IJCRT.ORG ISSN : 2320-2882
INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)
An International Open Access, Peer-reviewed, Refereed Journal

REDUCING HOT SAW RELATED DELAYS (168 MINUTES TO 0 MINUTE)

M.ARULMANI[1],S.HARIKRISHNA[2], S.KISHOR[3],G.KISHOREKUMAR[4], S.BALAJI[5]

1 ASSISTANT PROFESSOR 2,3,4,5, STUDENT
MECHANICAL ENGINEERING
MUTHAYAMMAL ENGINEERING COLLEGE(AUTONOMOUS),RASIPURAM, TAMILNADU

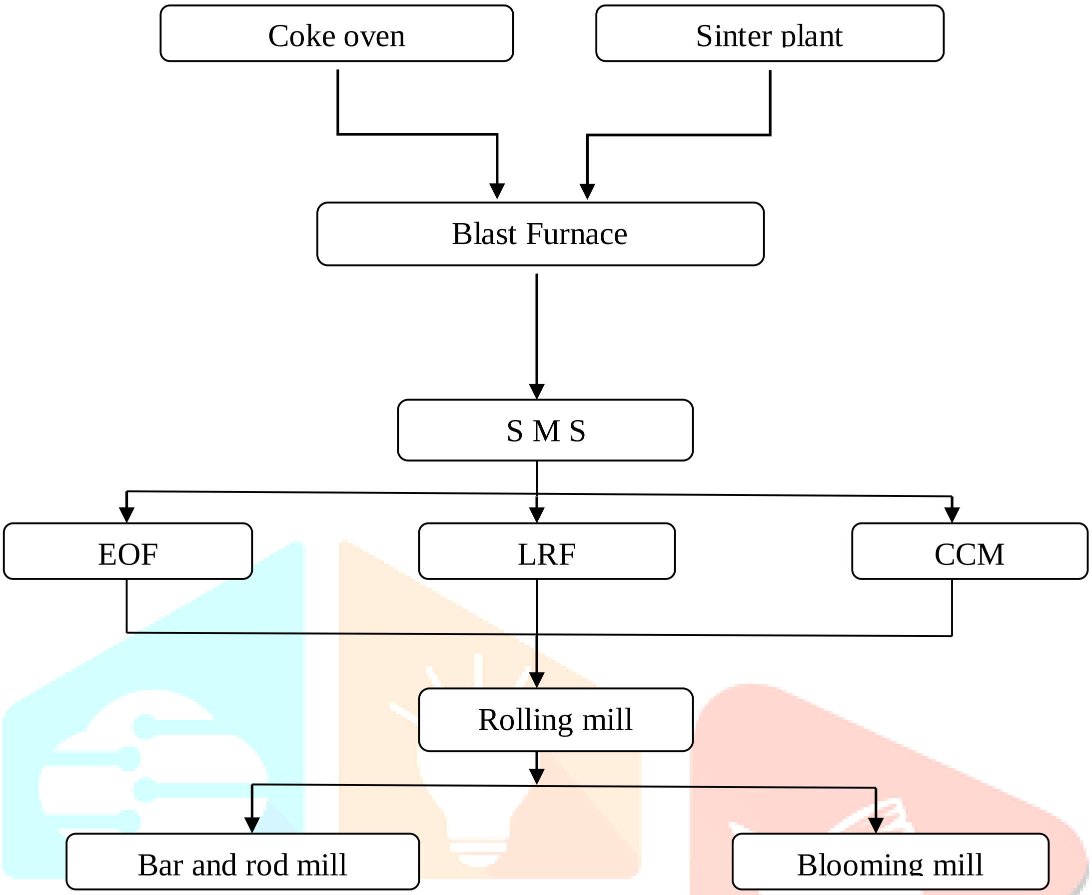
ABSTRACT : The process of deforming the bloom into different shape and size based on the customer requirement.These deformation process done in blooming mill.The blooms attain final stage by passing various sections, such as blast furnace, reversible mill, continuous mill ,hotsaw etc.We took case study in each section. Based on this study, we finalized highest delay occur in hotsaw. So, we took several measures to prevent delays in hotsaw with best of our knowledge and company guidance.

Keywords: Blooming Mill, Machine & Manufacturing

1. INTRODUCTION:

The JSW groups foray into steel manufacturing began in 1982, when it set up the JINDAL iron and steel company with its first steel plant at Mumbai.JSW Steels is India's second largest integrated private steel manufacturing company in corporate India.It has been ranked ninth among the top thirty world class steel makers.JSW steel ltd believes in creating sustainable growth while balancing utilization of natural resources and social development in its business decisions.JSW is committed to promote integrated responsible behavior and value for social and environmental well being.JSW commitment to do business responsibly is built into the core values of the company to conduct every aspect of business responsibly and sustainably.It relies on a dynamic leadership and it practices that seek to sustain and enhance the long term competitive advantage of JSW with care for the society and environment.Where the unique feature company product in round size are ⦰ 65-20 in RCS the size are 65 high precision rolling reducing and sizing block in bar and rod mill and DSIR approved R&D centre with sophisticated modern equipments.It provides a wide range of sizes and grades all under one roof.It also has a phased array technology that detects internal defects.More than 70% of capacitive power generation is done through waste heat.One of the few plants to use energy optimization furnace for special steel production.

