90.17	10.03	12.53	22.56
2/3/2007	10:32:07 PM	5843.06	906.56	4715.29	74.89	5007.19	45.60	55.04	86.60	10.01	14.16	24.17
2/3/2007	11:28:04 PM	5863.69	946.94	4721.49	75.89	5004.06	45.14	55.03	82.52	9.99	14.42	24.41
2/4/2007	12:24:00 AM	6390.66	905.75	4834.26	64.41	5143.13	43.02	55.02	68.28	9.97	17.67	27.63
2/4/2007	01:19:56 AM	7068.70	850.88	4964.07	66.80	5296.25	29.10	54.98	67.18	9.95	21.39	31.34
2/4/2007	02:27:04 AM	6073.55	850.63	4756.76	69.70	5060.31	41.44	55.02	67.02	9.93	15.65	25.58
2/4/2007	03:34:11 AM	5375.39	848.00	4614.16	70.81	4863.13	45.86	55.03	70.96	9.91	11.73	21.64
2/4/2007	04:30:07 AM	5704.36	896.88	4686.23	62.16	4938.44	43.45	54.97	58.06	9.89	13.83	23.72

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

2/4/2007	05:37:15 AM	5397.56	953.06	4636.83	73.92	4869.38	43.33	55.09	68.61	9.87	12.53	22.39
2/4/2007	06:44:22 AM	5744.06	949.81	4715.29	74.56	4962.81	46.22	55.00	75.16	9.85	14.81	24.66
2/4/2007	07:51:30 AM	6031.78	946.88	4776.52	71.67	5041.25	39.32	55.03	67.82	9.83	16.61	26.44
2/4/2007	08:25:04 AM	6493.78	950.94	4884.05	77.30	5170.63	32.26	55.10	68.71	10.00	18.95	28.94
2/4/2007	08:51:04 PM	6143.67	817.25	5022.97	72.41	5288.13	48.80	54.94	86.48	9.98	22.93	32.90
2/4/2007	10:09:23 PM	5719.83	898.94	4869.71	91.08	5129.38	44.38	55.00	87.31	10.13	18.03	28.15
2/4/2007	11:16:31 PM	5586.28	898.38	4821.86	111.76	5118.44	44.62	55.00	87.15	10.11	16.76	26.87
2/5/2007	12:23:38 AM	5608.97	898.06	4797.06	91.81	5093.75	42.98	55.00	74.06	10.09	16.15	26.23
2/5/2007	01:19:34 AM	5588.86	902.44	4787.95	104.78	5101.25	44.55	55.00	84.15	10.07	15.97	26.04
2/5/2007	02:26:42 AM	5098.50	951.25	4680.03	88.21	4975.94	56.59	55.01	86.22	10.05	13.02	23.07
2/5/2007	03:22:38 AM	5027.86	953.81	4660.08	83.86	4959.69	61.25	54.99	87.34	10.03	12.54	22.57
2/5/2007	04:29:46 AM	5024.25	1034.88	4673.83	114.94	4981.88	46.93	59.97	88.35	10.01	13.01	23.02
2/5/2007	05:25:42 AM	5005.69	1027.00	4654.65	103.28	4963.44	49.04	60.01	90.12	9.99	12.55	22.54
2/5/2007	06:32:49 AM	5351.16	1042.50	4729.44	115.95	5083.44	45.39	59.98	89.84	9.97	14.73	24.70
2/5/2007	07:39:57 AM	5841.52	896.13	5081.09	162.35	5510.31	24.98	54.96	80.23	9.95	24.69	34.63
2/5/2007	08:35:53 AM	7136.25	821.69	5102.41	105.20	5564.06	28.02	54.98	90.32	9.93	25.36	35.29
2/5/2007	09:09:27 AM	7338.89	765.19	5161.11	78.98	5642.19	29.66	55.02	87.85	10.37	25.21	35.58
2/5/2007	10:05:23 AM	7071.28	765.94	5040.60	95.70	5473.75	29.28	55.02	89.60	10.35	21.91	32.26
2/5/2007	01:49:08 PM	5365.08	902.75	4739.51	77.04	5023.44	60.59	54.97	86.02	10.33	13.54	23.87
2/5/2007	02:56:16 PM	6021.47	947.63	4863.32	95.01	5190.00	44.61	57.04	81.24	10.31	17.09	27.41
2/5/2007	04:03:23 PM	6529.36	948.69	4957.09	84.70	5313.13	44.27	57.00	68.76	10.29	19.81	30.10
2/5/2007	05:21:42 PM	7043.95	903.69	5065.98	101.95	5451.56	30.12	54.95	52.81	10.27	22.94	33.22
2/5/2007	06:17:38 PM	6328.27	580.44	4877.08	59.40	5225.63	43.61	54.30	52.60	10.25	17.72	27.97
2/5/2007	10:23:46 PM	5883.28	956.44	4898.97	87.05	5191.88	46.22	55.04	83.22	10.23	18.41	28.65
2/5/2007	11:30:54 PM	5285.16	947.63	4745.91	80.86	5033.13	46.56	55.03	67.06	10.21	14.20	24.41
2/6/2007	12:26:50 AM	5394.98	899.63	4755.98	80.37	5055.63	45.58	60.01	57.59	10.19	14.56	24.75
2/6/2007	01:33:57 AM	5068.08	928.88	4679.06	85.12	4976.25	62.68	60.02	56.62	10.17	12.48	22.66
2/6/2007	02:41:05 AM	4798.41	1086.00	4633.34	88.79	4936.56	79.07	60.03	64.43	10.15	11.28	21.43
2/6/2007	03:37:01 AM	4730.34	1101.44	4623.26	101.23	4926.88	65.10	60.00	67.23	10.13	11.08	21.21

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

2/6/2007	04:32:57 AM	2471.39	494.88	4702.51	42.99	4980.94	29.08	51.83	65.90	10.11	13.38	23.50
2/6/2007	05:28:54 AM	4907.20	1074.25	4686.42	103.65	4978.75	45.43	54.95	57.27	10.09	13.01	23.10
2/6/2007	06:36:01 AM	5648.67	1142.88	4837.36	97.05	5185.63	39.75	54.98	62.29	10.07	17.33	27.40
2/6/2007	07:43:09 AM	6984.14	848.19	5103.18	93.55	5487.50	27.89	54.92	71.03	10.05	24.87	34.93
2/6/2007	08:39:05 AM	6976.41	703.31	5051.64	71.98	5434.38	28.96	54.99	77.69	10.03	23.51	33.54
2/6/2007	09:12:39 AM	7207.92	665.75	5087.68	62.05	5491.56	30.51	54.99	80.19	10.48	22.72	33.20
2/6/2007	10:19:46 AM	6185.44	653.38	4822.05	65.46	5172.50	43.51	54.99	71.26	10.46	15.34	25.80
2/6/2007	11:26:54 AM	5864.72	528.44	4736.61	57.67	5061.88	53.68	49.03	68.55	10.44	13.02	23.46
2/6/2007	04:17:46 PM	6108.09	800.00	4898.58	84.06	5204.69	44.53	54.99	81.22	10.42	17.65	28.07
2/6/2007	05:24:54 PM	5915.77	797.63	4816.24	73.61	5125.94	43.03	57.00	77.00	10.40	15.42	25.82
2/6/2007	06:32:01 PM	5359.92	902.06	4688.94	67.89	4997.81	70.54	60.04	84.84	10.38	11.92	22.31
2/6/2007	07:39:09 PM	5292.38	999.19	4683.71	91.60	5008.13	57.93	60.01	88.92	10.36	11.86	22.22
2/6/2007	08:46:17 PM	5353.22	1001.69	4696.11	104.91	5037.19	45.39	59.99	88.62	10.34	12.29	22.63
2/6/2007	09:53:24 PM	5269.17	1026.06	4660.46	84.91	4990.63	56.32	59.99	85.58	10.32	11.37	21.69
2/6/2007	11:00:32 PM	6060.14	978.06	4839.88	90.10	5225.00	40.15	59.97	88.40	10.30	16.48	26.78
2/7/2007	12:07:39 AM	7023.84	951.44	5102.60	93.41	5546.88	27.87	60.00	86.22	10.28	23.94	34.22
2/7/2007	01:14:47 AM	6734.06	902.31	4931.91	84.70	5335.31	33.00	55.03	91.68	10.26	19.23	29.49
2/7/2007	02:21:54 AM	7448.20	790.88	5165.96	65.47	5655.31	28.10	55.00	83.10	10.24	25.88	36.12
2/7/2007	03:17:50 AM	7464.70	752.00	5363.97	78.60	5905.00	27.88	55.00	83.41	10.22	31.52	41.74
2/7/2007	04:24:58 AM	7428.61	699.38	5312.04	82.68	5900.00	27.95	54.98	91.64	10.20	30.14	40.34
2/7/2007	05:32:05 AM	7377.05	699.44	5202.96	81.63	5759.06	28.10	55.03	90.06	10.18	27.16	37.34
2/7/2007	06:28:02 AM	6834.09	712.75	4980.54	87.79	5455.00	27.90	55.03	88.99	10.16	21.00	31.16
2/7/2007	07:35:09 AM	5328.47	892.50	4599.04	75.01	4957.50	66.80	55.12	86.93	10.14	10.37	20.51
2/7/2007	08:31:06 AM	5607.94	946.31	4671.89	92.50	5047.19	43.11	55.01	87.04	10.12	12.49	22.61
2/7/2007	09:04:39 AM	5990.02	950.06	4754.43	98.30	5137.50	45.64	55.01	89.59	10.29	14.13	24.42
2/7/2007	09:38:13 AM	6025.59	953.44	4761.99	103.98	5159.06	44.88	55.00	85.71	10.27	14.42	24.69
2/7/2007	10:34:09 AM	5934.84	948.38	4718.39	87.21	5094.69	44.01	55.00	87.22	10.25	13.28	23.53
2/7/2007	11:30:06 AM	6982.08	885.75	4951.09	90.61	5368.13	29.65	54.97	90.87	10.23	19.89	30.12
2/7/2007	12:37:13 PM	7288.88	823.00	5054.94	83.31	5540.63	28.11	54.94	84.93	10.21	22.89	33.10

