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Comparison of Three Remedial Alternative Solutions' and Selection of Best for Alternative Design of Pressure Board UVSL

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Abstract: ***"Time saved is time earned". This project deal's with saving time of guide wood setting in "cold rolling mill 2" in cold rolling mill complex at "UTTAM VALUE STEELS LTD" situated at Wardha In Maharashtra. Guide wood and side guide is an arrangement in cold rolling so as to provide back tension in 1st pass and strip centering in order to create straight winding In coil along proper shape. Existing system is simple but having a major drawback as it is consuming more time during width change. The existing systems consist of wooden pieces of two different sizes, one size for top and another for bottom setting. Both types of this guide wood s are clamped in set of various widths of coils to be rolled. Width of coils varies from 900mm to 1330 mm. every times the width change the setup of guideword need to be changed and thus delay is caused .guide wood setting is fully a manual process and is done by operator himself . as manual factor is involved there are maximum chances of error that may cause wastage of time and material as well .moreover the guide wood setting causes the disturbance of rhythm of production any error in guide wood setting results in false value of parameter necessary for rolling that may defect in output. The project works deal with various alternative for existing setup of guide wood their comparative study, analysis and selection of best alternative. Three possible alternative are studied one consist of three pairs of rolls kept over one another with gap between each set to allow inward and out ward movement of side guide rolls .2nd one consist of alternative arrangement of five rolls . The third arrangement is a little bit change in existing system. These three methods will be studied and best one will be selected so as to save time and labor.***

Keywords: Cold Rolling, Pressure Board , 4hi Mill,Strip Centering , Coil Profile

1. Introduction To Topic

Guide wood and side guide is an arrangement in cold rolling so as to provide back tension in 1st pass and strip centering in order to create straight winding in coil along with proper shape. Existing system is simple but having a major drawback as it is consuming more time during width change. The existing systems consist of wooden pieces of two different sizes, one size for top and another for bottom setting. Both types of this guide wood s are clamped in set of various widths of coils to be rolled. Width of coils varies from 900mm to 1330 mm. every times the width change the setup of guideword need to be changed and thus delay is caused .guide wood setting is fully a manual process and is done by operator himself . as manual factor is involved there are maximum chances of error that may cause wastage of time and material as well .moreover the guide wood setting causes the disturbance of rhythm of production any error in guide wood setting results in false value of parameter necessary for rolling that may defect in output.

2. Objective of the Paper

This paper deals with the study of the existing system and possible alternative so as to avoid the delay in guide wood setting. An comparison is done between all possible system and best on is selected

3. Existing System

3.1 Working of Existing System

1) When lead screw is made to rotate by hydraulic motor then opposite direction threads on both side made the side guide to move in opposite direction i.e. they are either moving toward each other or moving away from each other .when the strip is to be centered then the side guide is moved in inward direction, and when the strip is to be released then they are moved away from each other.
2) Two pneumatic cylinders are provided to move pressure board up and down .the pressure board remains in down position during first pass so as to provide back tension and remain up in later passes.
3) When sheet is feeded for first pass then side guide is set to adjust the width of the sheet by moving it in and out, after that the top pressure board is made to rest on sheet which is lying on bottom pressure board.
4) During first pass top pressure is kept rest on bottom pressure board and after completion of first pass they are made to move upward to relieve sheets
5) Side guide can be moved in and out in both position of pressure board up as well down.
6) Width of guide wood can be changed by removing or adding guide wood to the set.

3.2 Actual schematic of existing system

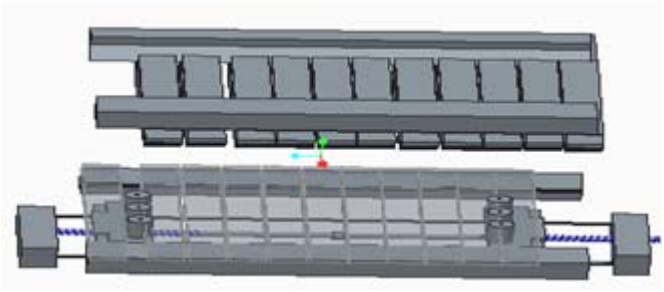


Figure1: Front view of existing guide wood

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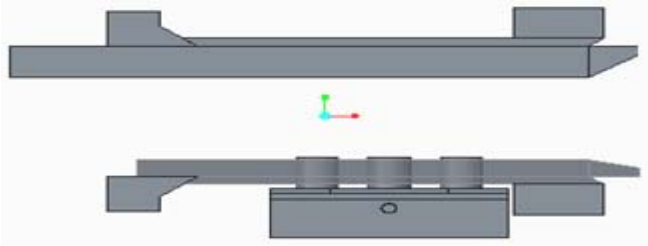


