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DESIGN AND FABRICATION OF MULTI GRINDING MACHINE

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ABSTRACT

The present invention pertains to a center less cylindrical grinding machine with a grinding wheel and a regulating wheel that can be laterally displaced toward a work piece that can be held bet wee these wheels, and with a rest blade for supporting the work piece that is realized rigid in the vertical direction and arranged and dimensioned such that a rotational axis of the work piece and a rotational axis of the grinding wheel lie in a common plane, wherein a height adjustment of the rotational axis of the regulating wheel beyond the plane is kinematic call decoupled from the lateral displacement of the regulating wheel and can be varied in order opposition the regulating wheel on the supported work piece.

A center less cylindrical grinding machine comprising grinding wheel and a regulating wheel that can be laterally displaced toward a work piece that can be held between these wheels, and with a rest blade for supporting the work piece that is realized rigid in the vertical direction and arranged and dimensioned such that a rotational axis of the work piece and a rotational axis of the grinding wheel lie in a common plane, wherein a height adjustment of the rotational axis of the regulating wheel beyond the plane is kinematic ally decoupled from the lateral displacement of the regulating wheel and can be varied in order to position the regulating wheel on the supported work piece

Keywords: Abrasive Belt, Wheel Grinding, Aluminium Oxides, Pulley.

I. INTRODUTION

Grinding is a key technology in metal manufacturing process because it can ensure required surface finish where other manufacturing process may have difficulty meeting product requirements. Grinding is applied in finish in gestates of product manufacturing cycle when the value of the machined part is already significant and where mistakes can be very expensive. Besides accuracy of dimensions and surface finish, grinding also influences physical layer properties such as residual stress, hardness and microstructure during the material removal process leading to high risk of a thermal damage of the parts surface layer. Grinding is a high-added value manufacturing process. In today's global manufacturer competition, companies that deliver high value in manufacturing have strong financial performance also because of their high-quality recognition. However, they must constantly improve their performances first of all in terms of quality and delivering time to maintain leadership in their business. This becomes possible only innovating, inventing, invest ting in Research and Development and last but not leas time tin gin people knowledge. This them is has been developed in collaboration with Avoid Aero, Global Supply Chain in Revolt plant. Avoid arioso GEA vacation business that designs, manufactures and maintains components and systems form chain Caltrans missions, turbines and combustors. Through continuous invest men tine search and development and consolidated network of relationships with major Universities and international Research Centers, Avid for grinding of casehardened steel bear in grace. The study has been conducted mainly on four phases that means my gradual growth in "grind logy". The first was a deepened study of grinding process and in the meantime the knowing of aeronautical product in particular gears, the second was a meticulous data collection of current grinding process from the company, the third was ac are flan is of gathered data, and the fourth was a multiple approach to improve the current process looking at the grinding in itself but also at the technologists needs, supporting them in the grinding parameters definition.

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Fig 1: Traditional Grinding Machine

II. LITERATURE REVIEW

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13. As an important material, titanium alloy is widely used in the manufacture of aircraft engine parts, and its processed surface quality is critical to the performance of aircraft engines. abrasive belt grinding (abg) is a kind of elastic grinding, which plays a significant role in improving titanium alloys' surface integrity. to validate the mathematical model's effectiveness from the grinding parameters to the surface residual stress after grinding, firstly, according to the molecular dynamics theory and abg process, a physical model of titanium alloy abg molecular system is proposed, and the embedded atom method is chosen as the interatomic potential of titanium alloy. dahu zhub, c. han dinga et. al.,

14. Robotic abrasive belt grinding has emerged as a finishing process in recent years for machining components with high surface finish owing to its advantages of excellent flexibility and high efficiency. the profile accuracy of components, however, is difficult to be guaranteed due to the contact wheel deformation in conformity with the surface of workpiece. to overcome this problem, an improved cutting force model is developed to analyze and assess the force-controlled robotic abrasive belt grinding mechanisms based on the experimental observation of the over- and under□cutting phenomenon on the cut-in and cut-off paths. specifically, a material removal rate model considering the effects of cut-in and cutoff paths is firstly built to demonstrate the real robotic belt grinding process. tie zhang and jiewen su et. al.,