ارائه مدل بهینه عملکرد آسیای نیمه خودشن

2/7/2007	01:33:09 PM	7498.22	639.31	5153.75	62.39	5654.06	28.32	54.94	76.90	10.19	25.74	35.93
2/7/2007	02:40:17 PM	7663.22	412.19	5160.34	45.02	5686.88	28.26	46.64	87.13	10.17	26.01	36.18
2/7/2007	10:52:32 PM	6202.45	788.63	4979.96	65.03	5200.63	44.51	55.05	90.53	10.49	19.66	30.15
2/7/2007	11:37:17 PM	5985.89	799.13	4906.72	81.66	5161.25	44.65	55.00	84.53	10.47	17.68	28.15
2/8/2007	12:33:13 AM	6202.45	817.38	4907.88	79.58	5189.06	42.91	55.03	90.33	10.45	17.79	28.24
2/8/2007	01:29:10 AM	3276.28	399.06	5069.27	38.86	5418.13	15.28	66.13	87.59	10.43	22.41	32.84
2/8/2007	02:36:17 AM	5849.25	805.19	4792.02	68.63	5067.81	57.09	54.99	88.08	10.41	14.70	25.11
2/8/2007	03:32:13 AM	6232.36	848.75	4863.13	77.41	5166.88	43.17	54.97	91.74	10.39	16.78	27.17
2/8/2007	04:28:10 AM	6680.95	770.44	4935.59	76.65	5267.50	43.86	55.00	87.07	10.37	18.89	29.26
2/8/2007	05:35:17 AM	6646.41	775.56	4918.34	74.72	5263.44	41.03	55.00	88.89	10.35	18.49	28.84
2/8/2007	06:31:13 AM	6125.11	801.19	4795.70	76.55	5142.19	43.40	55.03	89.13	10.33	15.13	25.46
2/8/2007	07:27:10 AM	6307.64	851.56	4829.80	75.55	5185.00	45.44	55.02	83.26	10.31	16.17	26.47
2/8/2007	08:34:17 AM	6836.16	848.88	4925.13	77.29	5299.06	40.22	55.04	87.98	10.29	18.92	29.21
2/8/2007	09:07:51 AM	7067.16	809.88	4963.10	86.02	5346.25	44.21	54.98	90.57	10.74	18.19	28.92
2/8/2007	10:03:47 AM	6505.13	800.50	4850.73	82.73	5219.06	45.38	55.03	90.08	10.72	15.11	25.83
2/8/2007	11:02:59 AM	6184.41	798.44	4764.31	66.71	5105.00	44.39	55.00	85.58	10.70	12.77	23.46
2/8/2007	11:58:56 AM	6220.50	800.38	4770.90	68.29	5115.63	43.47	55.06	74.27	10.68	13.03	23.71
2/8/2007	12:54:52 PM	7019.20	799.81	4926.87	81.87	5307.50	40.28	55.03	82.69	10.66	17.49	28.15
2/8/2007	01:50:48 PM	7294.55	702.19	5025.49	81.21	5446.56	28.33	55.02	92.17	10.64	20.34	30.98
2/8/2007	02:46:44 PM	6381.89	726.44	4797.25	75.66	5221.25	44.82	55.03	88.15	10.62	14.01	24.63
2/8/2007	03:53:52 PM	6023.53	894.06	4710.64	73.54	5067.19	43.59	54.98	88.84	10.60	11.66	22.26
2/8/2007	05:00:59 PM	6443.77	904.13	4842.98	87.96	5275.63	34.56	58.02	85.50	10.58	15.46	26.04
2/8/2007	05:56:56 PM	6967.64	838.44	4937.33	88.79	5360.31	30.37	57.96	80.23	10.56	18.19	28.74
2/8/2007	06:52:52 PM	6953.20	849.06	4934.23	90.46	5357.50	30.73	58.02	75.88	10.54	18.18	28.72
2/8/2007	08:00:00 PM	7049.11	826.19	4916.99	79.41	5323.75	41.93	58.01	68.95	10.52	17.78	28.29
2/8/2007	08:55:56 PM	7665.28	670.13	5143.09	56.33	5653.75	27.84	56.43	68.34	10.50	24.21	34.70
2/8/2007	09:51:52 PM	7449.75	597.88	5029.75	60.48	5501.56	27.85	55.03	71.81	10.48	21.10	31.58
2/8/2007	10:47:48 PM	6541.22	703.81	4785.24	74.49	5188.44	43.68	55.01	82.20	10.46	14.32	24.78
2/8/2007	11:43:45 PM	5689.41	792.88	4615.32	65.67	4971.25	73.28	55.09	86.20	10.44	9.63	20.07

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

2/9/2007	12:39:41 AM	5688.89	895.38	4631.21	73.39	4991.88	57.72	55.00	77.86	10.42	10.16	20.57
2/9/2007	01:46:48 AM	6546.89	901.75	4804.61	80.70	5198.13	42.87	55.05	82.58	10.40	15.11	25.50
2/9/2007	02:42:45 AM	7058.91	891.88	4936.36	98.33	5358.13	29.43	55.03	89.81	10.38	18.88	29.26
2/9/2007	03:38:41 AM	7532.77	832.75	5181.46	67.51	5697.19	27.88	54.93	88.16	10.36	25.85	36.20
2/9/2007	04:45:48 AM	6614.95	786.38	4801.51	62.09	5246.56	44.11	54.85	88.77	10.34	15.26	25.60
2/9/2007	05:41:45 AM	6321.05	776.63	4756.76	69.63	5170.63	44.12	55.00	88.69	10.32	14.08	24.40
2/9/2007	06:37:41 AM	5864.20	840.44	4673.64	78.14	5060.94	44.56	55.03	86.99	9.36	15.59	24.96
2/9/2007	07:44:49 AM	5673.94	899.19	4641.28	71.61	4998.13	54.84	55.03	84.19	10.28	11.00	21.28
2/9/2007	08:51:56 AM	7307.44	854.06	5008.05	68.22	5455.63	32.61	54.95	67.05	10.30	21.19	31.50
2/9/2007	09:03:07 AM	7534.31	858.88	5127.59	60.15	5618.13	29.70	55.03	63.21	10.71	22.93	33.64
2/9/2007	09:59:04 AM	7752.42	701.69	5215.75	52.58	5737.81	27.87	55.00	57.02	10.69	25.49	36.17
2/9/2007	11:06:11 AM	7377.05	495.31	4984.99	60.03	5433.44	34.91	53.75	72.21	10.67	19.09	29.76
2/9/2007	12:13:19 PM	6073.55	698.13	4683.52	60.21	5044.69	55.28	55.01	87.03	10.65	10.71	21.35
2/9/2007	01:20:26 PM	6116.86	800.44	4701.54	72.14	5074.69	45.42	55.04	87.14	10.35	12.40	22.75
2/9/2007	02:27:34 PM	6399.94	854.69	4764.70	90.01	5155.31	44.95	55.01	86.26	10.61	13.15	23.75
2/9/2007	03:23:30 PM	6257.63	900.56	4735.06	100.98	5136.25	45.40	55.00	87.55	10.59	12.40	22.98
2/9/2007	04:19:26 PM	6470.06	887.63	4791.24	100.27	5227.50	41.03	56.75	81.51	10.57	14.06	24.62
2/9/2007	06:22:30 PM	6374.16	815.56	4796.48	79.34	5140.31	44.70	60.01	88.74	10.55	14.28	24.83
2/9/2007	07:29:37 PM	6094.69	820.31	4727.89	90.97	5081.25	42.92	60.09	88.71	10.53	12.44	22.96
2/9/2007	08:25:34 PM	5959.08	862.63	4710.64	103.13	5075.94	43.59	60.01	90.76	10.51	12.03	22.54
2/9/2007	09:32:41 PM	6419.53	834.13	4807.91	82.42	5197.19	38.13	59.99	87.36	10.49	14.84	25.33
2/9/2007	10:39:49 PM	6633.52	798.81	4848.79	78.79	5274.38	33.98	54.95	87.71	10.47	16.07	26.54
2/9/2007	11:46:56 PM	7089.33	803.94	4943.92	97.74	5327.81	30.07	55.02	87.44	10.45	18.82	29.27
2/10/2007	12:42:53 AM	7330.64	799.31	5047.19	83.26	5486.56	27.87	55.03	91.38	10.43	21.80	32.23
2/10/2007	01:50:00 AM	7634.86	26.00	5196.57	55.88	5700.31	28.52	28.95	91.85	10.41	26.08	36.48
2/10/2007	02:12:23 AM	6513.89	720.00	4793.76	65.60	5193.13	44.29	55.34	93.59	10.57	14.09	24.66
2/10/2007	02:57:08 AM	6424.69	699.19	4782.72	65.32	5143.44	43.44	55.01	87.86	10.55	13.86	24.41
2/10/2007	03:53:04 AM	6113.25	740.31	4728.66	72.50	5086.56	45.19	55.04	91.66	10.53	12.42	22.96
2/10/2007	05:00:11 AM	6245.25	754.13	4772.26	75.19	5136.88	43.52	55.00	86.42	10.51	13.73	24.24