Figure 2: Side view of existing guide wood

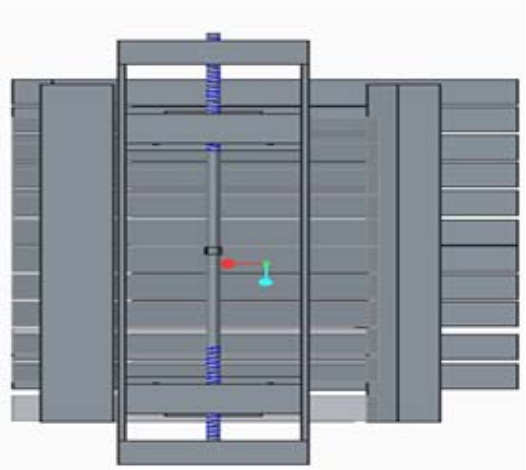


Figure 3: bottom view of existing guide wood

4. Study of Optional System

4.1 Five Roll Arrangement System



Figure 4: 3-d view of five rolls arrangement system

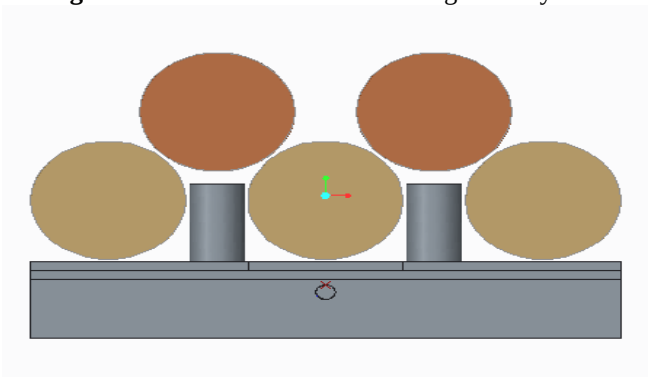


Figure 5: side view of five roll arrangement system

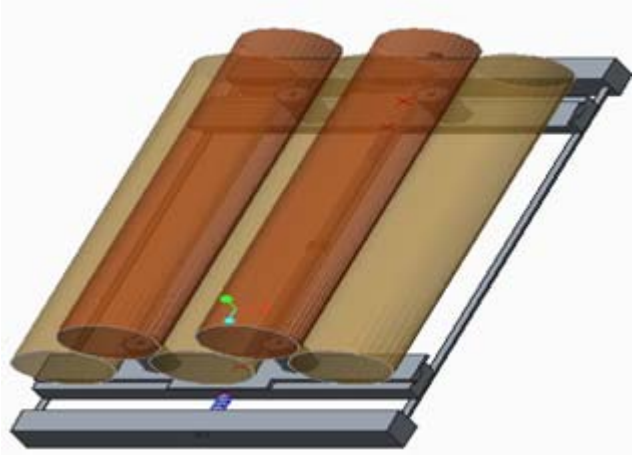


Figure 6: 3-d view of five roll arrangement system

a) Arrangement

The five rolls will be arranged in alternative manners two rolls over the top and the three rolls in the bottom. The arrangement can be clearly seen in the side view. The side guide roll is arranged in between the three bottom rolls so as to facilitate the inward and outward movement of the roll. The base plate on which the roll is mounted is kept in such manner as it should not interrupt in the up and down movement of the pressure rolls. The top two rolls will be mounted on the clamps which can be moved up and down so as to allow the feeding of sheet before first pass the bottom pressure rolls are fixed so that the top roll should rest on the bottom roll and it should hold the top roll pressure and sheets as well.

