

Modification in Coolant Header to Reduce Flow Marks and Ridge on Sheet Metal

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ABSTRACT: In sheet raw sheet metal generally occurring defect is occurrence of ridge and flow mark. Typically defects like ridges and flow marks are visible on sheet metal surface. This defect is visible and disturbing on surface in large scale production systems. So there are more chances that work order may be rejected due to the presence of flow marks and ridges. Also repair cost is more. To minimize this problem we have investigated the problem and proposed a method to minimize defect. Defects like flow marks and ridges are produced due to insufficient and inefficient method of spraying coolant so that by adjusting and increasing the number of headers and spray nozzles we can eliminate the defect after implementation of header change.

I. INTRODUCTION

Four HI reversible mill Fig 1.1 is a cold rolling mill which is used for reducing the thickness of metal sheet and making the thickness uniform. If the temperature of the metal is below its recrystallization temperature, the process is known as cold rolling. Metal sheet is passed between two work rolls; this work roll reduces the thickness of coil surface (Fig 1.2). Backup rolls are attached to the top and bottom of the work roll. The backup roll gives the tension on the work roll to reduce the thickness of the metal sheet. There are two cylinders attached above the top backup roll; this cylinder gives the tension or load on the backup roll. Basically, the cylinder works on high hydraulic pressure. First of all, H.R coil are attached to the mandrel; this is also called as POR (Pay of Rill). After attaching the coil, the coil is passed between the work roll through the pinch roll and pressure pad and sheet is wound to the DTR (Delivery Tension Rill) side mandrel. In Four HI reversible mill, metal sheet coil is completed in 7 passes. There are 3 types of rill in Four HI reversible mill: POR, ETR, DTR.

In Four HI reversible mill, there are two types of rolls that reduce the thickness of metal sheet.

1. Two Work Roll
2. two Back up roll

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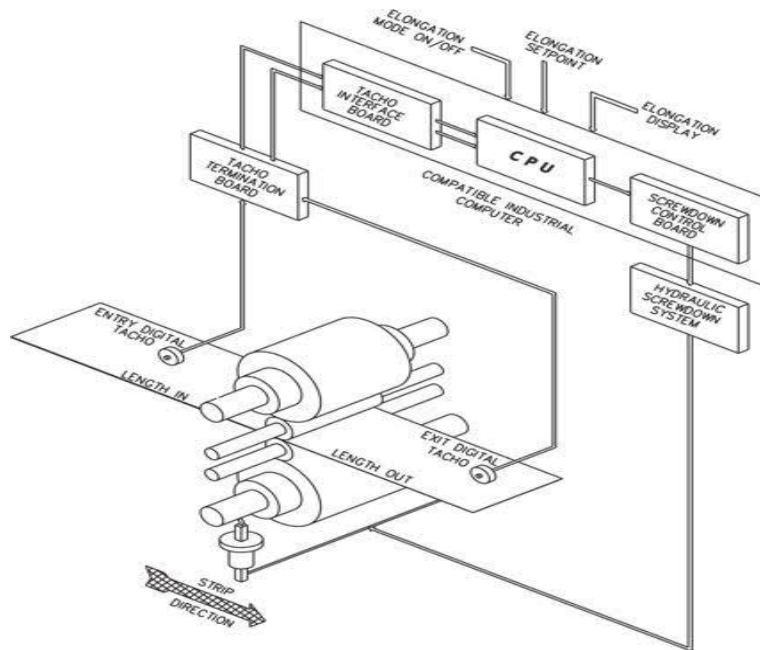
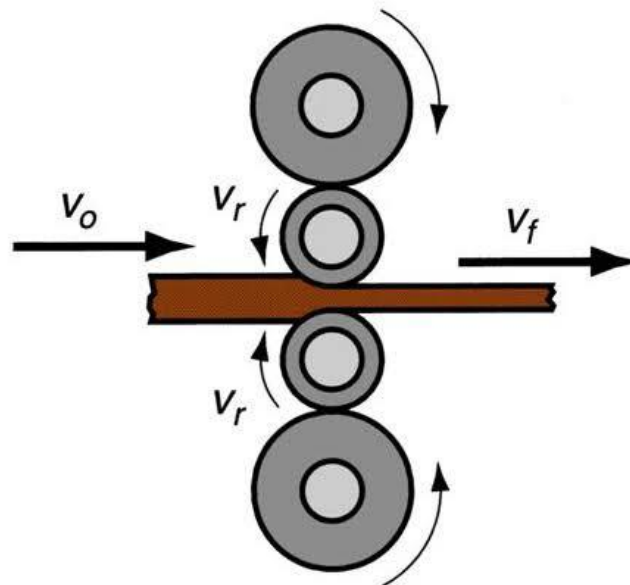


