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PERFORMANCE ANALYSIS OF HOT ROLLING MILL TO IMPROVE THE PRODUCTIVITY AND REDUCE THE PRODUCTION COST AND SCRAP VALUE

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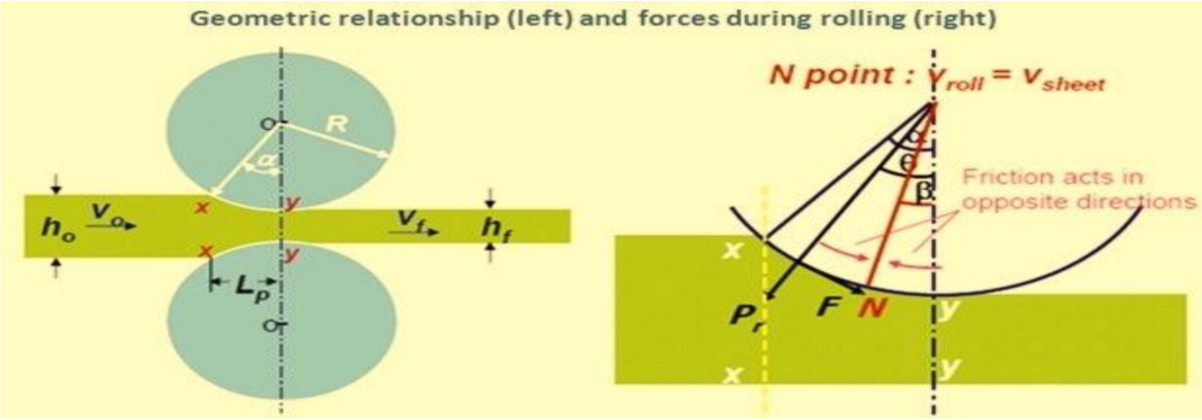
ABSTRACT: Rolling is the one of the most important industrial metal forming process where plastic deformation of a work pieces is achieved by compressing it under application of force between two rotating rolls. In this paper aims improved productivity of the production and reduce scrap value. In India presently scrap value price is very high 100% old condition mild steel scrap price INR-70.00 and 100% mild steel melting scrap price INR-56.00 generally the large amount of scrap which affect the cost of production. Most of the rolling mill work on the principal of experience and mutual settlement there are no fixed live and calculated arrangement of process. Rolling mill are one of the most productive and sensitive area of industries where slow process or any breakdown in production line is not acceptable. In hot rolling mill the large amount of scrap generated by **select Incorrect billet size, low temperature of reheating, wrong parameters setting in PLC, non-value added activity, excess billets gape, cobble rate.** In this condition properly maintain all the correct parameters before production the scrap value automatically decrease this is the only way through improve the productivity of production and reduce cost and scrap value.

KEYWORDS: Rolling Performance Analysis, PLC setting Right size of billets selection, Cobble rate, Mill Utilization, Improve productivity

1 .INTRODUCTION

Rolling is the metal working process that occurs above the re-crystallization temperature of the material after grains deform during processing. In which metal stock is passed through one or pairs of rolls to reduce the thickness and maintain the uniform thickness this process mainly focus on the cross-section of the billets or the metal which is forming. During the metal operation mill rolls are continuously a frictional heat generated between the rolled metal and the rolls and in the case of hot rolling heat transfer from hot metal work piece. Particular in the case of hot rolling steel where the steel to be rolled is preheated to temperature in excess of 1110˚c roll heating as a result of transfer can become rather excessive. When mechanical machinery move in periodical motion stress to the metal surfaces occur often leading to deformation of material.



Fg-1 Forces and geometrical relationship in rolling.

In fg-1 the relationship of force and geometric in rolling

. A metal sheet with a thickness **ho** enters the rolls at the entrance plane **xx** with a velocity **vo**

.It passes through the roll gap and leaves the exit plane **yy** with a reduced thickness **hf** and at a velocity **vf**

. Given that there is no increase in width the vertical compression of the metal is translated into an elongation in the rolling direction.

. Since there is no change in metal volume at a given point per unit time throughout the process therefore

bho vo=bhv=bh fvf ………………..Eq..1

where **b** is the width of the sheet **v** is the velocity at any thickness **h** intermediate **ho** and **hf**

Mechanism of rolling

$\mu = \tan\alpha$ or $\alpha = \tan^{-1}\mu$

If α is greater than $\tan^{-1}\mu$ the material would not enter the rolls unaided.

Draft or Maximum possible reduction in pass in rolling, **$D=\mu^2R$ or d(to-tf)**

Where,

D= draft in rolling (i.e. maximum possible reduction in one pass) in mm

μ= coefficient of friction

R= Radius of the roller in mm

Length of contact, L= √R×Dmax

Stain= In(to/tf) In (initial thickness/ final thickness)

Y average or flow stress= $640\frac{(STAIN)^{\mu}}{n+\mu}$

K= 640 mpa coefficient of strength value

n= hardening of coefficient of strength 0.15-0.5

Roll force F=L×width×flow stress

Torque T=0.5×F×L

Power P= 2π×F×L×N/60000

D=Dia of roller

t1= initial thickness

t2= final thickness

b1= width

L1= initial thickness

L2=final thickness

b×t1×L1=b2×t2×L2

2 .ROLLING PERFORMANCE

Drought: Drought also known as draft is a term meant to express the reduction in cross section height area or reduction in height in a vertical direction when compressed between two rolls. Draft is either direct or indirect. In direct draft results when the rolls exert on the stock in non-vertical direction. Basically it is a grinding action between the collars of two rolls rotating in opposite direction. When part of the pass profile is inclined in between the vertical and horizontal the deformation is caused by a combination of direct as well as indirect drafting up to an inclination of 45˚with the horizontal direction drafting predominates. However above 45˚ inclination the effects of indirect drafting come in to play. Near 90˚the deformation depends almost entirely on indirect draft. **D=(μ)²×R**

Elongation: in stock length is associated with reduction in area as volume of material leaves the rolls as enters them is equal. Elongation factor i.e. the ratio of the final length to the initial length is always greater then unity

Elongation=volume of billet/area of the billet

Spread: when steel stock is compressed between two rolls it obviously moves in the direction of least resistance. There is not only a longitudinal flow but also some lateral flow which is called spread. Roller signifies one action but two reactions. Spread is the flow of material at right angle to the directions compression and elongation. The coefficient of spread is the ratio between exit and entry width. The higher the coefficient of friction higher is the resistance to length wise flow and more is the spread.