ارائه مدل بهینه عملکرد آسیای نیمه خودشن

2/10/2007	05:56:08 AM	5653.31	844.94	4659.69	81.00	4999.69	64.19	55.01	87.73	10.49	10.65	21.14
2/10/2007	07:03:15 AM	6492.23	748.31	4832.32	73.89	5192.19	46.78	55.02	87.60	10.47	15.57	26.05
2/10/2007	07:59:11 AM	6613.92	768.56	4858.86	76.86	5222.50	45.55	55.00	78.04	10.45	16.40	26.85
2/10/2007	08:32:45 AM	6972.28	766.88	4926.29	84.03	5303.44	40.23	55.04	76.31	10.90	16.49	27.39
2/10/2007	02:30:45 PM	6701.58	701.19	5054.16	71.71	5309.69	46.25	55.00	86.68	10.88	20.16	31.04
2/10/2007	03:26:42 PM	6362.81	755.63	4954.77	70.54	5224.69	44.01	55.03	86.66	10.86	17.45	28.31
2/10/2007	04:33:49 PM	5740.97	754.69	4787.37	73.28	5059.06	74.77	54.97	83.28	10.84	12.83	23.68
2/10/2007	05:29:45 PM	5881.73	817.38	4802.67	79.16	5089.69	47.35	54.98	87.23	10.82	13.34	24.17
2/10/2007	06:36:53 PM	6402.52	856.06	4905.36	83.55	5216.25	45.11	54.98	89.50	10.80	16.31	27.11
2/10/2007	07:32:49 PM	6134.91	845.06	4837.36	86.14	5165.94	45.91	54.97	87.38	10.78	14.48	25.26
2/10/2007	08:39:57 PM	6195.23	854.25	4842.20	83.59	5160.94	45.00	54.99	79.48	10.76	14.69	25.46
2/10/2007	09:35:53 PM	6027.14	850.94	4805.77	93.11	5135.00	44.73	54.98	87.33	10.74	13.75	24.49
2/10/2007	10:31:49 PM	6420.56	849.31	4887.92	87.26	5222.19	42.36	55.00	86.46	10.72	16.14	26.86
2/10/2007	11:38:57 PM	6756.75	794.00	4956.13	81.51	5294.06	41.76	54.95	83.24	10.70	18.13	28.84
2/11/2007	12:34:53 AM	6999.09	723.88	5012.51	88.13	5349.06	35.38	55.01	86.26	10.68	19.80	30.48
2/11/2007	01:42:01 AM	6066.84	720.94	4821.47	77.60	5143.44	43.63	55.08	89.02	10.66	14.51	25.18
2/11/2007	02:37:57 AM	5553.80	847.13	4724.79	73.88	5024.06	66.58	54.98	85.76	10.64	11.88	22.52
2/11/2007	03:00:19 AM	5778.61	824.38	4767.02	71.45	5067.50	49.31	54.95	86.28	10.81	12.39	23.20
2/11/2007	03:45:04 AM	5754.38	803.63	4762.38	71.60	5063.44	47.17	55.02	87.33	10.79	12.34	23.13
2/11/2007	04:41:01 AM	5579.06	847.75	4730.41	77.30	5031.88	59.11	55.01	88.12	10.77	11.52	22.29
2/11/2007	05:48:08 AM	5533.69	895.00	4730.02	84.04	5030.94	55.55	55.02	87.98	10.75	11.59	22.34
2/11/2007	06:44:05 AM	5267.63	914.94	4687.39	93.44	4988.44	81.46	55.02	86.45	10.73	10.47	21.20
2/11/2007	07:51:12 AM	6349.92	922.25	4914.27	79.39	5226.56	44.00	55.02	78.46	10.71	16.92	27.63
2/11/2007	08:47:08 AM	7108.41	900.25	5109.96	105.15	5454.06	28.71	55.00	73.90	10.69	22.50	33.19
2/11/2007	09:09:31 AM	7204.31	850.63	5162.66	104.08	5546.88	27.68	55.02	75.82	11.14	22.18	33.31
2/11/2007	09:54:16 AM	7414.69	853.31	5334.52	82.23	5756.56	27.93	55.00	85.50	11.12	27.08	38.20
2/11/2007	11:01:23 AM	7519.88	676.13	5376.76	80.84	5852.81	27.80	55.01	86.53	11.10	28.35	39.45
2/11/2007	11:57:20 AM	7753.97	653.75	5267.09	68.54	5689.38	27.80	54.91	89.77	11.08	25.35	36.43
2/11/2007	12:53:16 PM	6630.42	662.19	4901.49	78.18	5252.50	44.09	55.01	88.17	11.06	15.16	26.22

ارائه مدل بهینه عملکرد آسیای نیمه خودشن

2/11/2007	07:58:23 PM	6355.59	854.81	5026.07	91.31	5259.06	46.24	55.03	87.21	11.04	18.74	29.78
2/11/2007	08:54:20 PM	6135.94	847.06	4935.01	80.51	5177.81	62.51	55.00	74.73	11.02	16.27	27.29
2/11/2007	09:50:16 PM	6687.14	849.00	5016.38	84.54	5280.31	43.14	55.00	78.54	11.00	18.63	29.63
2/11/2007	10:46:12 PM	6542.25	856.19	4982.09	103.23	5276.88	45.00	54.99	90.01	10.98	17.75	28.73
2/12/2007	12:04:31 AM	5424.89	1041.69	4755.79	84.38	5034.38	90.23	55.33	83.84	10.96	11.48	22.44
2/12/2007	01:00:27 AM	5431.08	1015.44	4756.17	114.86	5050.31	75.25	55.02	89.08	10.94	11.57	22.51
2/12/2007	02:07:35 AM	5369.20	1101.63	4744.94	116.50	5045.63	97.99	55.35	89.23	10.92	11.33	22.25
2/12/2007	03:03:31 AM	5396.02	1100.81	4753.85	134.10	5063.13	61.40	55.10	86.04	10.90	11.66	22.56
2/12/2007	04:10:39 AM	5162.44	1109.06	4709.48	131.06	5019.69	90.51	55.00	86.08	10.88	10.50	21.38
2/12/2007	05:06:35 AM	5346.00	1112.88	4752.11	134.91	5075.31	48.86	55.68	88.23	10.86	11.78	22.64
2/12/2007	06:13:42 AM	6374.67	943.13	4934.81	102.13	5258.13	44.70	54.91	89.90	10.84	16.99	27.82
2/12/2007	07:20:50 AM	6576.80	838.81	4956.32	87.42	5289.06	44.60	55.00	85.69	10.82	17.67	28.49
2/12/2007	08:16:46 AM	6683.02	830.94	4975.31	86.99	5308.13	43.27	54.99	78.17	10.80	18.28	29.08
2/12/2007	08:39:09 AM	6817.08	831.75	5010.38	90.36	5354.06	38.34	54.98	78.42	10.97	18.59	29.56
2/12/2007	12:34:05 PM	5988.98	764.81	4894.32	54.49	5158.13	43.02	55.04	85.18	10.95	15.41	26.36
2/12/2007	01:41:13 PM	5953.92	838.75	4854.21	66.25	5136.25	43.71	55.01	90.23	10.93	14.37	25.29
2/12/2007	02:48:20 PM	6366.42	891.19	4912.34	70.32	5196.56	43.52	55.03	88.43	10.91	16.08	26.99
2/12/2007	03:55:28 PM	6416.95	874.31	4913.31	87.36	5230.63	44.10	55.00	85.75	10.89	16.19	27.07
2/12/2007	05:02:35 PM	6044.67	876.63	4815.27	87.79	5136.88	44.49	54.99	86.92	10.87	13.51	24.38
2/12/2007	06:09:43 PM	6043.13	905.13	4805.58	78.58	5123.44	44.32	55.01	89.67	10.85	13.32	24.17
2/12/2007	07:05:39 PM	6199.88	896.00	4835.42	82.93	5164.38	43.18	54.99	87.75	10.83	14.24	25.07
2/12/2007	08:12:47 PM	6973.83	897.13	5026.26	97.01	5384.38	35.90	55.01	84.90	10.81	19.68	30.49
2/12/2007	09:08:43 PM	7130.06	797.44	5059.20	102.76	5425.63	33.49	54.98	90.46	10.79	20.68	31.47
2/12/2007	10:15:50 PM	6895.45	802.56	4985.96	84.21	5356.25	40.83	54.96	87.43	10.77	18.71	29.48
2/12/2007	11:11:47 PM	6706.22	803.75	4946.63	83.61	5314.69	43.69	54.99	87.60	10.75	17.68	28.43
2/13/2007	12:18:54 AM	6765.00	795.38	4943.34	75.14	5305.63	46.06	54.94	87.11	10.73	17.67	28.40
2/13/2007	01:14:50 AM	6460.27	795.44	4885.41	80.92	5243.13	45.21	55.01	87.74	10.71	16.13	26.83
2/13/2007	02:10:47 AM	6337.55	849.75	4863.13	82.90	5206.88	44.94	55.03	89.65	10.69	15.58	26.27
2/13/2007	03:06:43 AM	6277.22	904.19	4864.29	88.46	5208.13	45.38	55.03	86.68	10.67	15.69	26.36

ارائه مدل بهینه عملکرد آسیای نیمه خودشن

2/13/2007	04:02:39 AM	4576.69	650.81	4838.33	59.72	5230.31	29.39	61.78	89.43	10.65	15.05	25.69
2/13/2007	04:58:35 AM	6025.59	878.19	4852.86	82.20	5174.69	43.25	54.99	87.53	10.63	15.53	26.16
2/13/2007	05:54:32 AM	6137.48	872.00	4864.29	78.72	5190.00	44.86	55.00	88.12	10.61	15.94	26.54
2/13/2007	06:50:28 AM	6719.63	815.69	4971.24	75.58	5312.19	42.83	54.98	92.73	10.59	19.02	29.61
2/13/2007	07:57:36 AM	6505.64	799.31	4927.26	75.50	5275.31	41.98	54.98	85.03	10.57	17.86	28.43
2/13/2007	08:53:32 AM	6798.52	804.56	4967.17	77.04	5323.44	40.43	55.01	88.63	10.55	19.07	29.61
2/13/2007	09:49:28 AM	6929.48	770.13	5006.11	83.78	5373.75	36.06	54.97	86.88	10.53	20.24	30.77
2/13/2007	11:30:09 AM	6265.36	778.00	4878.63	64.98	5198.75	44.91	52.86	83.01	10.51	16.74	27.25
2/13/2007	12:37:17 PM	6738.19	754.69	4959.23	72.19	5299.06	38.08	54.99	91.01	10.49	19.08	29.57
2/13/2007	01:44:24 PM	6546.89	757.75	4926.87	73.84	5279.06	34.52	54.98	87.41	10.47	18.26	28.72
2/13/2007	02:40:21 PM	6582.47	750.56	4906.33	71.42	5245.63	39.12	55.03	87.56	10.45	17.76	28.21
2/13/2007	03:36:17 PM	6173.06	753.56	4812.75	70.04	5147.81	45.48	54.99	90.81	10.43	15.21	25.64
2/13/2007	04:43:24 PM	5812.13	801.25	4731.76	65.28	5054.06	43.83	54.99	83.99	10.41	13.02	23.43
2/13/2007	05:39:21 PM	6146.77	801.25	4805.77	69.96	5134.38	45.01	55.05	89.39	10.39	15.18	25.57
2/13/2007	06:35:17 PM	5871.94	796.56	4743.97	74.23	5067.19	45.14	55.02	86.55	10.37	13.52	23.89
2/13/2007	07:31:13 PM	5757.47	853.31	4726.14	72.70	5045.63	45.06	55.04	84.47	10.35	13.10	23.45
2/13/2007	08:27:10 PM	5859.05	851.69	4746.68	73.38	5069.38	42.98	54.98	86.22	10.33	13.76	24.09
2/13/2007	09:34:17 PM	5949.28	847.94	4769.93	82.81	5096.25	44.55	55.00	86.57	10.31	14.49	24.80
2/13/2007	10:41:25 PM	5999.30	904.00	4792.41	81.46	5122.50	43.31	54.98	88.20	10.29	15.21	25.49
2/14/2007	12:10:55 AM	6666.52	842.06	4925.32	81.99	5271.25	38.70	55.01	81.65	10.27	19.02	29.28
2/14/2007	02:25:10 AM	6264.84	786.31	4875.91	93.21	5205.63	45.15	55.01	84.91	10.25	17.71	27.96
2/14/2007	03:32:17 AM	5891.02	818.63	4786.98	94.36	5116.88	44.33	55.00	88.90	10.23	15.30	25.52
2/14/2007	04:28:13 AM	5777.58	817.06	4753.66	89.95	5078.13	43.49	55.02	91.40	10.21	14.44	24.65
2/14/2007	05:24:10 AM	6285.98	850.75	4872.81	85.33	5205.94	39.83	55.00	87.38	10.19	17.87	28.05
2/14/2007	06:20:06 AM	6796.97	846.94	5008.44	102.34	5360.94	28.04	55.05	91.01	10.17	21.75	31.92
2/14/2007	07:27:13 AM	6831.00	762.75	4998.56	94.95	5363.13	31.37	54.78	83.93	10.15	21.56	31.70
2/17/2007	06:06:25 PM	5932.78	851.69	4894.32	77.74	5138.75	45.61	55.06	85.86	10.13	18.71	28.84
2/17/2007	07:02:21 PM	6340.64	830.75	4912.92	79.07	5192.50	41.16	55.02	89.29	10.11	19.31	29.42
2/17/2007	07:58:17 PM	6007.55	816.69	4817.59	83.44	5111.25	44.77	55.00	87.55	10.09	16.72	26.80

