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Productivity enhancement of Trimdek using Guard Film Roller Stand and Auto-Stacker

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Abstract--This paper addresses the productivity enhancement of Trimdek profile using Guard Film Roller Stand and Auto Stacker. It also consider the topic of formation of trimdek (square-fluted steel cladding) by TRFM (Trimdek Roll Forming Machine). Roll forming is a continuous metal forming process taking sheet, strip or coil stock and bending or forming it to a continuous cross section. Here we are going to automate the handling process for roll forming sheets using guard film roll stand and auto stacker to eliminate manual handling. Guard film roll stand helps to enhance productivity by placing four rolls on same stand at a time. Guard film roll is a protective layer of thin film which is applied on trimdek sheets. Auto stacker enhances the productivity by stacking the sheets automatically.

Keywords--Trimdek, Trimdek Roll Forming Machine Guard Film Roller Stand, Auto Stacker, Roll forming

1. INTRODUCTION

Roll forming is a continuous metal forming process taking sheet, strip or coil stock and bending or forming it to a continuous cross section [1]. It is used to form a wide variety of different cross-section profiles. The process is performed between successive pairs of rolls that increasingly shape it until the desired section is completed. The roll forming process can be used to form a wide variety of cross-section profiles. Because the final form is achieved through a series of bends, the part does not require a symmetric cross-section. Some improvements are also done to increase the productivity of profiles using

- 1.1)Guard Film Roller Stand
- 1.2)Auto Stacker

Guard film roll stand helps to enhance productivity by placing four rolls on same stand at a time. Guard film roll is a protective layer of thin film which is applied on trimdek sheets. Auto stacker enhances the productivity by stacking the sheets automatically. The work approach included both literature studies as well as experimental work. The experimental part gave direct insight into the process. In



Fig. 1 Roll Forming Machine

2. TRIMDEK

Trimdek is a square fluted steel cladding. The fluting provides strength capabilities. It is our roofing and walling profile which is most cost effective. Both convex and concave pre-curved shapes of sheets are available in market. By using crimp curving process, Trimdek steel roofing profile can be curved. Both convex and concave pre-curved shapes of sheets are available in market. The minimum radius of curvature must be at least

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450mm for convex. The minimum radius of curvature must be at least 550mm [2].

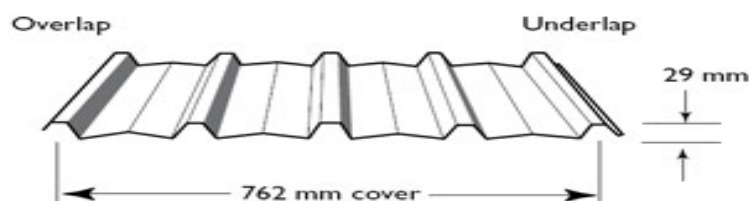


Fig. 2 Trimdek Profile

3. FORMATION OF TRIMDEK PROFILE

There are following steps to manufacture trimdek using TRFM

- 3.1) Raw material is available in form of coil
- 3.2) Coils are lifted with the help of crane.
- 3.3) These coils are loaded on coil bar of machine.
- 3.4) These coils are shifted from coil bar to mandrel of trimdek machine.
- 3.5) Coils (Sheets) pass through infeed guide roller and a no. of standing rollers roll forming, is a continuous bending operation in which a long strip of sheet metal (typically coiled steel) is passed through sets of rolls mounted on consecutive stands, each set performing only an incremental part of the bend, until the desired cross-section profile is obtained.
- 3.6) Rollers deform the sheet into desired profile.

4. TRIMDEK ROLL FORMER MACHINE

The Single Level Rollformer comprises three main sections. The Infeed (4.1), The Roll former (4.2) and the Guillotine (4.3).