TMT MILL LO= L1, L2 , L3,…………………..Ln (length)

bO = b1, b2 , b3,…………………..bn (width)

vO = v1, v2 , v3,…………………..vn (volume)

AO = A1, A2 , A3,…………………..An (Area)

Calculate of absolute height and mein head

Mein head let 1^{st} pass=h2 denoted

h=height h2m×b2×L2/h1×b1×L1=1 2^{nd} pass/1^{st} pass=1

hom=area of AO/width bO h2m absolute, b2 width, L2 Length it is denoted by

h1m= 1^{st} pass=A1/b1 1.coefficient of draft (γ) **= h2/h1**

h2m= 2^{nd} pass=A2/b2 2.coefficient of spread **(β)= b2/b1**

final head hnm= An/bn 3. Coefficient of elongation **(α)= L2/L1**

For example: 1^{st} pass value 2^{nd} pass height reduction

h1 value of 1^{st} pass=200mm h2 value of 2^{st} pass=150mm

b1 value of 1^{st} pass=250mm b2 value of 2^{st} pass=262mm

L1 value of 1^{st} pass=250mm L2 value of 2^{nd} pass=2545mm

Before passing sample area and volume: A1=L1b1=200×250=50000mm²

Volume=area×length(50000×2000)=10000000mm³

1.coefficient of draft (γ) = h2/h1**(150/200)=0.750mm**

2.coefficient of spread (**β**)= b2/b1 **(262/250)=1.048mm**

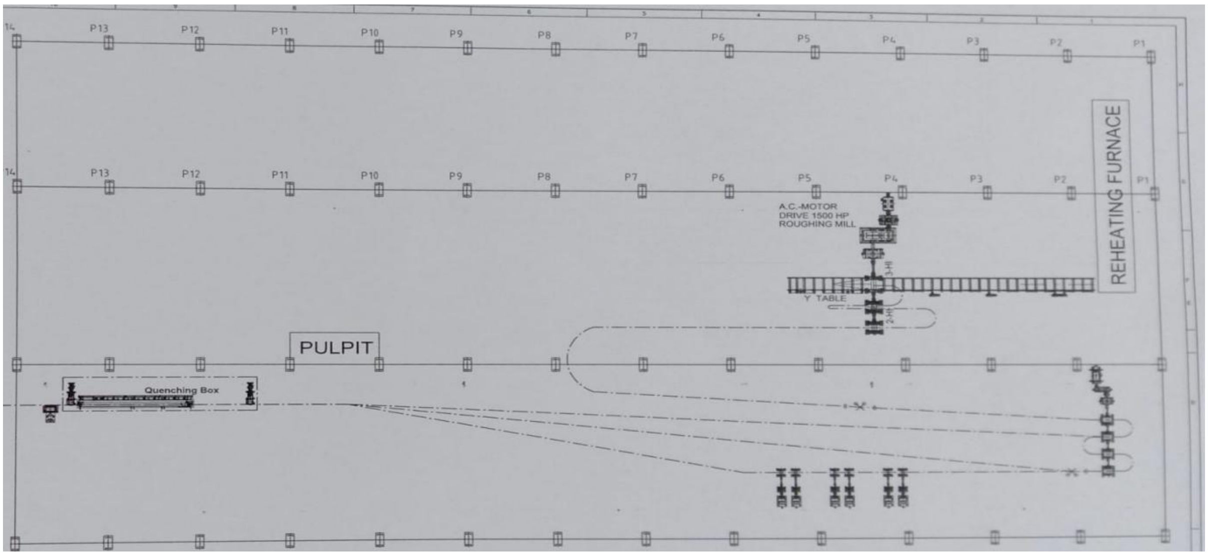
3. Coefficient of elongation (**α**)= L2/L1 **(2545/2000)=1.2725mm**

All the value putting on this equation α, β, γ=1

h2m×b2×L2/h1m×b1×L1=1 150×262×2545/200×250×2000=1.000

if the value keeps on going from 1 then the mill is not working properly. Proved

3 .PERFORMANCE ANALYSIS OF ROLLING



Fg-2 layout of 18 inch Ripe-tor mill

In this fg-2 shows billets come to reheating furnace and goes to roughing mill at 1200˚c. by roller convey. furnace produce hot billets 20ton in per hour and the distance between reheating furnace to roughing stand 10mtr.Roughing has 3 stand 2 stand 3 high roll and 1 stand 2 high roll. Rough motor rpm 750 and gear ratio 7.54 .total number of stand 13 roughing has 3 stand 9 pass inter has 4stand 4pass and finish 6stand DC 6pass total number of pass 19. After leave last stand of roughing the material goes to inter stand 10 number pass by ripe-tor.

Reheating Furnace→ Roughing stand→ Ripe-tor→ pre-pinch roll→ rotary shear cut→ Inter stand→ finish stand→ HMT→ pre-pinch roll→ Therm-ex box→ flying shear cut → post pinch roll→ tail breaker→ w type cooling bed→ cold shear cutting

ROUGHING	INTER	FINISH	MOTOR RPM	GEAR RATIO	STAND	PASS
ROUGHING			750	7.54	3	9
	INTER		740	2.83	4	4
		C1	1300	3.28	1	1
		C2	1194	2.5	1	1
		C3	1243	2	1	1
		C4	1181	1.55	1	1
		C5	1299	1.34	1	1
		C6	1306	1.07	1	1

ROLL DETAILS OF STAND

ROUGHING		INTER		FINISH	
ROLL DIA MM	RADIUS MM	ROLL DIA MM	RADIUS MM	ROLL DIA MM	RADIUS MM
460	230	310	155	C1-304	152
462	231	330	165	C2-321	160.5

464	**232**	**320**	**160**	**C3-287**	**143.5**
466	**233**	**344**	**172**	**C4-262**	**131**
468	**234**			**C5-273**	**136.5**
470	**235**			**C6-284**	**142**
480	**240**				
490	**245**				
500	**250**				

PASS DETAILS

ROUGHFING 9PASS 4STAND				
STAND 1 6PASS	**SIZE MM**	**AREA MM2**	**REDUCTION %**	**ELONGATION MTR**
R1=FLATE	80×110	8800	12	3.409
R2= FLATE	65×112	7280	17	4.12
R3=BOX	72×72	5184	28	5.787
R4=DAIMOND	42×95	3990	23	7.518
R5=SQUAR	48×48	2304	42	13.02
R6=DAIMOND	27×68	1836	20.3	16.33
STAND 2 2PASS				
R7=SQUAR	32×32	1024	44.22	29.296
R8=OVAL	19×48	912	10.93	32.894
STAND 3 1PASS				
R9=SQUAR	25×25	625	31.46	48
INTER 4STAND 4 PASS				
INT=1 OVAL	14.5×32	464	25.76	64.655
INT=2 SQUAR	18×18	324	30.17	92.592
INT=3 OVAL	11.5×24	276	14.18	108.695
INT=ROUND TMT	16TMT	200.96	27.53	150
CONTINUOUS 6STAND DC				
C1=OVAL	9.5×18	171	14.5	175.438
C2=ROUND TMT	12TMT	113.04	33.89	265.392
C3=OVAL	7.5×15	112.5	0.477	266.666
C4=ROUND TMT	10TMT	78.5	30	382.165
C5=OVAL	6.5×12	78	0.63	384.615
C6=ROUND TMT	8TMT	50.24	35.58	597.133

Elongation =volume of billet/area of the billet after reduce dia

Reduction % =(area in-area out)/area out×100

Roughing stand rolling performance analysis

Pass	Contac Length mm	Stain σ	Stress N/mm²	Roll force N	TORQE N-m	Power KW	MPS Mtr/sec	Roll dia mm	Reduction %	Elongation mtr
1	83.066	0.318	317.45	2.90	120.44	18.90	2.394	460	12	3.439
2	58.86	0.207	273.170	1.286	37.846	5.94	2.404	462	17	4.120
3	96.53	0.438	355.108	3.850	184.47	28.96	2.415	464	28	5.787
4	83.60	0.536	381.11	2.29	95.722	15.02	2.425	466	23	7.518
5	104.87	0.678	413.785	4.122	216.137	33.93	2.435	468	42	13.02
6	70.24	0.570	389.400	1.312	46.07	7.234	2.446	470	20.3	16.330
7	92.95	0.753	429.260	2.713	126.08	19.79	2.498	480	44.220	29.296
8	56.43	0.518	376.580	0.680	19.180	3.01	2.550	490	10.13	32.894
9	75.82	0.652	408.155	1.485	56.296	8.83	2.602	500	31.46	48.00