Fig 1.1 Four HI Mill



Four High Roll Mills

Fig. 1.2 Metal Sheet Passed Between the Roll

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II. USE REQUIREMENT OF COOLANT HEADER

1. Coolant header is used to spray coolant on coil surface with the help of nozzle.
2. There are many number of coolant headers are attached in Four HI reversible cold rolling mill.
3. Coolant header plays very important role in Four HI mill for cooling and finishing of sheet metal.



Fig1.2 Coolant header

III. PROBLEM STATEMENT

While working Four HI reversible mill after completing 7 passes on top and bottom surface shows some flow mark and soft ridges which leads to rejection in order. Flow mark appears on sheet as shown in fig 1.3 and ridge produces on top and bottom surface as shown in fig 1.4 Also waste in manpower and cost of manufacturing sheet.

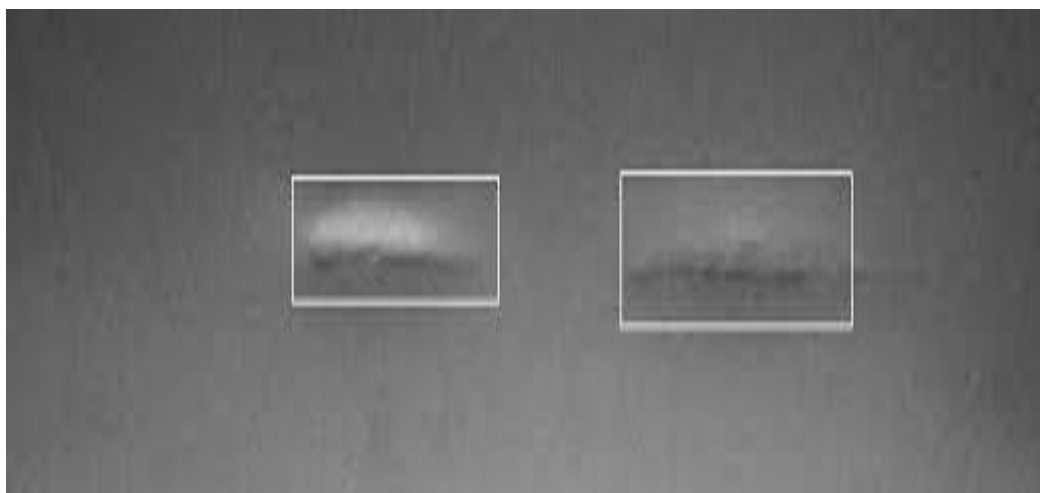


Fig . Flow Mark

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Fig1.4 Ridge on coil surface

IV. OBJECTIVES

1. To reduce the flow mark and soft ridges on MS sheet metal coil surface.
2. To redesign coolant header and nozzle angle to increase the surface quality and customer's satisfaction and to avoid the rejection.

V. MODIFICATION OF COOLANT HEADER

Coolant header is mechanical component is used in Four hi reversible cold rolling mill for spraying coolant on coil surface. There are many coolant header attached in Four hi mill for maintaining roll temperature and removing different types of Mark's on coil surface. Header are also be used for spraying air for remove debris on coil surface and improve coil surface quality. There are many like 10 –18 nozzle attached on header this nozzle spray the coolant on coil surface. This nozzle attached on header of various angle. The angle plays an very important roll for spraying coolant on coil. Angle depends on surface area of sheet metal and type of nozzle used. There are 8 to 9 coolant header attached in Four hi cold rolling mill. This 8 to 9 coolant header spray coolant at one time on different four hi reversible cold rolling mill.

