

Process Improvement Through Reduction In Blister Formation In 1250 T Press

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ABSTRACT:

Extrusion is a manufacturing process used to create objects of a fixed cross-sectional profile. Our project work was done in "Aditya Birla's" Hindalco Industries Ltd., Alupuram, Kochi. It is an extrusion plant in which aluminum billets and extruded in different shape and size with the help of dies. During extrusion there was a defect called blister formation which means Bubbles and irregular shapes are formed on extruded aluminum. This happens because after each extrusion the aluminum gets stuck to the fixed dummy fitted in the stem of extrusion press. Which cause the formation of blisters. We used Molygraph, it is a method of spraying chemical lubricant at the face of the fixed dummy fitted in the stem. That helps in the reduction of blister formation. The chemical used in molygraph is 'Boron Nitrate' which helps the extrusion to take place without getting the stick to the fixed dummy of the extrusion press.

Keywords: Extrusion, Molygraph, Chemical, Fixed dummy.

I.INTRODUCTION

Extrusion is a technique used to make objects of a fixed cross-sectional profile. A material is pushed through a die to form a continuous length of material of a fixed cross-section. The two main positive conditions of this strategy over other manufacturing structures are its ability to make complex cross-sections, and to work materials that are brittle, considering the way that the material just encounters compressive and shear stresses. It additionally forms leaves behind a great surface completion. Drawing is a comparable procedure, which utilizes the elasticity of the material to get it through the die. This compels the proportion of progress which can be acted in one phase, so it is confined to less unpredictable shapes, and different stages are regularly required. Drawing is the major technique to convey wire. Metal bars and chambers are in like manner as often as possible drawn.

Extrusion may be consistent (theoretically making uncertainly long material) or semi-diligent (conveying various pieces). system should be conceivable with the material hot or cold. Regularly removed materials fuse metals, polymers, earthenware, strong, exhibiting earth, and staple goods. The consequences of extrusion are for the most part called "extrudates".

Extrusion is commonly characterized into four kinds. They are: Direct Extrusion, roundabout Extrusion, sway extrusion and hydrostatic Extrusion. In direct Extrusion a strong slam drives the whole billet to and through a fixed bite the dust and should gave extra capacity to defeat the frictional capacity to conquer the frictional obstruction between the outside of the moving billet and binding chamber.

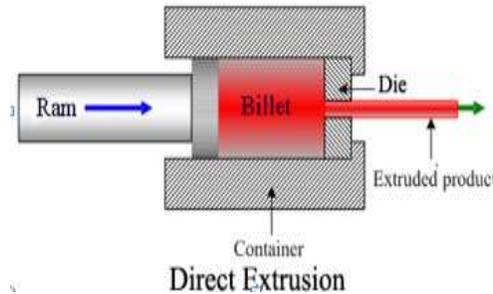


Fig 1: direct extrusion

INDIRECT EXTRUSION:

In indirect extrusion process an empty slam drives the pass on back through a fixed, kept billet. Since no relative movement, erosion between the billet and chamber is wiped out and the necessary power is lower. In sway extrusion process the expelled part are stripped by the utilization of stripper plate, since they tend to adheres to the punch.

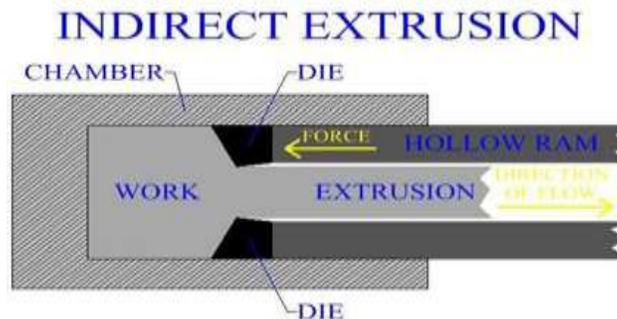


Fig 2: indirect extrusion

BORON NITRIDE:

Boron nitride (BN) is a warmth and synthetic safe crystalline compound with unmanageable properties made out of boron and nitride. Since it exists in numerous polymorphs, BN has advanced as a profoundly valuable compound, discovering its motivation in a wide scope of ventures and applications.

Boron nitride properties

The substance is made out of hexagonal structures that show up in crystalline structure and is normally contrasted with graphite. It might come as a level grid or a cubic structure, the two of which hold the synthetic and warmth opposition that boron nitride is known for.