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

2/17/2007	08:54:14 PM	5743.55	848.00	4749.01	94.68	5056.25	45.05	55.01	83.70	10.07	14.87	24.94
2/17/2007	09:50:10 PM	5467.17	950.88	4695.53	105.97	4997.19	43.33	55.01	89.93	10.05	13.45	23.50
2/17/2007	10:46:06 PM	5138.20	948.56	4634.69	110.29	4944.69	46.30	54.97	86.24	10.03	11.82	21.85
2/17/2007	11:42:02 PM	5179.45	945.19	4627.33	93.85	4931.25	48.06	54.98	81.13	10.01	11.70	21.71
2/18/2007	12:37:59 AM	5275.88	976.25	4638.38	101.47	4952.50	45.27	55.03	85.23	9.99	12.09	22.08
2/18/2007	01:33:55 AM	5313.52	1046.13	4657.36	118.93	4984.06	43.12	55.02	88.51	9.97	12.70	22.67
2/18/2007	02:29:51 AM	5094.38	1023.00	4612.22	115.70	4934.06	45.62	55.03	88.84	9.95	11.52	21.46
2/18/2007	03:36:59 AM	4972.17	1020.00	4590.33	112.06	4906.56	48.43	54.94	85.14	9.93	10.98	20.91
2/18/2007	04:44:06 AM	5335.17	1017.94	4647.87	128.58	4982.81	43.51	55.02	85.53	9.91	12.68	22.58
2/18/2007	05:40:02 AM	5496.56	1024.13	4697.66	138.63	5055.00	45.84	55.03	87.41	9.89	14.16	24.04
2/18/2007	06:47:10 AM	5191.83	1021.50	4624.42	142.99	4970.00	42.92	54.98	88.65	9.87	12.18	22.05
2/18/2007	07:43:06 AM	5301.14	1029.69	4637.21	121.96	4969.06	43.41	55.03	81.93	9.85	12.62	22.47
2/18/2007	08:39:03 AM	5767.27	1017.25	4740.87	135.72	5110.31	39.47	54.98	87.39	9.83	15.61	25.44
2/18/2007	09:46:10 AM	5607.42	1004.31	4777.49	176.56	5168.75	28.94	55.03	87.59	9.81	16.72	26.53
2/18/2007	10:53:18 AM	5485.73	1017.69	4686.04	152.17	5068.13	51.18	55.03	85.82	9.79	14.23	24.02
2/18/2007	12:00:25 PM	5954.44	1018.69	4733.31	131.82	5080.63	41.52	55.01	81.27	9.77	15.64	25.41
2/18/2007	01:07:33 PM	6476.25	905.25	4846.66	144.82	5218.13	32.88	55.03	83.42	9.75	18.90	28.65
2/18/2007	02:14:40 PM	6048.28	939.56	4763.34	178.01	5145.63	39.11	54.98	89.58	9.73	16.64	26.37
2/18/2007	03:21:48 PM	5901.33	956.00	4711.42	169.27	5083.75	47.42	55.03	90.68	9.71	15.27	24.97
2/18/2007	04:28:55 PM	5627.02	1006.88	4661.24	153.94	5058.44	40.31	55.05	91.15	9.69	13.94	23.62
2/18/2007	05:24:51 PM	5085.61	1049.88	4546.92	155.33	4929.06	42.63	55.02	88.74	9.67	10.81	20.48
2/18/2007	06:20:48 PM	5245.97	1046.75	4577.54	171.01	4963.44	44.35	54.99	86.67	9.65	11.74	21.39
2/18/2007	07:27:55 PM	5374.88	1053.31	4612.02	190.71	5012.81	43.28	55.04	88.18	9.63	12.78	22.41
2/18/2007	08:35:03 PM	5279.48	1048.75	4584.32	202.82	4980.94	45.42	55.03	89.15	9.61	12.07	21.69
2/18/2007	09:42:10 PM	5162.95	1049.75	4540.92	207.24	4925.63	44.49	55.02	90.11	9.60	10.92	20.52
2/18/2007	10:49:18 PM	4991.25	1049.25	4506.04	198.04	4889.69	43.12	55.01	91.28	9.58	10.02	19.59
2/18/2007	11:56:25 PM	5105.72	1007.50	4506.63	136.86	4884.38	43.58	55.03	82.10	9.56	10.10	19.66
2/19/2007	01:03:33 AM	5525.44	998.44	4607.96	166.18	5017.81	41.12	58.03	76.43	9.54	13.02	22.56
2/19/2007	02:10:40 AM	5369.72	921.13	4566.49	143.88	4990.63	49.95	60.05	87.80	9.53	11.92	21.45

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

2/19/2007	03:17:48 AM	4870.59	901.75	4449.86	168.53	4834.06	44.62	60.06	85.77	9.51	8.72	18.23
2/19/2007	04:24:55 AM	4445.72	981.00	4393.86	158.08	4757.81	65.97	59.98	86.48	9.49	7.22	16.71
2/19/2007	05:32:03 AM	4416.33	950.88	4384.95	158.97	4750.63	77.30	59.96	86.70	9.47	7.04	16.51
2/19/2007	06:39:10 AM	4450.36	982.94	4393.67	171.98	4760.94	61.02	60.02	88.52	9.46	7.36	16.81
2/19/2007	07:35:07 AM	4332.28	1020.56	4381.27	150.65	4747.19	72.27	60.04	83.48	9.44	7.08	16.52
2/19/2007	08:31:03 AM	4905.14	1030.13	4474.66	202.56	4859.38	43.16	60.01	89.22	9.42	9.77	19.19
2/19/2007	09:04:37 AM	5290.31	1026.38	4553.32	197.20	4968.44	44.66	60.03	85.47	9.87	10.18	20.05
2/19/2007	09:38:11 AM	5430.56	1031.38	4583.93	206.39	5022.50	40.58	60.01	90.06	10.02	10.42	20.44
2/20/2007	12:50:43 AM	6240.61	950.44	4736.41	159.07	5135.63	42.26	58.03	85.44	10.01	14.77	24.77
2/20/2007	01:57:51 AM	6277.22	906.75	4761.02	168.08	5168.44	37.18	58.03	88.50	9.99	15.53	25.52
2/20/2007	02:53:47 AM	6462.84	900.94	4784.27	144.91	5184.06	38.98	57.99	87.32	9.97	16.25	26.22
2/20/2007	03:49:43 AM	6444.28	903.00	4825.73	168.83	5242.81	28.96	58.06	87.34	9.95	17.49	27.44
2/20/2007	04:56:51 AM	6585.05	899.06	4858.28	182.68	5293.44	29.38	58.03	89.28	9.93	18.47	28.41
2/20/2007	06:03:58 AM	6576.80	894.94	4854.41	178.10	5287.19	28.64	58.01	89.21	9.92	18.43	28.35
2/20/2007	06:59:55 AM	6938.25	898.88	4966.98	172.85	5455.63	27.80	58.02	85.72	9.90	21.66	31.56
2/20/2007	07:55:51 AM	7269.80	824.50	5157.82	129.40	5659.69	27.99	57.98	82.18	9.88	27.09	36.97
2/20/2007	09:02:58 AM	7252.27	766.69	5213.23	138.01	5764.38	30.40	58.04	91.99	9.86	28.72	38.58
2/20/2007	09:58:55 AM	7154.30	744.88	5024.91	144.35	5563.44	27.87	58.03	88.20	9.85	23.50	33.35
2/20/2007	11:06:02 AM	6063.75	838.63	4678.29	142.20	5113.75	44.12	57.98	89.33	9.83	13.84	23.67
2/20/2007	12:01:59 PM	5109.33	956.06	4497.13	155.81	4895.94	46.32	57.99	87.62	9.81	8.83	18.64
2/20/2007	12:57:55 PM	4643.20	1042.50	4462.84	124.74	4850.00	69.36	55.34	87.25	9.79	7.94	17.73
2/20/2007	01:53:51 PM	5099.53	1082.50	4528.13	164.15	4922.81	43.44	55.00	82.59	9.78	9.84	19.62
2/20/2007	02:49:47 PM	5223.80	1074.44	4547.51	159.23	4938.13	42.90	55.03	89.08	9.76	10.45	20.21
2/20/2007	03:45:44 PM	5157.28	1100.75	4538.79	160.68	4930.94	43.21	55.01	90.53	9.74	10.28	20.02
2/20/2007	04:41:40 PM	4791.19	1098.88	4488.61	140.08	4865.94	45.70	54.97	82.23	9.72	8.94	18.67
2/20/2007	05:37:36 PM	5765.72	1111.44	4725.37	193.90	5160.63	29.71	55.01	89.65	9.71	15.66	25.37
2/20/2007	06:55:55 PM	5567.20	993.31	4635.86	150.17	5044.06	43.29	55.00	89.72	9.69	13.22	22.91
2/20/2007	07:51:51 PM	5797.69	1005.06	4676.93	144.45	5092.19	40.71	55.02	92.13	9.67	14.44	24.11
2/20/2007	08:47:47 PM	5745.61	1001.50	4715.68	153.47	5149.69	29.11	55.01	87.68	9.65	15.60	25.25