VI. PROBLEM ANALYSIS

The root causes and problem is analyzed and noted by observation of header. The nozzle of coolant header which is place on 30 angle of header does not cover the complete sheet with coolant, leads to create flow marks and ridge on coil during spray also Minimum number of coolant nozzle are observed.

VII. METHODOLOGY

1. Coolant header is mechanical component Which is used in Four hi reversible cold rolling mill for spraying coolant on coil surface.
2. Redesign coolant header and nozzle angle to increase the surface quality.

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3. There are many coolant header attached in Four hi mill for maintaining roll temperature and removing different types of Mark's on coil surface. Header are also be used for spraying air for remove debris on coil surface and improve coil surface quality.
4. There are many like 13 nozzle attached on header this nozzle spray the coolant on coil surface. This nozzle attached on header of various angle. The angle plays an very important roll for spraying coolant on coil .
5. The spray of coolant depends on nozzle and placement and number of nozzles on header. There are 8 to 9 coolant header attached in Four hi cold rolling mil. This 8 to 9 coolant header spray coolant at one time on different hi reversible cold rolling mill.

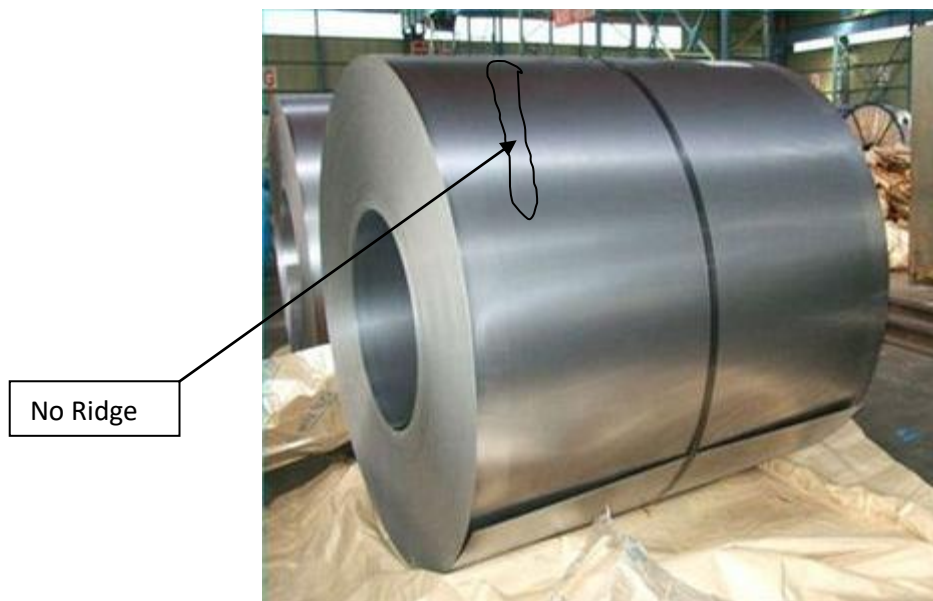
VIII. IMPLEMENTATION

Modification in coolant header

1. In earlier case number of nozzles are less and angle of nozzle are change which don't cover entire surface of the sheet causing irregular pattern of coolant spraying mark on the surface is observed Hence, Number of nozzles are increased from 13 to 15 which covers the entire sheet metal surface from one side to other side
2. In modified header, number of nozzles is increased so that is covering the entire surface by made to overlapping coolant spray with the next one for that Coolant spray nozzle angle is changed from 30° to 45°

IX. RESULT & DISCUSION

After implementation of above changes in coolant header , no flow mark and soft ridge on sheet or coil surface and uniform sheet surface is obtained and proper coating on coil surface can be done with no rejection in sheet metal coil. Hence there is increase in productivity and losses are minimised.





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X. CONCLUSION

By the implementation of new nozzle angle of coolant header and increasing number nozzle, entire sheets is covered with coolant and defects like ridges and flow marks are reduced and sheet metal coil productivity is increased in Four high reversible mill.

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