Heat and chemical resistance: The compound has a dissolving purpose of $2,973^{\circ}\text{C}$ and a warm development coefficient essentially over that of precious stone. Its hexagonal structure opposes decay in any event, when presented to 1000°C in encompassing air. Boron nitride doesn't break down in like manner acids.

Thermal conductivity: At 1700 to 2000 W/mK, boron nitride has a warm conductivity that is tantamount with that of graphene, a comparatively hexagon-latticed compound yet comprised of carbon molecules.

Lubricating property: Boron nitride can help the coefficient of erosion of greasing up oil, while diminishing the potential for wear.

Density: Contingent upon its structure, its thickness ranges from 2.1 to 3.5 g/cm³.

OBJECTIVE OF OUR WORK:

The identification of the root cause was a very big challenge as there are several parameters related to billet, die, extrusion, press condition etc which has an influence on causing blisters.

II. LITERATURE SURVEY

Bong-Sang Lee et.al (2011), presents an examination, the warmth stream of the plant scale aluminum extrusion process was researched to build up ideal persistent warmth treatment conditions. The surface temperature of the billets expanded at consistent slam speed, while it diminished with diminishes of the smash speed. So as to keep up the billet temperature inside a solutionizing temperature run before the succeeding water extinguishing step, the smash speed or the temperature of the blower ought to be controlled. The temperature accounts of the billets during the extrusion and sight-seeing blowing forms were effectively reproduced by utilizing the speed limit model in ANSYS CFX. The procedure to structure an ideal procedure by utilizing a business recreation program is depicted in this examination based on the metallurgical approval aftereffects of the microstructural perception of the extrudates.

Yogesh Dewang (2018) portrays extrusion is an assembling procedure used to make objects of a fixed cross-sectional profile. A material is pushed through a kick the bucket of the ideal cross-area. A brief and compact audit of the commitments made by the past specialists in the zone of extrusion process has been introduced. Steel material and aluminum amalgams are generally utilized by specialists as kick the bucket and billet material in extrusion process. FEM demonstrating of extrusion process is done by utilizing axisymmetric conditions as a rule. Cross section of the work piece is commonly done by utilizing axisymmetric quadrilateral components. Exploratory set-up and apparatuses used in development of extrusion process are introduced and examined. FEM results are introduced as far as variety of punch stroke, punch power.

S. Chahare, K. H. Inamdar, presents direct hot extrusion of Al 6063 aluminum compound was considered in this investigation to acquire the ideal procedure boundaries for include precision of a two track top profile utilized in business window gathering. Taguchi's plan of examinations by thinking about blend of three procedure boundaries (billet pre-warming temperature, compartment temperature, and slam speed) at three levels to decide the element precision as reaction boundary for a two track top expelled profile. S/N proportion examination is utilized to decide the ideal degree of procedure boundaries and ANOVA is utilized to research the effect of procedure boundaries on the component rakishness.

Ab Rahim SN et.al (2015), present of the assembling area, which is at the monetary level, must be made to support social orders in the high living by mechanical social orders and ready to build productivities with the goal that they can accomplish a similar way of life similarly. It will be a major issue on the grounds that reused materials have gotten essential to ecological. This paper presents a diagram of the patterns and the idea of rising to recognize the recyclability substance of the item for reusing aluminum chips by the hot extrusion process. It shows that despite

the fact that to accomplish the supportability, it needs the all encompassing enhancement of the whole condition. Extrusion innovation research is persistently improving which primarily engaged to accomplish of the ideal mechanical and physical properties and furthermore demonstrating and enhancement of the extrusion boundaries.

Junquan Yu and Guoqun Zhao (2018), Fine nanostructures of holding interfaces of weld wrinkles surrounded by opening kick the container expulsion in the nonattendance/proximity of a gas-pocket behind the platform of the expulsion fail horrendously were effectively thought to fathom the major interfacial holding frameworks. Specifically, it was found that, without a gas-pocket behind the expansion, there are two indisputably one of a kind interfacial structures. For the essential kind of holding interface, interfacial grain limits exist in contact zones and little scope voids exist in non-contact regions. For the second kind of holding interface, there are no interfacial grain restricts in contact locales and just nanoscale little scope voids exist in non-contact domains. Inside seeing a gas-pocket behind the augmentation, nanoscale voids and undefined layers exist at the holding interface. It was also found that the advancement of gas-pockets can be dodged by extending the significance of the welding chamber, and the development of the welding chamber's significance and expulsion speed in like manner adds to the volume reduction of little scope voids and the migration of grain limits at the holding interface, so as to improve the welding idea of weld wrinkles.

