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Review on Analysis of Defects in Progressive Tooling

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Abstract – *In this paper, problem occur in progressive tooling has been selected as investigation topic. Progressive tooling includes Automation, High cutting speed, innovations, Economization and Robotization. But also with this it also brings the slug pulling. Slug pulling occurs when the slug is caught to the punch face afterwards the punch pulls the slug up from the die. Slug pulling is cause of problem. Aim is to find the solution.*

Keywords- Slug pulling, punching, blanking, tool wear

1. INTRODUCTION

Slug pulling is the consequence of punching or blanking. Punching and blanking both are similar operation both differ only by understanding part and scrap in each operation. When slug is caught to the punch face and then punch pulls that slug up from die. Slug pulling is cause of problem at sheet metal cutting such as time losses, press failure, financial losses. Slug pulling troubles more nowadays than in the past due to High cutting speed, Automation, Price cutting, Material costs savings, cost reduction so on. There are no of dependent parameters of slug pulling like die, punch, relationship between punch and die, material and other cutting factors.

The industry is continuously facing the problem of Slug Pulling with Progressive tools. The defects in progressive tooling affect not only the quality of a final product but also productivity of industry. The wear during punching directly influences the dimensional and shape accuracy of products. The indirect costs for the heat treatment, grinding and maintenance have been increased as well.

Slug pulling occurs if a slug is caught to the punch face and afterward the punch pulls the slug up from the die. Slug pulling is cause of problems. The aim is to give an answer which of methods is more effective than the others. Researched holes were cut by using a press with various cutting tools. Slug pulling rate was observed by an indirect method of slug pulling rate measurement. The method is based on observation of indentations on work pieces caused by pulled slugs. It was found that a slug is most often pulled by common punch while on the other hand usage of ejector punches and special dies with grooves is more effective with no pulled slug. A surprise is that efficiency of the aeration punch has been higher than expectation.

Aim is to find the appropriate solution which will be more effective on this problem of slug pulling.

Fig 1: External Circlip

Circlip is known by some other names like C-clip, Seeger Ring, Snap Ring. It is a type of fastener made of semi flexible metal ring which has open ends and it can be snapped into the place like machine groove on a dowel pin or any other parts which permits the rotation but prevent lateral movement. Basically there are two types of circlip, external circlip and internal circlip.

External circlip is generally fitted on shafts and grooves. It is constructed as a curved beams of uniform strength. Radial strength of that circlip is reduced towards the free end so that constant round shape is maintained during its continuous use. The assemblies which are directed to

centrifugal force in that assemblies these circlips are generally used. Assemblies whrere high rotational speed is present there this external circlip secures that assembly. With the use of pliers these circlips can be fitted on the shafts, by expanding its opening. This external circlips applied axially on the external to the shaft that is expanded to pass over a shaft and then released to spring back into the groove. Tapered section is provided to external circlip which insures even pressure when fitted. This external circlip is suitable for majority of normal engineering applications, providing rigid yet shoulder on a shaft.

PROGRESSIVE TOOLING

- Progressive Tooling is metal working method that can encompass punching, coining, bending and several other ways of modifying metal raw material, combined with an automatic feeding system
- The feeding system pushes a strip of metal through all of the stations of a progressive tooling die. Each station performs one or more operations until finished part is made.
- Final station is cut off operation , which separates the finished part from the carrying web
- The metal which is punched away in the operation treated as scrap/slug.

LITERATURE SURVEY

Zhi-Xin Jia et.al. In progressive tooling punches & dies plays vital role. Structural design tool for punches & dies for progressive dies motor core described in this paper. Punch & die model is established it contains three aspects of information, geometry information, assembly related constraint attribute & hole related information on plates. Construction of this design tool is done on PC and integrated with Solid Works CAD systems. As result of this paper comes that it can dramatically improves design quality also saves time & cost.

Viktor Tittel et. al. After cutting operation if the slug caught on punch face & if that punch pulls slug up from die then it may said that slug pulling is occurring. Finding the effective method for reducing the slug pulling is the goal of this article. Slug pulling rate measurement method is used for measuring slug pulling rate. Ejector punches & special dies create less slug pulling than commonly used punches.

Viktor Tittel et.al. In this article methods & precaution against effect of slug pulling is given. In cutting operation we can see few problems. Out of which slug is one. This slug pulling is related to punching & blanking. Blanking & punching are same operation they differ by scrap and part. If slug caught to punch face & pulled up then slug pulling occurs. Because of slug pulling time losses, financial losses occur.

Manoj Balakrishnan et.al. Sheet metal cutting is get accepted & also get importance on wide range specially in mechanical sector. For extreme relevance, current work is focused on multistage progressive tooling. To get an efficient design, some strip layouts are analysed. Strip layout which possesses & satisfies balanced nature of high strip utilization factor. Centre of pressure is determined. Then calculation of forces involved, dimensions of plates are performed.

V. Allada et.al. When there is shortage of experienced process planners & unavailability of CAD/CAM systems that could provide integrated solution for manufacturing sheet metal tooling. CAD/CAM systems are too expensive & too narrow in scope. Design of press tools & its manufacturing functions are highly specialised. In this article framework and implementation details of integrated system that has been developed for local sheet metal tooling. AutoCAD platform using the Auto lisp programming.

J.C. Choi et. al. Development of CAD & CAM for irregular-shaped sheet metal products for blanking and bending operation. On knowledge based rules approach based. Experimental results and empirical knowledge of field experts. Program is written for system in Auto LISP using AutoCAD & smart CAM using personal computer & composed nine modules. System designed considering several factors, like diameter of material of a wire, complexities in blank geometry & punch profile.

Sachin. G et. al. Tool making is one of the trades, which needs detailed study, process planning and analysis before actual working. Process analysis and design analysis are two essential parameters on which success of any tool depends. That's why systematic approach is important during making of tool. Various aspects of "Press Tool" are given in this paper. Brief information about design analysis and overview of press tool is available in this paper, which is beneficial in order to get mass production of sheet metal component.

Kanda-Cho Reciprocating motion is present in press die with the movement of press machine. Very strong force present between upper die and lower die. With the use of reciprocating motion author developed high pressure compression unit which can be fitted inside of die set. Powerful air which will be generated from it will blow the slug which get generate during punching operation. Also that air can be used to perform some auxiliary motions like material sheet feeding. Basically this paper is about study of how to develop high pressure compression unit, and it is studied.

R. Q. Hsu et. al. There are no of press working operation like blanking, encountered in sheet metal processing. The punched part which should be fall down after punching occasionally comes up with the punch which is known as slug pulling. In this paper prediction of this phenomenon of slug carry up by punch in blanking by air blow of slug

CONCLUSION

A brief review on slug pulling occurring in progressive tools, different conventional and recent technique was discussed for solving the problem of slug pulling. Some methods are discussed in some research paper which can be considered during finding solution of the problem.

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