2. LAYOUT OF STEEL MANUFACTURING



The industrial production of coke from coal is called coking.The coal **is** baked in an airless kiln, a coke furnace or coking oven, at temperatures as high as 2,000 °C (3,600 °F) but usually around 1,000–1,100 °C (1,800–2,000 °F).The non-volatile residue of the decomposition is mostly carbon, in the form of a hard somewhat glassy solid that cements together the original coal particles and minerals.Bituminous coal must meet a set of criteria for use as coking coal, determined by particular coal assay techniques.

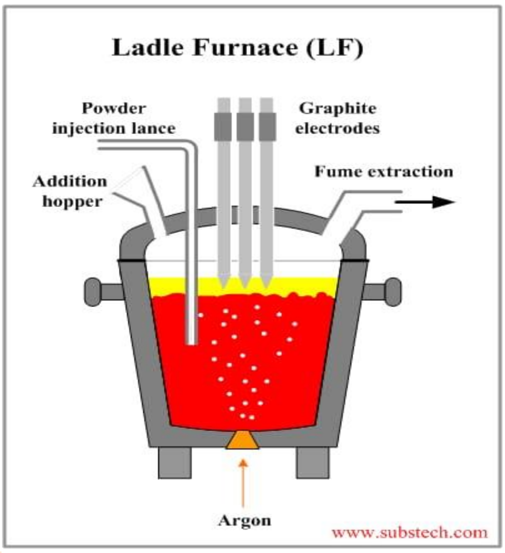
Steels grade I (Ash content not exceeding 15%).
Steels Grade II (Exceeding 15% but not exceeding 18%).
Washery Grade I (Exceeding 18% but not exceeding 21%).
Washery Grade II (Exceeding 21% but not exceeding 24%).
Washery Grade III (Exceeding 24% but not exceeding 28%).
Washery Grade IV (Exceeding 28% but not exceeding 35%).

STEEL MELTING: Steel melting is an oxidation process with the exception of reducing conditions being specifically required to eliminate sulphur.It involves selective oxidation of impurities like C, Si, Mn, p etc,. from pig iron.

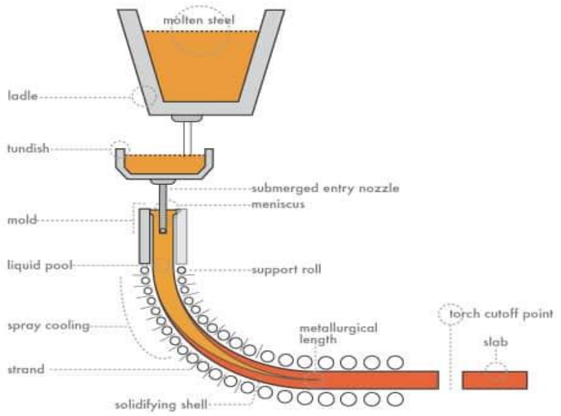
SMS: It consists of basic oxygen furnace (BOF) shop complex and continuous slab costing shop complex.The steel makings are provided by blast furnace.

EOF (ENERGY OPTIMIZING FURNANCE): It is a primary steel making furnace.This process was developed by the mini steel works.This process is presently being operated in India at JSW Siscol plant of Mulcand.

LRF (LADLE REFINING FURNACE): It is used to raise the temp and adjust the chemical composition of molten metal.Without LRF higher top temperature are normally required from steel making furnace due to heat losses during refining with conventional ladles.