b) Function

The function of the above arrangement is as given below

1) While feeding of the coil prior to first pass the top two roll will be lifted so as to allow the space to feed the coil in between the two arrangement (i.e. top and bottom roll arrangement)
2) Now the coil will be feeded in between the given space and between the roll in to the gripper.
3) Once the coil is feeded between the rolls and into the gripper the coil is centered in the pressure roll arrangement by the side guide rolls.
4) The side guide roll will move in and out to adjust with the width and to maintain the sheet in centre of the rolls.
5) Now the strip is centered in between the work roll as well as the bottom pressure roll , the top arrangement of the pressure roll will be moved downward on the sheet and the bottom set of pressure roll
6) The gap between the alternative rolls are arranged in such a way that there will be contact in between each roll and sheet as well
7) The rolls are free to rotate as they will be provided with bearing, thus they will move in the same direction as the sheets.
8) This will resist the movement of the sheet to some extent this in turn provides the back tension to the sheet for rolling.
9) Thus in this arrangement the purpose of the pressure board to provide strip centering and to facilitate back tension is fulfilled.

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c) Modification required

The following changes needed to be done to change over to the five roll arrangement

1) The up down movement of the roll need some different types of arrangements so as to hold the roll in such a way that their holder should not come in contact with each other , also it should allow the free contact of top and bottom pressure rolls with each other .
2) The side guide roll needed to be increased in length so as to adjust with the diameter of the rolls.
3) No pressure board clamps will be there as the pressure board will be totally replaced.

4.2 Six rolls arrangements system

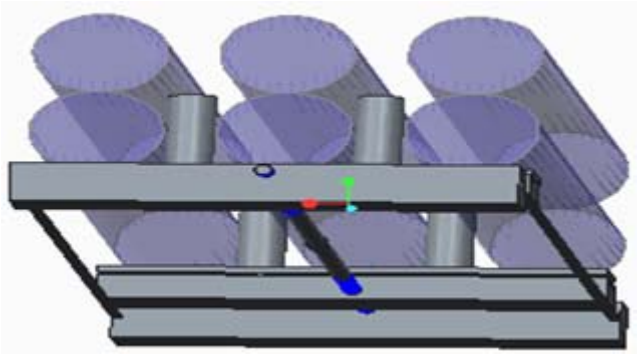


Figure 7: 3-d view of six rolls arrangement

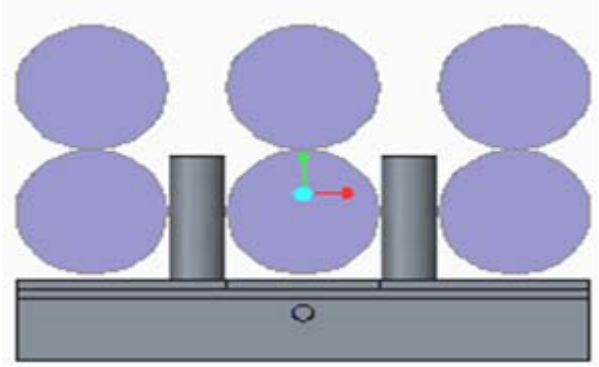


Figure 8: side view of six rolls arrangement

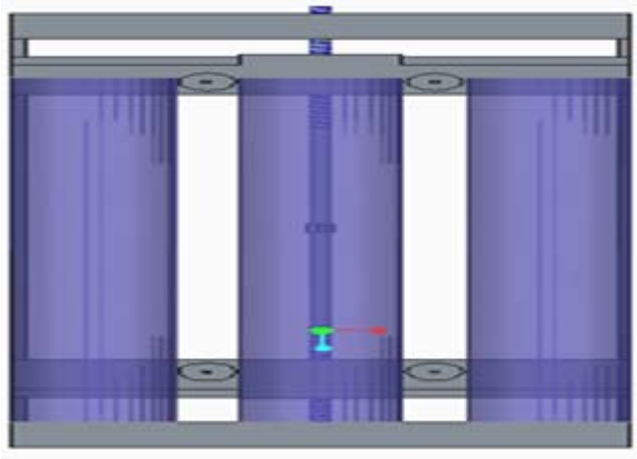


Figure 9: Top view of six rolls arrangement

a) Description

The above figures show the various arrangement of the another alternative systems