III. PROPOSED METHODOLOGY

A lubrication system is fixed known as molygraph. It is a process of spraying lubricant known as boron nitride to the fixed dummy to reduce the temperature and the stickiness of aluminium billets in fixed dummy.

3.1 EXTRUSION PRESS SCHEMATIC

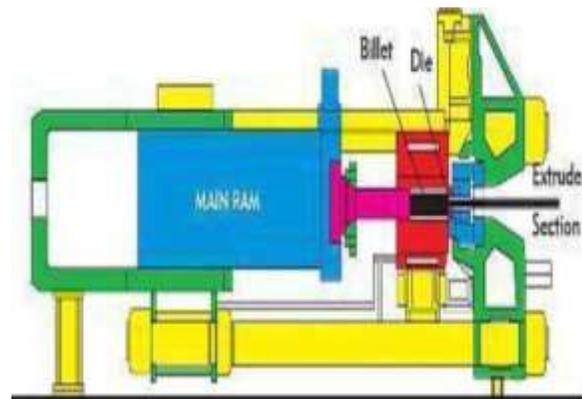


Fig 3: Cross Section through an Extrusion Press

3.2 DEFECTS IDENTIFIED

In extrusion process the hot billet at around 500 degree is forced through the heated die with the help of hydraulic ram. One of the major extrusion defects during extrusion is the blister formation. Blisters are bubble shaped raised areas in the surface of extrusion usually in the direction of extrusion as shown in fig.

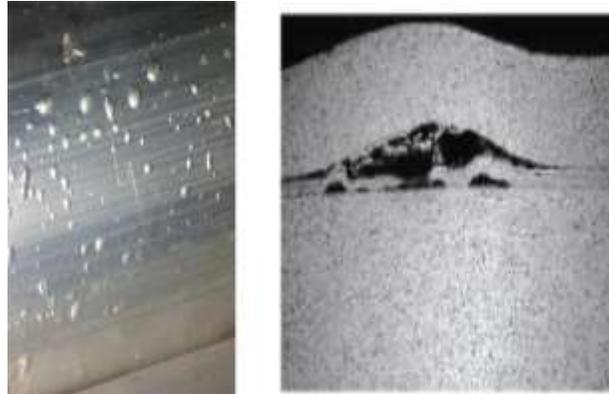


Fig 4: defects identification

In 1250 T extrusion press, the recovery loss on account of blister alone was 2.5 % of the press output. More over there were instances of customer complaints due to blisters inside the profiles which cannot be identified during initial inspection stage.

CAUSE & EFFECT DIAGRAM

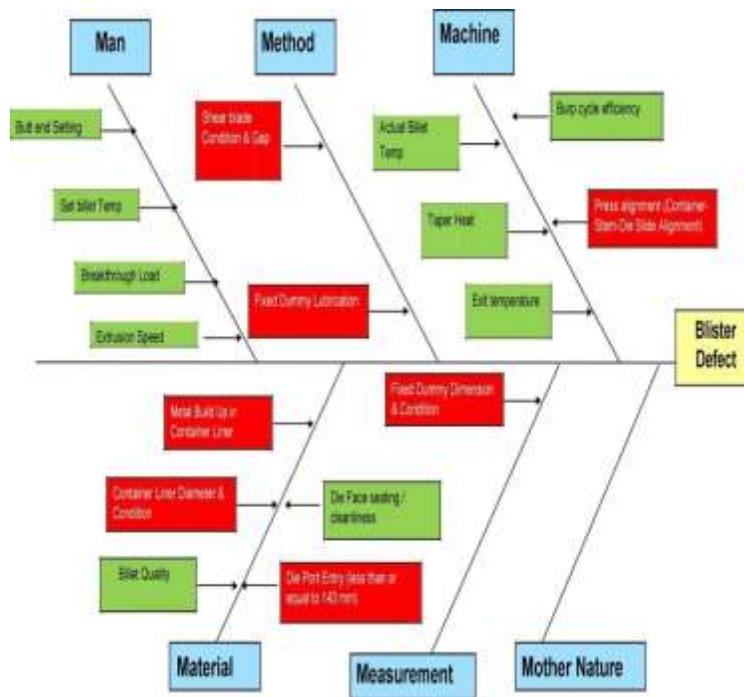


Fig 5: cause and its effect diagram

3.3 IMPLEMENTATION:

MOLYGRAPH

Molygraph’s specially lubricants have helped the steel producing ventures decreased cost and keep up tasks effectively. Steel fabricating is through procedure putting levels of popularity on greases outrageous burdens scathing and moist situations and high temperatures make it amazingly trying for oils to work ideally molygraphs