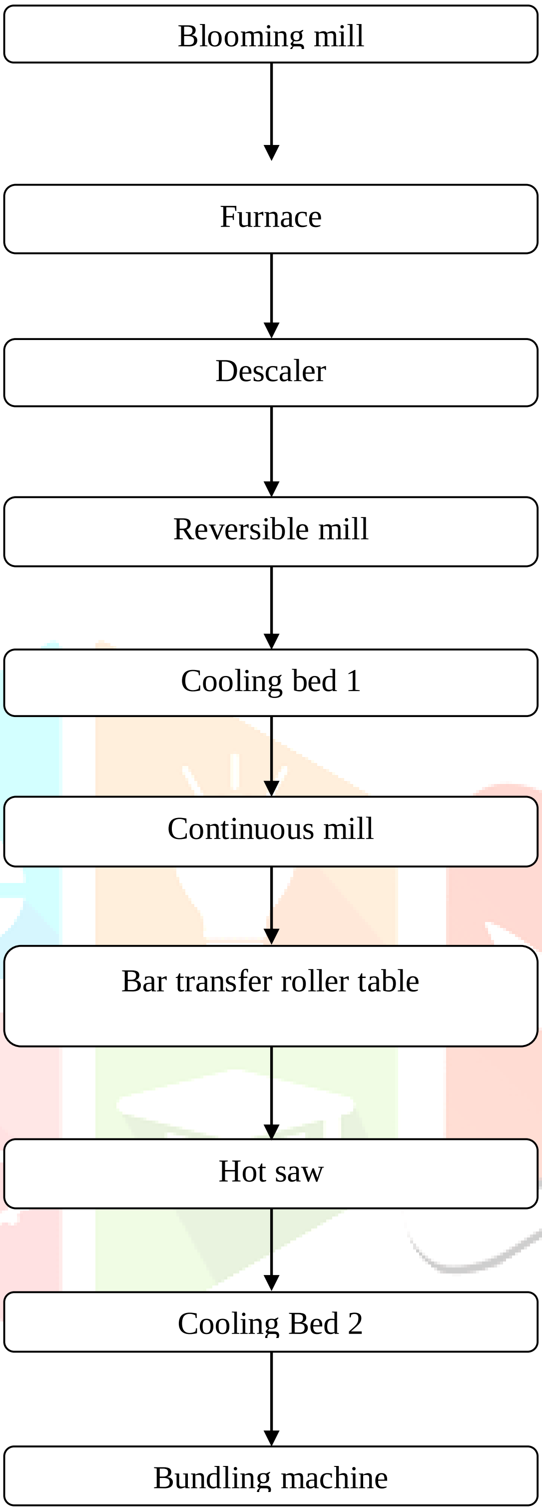
CCM (CONTINUOUS CASTING MACHINE): It is also known as strand casting, is the process where a metal is heated until it liquefies. The motion metal is then allowed to solidify until it becomes a semi-finished slab that is later rolled in the finishing mill.



ROLLING MILL: It is a metal forming process.Metal stock is passed through one or more pairs of rolls reduce the thickness.

3. STUDY OF BLOOMING MILL:A high-capacity rolling mill for the reduction, into blooms, of steel ingots of large cross section, with masses up to 12 tons and larger.In metallurgical plants the blooming mill is an intermediate link between the steel casting shops and the rolling shops, which turn out the finished product.

3.1 LAYOUT OF BLOOMING MILL



3.2FURNACE

The blooms are charged by means of Paul beam mechanism into the furnace.This mechanism lifts the beam, moves the beam forward and returns to its initial position.This beam mechanism carries and places the bloom into the furnace.The door opening and closing is done using a hydraulic mechanism manually or automatically using a Hot Metal Detector (HMD).The blooms undergo the process of soaking inside the furnace which is heated using oxygen and fuel pipes at temperatures of 800, 1000 or 1200°C.Inside the furnace, there are eight beams actuated by the walking beam mechanism. It is a work piece transfer mechanism having a walking beam carried by a slide mounted for reciprocal movement on a bed or table.

3.3 DESCALER

Descaling is the process of removing oxide deposits from a heated stock, either before or during forging operations. Scales are formed on a metal surface during heat treatment processes. The bloom is conveyed through a header unit consisting of water jets which supply highly pressurized water at about 250 bars. For this purpose, an accumulator is used rather than a pump.

3.4 REVERSIBLE MILL

This is where the blooms cross section is reduced to the required dimension. It consists of a 3.5MW motor coupled to a gear train which is coupled to a roller having several passes which have gradual reduction in size. There are two units which control the bloom manipulators and fingers. There are 12 entry and 8 exit rollers. The 6manipulators guide the bloom into different passes. The fingers tilt the bloom 90°. The entire operation is controlled manually from a Pull pit.

3.5 CONTINUOUS MILL

If the stock has to be further reduced to a circular cross section and upto 110mm diameter, it is proceeded to the continuous mill.This mill has eight stands named ST2, ST3,ST9.Arbitrarily the first stand is named ST1 which is the reversing mill.The horizontal mills are odd numbered stands and the vertical mills are even numbered stands.The rotational speed of each stand gradually increases so as to pull the stock out with the required diameter.

