A Case Study on Aluminium Extrusion Press: Problems Identified and Probable Alternative Solution for its Problem Related to Guideways

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Abstract - Aluminum Extrusion Press (Capacity 425 MT) consists of various components such as bed, cylinder, Ram, Ram stem, container, shear blade, guideways etc. The case study was carried out at Saraswati Extrusions Pvt. Ltd., Aurangabad. The paper includes introduction of the Aluminium Extrusion Press. The problems (two) identified on same machine one is related to guide ways and other is improper lubrication. Also paper includes a probable alternative solution (Using a Recent Technology of Linear Motion Guideways) for the problems mentioned, Conclusion and References.

Keywords – Extrusion Press, guideways, Linear Motion Guideways.

I. INTRODUCTION

Extrusion is a plastic deformation process in which a block of metal (billet) is forced to flow by compression through the die opening of a smaller cross-sectional area than that of the original billet. The aluminum is used as a raw material for extrusion. The study carried out at above mentioned firm includes functions of various parts, identification of problems and solution for one of its problem. The maintenance manual of the above mentioned firm is referred for more information.

The rest of the paper is organized as follows. Components of Press are explained in section II. Problems identified in Press in section III. Probable alternative solution for the replacement of flat guideways in section IV. Concluding remarks are given in section V.

II. COMPONENTS OF PRESS

Figure1. Photograph of Aluminium Extrusion Press [4].

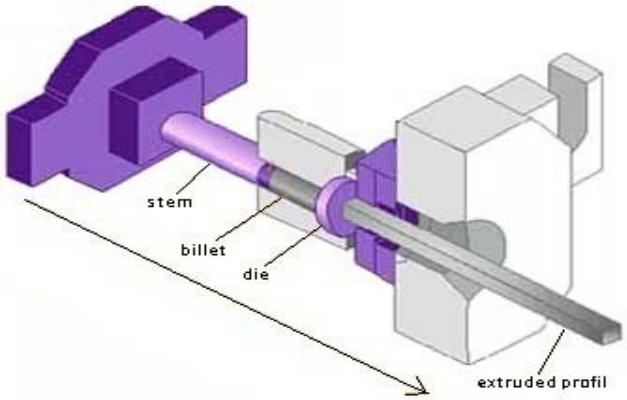

Figure 2. Components of Press[5]

Press consists of the following components:

Press base or Bedplate: It is a welded structure, it is designed to accurately position and support the press structure.

Main Cylinder: It is a hydraulic cylinder normally cast or forged steel incorporates the Main cylinder flange (Main cylinder platen).

Main Ram: It is the piston of main hydraulic cylinder.

Crosshead: It is mounted on the main ram, fitted with the extrusion stem and with guide shoes to guide the main ram travel along the Guide ways.

Crosshead Cylinders: For rapid pull-back of the main ram at speeds not possible using main cylinder action alone.

Ram Stem: It pushes the billet through the container.

Guideways: For guiding the Moveable crosshead and container, usually mounted on the press frame or bedplate or on the columns.

Tie rods or Columns: These operate in tension and restrain the extrusion force between the main cylinder platen and front or resistance platen.

Platen: It is a cast or forged steel that supports for extrusion tooling and so it is designed for minimum deflection under load.
Tooling stack or die stack: It includes the die, die-backer, bolster, die ring and other spacers.
Die changer: It is a device for rapid changing of dies.

. III. PROBLEMS IDENTIFIED IN PRESS

1. *Misalignment of press:-*

   The misalignment is due to wear of guideways. The types of guideways used on the press are flat guideways. There are some factors which are responsible for wearing of these guideways.
   Those are; Continuous strokes of main cylinder and improper lubrication.

2. The dies, stem and container can fail prematurely if they are not installed, operated & maintained with due regard for the design loading
   These were the two problems identified in press. The study was based on the problems related to Guideways. The present guideways are flat and it was observed that the bolts of those guideways were also damaged. The labours were replacing a new guideways on the press. This replacement is done after every six to eight months depending on number of strokes of main cylinder. This is the main reason for misalignment of press that was observed during study. This problem results in improper extrusion causing wastage of material & time.
   The maintenance of Aluminium extrusion press is not so easy. [Maintenance Manual]The problem of misalignment of press results delay in production as its maintenance is time consuming & costly.

IV. PROBABLE ALTERNATIVE SOLUTION FOR FLAT GUIDEWAYS

The recent technology of Linear Motion (LM) guideways is one of the method of reducing the wear of guideways which cause misalignment of press [2]
Linear Motion Guide ways are used for precision working of any machine. Now-a-days these are used on CNC machines, in industrial robots, semiconductor machines etc.[3] Due its various characteristics it can also be used on Extrusion Press.

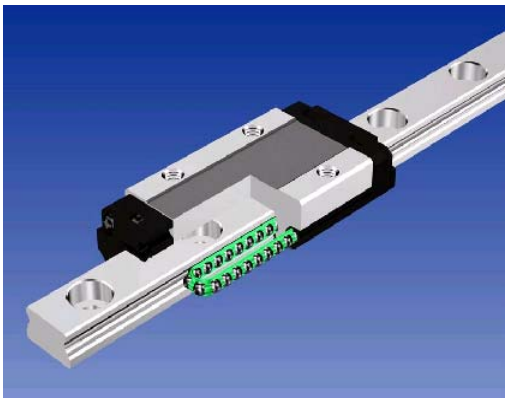

Figure3a

Figure3b

LM Guideway having a rail with single block & double block respectively[6]

Following are the characteristics of Linear Motion Guide ways:

1. Built in long life lubrication.
2. Equal load capacities in four directions.
3. Smooth running due to new ball re-circulation.
4. High accuracy low friction low maintenance.

5. High speed low noise.
6. Interchangeability
7. Environment Protection production.

ADVANTAGES:

1. Maintenance free- No need for frequent periodic lubrication or automatic lubrication systems.
2. Large increase in maintenance intervals.
3. Reduced lubrication cost.
4. Clean and environmentally friendly.

IV.CONCLUSION

Extrusion Press has number of components such as die, container, tie rods,guideways,crosshead cylinder etc. The study id based on these components and problems related to guideways which are responsible for misalignment of press. The probable alternative solution for replacement of flat guideways is use of Linear Motion Guideways (LM Guideways).Due to its various characteristics & advantages as mentioned in paper, these can be used on Extrusion Press

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