Roughing pass 1 = Draft (110-80)=30mm Roll dia 460mm radius 230mm

Dmax(μ)²×R =(0.35)²×230=**28.175mm**

Contact length=L√R×Draft (√230×30)= **83.066mm**

Stain σ=In(tin/tout) In(110/80)= **0.318**

Flow stress== $640\,\frac{(STAIN)^{\mu}}{n+\mu}$ $640\,\frac{(0.318)^{0.35}}{1+0.35}$ =428.57/1.35=**317.45 Mpa**

Roll force= flow stress×width×contact length

F=(317.45×110×83.066)=2900623.187/1000000=**2.90N**

Torque=0.5×F×L (0.5×2.90×83.066)=**120.44 N-m**

Power= 2π×F×L×N/60000 (2×3.14×2.90×83.066×750)/60000 =**18.90 KW**

Roughing pass 2 = Draft (80-65)=15mm Roll dia 462mm radius 231mm

Dmax(μ)²×R =(0.35)²×231=**28.29mm**

Contact length=L√R×Draft (√231×15)= **58.86mm**

Stain σ=In(tin/tout) In(80/65)= **0.207**

Flow stress== $640\,\frac{(STAIN)^{\mu}}{n+\mu}$ $640\,\frac{(0.207)^{0.35}}{1+0.35}$ =368.78/1.35=**273.170 Mpa**

Roll force= flow stress×width×contact length

F=(273.170×80×58.86)=1286302.896/1000000=**1.286N**

Torque=0.5×F×L (0.5×1.286×58.86)=**37.846 N-m**

Power= 2π×F×L×N/60000 (2×3.14×1.286×58.86×750)/60000 =**5.94 Kw**

Roughing pass 3 = Draft (112-72)=40mm Roll dia 464mm radius 232mm

Dmax(μ)²×R =(0.35)²×232=**28.42mm**

Contact length=L√R×Draft (√232×40)= **96.53mm**

Stain σ=In(tin/tout) In(112/72)= **0.438**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{(\mathbf{0.438})\mathbf{0.35}}{1+0.35}$ =479.397/1.35=**355.108 Mpa**

Roll force= flow stress×width×contact length

F=(355.108×112×96.33)=3831246.008/1000000=**3.83N**

Torque=0.5×F×L (0.5×3.83×96.33)=**184.47 N-m**

Power= 2π×F×L×N/60000 (2×3.14×3.83×96.33×750)/60000 =**28.96 KW**

Roughing pass 4 = Draft (72-42)=30mm Roll dia 466mm radius 233mm

Dmax(μ)²×R =(0.35)²×233=**28.54mm**

Contac length=L√R×Draft (√233×30)= **83.60mm**

Stain σ=In(tin/tout) In(72/42)= **0.536**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{(\mathbf{0.536})\mathbf{0.35}}{1+0.35}$ =514.50/1.35=**381.11 Mpa**

Roll force= flow stress×width×contact length

F=(381.11×72×83.60)=2293977.312/1000000=**2.29N**

Torque=0.5×F×L (0.5×2.29×83.60)=**95.722 N-m**

Power= 2π×F×L×N/60000 (2×3.14×2.29×83.60×750)/60000 =**15.02 KW**

Roughing pass 5 = Draft (95-48)=47mm Roll dia 468mm radius 234mm

Dmax(μ)²×R =(0.35)²×234=**28.665mm**

Contact length=L√R×Draft (√234×47)= **104.87mm**

Stain σ=In(tin/tout) In(95/48)= **0.678**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{(\mathbf{0.678})\mathbf{0.35}}{1+0.35}$ =558.61/1.35=**413.785Mpa**

Roll force= flow stress×width×contact length

F=(413.785×95×104.87)=4122395.13/1000000=**4.122N**

Torque=0.5×F×L (0.5×4.122×104.87)=**216.137 N-m**

Power= 2π×F×L×N/60000 (2×3.14×4.122×104.87×750)/60000 =**33.93KW**

Roughing pass 6 = Draft (48-27)=21mm Roll dia 470mm radius 235mm

Dmax(μ)²×R =(0.35)²×235=**28.78mm**

Contact length=L√R×Draft (√235×21)= **70.24mm**

Stain σ=In(tin/tout) In(48/27)= **0.570**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{(0.570)0.35}{1+0.35}$ =525.69/1.35=**389.40Mpa**

Roll force= flow stress×width×contact length

F=(389.40×48×70.24)=1312869.88/1000000=**1.312N**

Torque=0.5×F×L (0.5×1.312×70.24)=**46.07 N-m**

Power= 2π×F×L×N/60000 (2×3.14×1.312×70.24×750)/60000 =**7.234KW**

Roughing pass 7 = Draft (68-32)=36mm Roll dia 480mm radius 240mm

Dmax(μ)²×R =(0.35)²×240=**29.40mm**

Contact length=L√R×Draft (√240×36)= **92.95mm**

Stain σ=In(tin/tout) In(68/32)= **0.753**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{(0.753)0.35}{1+0.35}$ =579.50/1.35=**429.26Mpa**

Roll force= flow stress×width×contact length

F=(429.26×68×92.95)=2713180.756/1000000=**2.713N**

Torque=0.5×F×L (0.5×2.713×92.95)=**126.08 N-m**

Power= 2π×F×L×N/60000 (2×3.14×2.713×92.95×750)/60000 =**19.79KW**

Roughing pass 8 = Draft (32-19)=13mm Roll dia 490mm radius 245mm

Dmax(μ)²×R =(0.35)²×245=**30.01mm**

Contact length=L√R×Draft (√245×13)= **56.43mm**

Stain σ=In(tin/tout) In(32/19)= **0.518**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{(0.518)0.35}{1+0.35}$ =508.38/1.35=**376.58Mpa**

Roll force= flow stress×width×contact length

F=(376.58×32×56.43)=680013.100/1000000=**0.680N**

Torque=0.5×F×L (0.5×0.680×56.43)=**19.18N-m**

Power= 2π×F×L×N/60000 (2×3.14×0.680×56.43×750)/60000 =**3.01KW**

Roughing pass 9 = Draft (48-25)=23mm Roll dia 500mm radius 250mm

Dmax(μ)²×R =(0.35)²×250=**30.62mm**

Contact length=L√R×Draft (√250×23)= **75.82mm**

Stain σ=In(tin/tout) In(48/25)= **0.652**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{(0.652)0.35}{1+0.35}$ =551.01/1.35=**408.155Mpa**