3.6 BAR TRANSFER ROLLER TABLE (BTRT)

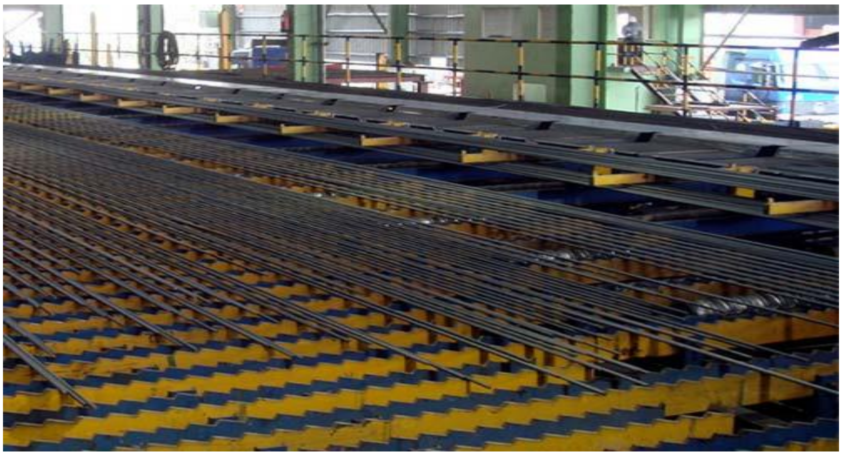
BTRT serves as a time intermediary between rolling out the stock and cutting the stock.In other words, this avoids what is called as choke.The BTRT consists a total of 108 rollers, 54 of which aligned with the Hot Saw cutting axis and the remaining 54 are aligned with the continuous mills axis.The lifting and lowering of the train is done by hydraulic mechanism and the horizontal motion for transferring the stock from the continuous mills axis to the hot saw axis is done by a chain drive which is powered by motor.The BTRT transfers two stocks at once to the hot saw axis.

3.7 HOT SAW

Hot saw means cutting the hot bloom for required shape and size to the customer.

HOT CIRCULAR SAW BLADE

Hot saw blade is a cutting instrument which cuts the stock to the required length of the customer. Here Blecher hot saws are used. They run at 1355 rpm powered by 355 kW motor. In the cutting region there are three hot saw blades namely 2, 3, 3a. Of these 3a is movable and 2 and 3 are fixed. **COOLING BED :**There are two types of cooling used normal air cooling and slow cooling.Normal cooling uses an array of pillars supported on a frame which follow a mechanism similar to walking beam mechanism. Slow cooling takes place in a closed box where a set of stocks are placed in hot condition inside a box.