demonstrated oils arrangements combined with start to finish ointment training, backing and direction from the field designing group will make your steel plant run significantly more profitably.

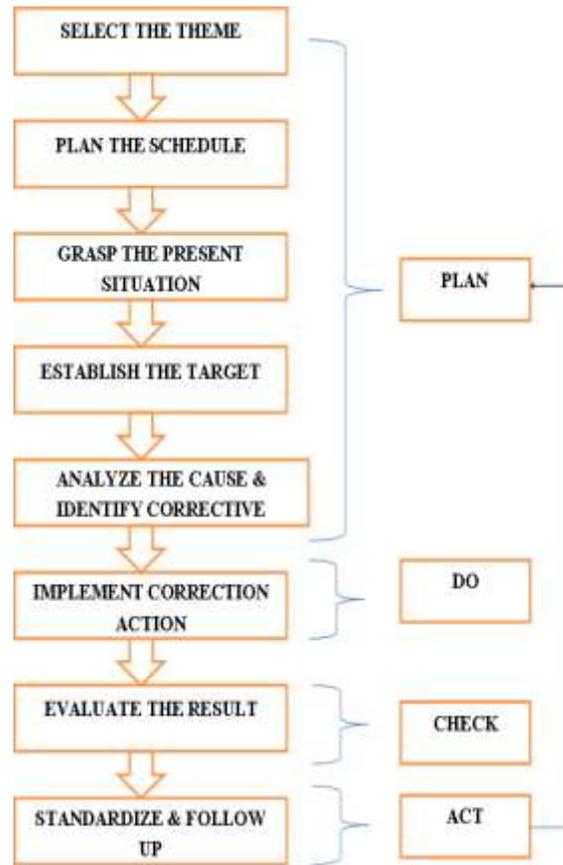


Fig 6: Proposed work flow

BORON NITRIDE

Boron nitride is a heat and chemically resistant refractory compound of boron and nitrogen with the chemical formula BN. It exists in various crystalline forms that are isoelectronic to a similarly structured carbon lattice. The hexagonal form corresponding to graphite is the most stable and soft among BN polymorphs, and is therefore used as a lubricant and an additive to cosmetic products.

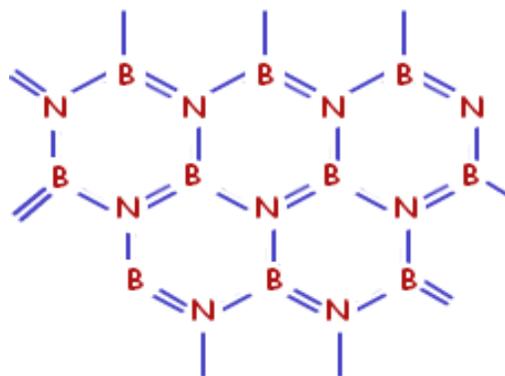


Fig 7: Boron nitride structure

IV.RESULT AND DISCUSSION

4.1 EXTRUSION PRESS:

The specifications of the extrusion press are as follows:

Specifications	Press 11	Press 29
Make	LOEWY (USA)	FARREL - WATSON - STILLMAN (USA)
Installed on	1955	1967
Press capacity	1250 U.S.TONS	3300 U.S.TONS
Container diameter	6.375"	9.375"
Suitable billets size	6"	9"

The extrusion market in India is a highly competitive segment where the actual consumption is less than 50 % of the total installed capacity of the extrusion presses. More over there is threat of import from china also. So the quality of extruded products is the main criteria for the existence of the any extrusion plant. The recovery, utilisation and through put are the three main criteria's for extrusion.