Roll force= flow stress×width×contact length

F=(408.155×48×75.82)=1485422.981/1000000=**1.485N**

Torque=0.5×F×L (0.5×1.485×75.82)=**56.296 N-m**

Power= 2π×F×L×N/60000 (2×3.14×1.485×75.82×750)/60000 =**8.83KW**

Roughing velocity stand roll wise

Roll dia=460mm,462mm,464mm,468mm,470mm,480mm,490mm,500mm

Motor Rpm=750 and **gear ratio**=7.54

Pass 1 **Roughing motor Rpm=750 Gear ratio=7.54 Roll Dia=460 mm**

Stand rpm=motor rpm/gear ratio (750/7.54)= **99.469r/mints**

Velocity= π×D×N/60000 (3.14×460×99.46)/60000=**2.394 mps**

Pass 2 **Roughing motor Rpm=750 Gear ratio=7.54 Roll Dia=460 mm**

Stand rpm=motor rpm/gear ratio (750/7.54)= **99.469r/mints**

Velocity= π×D×N/60000 (3.14×462×99.46)/60000=**2.404 mps**

Pass 3 **Roughing motor Rpm=750 Gear ratio=7.54 Roll Dia=464 mm**

Stand rpm=motor rpm/gear ratio (750/7.54)= **99.469r/mints**

Velocity= π×D×N/60000 (3.14×464×99.46)/60000=**2.415 mps**

Pass 4 **Roughing motor Rpm=750 Gear ratio=7.54 Roll Dia=464 mm**

Stand rpm=motor rpm/gear ratio (750/7.54)= **99.469r/mints**

Velocity= π×D×N/60000 (3.14×466×99.46)/60000=**2.425 mps**

Pass 5 **Roughing motor Rpm=750 Gear ratio=7.54 Roll Dia=464 mm**

Stand rpm=motor rpm/gear ratio (750/7.54)= **99.469r/mints**

Velocity= π×D×N/60000 (3.14×468×99.46)/60000=**2.435 mps**

Pass 6 **Roughing motor Rpm=750 Gear ratio=7.54 Roll Dia=464 mm**

Stand rpm=motor rpm/gear ratio (750/7.54)= **99.469r/mints**

Velocity= π×D×N/60000 (3.14×470×99.46)/60000=**2.446 mps**

Pass 7 **Roughing motor Rpm=750 Gear ratio=7.54 Roll Dia=464 mm**

Stand rpm=motor rpm/gear ratio (750/7.54)= **99.469r/mints**

Velocity= π×D×N/60000 (3.14×480×99.46)/60000=**2.498 mps**

Pass 8 **Roughing motor Rpm=750 Gear ratio=7.54 Roll Dia=464 mm**

Stand rpm=motor rpm/gear ratio (750/7.54)= **99.469r/mints**

Velocity= π×D×N/60000 (3.14×490×99.46)/60000=**2.550 mps**

Pass 9 **Roughing motor Rpm=750 Gear ratio=7.54 Roll Dia=464 mm**

Stand rpm=motor rpm/gear ratio (750/7.54)= **99.469r/mints**

Velocity= π×D×N/60000 (3.14×500×99.46)/60000=**2.602 mps**

Inter stand rolling performance and analysis

Pass	**Contact Length mm**	**Stain σ**	**Stress N/mm²**	**Roll force N**	**TORQE N-m**	**Power KW**	**MPS Mtr/sec**	**ROLL dia mm**	**Reduction %**	**Elongation mtr**
10	40.340	0.544	383.08	0.386	7.78	1.20	4.242	310	25.76	64.655
11	48.06	0.570	389.400	0.598	14.36	2.22	4.510	330	30.17	92.592
12	32.24	0.440	355.670	0.206	3.32	1.263	4.378	320	14.18	108.695
13	37.09	0.405	345.50	0.307	5.702	0.883	4.707	344	27.53	150.00

Inter stand pass 10 = Draft (25-14.5)=10.5mm Roll dia 310mm radius 155mm

Dmax(μ)²×R =(0.35)²×155=**18.987mm**

Contact length=L√R×Draft (√155×10.5)= **40.34mm**

Stain σ=In(tin/tout) In(25/14.5)= **0.544**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{\mathbf{(0.544)0.35}}{\mathbf{1+0.35}}$ =517.17/1.35=**383.08Mpa**

Roll force= flow stress×width×contact length

F=(383.08×25×40.34)=386336.18/1000000=**0.386N**

Torque=0.5×F×L (0.5×0.386×40.34)=**7.78 N-m**

Power= 2π×F×L×N/60000 (2×3.14×0.386×40.34×740)/60000 =**1.20KW**

Inter stand pass 11 = Draft (32-18)=14mm Roll dia 330mm radius 165mm

Dmax(μ)²×R =(0.35)²×165=**120.21mm**

Contact length=L√R×Draft (√165×14)= **48.06mm**

Stain σ=In(tin/tout) In(32/18)= **0.570**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{\mathbf{(0.570)0.35}}{\mathbf{1+0.35}}$ =525.69/1.35=**389.4Mpa**

Roll force= flow stress×width×contact length

F=(389.4×32×48.06)=598866.048/1000000=**0.598N**

Torque=0.5×F×L (0.5×0.598×48.06)=**14.36N-m**

Power= 2π×F×L×N/60000 (2×3.14×0.598×48.06×740)/60000 =**2.22KW**

Inter stand pass 12 = Draft (18-11.5)=6.5mm Roll dia 320mm radius 160mm

Dmax(μ)²×R =(0.35)²×160=**19.6mm**

Contact length=L√R×Draft (√160×6.5)= **32.24mm**

Stain σ=In(tin/tout) In(18/11.5)= **0.44**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{(\mathbf{0.44})\mathbf{0.35}}{\mathbf{1+0.35}}$ =480.162/1.35=**355.67Mpa**

Roll force= flow stress×width×contact length

F=(355.67×18×32.24)=206402.414/1000000=**0.206N**

Torque=0.5×F×L (0.5×0.206×32.24)=**3.32 N-m**

Power= 2π×F×L×N/60000 (2×3.14×0.206×32.24×740)/60000 =**1.263KW**

Inter stand pass 13 = Draft (24-16)=8mm Roll dia 344mm radius 172mm

Dmax(μ)²×R =(0.35)²×172=**21.07mm**

Contact length=L√R×Draft (√172×8)= **37.09mm**

Stain σ=In(tin/tout) In(24/16)= **0.405**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{(\mathbf{0.405})\mathbf{0.35}}{\mathbf{1+0.35}}$ =466.43/1.35=**345.50Mpa**

Roll force= flow stress×width×contact length

F=(345.50×24×37.09)=307550.28/1000000=**0.3075N**

Torque=0.5×F×L (0.5×0.3075×37.09)=**5.702N-m**

Power= 2π×F×L×N/60000 (2×3.14×0.3075×37.09×740)/60000 =0.883**KW**

Inter stand velocity roll wise

Roll dia=310mm,330mm,320mm,344mm

Motor Rpm=740 and **gear ratio**=2.83

Pass 10 **Inter motor Rpm=740 Gear ratio=2.83 Roll Dia=310 mm**

Stand rpm=motor rpm/gear ratio (740/2.83)= **261.48r/mints stand rpm**

Velocity= π×D×N/60000 (3.14×310×261.48)/60000=**4.242 mps**

N×D×3.14/Gear ratio×60000(740×310×3.14)/2.83×60000=720316/169800=**4.242 mps**

Pass 11 **N**×D×3.14/Gear ratio×60000(740×330×3.14)/2.83×60000=766788/169800=**4.515 mps**

Pass 12 **N**×D×3.14/Gear ratio×60000(740×320×3.14)/2.83×60000=743552/169800=**4.378 mps**

Pass 13 N×D×3.14/Gear ratio×60000(740×344×3.14)/2.83×60000=799318/169800=**4.707 mps**

Finish stand rolling performance and analysis

Pass	Contact Length mm	Stain σ	Stress N/mm²	Roll force N	TORQE N-m	Power KW	MPS Mtr/sec	ROLL dia mm	Reduction %	Elongation mtr
14	31.43	0.518	376.583	0.189	2.97	0.812	6.30	304	14.5	175.438
15	31.03	0.40	344	0.192	2.97	0.744	7.82	321	33.89	265.392
16	25.41	0.470	363.97	0.110	1.39	0.363	9.30	287	0.477	266.666
17	25.59	0.405	345.50	0.132	1.688	0.417	11.324	262	30	382.165
18	21.85	0.425	351.38	0.076	0.830	0.225	13.08	273	0.63	384.615
19	23.83	0.405	345.503	0.098	1.177	0.321	16.86	284	35.58	597.133