b) Component

1) Pressure Rolls: - the six rolls will be mild steel of length 1450 mm and diameter 100 mm each. All rolls will of equal shape and size. The rolls will be arranged in the set of two rolls each thus there will be 3 set of rolls
2) Guide rolls: - the guide roll needed to be modified. The height of the guide roll will be increased up to 75 mm so as to facilitate the pressure of top guide roll. The number of the guide roll required will be two sets.
3) Lead screw: - same as the original system

c) Arrangement

The six rolls will be arranged in set of two rolls each thus having the three sets of rolls three rolls over the top and the three rolls in the bottom. The arrangement can be clearly seen in the side view. The side guide roll is arranged in between the three set of rolls so as to facilitate the inward and outward movement of the roll. The base plate on which the roll is mounted is kept in such manner as it should not interrupt in the up and down movement of the pressure rolls. Each set of rolls will be mounted on the clamps which can be moved up and down so as to allow the feeding of sheet before first pass. The bottom pressure rolls are fixed so that the top roll should rest on the bottom roll and it should hold the top roll pressure and sheets as well.

d) Function

The function of the above arrangement is as given below

1) While feeding of the coil prior to first pass the top set of three roll will be lifted so as to allow the space to feed the coil in between the two arrangement (i.e. top and bottom roll arrangement)
2) Now the coil will be feeded in between the given space and between the roll in to the gripper.
   i) Once the coil is feeded between the rolls and into the gripper the coil is centered in the pressure roll arrangement by the side guide rolls.
   ii) The side guide roll will move in and out to adjust with the width and to maintain the sheet in centre of the rolls.
   iii) Now the strip is centered in between the work roll as well as the bottom pressure roll , the top arrangement of the pressure roll will be moved downward on the sheet and the bottom set of pressure roll
   iv) The gap between the top and bottom rolls are arranged in such a way that top set of roll will lie on the bottom set.
   v) The rolls are free to rotate as they will be provided with bearing, thus they will move in the same direction as the sheets.
   vi) This will resist the movement of the sheet to some extent this in turn provides the back tension to the sheet for rolling.
   vii) Thus in this arrangement the purpose of the pressure board to provide strip centering and to facilitate back tension is fulfilled.

e) Modification required

The following changes needed to be done to change over to the six roll arrangement

1) The up down movement of the roll need some different types of arrangements so as to hold the roll in such a way

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that their holder should not come in contact with each other , also it should allow the free contact of top and bottom pressure rolls with each other .

2) The side guide roll needed to be increased in length so as to adjust with the diameter of the rolls.
3) No pressure board clamps will be there as the pressure board will be totally replaced.