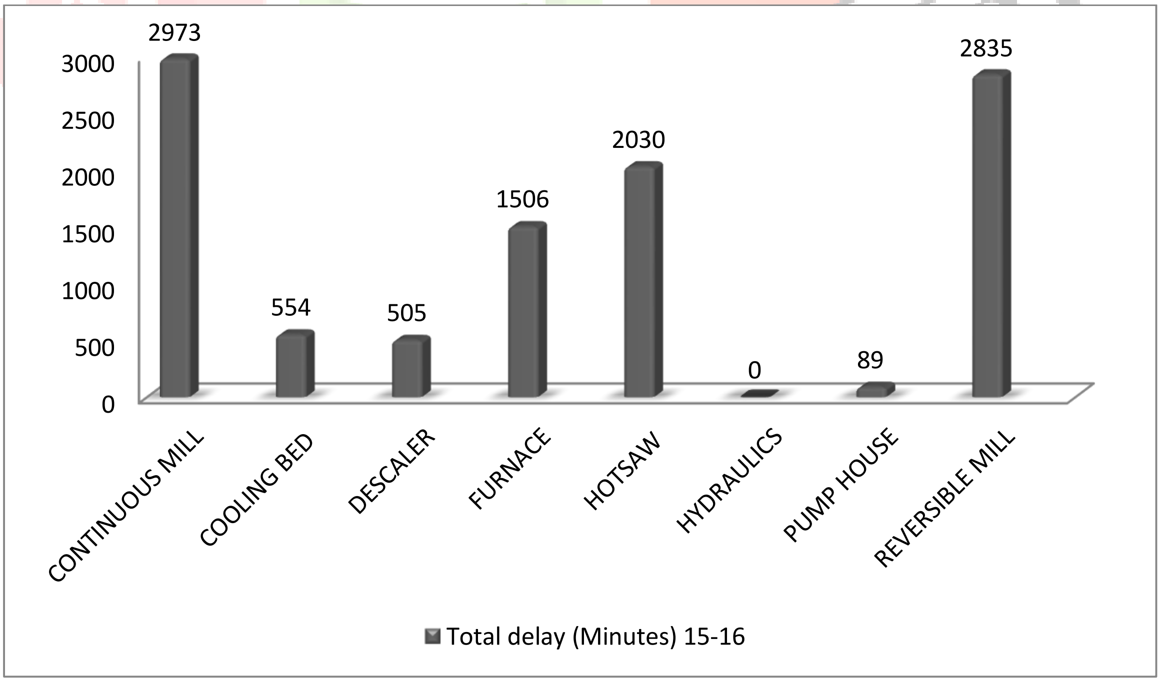


3.9 BUNDLING MACHINE

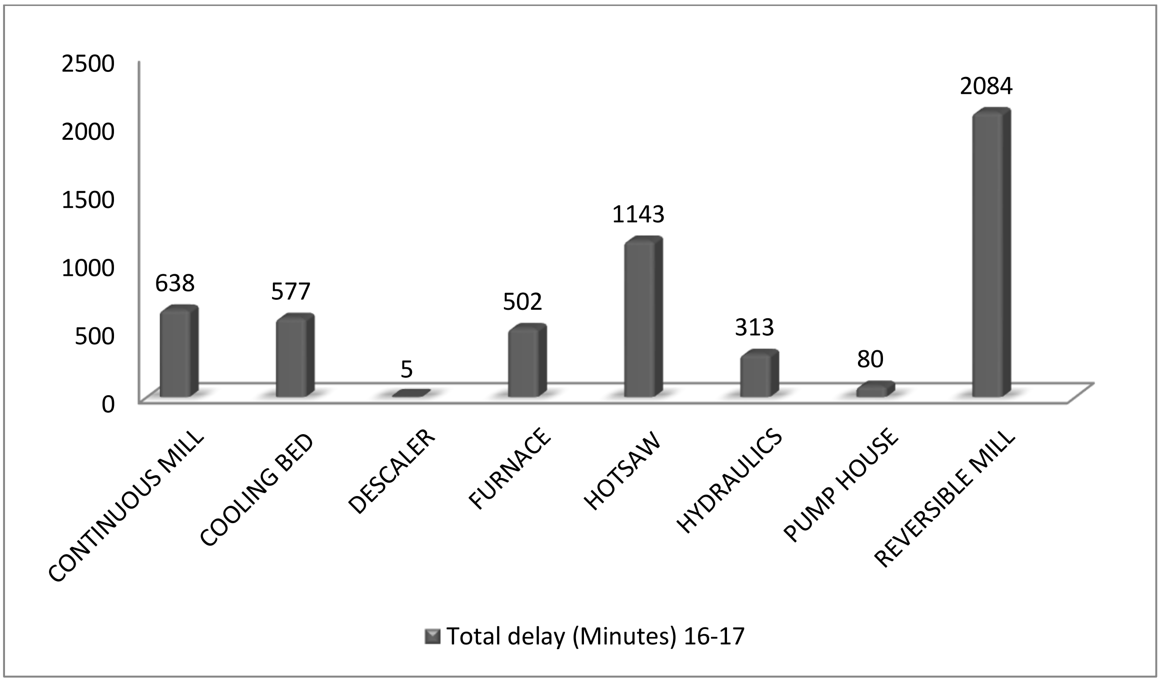
Once cooling is done, a set of stocks are bundled by means of a bundling machine and sent to packing. Bundling of bloom is done by using steel ropes.

4 SELECTION OF PROBLEM (GRAPH SHOWING HIGHER DELAYS IN HOT SAW)

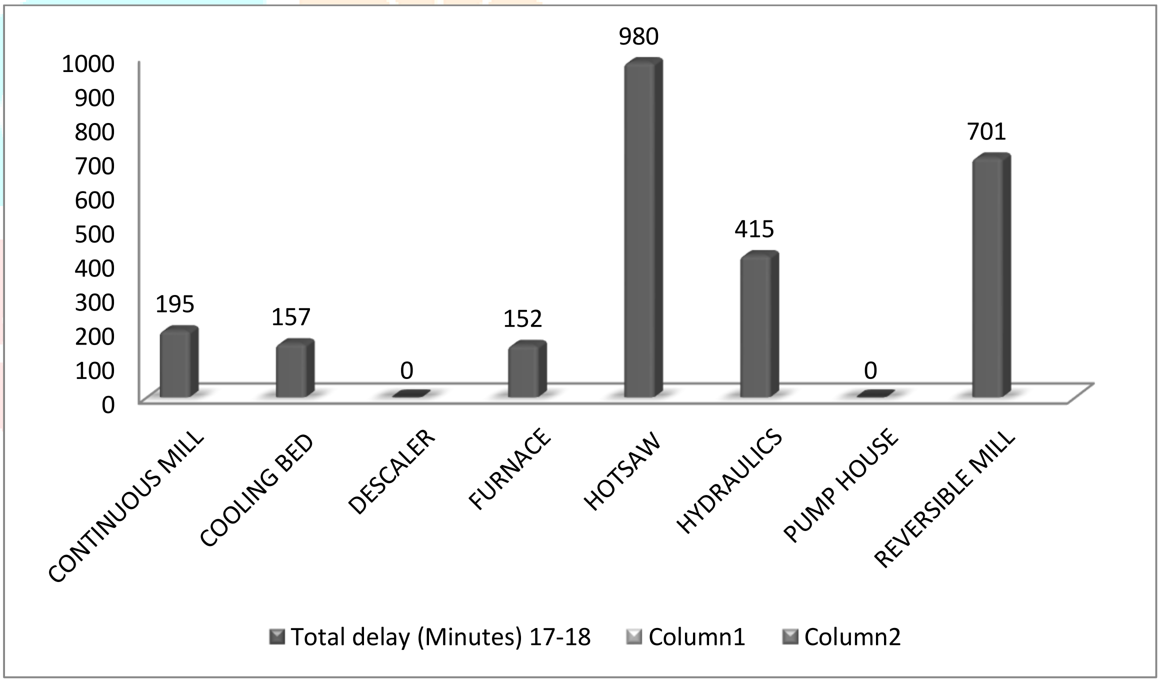
DELAY REPORT FOR BLOOMING MILL FOR YEAR (2015-2016)