Finish stand pass 14 = Draft (16-9.5)=6.5mm Roll dia 304mm radius 152mm

Dmax(μ)²×R =(0.35)²×152=**18.62mm**

Contact length=L√R×Draft (√152×6.5)= **31.43mm**

Stain σ=In(tin/tout) In(16/9.5)= **0.518**

Flow stress== $640\,\frac{(STAIN)\mu}{n+\mu}$ $640\,\frac{\mathbf{(0.518)0.35}}{\mathbf{1+0.35}}$ =508.388/1.35=**376.583Mpa**

Roll force= flow stress×width×contact length

F=(376.583×16×31.43)=189376.05/1000000=**0.189N**

Torque=0.5×F×L (0.5×0.189×31.43)=**2.97 N-m**

Power= 2π×F×L×N/60000 (2×3.14×0.189×31.43×1306)/60000 =**0.812KW**

Finish stand pass 15 = Draft (18-12)=6mm Roll dia 321mm radius 160.5mm

Dmax(μ)²×R =(0.35)²×160.5=**19.66mm**

Contact length=L√R×Draft (√160.5×6)= **31.03mm**

Stain σ=In(tin/tout) In(18/12)= **0.40**

Flow stress== $640\,\frac{(STAIN)\mu}{n+\mu}$ $640\,\frac{\mathbf{(0.40)0.35}}{\mathbf{1+0.35}}$ =464.40/1.35=**344Mpa**

Roll force= flow stress×width×contact length

F=(344×18×31.03)=192137.76/1000000=**0.192N**

Torque=0.5×F×L (0.5×0.192×31.03)=**2.978 N-m**

Power= 2π×F×L×N/60000 (2×3.14×0.192×31.03×1194)/60000 =**0.744KW**

Finish stand pass 16 = Draft (12-7.5)=4.5mm Roll dia 287mm radius 143.5mm

Dmax(μ)²×R =(0.35)²×143.5=**50.22mm**

Contact length=L√R×Draft (√143.5×4.5)= **25.41mm**

Stain σ=In(tin/tout) In(12/7.5)= **0.470**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{(0.470)0.35}{1+0.35}$ =491.37/1.35=**363.977Mpa**

Roll force= flow stress×width×contact length

F=(363.977×12×25.41)=110983.86/1000000=**0.110N**

Torque=0.5×F×L (0.5×0.110×25.41)=**1.39 N-m**

Power= 2π×F×L×N/60000 (2×3.14×0.110×25.41×1243)/60000 =**0.363KW**

Finish stand pass 17 = Draft (15-10)=5mm Roll dia 262mm radius 131mm

Dmax(μ)²×R =(0.35)²×131=**16.04mm**

Contact length=L√R×Draft (√131×5)= **25.59mm**

Stain σ=In(tin/tout) In(15/10)= **0.405**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{(0.405)0.35}{1+0.35}$ =466.43/1.35=**345.50Mpa**

Roll force= flow stress×width×contact length

F=(345.50×15×25.59)=132620.175/1000000=**0.132N**

Torque=0.5×F×L (0.5×0.132×25.59)=**1.688 N-m**

Power= 2π×F×L×N/60000 (2×3.14×0.132×25.59×1181)/60000 =**0.4175KW**

Finish stand pass 18 = Draft (10-6.5)=3.5mm Roll dia 273mm radius 136.5mm

Dmax(μ)²×R =(0.35)²×136.5=**16.721mm**

Contact length=L√R×Draft (√136.5×3.5)= **21.85mm**

Stain σ=In(tin/tout) In(10/6.5)= **0.425**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{(0.425)0.35}{1+0.35}$ =474.36/1.35**=351.38Mpa**

Roll force= flow stress×width×contact length

F=(351.38×10×21.85)=76776.53/1000000=**0.076N**

Torque=0.5×F×L (0.5×0.076×21.85)=**0.830 N-m**

Power= 2π×F×L×N/60000 (2×3.14×0.076×21.85×1299)/60000 =**0.225KW**

Finish stand pass 19 = Draft (12-8)=4mm Roll dia 284mm radius 142mm

Dmax(μ)²×R =(0.35)²×142=**17.39mm**

Contact length=L√R×Draft (√142×4)= **23.83mm**

Stain σ=In(tin/tout) In(12/8)= **0.405**

Flow stress== $640\frac{(STAIN)\mu}{n+\mu}$ $640\frac{(0.405)0.35}{1+0.35}$ =466.43/1.35=**345.503Mpa**

Roll force= flow stress×width×contact length

F=(345.503×12×23.83)=98800.037/1000000=**0.0988N**

Torque=0.5×F×L (0.5×0.00988×23.83)=**1.177 N-m**

Power= 2π×F×L×N/60000 (2×3.14×0.0988×23.83×1306)/60000 =**0.321KW**

Finish stand velocity roll wise

Roll Dia=304mm,321mm,287mm,262mm,273mm,284mm

Pass 14 N×D×3.14/Gear ratio×60000(1300×304×3.14)/3.28×60000=1240928/188400=**6.58 mps**

Pass 15 N×D×3.14/Gear ratio×60000(1194×321×3.14)/2.5×60000=1203480/150000=**8.02 mps**

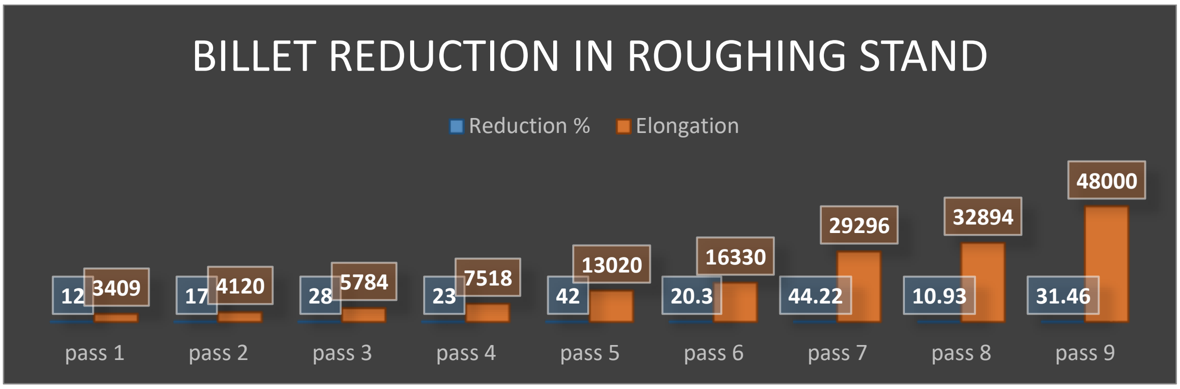
Pass 16 N×D×3.14/Gear ratio×60000(1243×287×3.14)/2×60000=1120166/120000=**9.33 mps**

Pass 17 N×D×3.14/Gear ratio×60000(1181×262×3.14)/1.55×60000=971585.08/90000=**10.79 mps**