- 4.1) Infeed guides the material from the coil into the preparation section. and is also equipped with a Lubricating Felt which applies a lubricant to the material.
- 4.2) The Rollformer is equipped with a series of forming rollers through which the material passes to create the desired sheet profile. The rollformer comprises two sets of rollers in two levels, one for the upper level and one for the lower level. The main group of rollers is the forming rollers.

4.3) A Single Level Hydraulic Guillotine cuts the profiled material into pre-set length. The guillotine is tested and set square at the Hayes factory, but before running the first order, a

S.No.	No. of guard film rolls	Production in metric ton
1	1 Roll	16
2	2 Rolls	24
3	3 Rolls	32
4	4 Rolls	40

squareness test should be done.

5. PRODUCTIVITY ENHANCEMENT USING GUARD FILM ROLL STAND

Problem Status

- Single guard film roll can be loading at existing system in one time.
- Excessive manpower use at trimdek.
- Use of the Crane frequently [3].
- Before implementation of this system: 15-20 minutes required to load the single roll on existing guard film arrangement

Theme

Provision of Loading 4 nos. guard film rolls on Trimdek machine.



Fig. 3 Guard Film Roll Stand

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Analysis:

- Down time very high with guardfilm.
- Single roll loading at one time
- Manpower fatigue.
- Waiting for Crain.
- Reduction in manpower requirement

Obsrvation Table

TABLE I
PRODUCTION RATE

Here we can observe that as we increases guard film rolls, production of metal sheets also increases. This result is also shown on bar graph.

6 .PRODUCTIVITY ENHANCEMENT USING AUTO STACKER

Problem Status

Earlier we used to do manual handling to lift the final product in form of sheets[4]. It took more time, more manpower that reduced productivity.

Solution

Now we have provided Auto Stacking Conveyor which has completely eliminated manual handling of sheets.

Benefits

- Increased Production Rate
- Elimination of Manual handling
- Automatic movement of sheets on the conveyors

It is observed that if we do manual handling to lift the final product which is in form of sheets then productivity decreases. It takes more time, more manpower that reduced productivity. On the other hand Auto Stacking Conveyor which has completely eliminated manual handling of sheets and increases productivity. The result is shown below.



Fig. 4 Auto Stacker

Observation Table

TABLE 2
PRODUCTION RATE

S.No.	Handling of metal sheets	Production in metric ton
1	Manual handling	10
2	Auto Stacker	30

Thus it is observed that if we do manual handling then productivity decreases[5]. Auto Stacking Conveyor increases productivity. The result is shown on bar graph.

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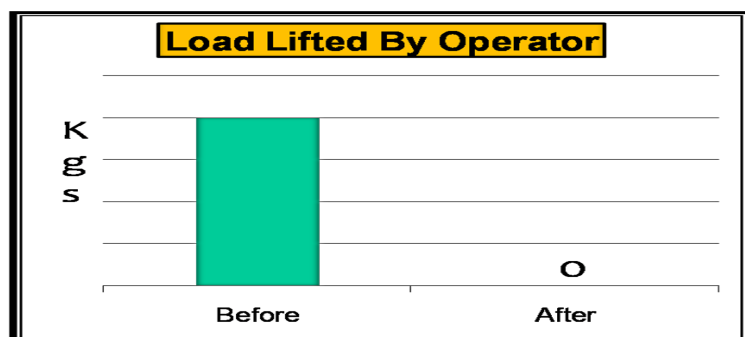