ارائه مدل بهینه عملکرد آسیای نیمه خودشن

2/20/2007	09:54:55 PM	6366.42	998.75	4853.63	176.52	5261.88	27.65	54.96	90.28	9.64	19.54	29.18
2/20/2007	10:50:51 PM	6548.44	953.75	4879.79	190.63	5285.94	27.73	55.00	91.64	9.62	20.35	29.97
2/20/2007	11:46:48 PM	6367.45	899.56	4823.02	158.18	5228.13	29.44	54.99	84.67	9.60	18.82	28.43
2/21/2007	12:42:44 AM	6680.44	899.50	4899.16	165.22	5305.00	27.83	58.08	83.70	9.58	21.03	30.62
2/21/2007	01:38:40 AM	6972.80	852.31	4994.29	145.79	5469.06	27.80	57.97	88.95	9.57	23.77	33.34
2/21/2007	02:34:36 AM	7046.53	850.00	5019.09	140.03	5502.81	27.80	57.99	88.49	9.55	24.54	34.09
2/21/2007	03:30:33 AM	7132.13	848.81	5115.39	141.21	5616.88	27.80	55.03	88.57	9.53	27.31	36.85
2/21/2007	04:37:40 AM	7236.80	801.81	5225.44	122.09	5753.13	27.72	55.02	90.18	9.51	30.47	39.99
2/21/2007	05:33:36 AM	7183.69	832.63	5201.02	136.44	5763.44	27.83	55.02	87.29	9.50	29.86	39.36
2/21/2007	06:40:44 AM	7325.48	451.13	5246.94	98.80	5815.31	27.88	49.62	89.72	9.48	31.22	40.70
2/21/2007	07:36:40 AM	7194.00	774.81	5155.11	126.70	5695.63	27.65	55.01	85.77	9.46	28.71	38.17
2/21/2007	08:32:36 AM	7320.33	674.13	5232.41	101.07	5809.38	28.02	55.08	86.38	9.44	30.95	40.40
2/21/2007	09:06:10 AM	7387.36	658.56	5327.54	112.78	5939.06	30.31	55.01	89.92	9.89	31.82	41.71
2/21/2007	09:39:44 AM	7478.11	520.81	5227.38	106.92	5830.94	27.76	55.04	89.64	9.87	29.08	38.95
2/21/2007	10:35:40 AM	7229.06	522.00	4941.21	99.78	5451.56	27.95	55.05	87.99	9.86	21.12	30.97
2/21/2007	11:42:48 AM	5844.09	743.38	4580.44	98.04	4993.44	44.18	55.03	90.84	9.84	11.06	20.90
2/21/2007	12:49:55 PM	5690.44	797.31	4571.73	92.66	4964.38	43.07	55.08	83.78	9.82	10.89	20.71
2/21/2007	01:57:03 PM	5828.63	769.31	4597.30	71.29	4974.06	43.83	55.04	80.41	9.80	11.67	21.48
2/21/2007	02:52:59 PM	6032.81	720.50	4632.76	57.30	5002.50	43.76	55.03	73.02	9.79	12.74	22.53
2/21/2007	03:48:55 PM	6011.67	697.94	4631.01	61.32	5003.44	44.91	55.04	74.65	9.77	12.76	22.53
2/21/2007	04:44:52 PM	5892.05	782.00	4620.94	80.74	4996.25	44.86	55.09	88.29	9.75	12.55	22.30
2/21/2007	05:40:48 PM	5748.19	798.69	4599.04	88.89	4974.69	43.17	55.04	90.74	9.73	12.01	21.74
2/21/2007	06:36:44 PM	5240.30	827.13	4512.05	82.46	4878.44	53.04	55.04	89.10	9.72	9.63	19.35
2/21/2007	07:32:40 PM	5267.11	902.25	4533.56	90.39	4901.56	46.88	55.01	91.26	9.70	10.31	20.01
2/21/2007	08:28:37 PM	5074.27	900.63	4508.17	87.49	4874.38	61.43	54.96	85.66	9.68	9.67	19.35
2/21/2007	09:24:33 PM	5289.28	949.50	4549.06	105.58	4918.75	44.99	54.98	85.41	9.66	10.89	20.55
2/21/2007	10:20:29 PM	5743.55	979.19	4632.37	104.15	4999.38	44.92	55.02	90.49	9.64	13.30	22.94
2/21/2007	11:16:26 PM	6501.52	988.38	4811.59	141.68	5194.38	34.84	55.04	84.16	9.63	18.40	28.02
2/22/2007	12:12:22 AM	6857.81	882.50	4885.02	134.57	5285.63	29.48	55.04	75.71	9.61	20.53	30.14

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

2/22/2007	01:19:29 AM	6547.41	774.63	4785.82	103.02	5170.63	39.17	55.03	84.50	9.59	17.81	27.41
2/22/2007	02:26:37 AM	6046.73	800.50	4692.04	119.16	5076.56	42.11	55.04	88.67	9.74	14.57	24.32
2/22/2007	03:22:33 AM	5850.80	850.31	4662.98	115.60	5045.94	45.49	55.04	84.37	9.73	13.83	23.55
2/22/2007	04:18:29 AM	5920.92	879.00	4688.94	121.66	5075.31	42.02	55.04	86.24	9.71	14.63	24.34
2/22/2007	05:14:26 AM	5817.28	903.38	4678.09	133.59	5063.75	43.42	55.03	86.07	9.69	14.39	24.08
2/22/2007	06:10:22 AM	5842.55	917.88	4691.85	127.18	5071.88	43.62	54.96	80.96	9.67	14.85	24.52
2/22/2007	07:06:18 AM	6161.20	902.88	4773.03	155.78	5155.31	43.64	55.05	86.36	9.66	17.20	26.86
2/22/2007	08:13:26 AM	6309.19	893.69	4787.95	127.18	5160.94	43.61	54.98	80.51	9.64	17.69	27.33
2/22/2007	09:09:22 AM	6657.75	897.81	4869.33	139.83	5250.94	30.18	55.30	83.92	10.07	18.24	28.31
2/22/2007	10:05:18 AM	6866.58	858.94	4898.19	138.74	5283.44	31.44	54.98	85.27	10.05	19.12	29.18
2/22/2007	11:01:15 AM	6503.58	851.31	4801.32	115.73	5185.31	44.92	54.98	89.87	10.03	16.47	26.51
2/22/2007	11:57:11 AM	5910.61	897.00	4670.73	119.03	5054.06	44.79	55.09	89.09	10.02	12.88	22.90
2/22/2007	12:53:07 PM	6025.08	925.94	4689.91	107.60	5063.13	44.55	55.02	87.59	10.00	13.49	23.49
2/22/2007	01:49:03 PM	5610.00	950.50	4603.69	123.60	4985.94	42.65	54.98	90.15	9.98	11.14	21.12
2/22/2007	02:56:11 PM	5674.97	944.06	4612.80	120.50	4993.44	43.18	54.98	91.26	9.96	11.47	21.43
2/22/2007	03:52:07 PM	5729.11	952.25	4621.91	112.30	4999.38	43.03	55.02	85.31	9.95	11.79	21.74
2/22/2007	04:48:03 PM	5635.27	951.06	4591.49	89.64	4955.31	43.59	57.16	88.40	9.93	11.01	20.94
2/22/2007	05:44:00 PM	6440.16	902.69	4764.31	102.50	5141.25	46.30	57.98	84.26	9.91	15.93	25.84
2/22/2007	06:39:56 PM	6629.39	899.38	4797.44	102.18	5178.75	39.15	58.07	80.18	9.89	16.93	26.82
2/22/2007	07:35:52 PM	6340.64	864.50	4738.35	111.58	5120.94	47.67	58.04	89.42	9.88	15.34	25.22
2/22/2007	08:31:48 PM	5952.89	910.56	4658.33	107.73	5034.06	45.31	58.04	86.92	9.86	13.17	23.03
2/22/2007	09:38:56 PM	5964.23	919.06	4663.56	91.32	5031.25	44.53	58.00	77.82	9.84	13.38	23.23
2/22/2007	10:34:52 PM	6144.70	915.94	4708.90	100.08	5078.75	43.88	58.04	79.46	9.82	14.73	24.55
2/22/2007	11:30:49 PM	6398.39	929.44	4783.11	118.56	5155.63	39.81	58.01	86.13	9.81	16.88	26.69
2/23/2007	12:26:45 AM	6820.69	881.31	4895.29	140.40	5280.94	30.61	57.98	89.52	9.79	20.10	29.89
2/23/2007	01:22:41 AM	6614.95	857.81	4829.22	109.77	5212.50	42.12	58.04	92.01	9.77	18.32	28.09
2/23/2007	02:18:37 AM	6431.91	851.31	4790.47	113.61	5179.38	43.99	58.06	87.44	9.75	17.30	27.05
2/23/2007	03:14:34 AM	6472.64	856.25	4792.99	106.81	5178.44	42.01	58.01	90.08	9.74	17.44	27.18
2/23/2007	04:21:41 AM	6296.30	848.00	4756.17	105.11	5145.00	46.74	58.01	91.85	9.72	16.48	26.20

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

2/23/2007	05:28:49 AM	6889.78	859.50	4912.92	152.58	5311.56	29.38	54.97	88.11	9.70	20.95	30.65
2/23/2007	06:24:45 AM	7369.83	647.50	5086.91	98.56	5590.63	27.80	54.93	90.46	9.68	25.91	35.59
2/23/2007	07:20:41 AM	7401.80	600.88	5126.43	98.98	5641.56	27.87	55.03	85.46	9.66	27.09	36.75
2/23/2007	08:27:49 AM	7531.73	601.19	5187.08	104.69	5745.63	29.50	55.07	87.97	9.65	28.86	38.51
2/23/2007	09:23:45 AM	7660.13	435.81	5111.51	80.90	5637.19	28.03	55.09	88.27	10.38	23.80	34.18
2/23/2007	10:19:41 AM	6953.72	445.81	4782.72	88.75	5201.88	41.39	55.09	90.41	10.36	14.64	25.00
2/23/2007	11:15:38 AM	6057.05	701.25	4615.90	82.68	5011.25	43.03	55.00	89.58	10.34	10.03	20.37
2/23/2007	12:11:34 PM	6031.78	750.94	4617.64	80.49	5003.75	43.38	55.04	88.63	10.33	10.15	20.47
2/23/2007	01:07:30 PM	5942.06	845.13	4609.31	92.04	4989.69	43.94	55.03	81.86	10.31	9.98	20.29
2/23/2007	02:14:38 PM	6634.55	843.94	4751.91	112.12	5141.56	40.34	54.94	84.31	10.29	14.06	24.35
2/23/2007	03:21:45 PM	6910.41	849.25	4810.81	146.09	5215.94	35.47	54.99	88.84	10.27	15.78	26.05
2/23/2007	04:28:53 PM	6772.22	842.63	4779.81	127.48	5191.56	40.02	54.96	91.26	10.26	14.98	25.24
2/23/2007	05:36:00 PM	6578.86	849.06	4743.97	107.27	5150.00	39.92	60.05	86.94	10.24	14.05	24.28
2/23/2007	06:31:56 PM	6668.06	852.56	4761.60	106.61	5170.94	39.14	60.08	90.01	10.22	14.61	24.83
2/23/2007	07:27:53 PM	6321.05	872.25	4686.62	108.73	5088.75	44.42	60.00	91.09	10.20	12.58	22.78
2/23/2007	08:35:00 PM	6130.27	891.63	4658.72	117.27	5059.38	44.86	60.03	87.98	10.18	11.86	22.05
2/23/2007	09:30:56 PM	5337.23	983.25	4511.66	96.23	4892.19	73.69	60.01	90.85	10.17	7.81	17.97
2/23/2007	10:38:04 PM	5584.22	1000.25	4572.31	108.04	4952.19	46.08	60.04	88.86	10.15	9.58	19.73
2/23/2007	11:45:12 PM	5545.55	967.19	4564.36	117.01	4943.44	46.69	60.00	83.92	10.13	9.43	19.56
2/24/2007	12:52:19 AM	6268.45	1001.81	4716.46	122.54	5095.31	44.65	60.03	85.90	10.11	13.77	23.88
2/24/2007	01:59:27 AM	6389.11	972.75	4749.20	152.89	5138.75	42.42	58.02	87.38	10.10	14.76	24.85
2/24/2007	03:06:34 AM	6152.95	974.69	4697.66	154.87	5091.25	45.75	55.02	82.59	10.08	13.38	23.46
2/24/2007	04:02:30 AM	6399.94	953.56	4746.68	149.45	5134.06	45.16	54.98	88.34	10.06	14.83	24.89
2/24/2007	05:09:38 AM	6576.28	904.69	4778.07	130.63	5169.06	43.70	55.03	88.98	10.04	15.78	25.82
2/24/2007	06:05:34 AM	6395.81	948.88	4746.49	131.88	5134.38	44.92	55.03	91.58	10.03	14.96	24.99
2/24/2007	07:01:30 AM	6393.75	949.44	4759.08	148.57	5147.81	43.02	55.02	87.80	10.01	15.39	25.40
2/24/2007	07:57:27 AM	6574.22	946.75	4785.63	112.89	5171.88	42.31	55.01	77.15	9.99	16.20	26.20
2/24/2007	09:04:34 AM	6844.92	857.94	4823.02	91.35	5221.56	43.96	55.05	67.69	10.72	14.32	25.04
2/24/2007	10:00:30 AM	6830.48	792.31	4810.23	86.39	5205.63	44.76	55.04	58.57	10.70	14.03	24.73