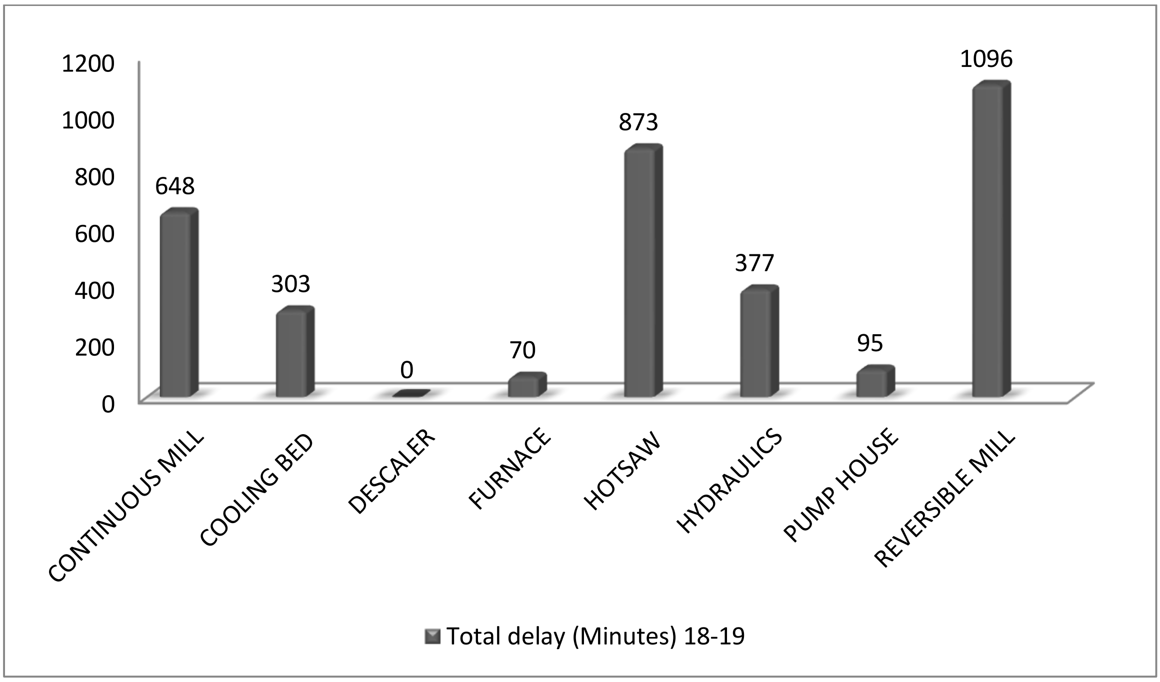
1. **DELAY REPORT FOR BLOOMING MILL FOR YEAR (2016-2017)**



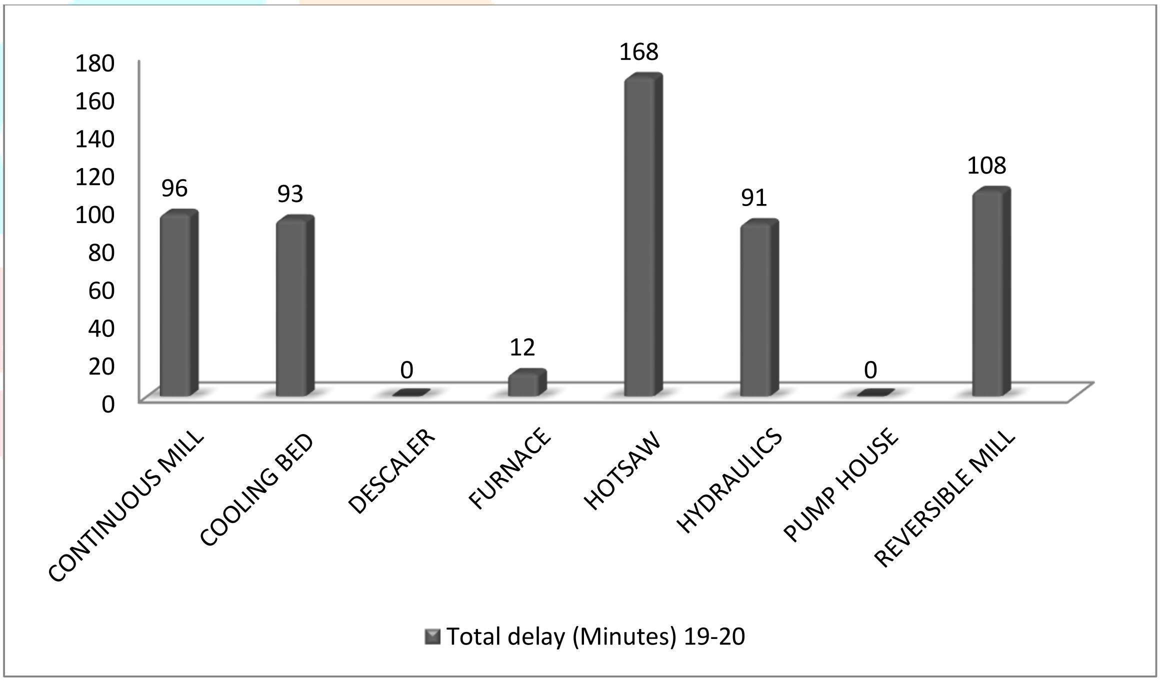
2. **DELAY REPORT FOR BLOOMING MILL FOR YEAR (2017-2018)**