4.2 FIXED DUMMY LUBRICATION SYSTEM

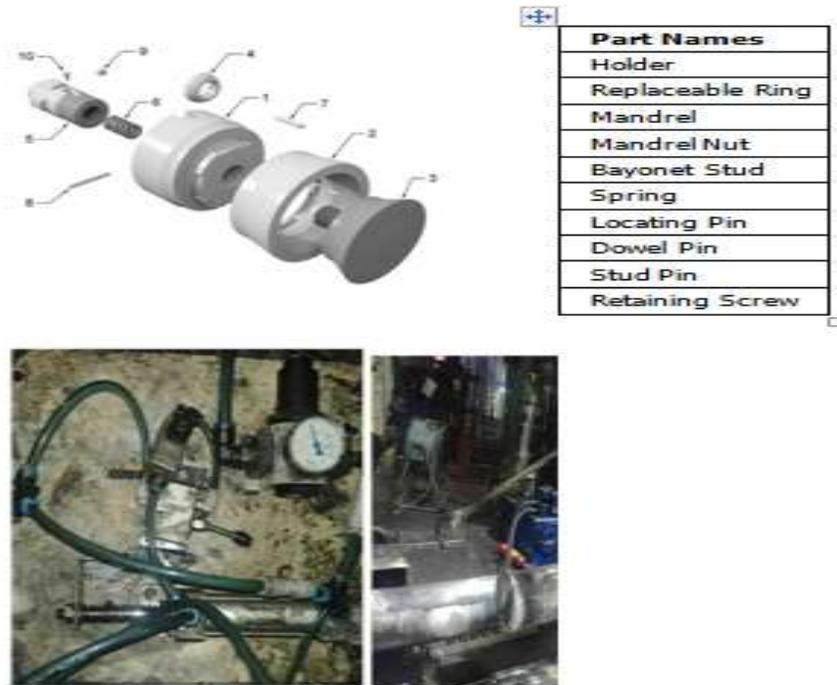
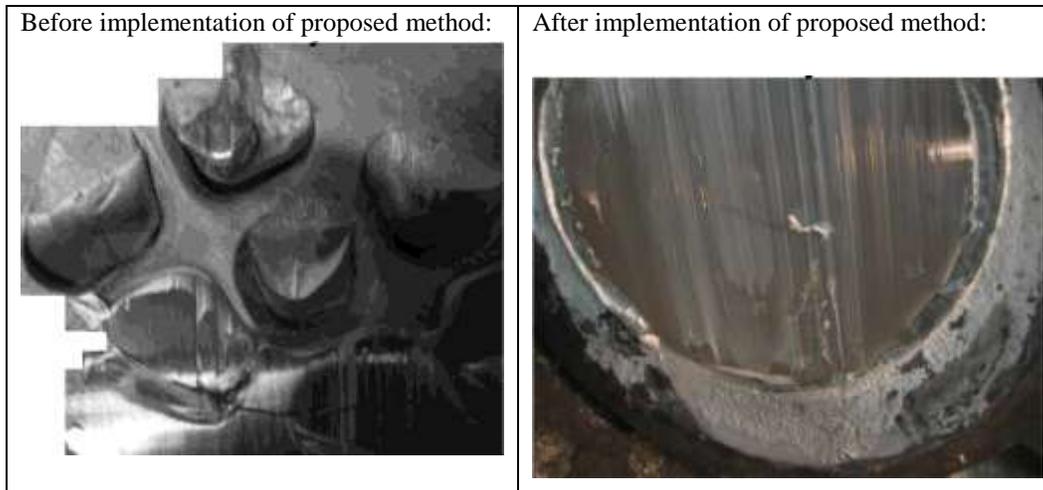


Fig 8: experimental result



After implementation of the various action plans derived, rejections on account of blister was drastically reduced from 10 T/month to less than 0.6 T per month. This has improved the overall recovery, equipment reliability, production and quality and has also lead to the reduction in customer complaints. Scavenging of the container on a daily basis and weighing of the skin metal weight has resulted in monitoring the liner conditions and dummy block wear out beforehand which inturn enabled us to take timely preventive measures to avoid blister formation.

V.CONCLUSION

Design & Installation of Fixed dummy lubrication system: An in-house lubrication system was designed and developed. Design of scavenging block: A specific design of scavenging block was done for better properties. Container guide modification: In-house modification was done to prevent the container-die slide misalignment during the operation. Special design developed to reduce blister formation: A modified die design was developed to prevent metal pull out from the die.

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