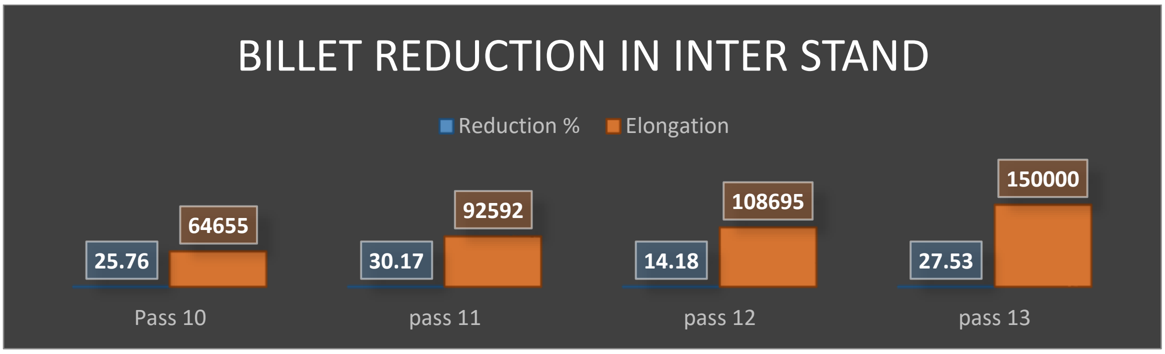
Pass 18 N×D×3.14/Gear ratio×60000(1299×273×3.14)/1.34×60000=1113528.78/80400=**13.84 mps**

Pass 19 N×D×3.14/Gear ratio×60000(1187×284×3.14)/1.07×60000=1058519.12/64200=**16.48 mps**

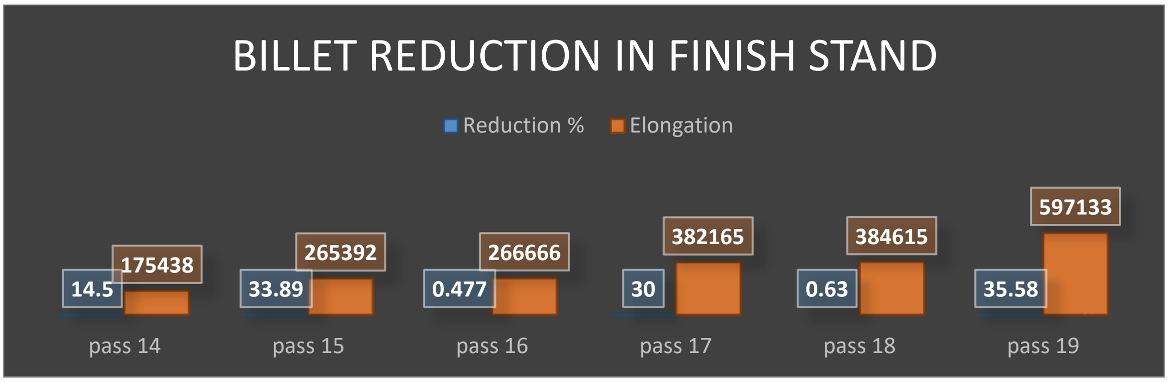
4.1 BILLET REDUCTION AND ELONGATION ANALYSIS ROUGHING STAND



4.2 BILLET REDUCTION AND ELONGATION ANALYSIS INTER STAND

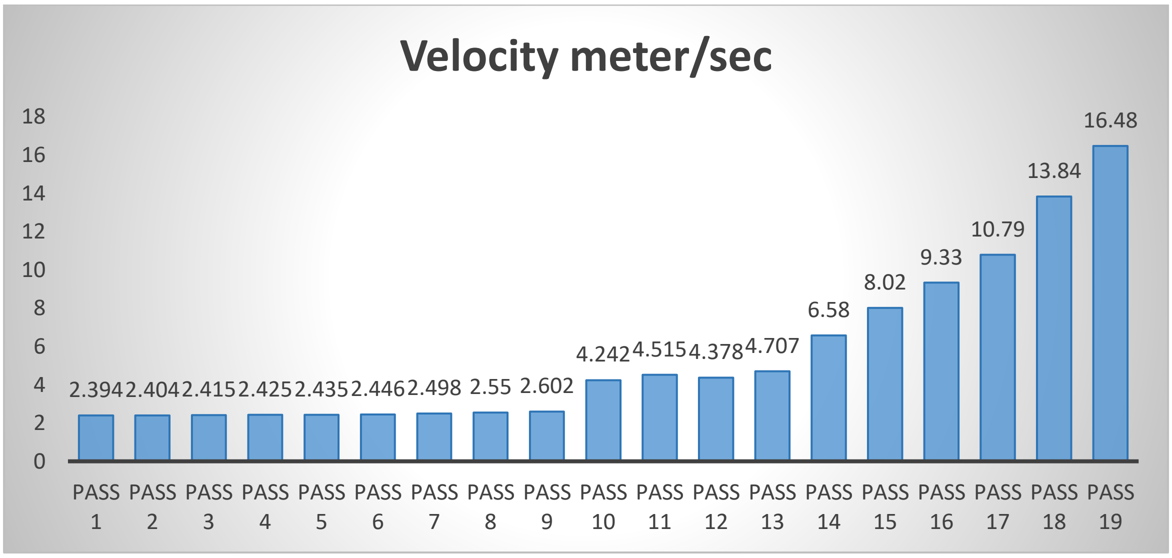


4.3 BILLET REDUCTION AND ELONGATION ANALYSIS FINISH STAND



Before rolling the billets size was 100×100×3000mm and when it is passing through roughing inter or finish stand the billets length will increase and the actual value get this graph total length **597.133mtr.**

4.4 BILLET VELOCITY ROUGHING INTER AND FINISH STAND



5. PROGRAMING LOGICAL CONTROL PLC

PLC stands for programmable logic controller. A PLC is a programmable computing device that is used to manage electromechanical processes, usually in the industrial niche. A PLC is sometimes referred to as an industrial PC, a term that describes a PLC's main function as a specialized industrial computing machine.

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PLC VEGA CONTROL SYSTEM **PLC SETTING PARAMETER**

5. PLC SETTING PERAMETERS AS PER PRODUCTION

8MM BAR SIZE 16.5MILL SPEED

NAME	RPM MOTOR	ROLL DIA	MPS	LEAD	BITE VALUE	RF FACTOR	TLC ON/OFF	LIMIT
INTER	740	344	4.71	-	-	-	-	-
C1	1300	304	6.31	13.3	1	1.24	ON	5
C2	1194	313	7.83	9.8	3	1.19	ON	5
C3	1243	286	9.31	10.7	2	1.22	ON	8
C4	1181	284	11.34	10.5	4	1.18	ON	4
C5	1299	264	13.40	11.7	2	1.23	ON	5
C6	1306	258	16.50	9.1	6	1.00	OFF	0
PPR-1	1230	260		-	-	-	-	-
POST PR1	1058	311	17.25	4.5	-	-	-	90
FLYING SHEAR	425	-	17.24	0.0	-	-	-	
TB-1	1104	304	17.59	2.0	-	-	-	80
TB-2	1119	300	17.59	2.0	-	-	-	80

PPR- pre-pinch roll open close(ms)-**50**

Pre-pinch roll close delsy(ms)-**1**

RF FACTOR=C1 STAND MPS/C2 STAND MPS

POST –PR- HMD to post pinch roll open distance (mtr)-**16**

HMD to post pinch roll close distance (mtr)-**16**

DS(FLYING SHEAR)=Set cut length mtr **60**

Customer cut length mtr **12**

1st cut length off set mtr **1.7**

Total cut length mtr **1.6**

DS1 Lead -0

Length optimization offset mtr **0**

Diverter shift count **92%**

End cut count **50%**

TB Down **55%**

TAIL BREAKER	**TB-1**	**TB-2**
Tail breaker lead	2	2
Distance from pinch	16.5mtr	17.5mtr
Distance from shear	13mtr	14mtr
Start breaking length	4mtr	5mtr
Small psc breaking length	6mtr	6.4mtr
Last pcs breaking length	6.5mtr	5.5mtr
Long pcs breaking length	4mtr	5mtr
Breaking MPS greater then 48	5.5mtr	5.7
Breaking MPS greater then 36	5.4mtr	5.5mtr
Breaking MPS greater then 24	5.7mtr	5.5mtr
Breaking MPS greater then 24	5.7mtr	5.5mtr
Down time from small pcs (ms)	500	500
Down time from last pcs (ms)	1100	1050
Current limits	80	80
Gear ratio	1	1