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

2/24/2007	11:07:38 AM	6576.28	800.81	4753.66	95.36	5125.00	45.48	54.99	80.86	10.69	12.51	23.20
2/24/2007	12:14:46 PM	6361.78	849.44	4716.46	113.87	5091.56	45.30	55.04	91.10	10.67	11.54	22.21
2/24/2007	01:10:42 PM	6069.42	869.00	4665.50	116.16	5051.25	42.99	55.06	84.69	10.65	10.18	20.83
2/24/2007	02:06:38 PM	6290.63	897.81	4707.35	103.28	5088.75	45.35	55.03	73.04	10.63	11.42	22.06
2/24/2007	03:02:34 PM	6873.28	813.50	4822.63	120.06	5204.69	41.69	55.03	73.58	10.62	14.73	25.35
2/24/2007	03:58:31 PM	6959.39	770.13	4852.86	144.76	5245.00	31.43	54.99	87.32	10.60	15.65	26.25
2/24/2007	05:05:38 PM	6475.73	796.81	4740.09	135.91	5135.63	50.59	55.01	91.13	10.58	12.55	23.13
2/24/2007	06:01:34 PM	6347.86	805.63	4717.04	138.84	5110.94	45.62	55.10	88.04	10.56	11.98	22.54
2/24/2007	07:08:42 PM	6255.56	818.19	4698.83	128.24	5086.88	44.36	55.04	88.14	10.55	11.54	22.08
2/24/2007	08:04:38 PM	6087.98	836.69	4675.96	130.67	5070.31	45.10	55.02	86.61	10.53	10.96	21.49
2/24/2007	09:11:46 PM	5828.63	842.25	4625.59	133.11	5017.50	43.21	55.00	87.81	10.51	9.62	20.13
2/24/2007	10:18:53 PM	5620.83	885.06	4599.04	111.86	4969.38	45.52	55.00	88.68	10.49	8.95	19.44
2/24/2007	11:14:50 PM	5405.81	883.75	4570.56	116.65	4946.25	55.03	55.02	85.73	10.48	8.22	18.69
2/25/2007	12:10:46 AM	5508.42	943.00	4592.46	115.57	4959.06	48.05	55.00	85.33	10.46	8.90	19.36
2/25/2007	01:06:42 AM	5878.13	948.00	4665.89	147.88	5047.81	44.78	55.00	88.28	10.44	11.03	21.48
2/25/2007	02:02:38 AM	6182.34	919.63	4735.06	162.78	5121.88	41.28	55.05	90.18	10.42	13.05	23.47
2/25/2007	02:58:35 AM	6122.02	896.13	4723.82	163.89	5114.06	40.80	54.98	86.70	10.41	12.80	23.21
2/25/2007	04:05:42 AM	6022.50	894.63	4698.24	147.74	5087.50	44.67	54.91	87.43	10.39	12.16	22.54
2/25/2007	05:01:38 AM	5788.92	901.81	4646.71	133.54	5024.38	43.14	55.06	91.50	10.37	10.78	21.15
2/25/2007	05:57:35 AM	5934.33	900.75	4678.48	130.16	5054.38	45.23	55.04	88.08	10.35	11.74	22.09
2/25/2007	07:04:42 AM	6178.22	891.44	4738.93	142.99	5115.00	41.41	55.05	88.49	10.34	13.51	23.84
2/25/2007	08:11:50 AM	6628.88	891.25	4825.92	123.36	5193.75	40.70	55.01	84.37	10.32	16.02	26.34
2/25/2007	09:18:57 AM	6602.06	798.13	4796.86	99.55	5166.88	44.87	55.00	89.08	10.90	12.87	23.77
2/25/2007	10:14:54 AM	6051.89	804.06	4674.61	100.29	5049.06	43.87	54.99	88.47	10.88	9.51	20.39
2/25/2007	11:22:01 AM	5862.14	873.50	4636.63	102.85	5008.75	45.53	55.04	86.44	10.86	8.52	19.38
2/25/2007	12:29:09 PM	6463.36	886.75	4748.62	100.41	5123.44	44.34	55.00	82.10	10.85	11.73	22.58
2/25/2007	01:25:05 PM	6865.03	853.81	4833.29	138.67	5225.31	41.43	55.05	86.23	10.83	14.18	25.01
2/25/2007	02:21:01 PM	6439.64	850.69	4734.48	146.16	5127.50	42.26	55.06	87.93	10.81	11.47	22.28
2/25/2007	03:16:57 PM	5422.83	897.00	4529.29	100.95	4909.06	84.05	54.98	90.55	10.79	5.78	16.58

ارائه مدل بهینه عملکرد آسیای نیمه خودشکن

2/25/2007	04:12:54 PM	5565.66	958.81	4563.01	115.49	4945.63	50.37	55.00	85.90	10.78	6.80	17.58
2/25/2007	05:08:50 PM	5392.41	969.38	4531.42	106.46	4911.25	69.28	55.00	89.38	10.76	5.99	16.74
2/25/2007	06:15:57 PM	5437.27	1097.94	4550.02	123.54	4933.44	55.26	60.05	89.16	10.74	6.58	17.32
2/25/2007	07:23:05 PM	5426.44	1103.56	4557.39	157.98	4954.06	45.56	60.01	88.16	10.72	6.86	17.58
2/25/2007	08:30:12 PM	5262.98	1098.19	4530.07	154.55	4924.38	56.06	60.00	91.29	10.71	6.16	16.86
2/25/2007	09:37:20 PM	5151.61	1108.06	4519.02	157.87	4908.13	61.89	60.00	90.72	10.69	5.92	16.61
2/25/2007	10:33:16 PM	5293.41	1107.81	4534.33	163.05	4920.94	50.87	60.03	92.05	10.67	6.42	17.09
2/25/2007	11:40:24 PM	5317.13	1107.44	4541.50	172.18	4924.38	46.82	60.04	92.93	10.65	6.69	17.34
2/26/2007	12:47:31 AM	5127.38	1109.81	4512.83	158.36	4893.44	62.37	60.03	89.20	10.64	5.96	16.59
2/26/2007	01:54:39 AM	5048.48	1112.56	4508.76	166.38	4890.00	61.69	59.99	88.85	10.62	5.91	16.53
2/26/2007	03:01:46 AM	4954.13	1110.81	4486.86	134.41	4866.25	79.14	60.01	90.08	10.60	5.37	15.97
2/26/2007	04:08:54 AM	4796.34	1104.75	4464.00	106.42	4840.94	92.31	59.95	86.84	10.58	4.80	15.38
2/26/2007	05:04:50 AM	4961.86	1116.69	4485.31	134.13	4858.75	77.24	58.01	88.73	10.56	5.47	16.03
2/26/2007	06:00:46 AM	5050.55	1123.38	4499.07	133.20	4871.88	63.34	56.03	90.94	10.55	5.92	16.47
2/26/2007	07:07:54 AM	5547.09	1115.31	4568.24	132.66	4939.06	44.83	55.98	82.28	10.53	7.94	18.47
2/26/2007	08:03:50 AM	6351.47	1040.75	4715.29	124.21	5087.19	45.13	55.97	67.22	10.51	12.14	22.65
2/26/2007	09:10:58 AM	7067.16	946.88	4870.29	174.24	5266.88	37.53	56.07	74.32	11.09	14.15	25.25
2/26/2007	10:06:54 AM	6836.16	952.75	4828.83	167.39	5240.31	38.31	59.58	84.84	11.08	13.06	24.14
2/26/2007	11:02:50 AM	6116.86	957.69	4661.04	148.38	5096.56	44.31	60.03	88.08	11.06	8.42	19.48
2/26/2007	12:09:58 PM	5887.92	1054.63	4595.94	151.12	4993.75	43.38	60.06	89.51	11.04	6.66	17.70

GM(1,1)

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.(Jiang et.al., 2004)

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:(Jiang et.al., 2004)

GM(1,1)

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$$X^{(0)}=[x^{(0)}(1),x^{(0)}(2),...,x^{(0)}(i), ..., x^{(0)}(n)] \quad ()$$

$$x^{(0)}(i) \quad i$$

$$x^{(1)} \quad x^{(0)} :$$

.

