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Review on Cooling Systems for Cold Roll Forming

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Abstract: As we know in this competitive world we should have max output with minimum rejection rate. So manufacturing should be done in precision with reduce defects. Also safety of worker is also an important consideration parameter. Automation is must to get maximum output & taking ergonomics into consideration. So this paper would be useful for engineering students & other people related to this field

Keywords: Roll Forming, PLC, Pneumatic cylinder, Coolant.

I. INTRODUCTION

Roll Forming is type of rolling which involves continuous bending of long strip of sheet metal into desired cross-section. Strip is then passed through set of rollers until desired profile is obtained. Roll Forming Machines are available that produce shape of different size and material thickness using the same roll. Variation in size is achieved by making the distance between the rolls, variable by manual adjustment or computerised control allowing for rapid changeover. The specialised mill are present in the light gauge framing industry where metal studs and tracks of standardised profile & thickness. The roll forming machine is being manufactured by 'Jaya Hind Sciaky Ltd', Pune. Cold forming is the operation used for manufacturing of rim. In roll forming two or more rollers are used without addition of any heat.

II. LITERATURE SURVEY

Youngyun Woo, et.al^[1]: He states that the metal sheet of various cross section profiles like profile for automotive railway, sheet construction, building industries, etc are being studied. Two sheets are being joined together by adhesive material. Here the two layers are used of SPCC and AL5052 material. The bend angle of roll form blank decreased. When the combination is changed from SPCC+ AL5052 to AL5052+SPCC. The longitudinal bow height increases in order of concave, trapezoidal and convex shape.

William Ion, et.al^[2]: In this paper the author says that cold roll forming is an incremental sheet forming process, which offers a wide range of advantages. The material used for sheet metal is UHSS (Ultra High Speed Steel). Here two profiles are being studied. i) v-section ii) flat strip with the rim. Here as number of passes increases, the length of sheet also increases.

Aromal kannan, et.al^[3]: In it different natural oils like castor oil, palm oil, rice bran oil, sesame oil, sunflower oil, etc are being studied for their coolant action on cutting. They have stated the property of vegetable oil that they have higher boiling point and greater molecular weight and this result in less loss due to vaporisation and misting. Also the temperature is not much as compared to conventional cutting fluids. Also the roughness is reduced by using natural oils. Natural oils for using as coolant are being checked for output parameters like cutting force, tool wear and tool life.

Zinat Ara Nisha, et.al^[4]: In it they have explained that minimum quantity of lubrication, they have carried out analysis regarding machining cost and they have stated that 15% of total machining cost is spent on cutting fluid. In this they have used temperature sensors for their experiment. When temperature is less than 40°C for the turning operation on lathe then according to the setup the solenoid valve which makes the coolant flow on the workpiece is in closed state and when it becomes equal to 40°C then the solenoid valve opens for 2 seconds and when temperature exceeds 40°C, then solenoid valve is continuously open and cutting fluid flows continuously. Also due to intelligent cooling, surface roughness is more, also tool life reduces a bit as compared to flood cooling but wastage of coolant is comparatively very less as compared to flood cooling. If intelligent cooling system is brought in operation then machining cost reduces as coolant cost reduces. Junsong Jin, et.al^[5]: In this paper finite element analysis is done on the rotary forming process of rim. In this paper they have compared experimental study and observations with the FEA calculations. They have made FEA calculations on rolling of upper roller surface, lower roller surface as well as arc bottom surface. The rotary forming process for thickening of rim is divided into three parts: i) Elastic Bending ii) Roller Groove Filling iii) Flash Forming.

WANG Hai-tao, et.al^[6]: Explains that Speed and working condition of the Piston has effect on friction force. By the setup as the speed increases friction force also increases to some extent and then reduces gradually. Stroke length doesn't have any effect on friction force. It is independent of stroke length. As pressure of compressor air increases, friction force also increases for same stroke length of piston cylinder arrangement. Friction Force varies with working condition of piston. When piston is stationary friction force is high.

M.Ravi Shankar, et.al^[7]: In it they have stated the difference between dry air cooling, flood cooling and cooling with minimum quantity cutting fluid. The fluids are studied on various parameters like surface roughness, chip thickness and tool flank wear. It was observed that the surface roughness reduced from 22% to 15.5%. Also, chip thickness reduced from 9.5% to 5% and flank wear also reduced from 15.5% to 6% compared with dry air cooling. For minimum quantity cutting fluid as we increase the air pressure along with coolant flow, the cutting fluid required is less. So, if minimum quantity cutting fluid is brought into use we can save a lot of cutting fluid as well as cost on machining. Also the product obtained will have good finish property.

Quan Liang, et.al^[8]: Describes that different PLC system that is the traditional plc systems and the developing plc systems. The soft plc systems are available which uses computer systems for the hardware input to the plc. There are various schemes available for the soft PLC systems. The first scheme is the traditional systems which has the hardware platform made of PLC hardware. Its limitation is maintenance and upgrading is very difficult and non economical. The second scheme uses the embedded controller. The embedded controller is itself a super small computer system. The third scheme uses the industrial PC. In this Plc system have input/output cards or input/output terminals. It has advantage of using the PC software and hardware. This paper has introduction of the virtual machine of the soft plc running system. The virtual machine is like the hardware of the computer CPU. It performs in the same way as the CPU performs. It takes the instructions, interprets the codes and executes the program

A Ramalho, et.al^[9]: Here the phenomenon of friction is being studied. They have studied friction model based on Amontons – Coulomb theory. Here two techniques are used for finding out friction. The two techniques used are i) Unidirectional cross cylinder sliding with linear increase of the load. ii) Stress forming condition. The various parameters studied to assess are sliding surface, roughness lubricant effect, and load and running in effect. It was observed that roughness of die material had significant effect on friction coefficient when highest pressure contact their friction value obtained low stribeck curve was used for analysing friction coefficient. According to both operation parameters and lubrication characteristics of the lubricating oil.

Wang Biao, et.al^[10]: In this paper they say that environment concern is a major factor as the fluid they used for machining operation are hazardous to environment as well as the people nearby. So they have carried out experiment on natural cutting fluids. In it, it is being observed that using oil/water emulsion the life of tool increases 2.28 times as compared to dry cutting. Also surface roughness improves by using oil/water emulsion fluid. Also cooling & lubrication improves by using this cutting fluid.

III.SUMMARY

Coolant properties are being studied so as to understand which type of coolant is to be used for roll forming machine. The machine can be brought into automation with the help of PLC. The method for manufacturing of casing for the roll forming machine is being studied, so as to avoid splashing of coolant on the floor. Coolant flow methods like flood cooling, jet cooling, intelligent cooling (Minimum quantity cutting fluid), etc are being studied for selection of coolant flow system. Pneumatic cylinder are being studied for faster extension and retraction of the piston (Pneumatic cylinders will be used for actuating the doors). Also cylinder with cushioning are efficient one's because the rate of extension and retraction is about 3000 times per shift. Pump should be selected in such a manner it should make the flow continuous with least chances of the priming to occur, solenoid valve can be used for this operation as pump will be continuously ON. So solenoid valve should be programmed in such a way that they will allow the coolant flow at the specified intervals of time. If all the above specified objectives are brought into consideration then the productivity will improve the life of roller, because roller temperature will be under control, therefore maximum rim output can be achieved, as the rejection rate will reduce. Safety of workers and cleanliness of working environment is important according to ergonomics consideration prescribed by various organisations.

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