MISROLL RCP FOR 16MM BYPASS	**value**
Bypass cut divertor N TO A (MS)	13200
Bypass cut divertor A TO N (MS)	13100
Bypass cut divertor N TO A (MS)	7750
Bypass cut divertor A TO N (MS)	7850
C-1 TLC delay	50
RS front shift delay	280

10MM BAR SIZE MILL SPEED 11.93MPS

NAME	RPM MOTOR	ROLL DIA	MPS	LEAD %	BITE VALUE	RF FACTOR	BCD MS	TLC ON/OFF	TV VALUE %	CURRENT LIMITS %
INTER	740	332	4.55	-	-	-	-	-	-	-
C1	1180	305	5.75	0.9	0.00	1.45	100	ON	5	-
C2	1260	316	8.34	14.4	3.00	1.14	200	ON	2	-
C3	1353	269	9.53	8.9	3.00	1.25	100	ON	5	-
C4	1385	255	11.93	8.5	5.00	1.00	150	ON	5	-
PPR-2	893	264	12.34	3.5	-	-	-	-	-	-
POST-PR	772	307	12.40	4.0	-	-	-	-	-	60
DS-1	309		12.54	1.0	-	-	-	-	-	-
TB-1	803	304	12.77	3.0	-	-	-	-	-	50
TB-2	795	304	12.77	3.0	-	-	-	-	-	50

PPR-2- Pre pinch roller open delay(ms) 300

Pre pinch roller close delay(ms) 10

POST-PR HMD to post pinch open distance- 15mtr

HMD to post pinch close distance -1mtr

Tail lead enable - disable

DS-1-Set cut length mtr – 60

Customer cut length mtr- 12

Total cut length offset mtr- 1.4

First cut length offset mtr- 1.9

DIV shift count % -95

End cut count % -95

TB Down % -50

TMT speed reb selection –Auto

Length cut rib selection- finish

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TAIL BREAKER	**TB-1**	**TB-2**
Distance from pinch	17mtr	18mtr
Distance from shear	12mtr	13mtr
Start breaking length	5mtr	5mtr
Small psc breaking length	4.3mtr	6.9mtr
Last pcs breaking length	4.8mtr	5mtr
Long pcs breaking length	5.6mtr	5.6mtr
Breaking MPS greater then 48	6.3mtr	4.8mtr
Breaking MPS greater then 36	5mtr	5mtr
Breaking MPS greater then 24	5.5mtr	5mtr
Breaking MPS less then 24	5mtr	5mtr
Down time from small pcs (ms)	700	700
Down time from last pcs (ms)	1300	1300
Current limits	75	50
Gear ratio	1	1

MISROLL RCP FOR 16MM BYPASS	**value**
Bypass cut divertor N TO A (MS)	14300
Bypass cut divertor A TO N (MS)	14400
Bypass cut divertor N TO A (MS)	7800
Bypass cut divertor A TO N (MS)	7800
C-1 TLC delay	200
RS front shift delay	160
RS tail shift delay (ms)	0

12MM BAR SIZE MILL SPEED 7.91MPS

NAME	RPM MOTOR	ROLL DIA	MPS	LEAD %	BITE VALUE	RF FACTOR	BCD MS	TLC ON/OFF	TV VALUE %	CURRENT LIMITS %
INTER	740	4.79	350	-	-	-	-	-	-	-
C1	1285	6.26	305	9.8	0.00	1.23	100	ON	8	-
C2	1194	7.91	316	9.8	7.00	1.00	500	OFF	5	-

PPR-2	592	8.22	265	4	-	-	-	-	-	-
POST PR	497	-	322	6	-	-	-	-	-	65
DS-1	209	8.46	852	1	-	-	-	-	-	-
TB-1	537	-	307	3	-	-	-	-	-	50
TB-2	547	-	301	3	-	-	-	-	-	50

PPR-2- Pre pinch roller open delay(ms) 100

Pre pinch roller close delay(ms) 100

POST-PR HMD to post pinch open distance- 13mtr

HMD to post pinch close distance -17mtr

Tail lead enable - disable

DS-1-Set cut length mtr – 60

Customer cut length mtr- 12

First cut length offset mtr- 2.1

Total cut length offset mtr- 1.5

DIV shift count % -94

End cut count % -50

TB Down % -50

TMT speed reb selection –Auto

Length cut rib selection- finish

TAIL BREAKER	**TB-1**	**TB-2**
Distance from pinch	16mtr	18mtr
Distance from shear	12mtr	13mtr
Start breaking length	6mtr	6mtr
Small psc breaking length	5.2mtr	6.3mtr
Last pcs breaking length	6.5mtr	5mtr
Long pcs breaking length	7.0mtr	7.3mtr
Breaking MPS greater then 48	6mtr	4.9mtr
Breaking MPS greater then 36	5.5mtr	5.5mtr
Breaking MPS greater then 24	5.5mtr	5mtr
Breaking MPS less then 24	5mtr	5mtr

Down time from small pcs (ms)		500	500
Down time from last pcs (ms)		1000	1000
Current limits	80	70	
Gear ratio	1	1	
MISROLL RCP FOR 16MM BYPASS		**value**	
Bypass cut divertor N TO A (MS)		12500	
Bypass cut divertor A TO N (MS)		12500	
Bypass cut divertor N TO A (MS)		7800	
Bypass cut divertor A TO N (MS)		7800	
C-1 TLC delay		150	
RS front shift delay	150		
RS tail shift delay (ms)		0	

16MM BAR SIZE MILL SPEED 4.80MPS

NAME	RPM MOTOR	ROLL DIA	MPS	LEAD	CURRENTLIMIT
INTER	740	344	4.71	-	-
B/PR	780	-	-	-	-
PPR	360	262	-	-	-
POST PR	309	311	5.3	5.0	90
DS-1	125	-	5.09	1.0	-
TB-1	326	304	5.2	3.0	70
TB-2	330	300	5.2	3.0	70

PPR-2- Pre pinch roller open delay(ms) 500

Pre pinch roller close delay(ms) 300

POST-PR HMD to post pinch open distance- 17mtr

HMD to post pinch close distance -18mtr

Tail lead enable - disable

DS-1-Set cut length mtr – 60

Customer cut length mtr- 12

First cut length offset mtr- 0.6

Total cut length offset mtr- 0.6

DS-FLYING SHEAR-lead -1

Length optimization offset-mtr-0

DIV shift count % -95

End cut count % -30

TB Down % -50

TMT speed ref selection –manual

Length cut rif selection- pinch

TAIL BREAKER	TB-1	TB-2
Distance from pinch	24mtr	25mtr
Distance from shear	12mtr	13mtr
Start breaking length	4mtr	4mtr
Small psc breaking length	4mtr	4mtr
Last pcs breaking length	4mtr	4mtr
Long pcs breaking length	13mtr	13mtr
Breaking MPS greater then 48	5.3mtr	5mtr
Breaking MPS greater then 36	8mtr	8mtr
Breaking MPS greater then 24	5.5mtr	5mtr
Breaking MPS less then 24	5mtr	5mtr
Down time from small pcs (ms)	700	700
Down time from last pcs (ms)	1000	1000
Current limits	70	70
Gear ratio	1	1