$$X^{(1)}=[x^{(1)}(1),x^{(1)}(2),...,x^{(1)}(i) , ...,x^{(1)}(n)] \quad ()$$

$$x^{(1)}(k)=\sum_{i=1}^k x^{(0)}(i)$$

¹ Grey forecasting theory

² Cumulative generation operator

³ Reverse cumulative generation operator

⁴ Grey modeling operator

$$x^{(1)}(k) \quad \vdots$$

$$\vdots \quad x^{(1)}(k) \quad .$$

$$\frac{dx^{(1)}}{dt} + ax^{(1)} = u \tag{}$$

$$u \sim a \quad \text{GM}(1,1)$$

$$.(\quad)$$

$$A = \left(B^T B\right)^{-1} B^T Y_n \tag{}$$

$$\vdots$$

$$Y_n = \begin{bmatrix} x^{(0)}(2) \\ x^{(0)}(3) \\ \vdots \\ x^{(0)}(n) \end{bmatrix}, \quad B = \begin{bmatrix} -\frac{1}{2} \left(x^{(1)}(1) + x^{(1)}(2)\right) & 1 \\ -\frac{1}{2} \left(x^{(1)}(2) + x^{(1)}(3)\right) & 1 \\ \vdots & \vdots \\ -\frac{1}{2} \left(x^{(1)}(n-1) + x^{(1)}(n)\right) & 1 \end{bmatrix}, \quad A = \begin{bmatrix} a \\ u \end{bmatrix}$$

$$\vdots \quad \text{GM}(1,1)$$

$$\hat{x}^{(1)}(k+1) = \left(x^{(0)}(1) - \frac{u}{a}\right)e^{-ak} + \frac{u}{a} \tag{}$$

$$k+1$$

$$\vdots \quad x(0) \quad \hat{x}^{(0)}(k+1)$$

$$(\quad)$$

$$\hat{x}^{(0)}(k+1)=\hat{x}^{(1)}(k+1)-\hat{x}^{(1)}(k) \tag{}$$

$$n \qquad \qquad \qquad \text{GM}(1,1)$$

$$, \qquad \qquad \qquad n$$

$$x^{(0)}(n+1)$$

$$x^2(0) \qquad \qquad \qquad x(0) \qquad \qquad \qquad (x^{(0)}(1))$$

$$\text{GM}(1,1) \qquad \qquad \qquad ,$$

$$, \qquad \qquad \qquad ,$$

$$,$$

$$,$$

$$.P \qquad \qquad \qquad C \qquad \qquad \qquad :$$

$$,$$

$$X^{(0)}=[x^{(0)}(1),x^{(0)}(2),..., x^{(0)}(n)]$$

$$\varepsilon(k)=x^{(0)}(k)-\hat{x}^{(0)}(k), k=1,2,...,n: \qquad \qquad \hat{X}^{(0)}=[\hat{x}^{(0)}(1),\hat{x}^{(0)}(2),\ldots,\hat{x}^{(0)}(n)]$$

$$S_2, \quad S_1,$$

$$:$$

$$\overline{x}=\frac{1}{n}\sum_{i=1}^n x^{(0)}(i), \quad S_1=\sqrt{\frac{\sum_{i=1}^n \left[x^{(0)}(i)-\overline{x}^{(0)}\right]^2}{n-1}} \tag{}$$

$$(\quad)$$

$$\bar{\varepsilon} = \frac{1}{n} \sum_{i=1}^n \varepsilon(i), \quad S_2 = \sqrt{\frac{\sum_{i=1}^n [\varepsilon(i) - \bar{\varepsilon}]^2}{n-1}} \quad ()$$

، $P \quad C$

$$C=S_2/S_1 \quad ()$$

$$P = P \{ |\varepsilon(i) - \bar{\varepsilon}| < 0.6745 \ S_1 \} \quad ()$$

/

C

C

P

/

P

C P

(Jiang, 2004)

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$< /$	$/ \leq P < /$	$/ \leq P < /$	$\geq /$	P
$> /$	$/ < C \leq /$	$/ < C \leq /$	$\leq /$	C

:

GM(1,1)

$$e^{(0)}(k) = x^{(1)}(k) - \hat{x}^{(1)}(k) \quad k=1,2,\dots,n \quad ()$$

$$e_1(0) = \{e_1^{(0)}(1), e_1^{(0)}(2), \dots, e_1^{(0)}(n_1)\} \quad n_1 \leq n \quad ()$$

$$e_1(0) \quad \text{GM}(1,1) \\ .()$$

$$\hat{e}_1^{(1)}(k+1) = \left(\hat{e}_1^{(0)}(1) - \frac{u_\varepsilon}{a_\varepsilon} \right) e^{-a_\varepsilon k} + \frac{u_\varepsilon}{a_\varepsilon} \quad ()$$

$$\text{GM}(1,1)$$

$$\delta(k) = \begin{cases} 1 & k > n - n_1 \\ 0 & k \leq n - n_1 \end{cases}$$

$$\hat{x}^{(1)}(k+1) = \left(x^{(0)}(1) - \frac{u}{a} \right) e^{-ak} + \frac{u}{a} + \delta(k) \left[\left(\hat{e}_1^{(0)}(1) - \frac{u_\varepsilon}{a_\varepsilon} \right) e^{-a_\varepsilon k} + \frac{u_\varepsilon}{a_\varepsilon} \right] \quad ()$$

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(Helton and Davis, 2003)

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.(McKay et. al., 1979)

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(McKay

et al., 1979; Iman, 1999; Helton and Davis, 2003).

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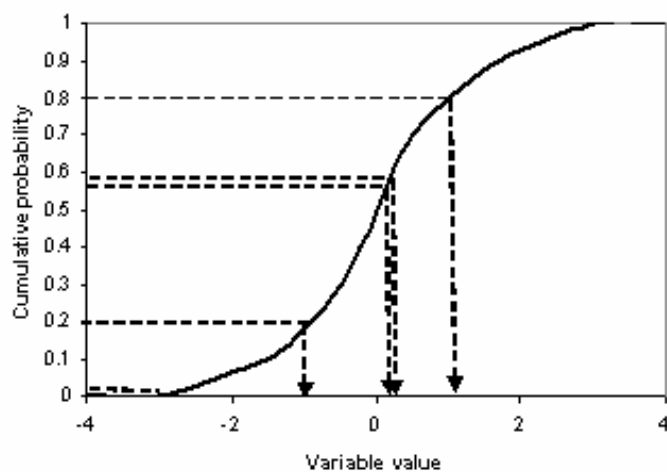
¹ Latin hypercube sampling

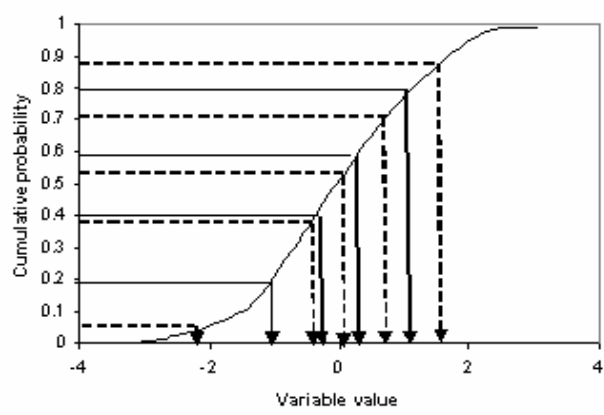
$$u_i = \frac{u}{N} + \frac{(i-1)}{N} \quad ()$$

$$i = 1, 2, \dots, n$$

u

i u_i





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$$X_1...X_n$$

T

F

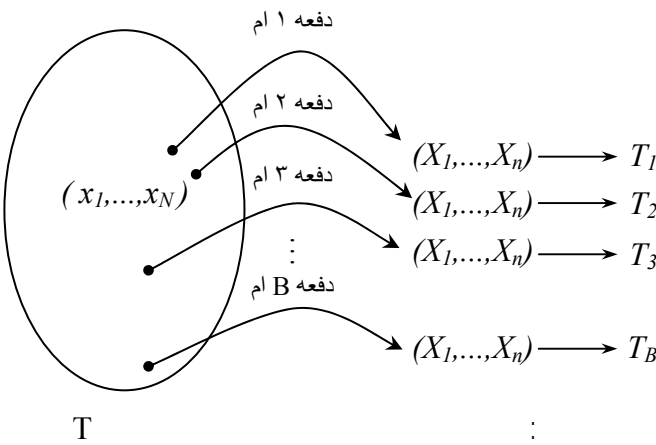
(i.i.d)

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F

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T

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$$(T : T_1...T_n)$$

T

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B

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:

T

B

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$$F_T(t) \cong \frac{1}{B} \sum_{i=1}^B I(T_i \leq t) \quad ()$$

$$bias(T) \cong \frac{1}{B} \sum_{i=1}^B T_i - \theta \quad ()$$

$$SE(T) \cong \left[\frac{1}{B} \sum_{i=1}^B \left(T_i - \frac{1}{B} \sum_{j=1}^B T_j \right)^2 \right]^{\frac{1}{2}} \quad ()$$

$$y = f(x_1, x_2, x_3, \dots, x_n) \quad ()$$

$$x_1, x_2, x_3, \dots, x_n \quad y$$

$$f(x_1, \dots)$$

$$x_j \quad x_i \quad x_i$$

$$x_j \quad x_i \quad ,$$

$$.(Cov(x_i, x_j) = 0, i \neq j)$$

$$: \quad a \quad (g = f(x)) \quad x$$

$$f(x) = f(a) + f'(a)(x-a) + f''(a)(x-a)^2/2! + \dots \quad ()$$

$$y$$

$$y = f(\bar{x}_1, \bar{x}_2, \bar{x}_3, \dots, \bar{x}_n) + \sum_{i=1}^n f'_{\bar{x}_i}(\dots)(x_i - \bar{x}_i) + \frac{1}{2} \sum_{i=1}^n \sum_{j=1}^n f''_{\bar{x}_i \bar{x}_j}(\dots)(x_i - \bar{x}_i)(x_j - \bar{x}_j) \quad ()$$

$$f''(\dots) \quad f'_{\bar{x}_i}(\dots) = f'_{\bar{x}_i}(\bar{x}_1, \bar{x}_2, \bar{x}_3, \dots, \bar{x}_n)$$

$$: \quad E(y) \quad y$$

$$E(y) = \bar{y} = f[E(\bar{x}_1), E(\bar{x}_2), E(\bar{x}_3), \dots, E(\bar{x}_n)] + \sum_{i=1}^n f'_{\bar{x}_i}(\dots) E[(x_i - \bar{x}_i)] + \frac{1}{2} \sum_{i=1}^n \sum_{j=1}^n f''_{\bar{x}_i \bar{x}_j}(\dots) E[(x_i - \bar{x}_i)(x_j - \bar{x}_j)] \quad ()$$

$$E[(x_i - \bar{x}_i)] = 0, \quad E(\bar{x}_i) = \bar{x}_i, \quad E[(x_i - \bar{x}_i)(x_j - \bar{x}_j)] = Cov(x_i, x_j) = 0$$