4.3 Slot Arrangement System

The slot arrangement system is as given below

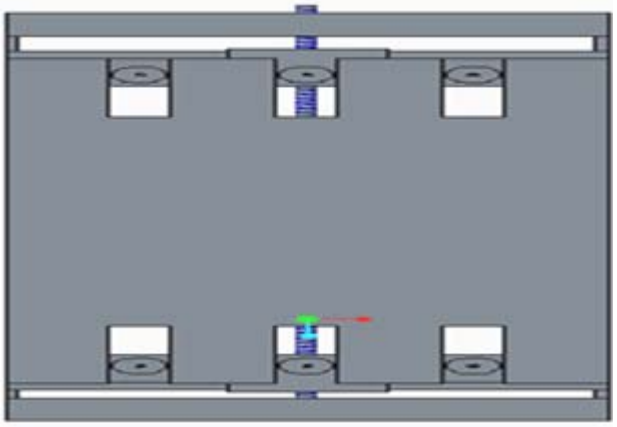


Figure 10: Top view of slot arrangement

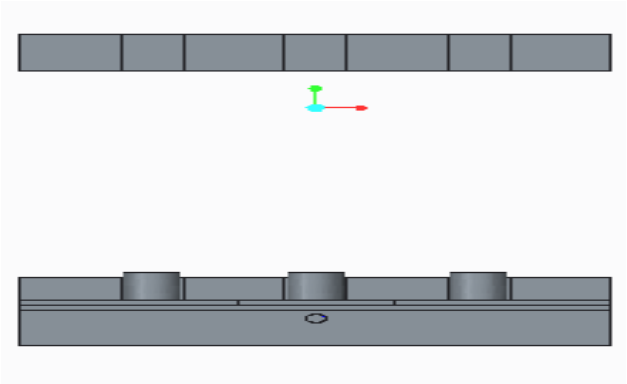


Figure 11: Side view of slot arrangement



Figure 12: Front view of slot arrangement

a) Component

1) Pressure board arrangement: -the pressure board arrangement will be same as that of the original existing system with slot provided in between to allow the side guide roll freely.
2) Guide rolls: - the guide roll need not to undergo any modification as the same will be required that of the original system
3) Lead screw: - same as the original system

b) Arrangement

The slot arrangement will be the small modification in the original existing system. The difference will be that some slots will be provided in between to allow the movement of the side guide roll. It will consist of top and bottom pressure board also.

c) Function

The function of the above arrangement is as given below

1) While feeding of the coil prior to first pass the top pressure board will be lifted so as to allow the space to feed the coil in between the two arrangement (i.e. top and bottom pressure board arrangement)
2) Now the coil will be feeded in between the given space and between the pressure boards in to the gripper.
3) Once the coil is feeded between the rolls and into the gripper the coil is centered in the pressure board arrangement by the side guide rolls.
4) The side guide roll will move in and out to adjust with the width and to maintain the sheet in centre of the rolls.
5) Now the strip is centered in between the work roll as well as the bottom pressure board the top pressure board will be moved downward on the sheet and the bottom pressure board
6) The friction between the top pressure board and bottom pressure board with the sheet in between will resist the movement of the sheet thereby generating back tension.

d) Modification required

The following changes needed to be done to change over to the slot arrangement

1) Slots will be provided in top and bottom pressure board to allow the movement of the guide roll.

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I) Comparative study of three alternative systems:-

S. No	*Points of comparison*	*Five rolls arrangement*	*Six rolls arrangement*	*Slot arrangement*
1	Modification required	The whole set up needed to be changed to incorporate the five roll arrangement.	The whole set up needed to be changed to incorporate the six roll arrangement.	Little modification is required to incorporate the system.
2	Time required for introducing new set up	Much more time will be required as the rolls and its attachments need to be design, manufactured and fixed.	Much more time will be required as the rolls and its attachments need to be design, manufactured and fixed.	Comparative less time is required as the same set up is to be used only Teflon pieces need to be cut and fixed.
3	Design and analysis	The rolls and its arrangement need to be design for size ,its material is to be selected stress to be calculated and redesign	The rolls and its arrangement need to be design for size ,its material is to be selected stress to be calculated and redesign	No design is to be made only analysis of the system is to be done for its safe working .
4	Cost	Both initial set up cost and maintenance cost will be higher.	Both initial set up cost and maintenance cost will be higher.	Both initial set up cost and maintenance cost will be lower.
5	Maintenance	Maintenance will be high as it will have moving rolls its bearing and blocks and bearing lubrication	Maintenance will be high as it will have moving rolls its bearing and blocks and bearing lubrication	Maintenance will be low for no moving parts and the material being used is cheap and readily available
6	Helpful to operator	It becomes difficult to have a watch on strip being in centre as rolls will be there.	It becomes difficult to have a watch on strip being in centre as rolls will be there.	Will be same as the existing system helpful and convenient.
7	Life	Life will be more	Life will be more	Less life
8	Alternative option	No other alternative option	No other alternative option	Wooden pieces can be used instead of Teflon
9	Replacement cost	Will be high as the rolls are costly	Will be high as the rolls are costly	Less as the Teflon pads needed to be replaced

5. Result

1) The original system is studied
2) The three possible alternatives are studied
3) Comparative study of alternative system has been done
4) Best method is selected

6. Conclusion

The best possible alternatives is the ***slot arrangement method*** and they can be implemented to avoid the delay

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