Fig. 5 Load Lifted by operator

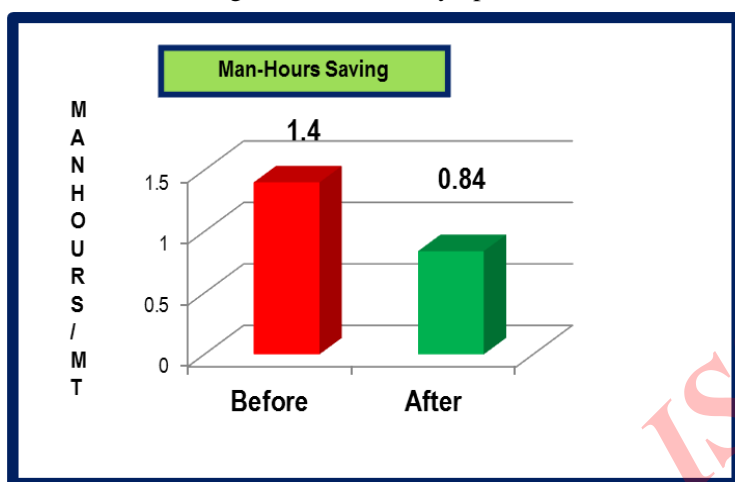


Fig. 6 Man Power Saving

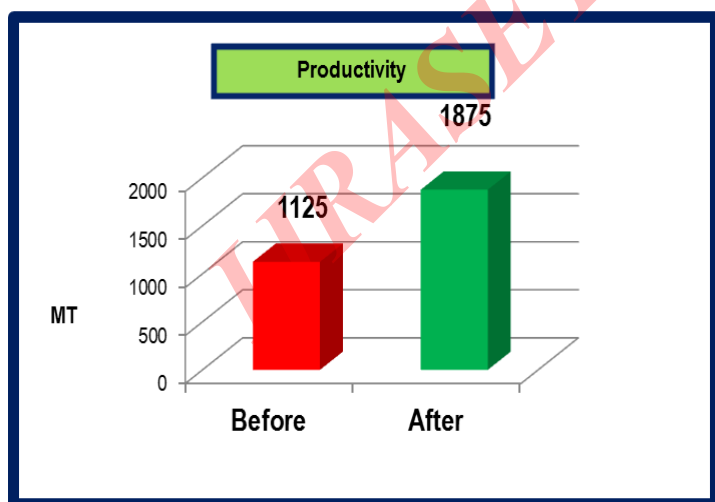


Fig.7 Productivity

Advantages

- Appropriate movements of operator from ergonomic point of view
- No Stress & Strain to operator body
- Machine capacity increased
- Operator morale boost up due to Safe Operating Practices
- Accelerated the Logistic Activity as material handling time reduced
- Timely Compliance of Shipment commitments

7. CONCLUSION

This paper has considered the topic of formation of trimdek (square-fluted steel cladding) by TRFM (Trimdek Roll Forming Machine). Here a continuous roll forming process is proposed. Here we are going to automate the handling process for roll forming sheets to eliminate manual handling, less time cycle and increase productivity[6]. Here a continuous roll forming process for the folding of thin-films is proposed and studied as a key step in the continuous manufacturing of sheet cladding. Some improvements are also done to increase the productivity of profiles using

- 1) Guard Film Roller Stand
- 2) Auto Stacker

The work approach included both literature studies as well as experimental work. In this thesis it is shown that how from raw material which is in form of coil, steel cladding or trimdek is formed using trimdek roll forming machine. The roll forming process allows operations such as punching, notching, and welding. All these operations are performed in-line. The roll forming process eliminates or reduces labor cost and time for secondary operations. Can be used for both roofing and walling in industrial, commercial and domestic applications. Some improvements are also done using Guard Film Roller Stand and Auto Stacker which improves productivity and reduces man power.

8 .FUTURE WORK

- Future Target of producing trimdek profile is 50 MT Per Shift.

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- As well some relevant drawbacks are highlighted, as level of accuracy permitted by the process[12]. The research efforts are done in level of accuracy in this field, taking into account some general considerations on the difference sources of shape .Finally, some strategies for error minimization are presented and discussed .
- Efforts have been made To manufacture new steel sheets with still higher strength , some efforts have been developed.
- In fabricating space structures, roll forming could play an important role. An automated beam builder has already been developed, around seven-station roll forming lines which could be used in space to produce the beams that would form the building blocks of space station orbiting the earth.

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