$$i \neq j$$

$$E(y) = f(\bar{x}_1, \bar{x}_2, \bar{x}_3, \dots, \bar{x}_n) + \frac{1}{2} \sum_{i=1}^n f''_{\bar{x}_i}(\dots) * Var(x_i) \quad ()$$

$$: \quad y \quad ,$$

$$\sigma_y^2 = \sum_{i=1}^n (f'_{\bar{x}_i})^2 \times Var(x_i) = \sum_{i=1}^n \left(\frac{\partial y}{\partial x_i} \right)^2 * \sigma_{x_i}^2 \quad ()$$

$$. \quad (\quad) \quad ()$$

$$. \quad .$$

$$. \quad (\quad)$$

$$.$$

$$(\quad)$$

$$x_i \ y$$

(Xiao, 2003)

$$x_i \ (\)$$

$$x_i$$

$$y$$

$$x_n \ x_1$$

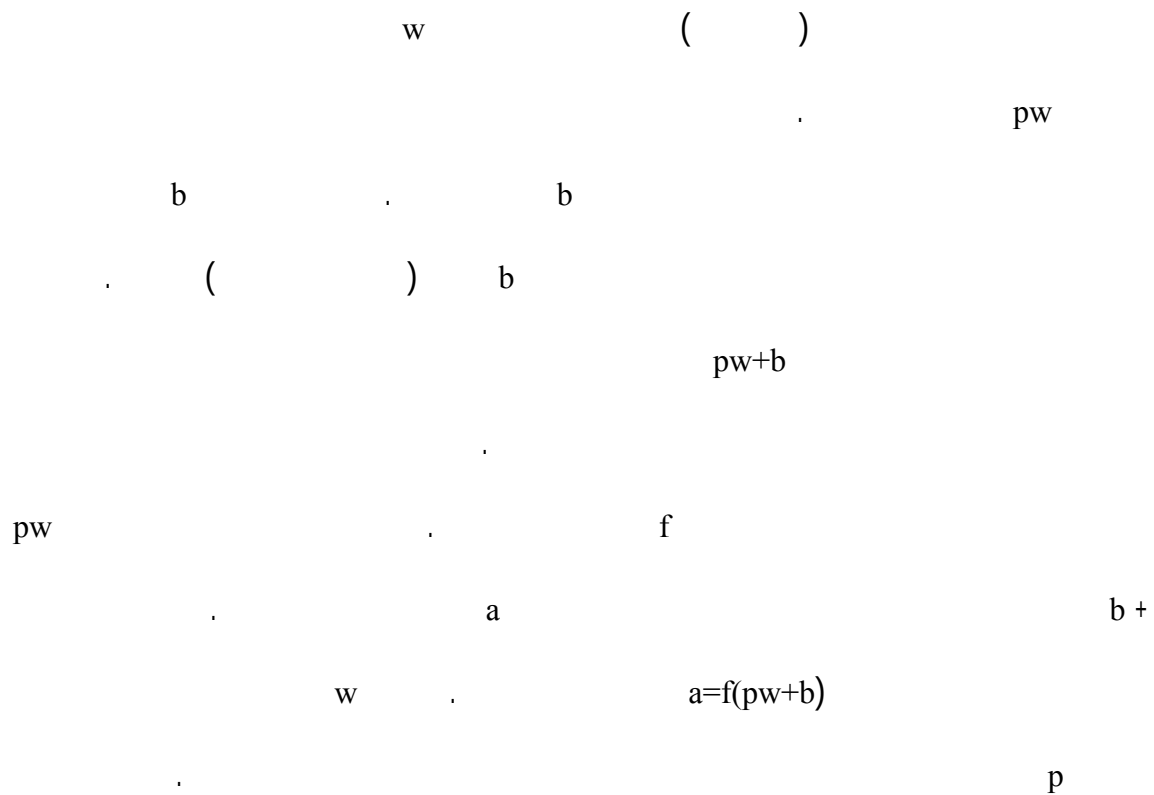
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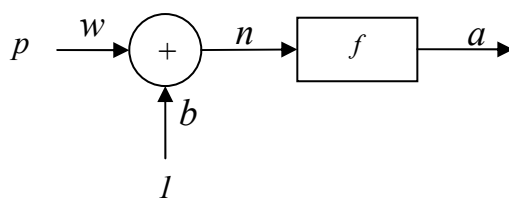
p

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¹ Transfer Function

² Weight



$$\begin{bmatrix} p_1 \\ p_2 \\ \vdots \\ p_n \end{bmatrix} W_{n^*m} + \begin{bmatrix} b_1 \\ b_2 \\ \vdots \\ b_n \end{bmatrix}$$

W

f

b w

b

b w

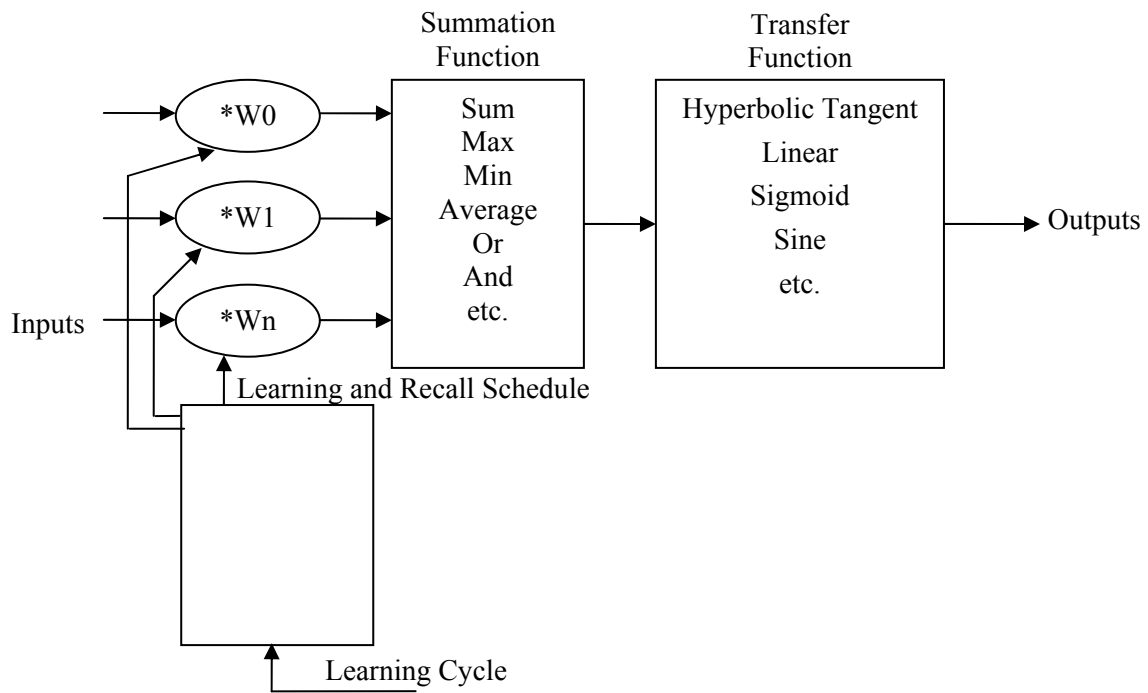
f

$$\begin{aligned} & p \quad a \quad p \\ & \quad \quad \quad a \\ & (a_1, a_2, a_m) \quad m \quad (p_1, p_2, p_3 \dots, p_n) \quad n \\ & \quad n \quad w \quad b \end{aligned}$$

OR

n AND

¹ Weighting factor



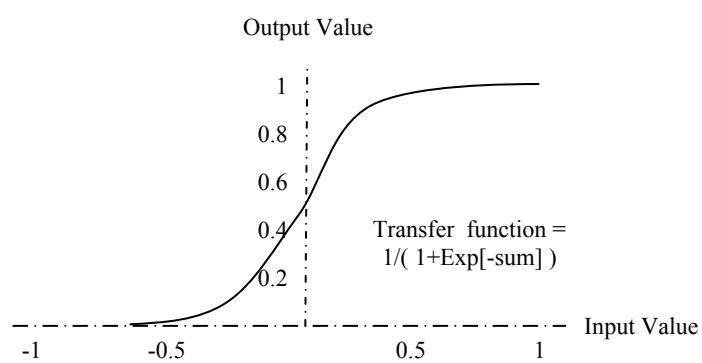
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m

n

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Abstract

Semiautogenous (SAG) mills are the main part of mineral processing plants. Any variation in these mills affect on the processing circuit directly. Reducing these variations and therefore better controlling the processing system is the aim of SAG mill modeling. SAG mill modeling has been doing on various approaches. One of the most important features of these mills is the huge power draw which is about 5-10 MW/h. This includes the highest cost in the whole mineral processing unit, therefore predicting the mill power draw in grinding technology is very profitable.

Numerous models have been introduced in batch or pilot scale yet, but there has not introduced any model for the industry scale. One of the main parameters for the industry scale model is the operational time that has not been included in previous model. Thus introducing a novel model for predicting SAG mill power draw based on the operational time was the aim of this thesis.

Liner wear is one of the most important parameters which effect the mill power draw variations. In this research a new kinetics model was introduced for liner wear prediction and then including it in power draw model. Accordingly a dynamic model was introduced for mill power draw prediction.

The proposed model was validated with various methods such as Monte Carlo Simulation, Variance Propagation Law and Neural Network Modeling with Sarcheshmeh copper complex data. All analysis results confirmed the model validation. The new modified model predicted the mill power draw at 6000 kW that was equal to real operational values with only 1% variance but previous models predicted the mill power at 9400 kW that is much far from the real values.

This research showed that the SAG mill liner wear is follow by zero order kinetics model with high precision ($R^2 = 0.997$). Using this model, the liner thickness prediction at any given time was possible. On the other hand the liner change out time was estimated.

Liner weight wear rate for the Sarcheshmeh copper complex SAG mill was estimated 25 kg/h and for the liner thickness was about 0.017 mm/h. The wear rate constant in the kinetics model was calculated 10^{-4} h^{-1} .

In this thesis a new approach was also presented for the liner wear by using Grey Theory. The prediction error for liner wear was about 1.7% that showed the grey theory was also a proper method for predicting the liner change out time. Applying the grey theory, the useful life of Sarcheshmeh SAG liner was estimated 5400 hours which was almost equal with real conditions.

Monte Carlo simulation results showed that mill power draw could be controlled by controlling just two operational parameters such as fixed and free end trunnion pressures.

Key words: Semiautogenous mill, modeling, power draw, liner, Sarcheshmeh copper complex.



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**Introducing a Novel Model for Semiautogenous Mill
Operation Based on Liner Wear
(Case Study: Sarcheshmeh Copper Complex)**

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March 2009