3. **DELAY REPORT FOR BLOOMING MILL FOR YEAR (2018-2019)**



5.DELAY REPORT FOR BLOOMING MILL FOR YEAR (2019-2020)



6 PROBLEM OCCURS IN HOT SAW

Major problems appear on hot saw

Entry horizontal clamp guide rod came out from square block.Exit rear end linear bearing damage and length variation in cutting due to that.Entry horizontal clamp piston rod thread worn out. Linear bearing bolt sheared.Exit apron plate dislocated.

WHY WHY ANALYSIS

Cause No:	1
Reason for Gap:	Entry horizontal clamp guide rod came out from square block.
Why 1	Thread of guide rod damage.
Why 2	Thread of guide rod not fully tight with the front block.
Why 3	
Why 4	
Why 5	
Root Cause	Thread type of guide rod is not withstanding the load.
Counter Measure:	Introduction of lock plate arrangement and grip screw in guide rod and front block respectively.

BEFORE

AFTER

Cause No:	2
Reason for Gap:	Exit rear end linear bearing damage and length variation in cutting due to that.
Why 1	Vibration takes place.
Why 2	Linear bearing inner two bolts are not able to mounting.
Why 3	
Why 4	
Why 5	
Root Cause	The gap between sub tank and linear bearing is low.
Counter Measure:	Increase the gap between sub tank and bearing.

BEFORE **AFTER**

PREVENTIVE MAINTANCE SCHEDULE

S.no	Equipment	Description
1	Roller	Gear Box (Oil level indication-10mm). if <10mm then topup.
		Check for Oil Seal wear (55*10*100), if >0.5 mm then change the oil seal.
		Hollow shaft wear (55*40*180), if >0.5 mm then replace the shaft.
		Check the plumber block temperature ,if > 50 degree then flush the cooling line.
		Check visually if the water in roller trough touches and wets the roller.
		Check the plumber block bolt tightness (M24*80).
		Check the gear box bracket bolt tightness (M10*50).
		Check the gearbox bolt tightness (M20*50).
		Check for any oil leakage.
2	Horizontal clamping system	Check the movable block wear, if > 5mm then replace the cylinder.
		Check for the free movement.
		Check the guide rod greasing.
		Check the guide rod mounting.
3	Vertical clamping system	Not in line.
4	Tail discharging system	Not in line.
5	Blade cooling system	Ensure the suction valve is open.
		Check for any water leakages from the pump.
		Check for vibration and temperature.
		Check for base bolt tightness.
		Lubricate the pump bearing.

		Check for coupling spider conditioning.
		Check for ON/OFF valve for any water leakage.
		Check for ON/OFF valve arm conditioning.
		Check for ON/OFF valve pin wear,if > 1mm then change the pin.
		Check oil level and high level air pressure >5bar in FRL
		Check the condition of the nozzles and its position.
		Check the vibration less than 10mm.
		Check the temperature <60deg C.
		Check the oil level.
		Check the air pressure.
		Check the coupling fastner condition.
		Check the mounting unit.
6	Hot saw gear box	
		Inspect the linear motion bearing condition.
		Inspect the rail path any wear using profile, if >1mm rail has to be changed.
		Ensure the travel cylinder mounting bolts are intact.
		Ensure the pre movement of blade mounting cylinder arrangement.
		Check the tightness of lock plate of mounting pins.
		Check the mounting condition of the doors.
		Gear Box (Oil level indication-10mm). If required topup.
		Oil Seal Condition (55*10*100).
7	Measuring gauge roller table	
		Hollow shaft condition (55*40*180), Keyway inspection.
		Inspection of plumber block cooling line.

		Plumber block greasing.
		Check water flow in below roller to touch and wet the roller.
		Check the plumber block bolt tightness (M24*80).
		Check the gear box bracket bolt tightness (M10*50).
		Check the gearbox bolt tightness (M20*50).
		Check the rack mounting bolt tightness.
		Inspect the measuring gauge cylinder mounting.
		Check any oil leakage in cylinder.
		Check the buffer unit.
8	Measuring gauge	Check the cylinder inlet & outlet oil hose connection.
		Inspect the cylinder connecting pin and lock plate condition.
		Ensure the measuring gauge stopper condition.
		Inspect any water leakage in water tap.
		Inspect to cylinder base weld checking.
		Check the air pressure.
9	Kick off	Check the FRL oil level.
		Check the plumber block base bolt.
		Check the plumber block cover bolt.
		Check the greasing.
10	CGLS	Not in line.