MISROLL RCP FOR 16MM BYPASS	value
Bypass cut divertor N TO A (MS)	10700
Bypass cut divertor A TO N (MS)	11800
Bypass cut divertor N TO A (MS)	7700
Bypass cut divertor A TO N (MS)	7800
C-1 TLC delay	50
RS front shift delay	180
RS tail shift delay (ms)	0

Exp mill speed	4.8
Inter loopier selection	NO
Inter motor rpm	740
Inter roll dia	344
Gear ratio	2.83

20MM BAR SIZE MILL SPEED 4.9MPS

Mill speed	4.9mps
Inter motor rpm	740
Inter roll dia	290
Inter gear ratio	2.83
Bypass cut divertor N to A	12100
Bypass cut divertor A to N	12200
Bypass cut divertor N to A	7450
Bypass cut divertor A to N	7800

6. RIGHT SIZE OF BILLETS SELECTION PROCESS

Billet size 100×100×3000 mm, 8mm production ,section weight (0.382-0.4068)kg/mtr, stander wt 0.395±3%, mill speed 16.13 mps, billets wt 235.500kg

In 1 Billet Burning loss or crop cutting=3.525+2.361=5.886kg

Billet weight 235.500-5.886=229.614 kg

So length of billet=229.614/0.395=581.30mtr total length

1 billets passing time=total length/mps(581.30/16.13)=35.98 sec +billet gap time 3 sec=39 sec pass 1 billet

So in 1 hour billet pass 3600/39=92.30 pcs approx 21 MT

If the billet gap 5 sec (36+5)=41 sec

In 1 hour passing billets 3600/41=87.80pcs

After crop cutting or burning loss billets wt 229.614 kg

TMT goes on cooling bed 60 mtr length and the party demand of 12mtr 1pic

If the maintain section wt 0.395kg/mtr so the total number of pcs in 1 billets TMT (580/120=48.33 PCS)

It means 0.33% random rod generated in 1 billet for 8 mm production

After burning or crop cutting billets wt was (229.614-227.520)=2.094 kg random(0.395×12=4.74×48pcs rod wt=227.520kg)

Total loss of material in 1 billet (burning+crop+coldshear cutting) 5.886+2.094=7.98 approx 8.00kg

Its means in 1 billet 3.4% approx. 4%

7. COBBLE RATE

Cobble rate is the measure of the percentage of charge billet loss to cobbles. If the cobble rate is **0.75%** then **0.75%** of all billets charged are lost to cobbles. If the mill rolls per year **640940/0.75%** it means that **4807.05pcs** billet are loss at **235.500kg** or **0.2355MT** loss in ton is **0.2355×4807.05pcs=1132.06MT** if necessary that all attempt are to be made in the mill to reduce the cobble rate (mis roll).

8. MILL UTILIZATION

Mill utilization is a measure of the percentages of time that the mill is rolling steel. Measure of percentages is as a percentage of calendar time. utilization are maintain outages scheduled and unscheduled holiday outage downtime for cobble clearing roll and changes, excess billets gap and other factor that create time when a billet is not in the mill. Good figures for rod mill utilization figure are 90% to 93% for structure mill.

If the rolls= In 1 Billet Burning loss or crop cutting=3.525+2.361=5.886kg

Billet weight 235.500-5.886=229.614 kg

So length of billet=229.614/0.395=581.30mtr total length

1 billets passing time=total length/mps(581.30/16.13)=35.98 sec +billet gap time 3 sec=39 sec pass 1 billet

So in 1 hour billet pass 3600/39=92.30 pcs approx 21 MT

If the billet gap 5 sec (36+5)=41 sec

In 1 hour passing billets 3600/41=87.80pcs

In 20 hours running mill production =413.538MT, in month 413.538×30=12406.14MT, in a year 413.538×365=150941.370MT /0.2355MT billet weight=640940 pcs.

Per day=413.538MT(1756pcs), per moth=12406.40MT(52680pcs), per year=150941.39(640940pcs)

9. IMPROVE PRODUCTIVITY

If the roll 80%of the year 365×24×0.80=7008 hours

If the roll 81% of the year(1% Improve) 365×0.81=7095.6 hours

so, 81% of the year-80% of the year(7095.6-7008)=87.6 hours

if the roll 150941.37 per year=64090 pcs that is billets gap

let, the average billet gap 5 second that is (5×640940 pcs)=3204700/3600=**890.194** hour of billet gap

∴ the reduce billet gap 1 second that is (5-1)=4 second (4×640940)=2563760/3600=**712.55** hours

Creating addition (890.194-712.155)=178.039 hours of extra rolling.

If number of billets using per day of weight (413.538×178.039)=73625.891 MT of rolled.

Extra number of billets 73625.891/0.23555=312636.479pcs

The average value running production rate=150941.37 MT

∴ extra rolling =178.039hours (150941.37×178.039 hr)=**26873450.570MT**(114112316.645 pcs)

Before production 80% of the year	After improve 1%(81%) of the year
5sec billet gap×640940=3204700/3600=890.194 hours billet gap.	Reduce 1 sec billet gap it means 4 sec×640940=2563760/3600=712.15 hours
80% of the year(365×24×0.80)=7008 hours Creating addition(890.194-712.15)=178.044 hours	81% of the year(365×24×81)=7095.60 hours Extra 178.044 hours rolling
Per day number of billets consumption 1756 pcs =413.538MT	Extra(413.538×178.044)=73627.95MT 312645.264 PCS
Average value run production rate Per day production=**413.538MT** Per month=**12406.400MT** Per year =**150941.370MT**	Average value run after improve 1% production rate Per day production=**73625.89MT** Per month=**2239454.214MT** Per year =**26873450.573MT**

10. RESULT

• In this study the scrap value reduce by right set of PLC perfect calculation of billets size before rolling.

• Any industries over all yield value maximum 6% in this study the yield value 4%approx for 8mm TMT production minimum 8 kg loss of material in 1 billet if maintained the section weight 0.3832-4.068kg/mtr then it is possible at 235.500kg billet weight.

• In rolling mill industries the main reason of production increase or decrease excess billet, non value added activity or large amount of mis roll.

• Random or scrap are generate by mill fault , low furnace temperature, do not maintained required section weight when the production going on.

• In rolling process load, velocity, RF factor, lead are most important parameters if the velocity increase during rolling condition on that time 1 billet move along with another billet. This time the flying shear do not cut as per required length because flying shear moving time reduce on that time the billets gap reduce then zero becomes zero. In repiter mill maximum 3 sec billet gap is acceptable not less. If the velocity high in this condition the material jump in finish stand or pre-pinch roll.

• If RF Factor (elongation) will increase when the material pass through 1 stand to another stand in continuous stand on that time material will broken because the tension for will increase between 1 stand to another stand. (RF=C2 STAND MPS/ C1 MPS) RF=7.83/6.31=1.24 that is RF factors.

11. CONCLUSION

In a TMT production plant the different types of scrap generate. The scrap value lead to increase in cost of production and any industries overall yield value maximum 6% which is more then any industries. Basic of the concept of all over industries the scrap value reduce it is important for any leading company in the steel sector.

It is clear that the rolling mill work on the principal experience and mutual settlement there are no fixed live and calculated arrangement of process. In a rolling where slow process or any breakdown in production line is not acceptable.

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