7.EFMEA

EFMEA-HOTSAW

Function / Process Requirement	Equipment Location	Superior Equipment	Sub Equipment	BOM	Potential Failure Mode	Potential Effects of failure	Severity (S)	Potential Causes/mechanisms of failure	Occurrence (O)	Current Detection	Detectability (D)	RPN	Bucket	Recommended Actions (counter measure)
To cut rolled product as per the required length of customer	Hot saw	Clamping system	Horizontal clamping system	Square block	Crack on square block	Clamp mark on Roller product		Stress acted		Inspection of structure				Maintain pressure at 90 bar
				Square block	Clamp impresion	Clamp mark on Roller product		Roughness of front plate		Inspection of roughness				Replace clamp plate at required time
				Cylinder	Cylinder oil leakage	Higher oil consumption		Ferrule fitting loosened		Inspection of pipe line				Check the tigtness of net per week
				Cylinder	Not Automatic Reverse	Bloom hit the clamp		Proxy sensor error		No deduction				Check the condition of proxy sensor
				Guide rod	Guide rod broken	Improper clamping		Bloom hitten(Proxy sensor error)		No deduction				
				Cylinder	Piston rod thread worn out	Cylinder not react		Threaded type not with stand the load		Visual deduction				Provide lock plate arrangement and grip screw in guide rod
				Cylinder	Clamp retracted during cutting	Cutting blade damage		Proxy sensor error		No deduction				Check the condition of proxy sensor
				Cylinder	Allen bold loosened in front plate	Length variation during cutting		Due to vibration		Visual deduction				To chaek the tightness of front plate mounting bolds on clamping system
		Roller table	Roller assy.	Horizontal roller	Burr acumulated on roller	Scratch line obseved in roller product		Due to heat		Visual deduction				Provide cooling system to roller
				Vertical roller	Vertical roller jam	Scratch line occur in roller product		Due to over heat		Visual deduction				Provide cooling system to vertical roller and grinding
				Roller bearing	Balls are wear	Roller cannot rotate freely		Greasing not done		Visual deduction				To check and apply the greasing per month
				Apron plate	Plate dislocated	Bloom cannot forward		Bloom hitted		Visual deduction				Change the apron plate design flat in to inclined font surface
				Apron plate side	Burr acumulated on side plate	Scratch line in rolled product		Due to heat		Visual deduction				Provide collar roller
		Cutting saw sysem	saw	Linear bearing	Bearing bolt shear	Length variation		Due to vibration		Visual deduction				Provide vibrtion sensor
				Bevel gear	Teeth worn out	saw blade cannot rotate properly		Agning		Inspection of gear box				Replace the bevel gear if it worn out
				Door(Proxy air gap)	Nut loosened	Hot saw not running or stop		Due to vibration		Visual deduction				Continuous monitoring of gear box vibration and change the blade if higher then 20 mm per sec
				Rail	Rail wear	Saw not move popoerly		Due to burr accumulation		Inspection of rail				Replace the rail
				Saw blade	Blade bend	cutting burr are created		blade wear		Inspection of saw blade				Replace the balde at required time
		Blade cooling system	pipe line	Nozzle	Insufficient pressure of cooling water	Poor blade life		Nozzle hole size increased		Visual inspection				Replace nozzle if surface wear
				Hose	Water hose puncture	Water leakage		Agning		Inspect the hose				Replace the hose at required time
				Pipe	Crack in water line welding	Water leakage		Less welding tickness		Visual duduction				Increase the welding thickness in bend
			Pump	Arm	Arm broken	Passing of water		Over packing given to T pin		Inspection of pump				Timely replacement of gun metal bush/Continuous monitoring of passing pressure
				ON/OFF valve plunger	Gunmetal bus worn out	Water leakage		Seal wear		Inspection of plunger				Provide two seal on plunger
			ON/OFF valve	Actuator	Actuator not opened properly	Insufficient flow of cooling water		Less pressure		Inspect the pressure flow in FRL unit				Maintain the pressure between 3 to 5 bar in FRL unit
		Hydraulic system	Cylinder assembly	Cylinder	oil leakage	Higher oil consumption		O ring wear		Inspection of cylinders				change the O ring if any leakage occurs
			Oil line	Hose	Hose puncture	Oil leakage		Due to wear		Inspection of wear				Replace the hose at required time
			Pump	spider valve	pressure flow of oil is low	Saw movement occurs slowely		Spider valve wear or damage		Inspection of walve				Maintain the pressure of oil flow

8.CONCLUSION:

The primary objective of this project training is to give a better solution to the problems and employ it practically. To the extent of our knowledge, we have solved the problems that were given and the solution for these has been successfully implemented and has given better results.