15. Collision may occur during the grinding of a workpiece by a robot sand belt. to solve this problem, a collision-free planning algorithm for the robot motion path is developed based on the collision layer method. collision-free planning of the robot motion path is studied, and a means to adjust the machining frame on the belt is determined (i.e. moving along the axis of the belt and rotating around the tangent line). the planning curve is rapidly found on the collision layer using neighborhood search and recursive methods, and the amount of collision detection is significantly reduced. the planning curve is transformed into the robot motion path. simulation and experimentation show that the amount of collision detection required by the proposed algorithm is 3.86% less than that required by a method using a complete collision layer. moreover, the robot grinds the workpiece without collision. the proposed method is simple, stable, and easy to implement and 14 possesses a good engineering application value. vigneashwara pandiyan et. al.,

16. Industrial interest in tool condition monitoring for compliant coated abrasives has significantly augmented in recent years as unlike other abrasive machining processes the grains are not regenerated. tool life is a significant criterion in coated abrasive machining since deterioration of abrasive grains increases the surface irregularity and adversely affects the finishing quality. predicting tool life in real time for coated abrasives not only helps to optimize the of the tool's life cycle but also secures the surface quality of finished components. wei wang et. al.,

17. Robotic belt grinding systems can be used not only to replace low efficiency, high pollution manual finishing operations but also to improve production rate and manufacturing flexibility, especially for grinding small batches of workpieces with complicated features. the contact wheel is made from soft material with significant elasticity and is tensioned by a grinding belt. soft contact between the workpiece and contact wheel provides the benefits of high surface quality but reduces the dimensional accuracy of the finished workpiece. this paper analyzes the contact wheel's deformation caused by belt tension in order to accurately predict the depth of cut. the elastic mechanics based on the power series method is employed to establish and solve the tension model, and the deformation of the contact wheel is obtained. the validity of the analytical model is verified by a finite element software. then, two modified models of grinding stress distribution are developed, and the distribution of depth of grinding is predicted. tests are running and showing that the prediction error is less than 3.1% on a given grinding path. an accurate, fast method is thus developed to predict the depth of cut for belt grinding. lai zou1 et. al.,

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18. Abrasive belt grinding is considered a flexible and precision machining method. the complicated contact status prevents the traditional simulation model from accurately predicting the machined surface topography, so this paper develops a new numerical simulation approach to solve this issue. the abrasive belt surface topography was detected using a 3d appearance optical scanning apparatus 15 and was processed by surface fitting and noise filtering. based on the johnson transformation system and filter impulse function, the surface topography generation of non-gauss abrasive belt was realized. the simulation result showed that it was well consistent with the measured topography. subsequently, a vibration model was superimposed on the original moving track of abrasive grain in consideration of flexible grinding characteristic to establish the grain kinematic model of abrasive belt. y. j.wang et. al.,

19. Belt grinding technology is used for machining the complex surface of a blade; however, it is difficult to ensure processing accuracy. to solve this problem, a surface removal contour (src) model for grinding the complex paper discusses why the normal contact pressure between the grinding wheel and workpiece surface accords with the hertz contact theory, and further, the calculation method for the pressure distribution of the hertz contact is given. second, the src model is determined from the material removal rate (mrr) nonlinear model. to determine the parameters of the mrr nonlinear and linear models, an abrasive belt grinding experiment was performed, which showed the relative error for the mrr nonlinear model and for the linear model. third, combined with the hertz contact theory, a src model based on the mrr nonlinear model was built. a. jourani et. al.,

20. Belt grinding is a finishing manufacturing process, which usually follows a hard turning operation. experimental investigations show that the belt grinding process improves the surface texture and leads to compressive residual stresses. to study the contact between the belt constituted by abrasive grains and the surface, in particular to understand the physical of abrasion, a three-dimensional numerical model is established and presented in this paper. this method provided important and essential information to understand the way the abrasive grains remove the material in the belt and workpiece interface. important data induced: the normal load distribution, the local coefficient of friction, which depends on the attack angle and then the tangential load on each abrasive grain could be computed. the pressure distribution, the surface deformation and the distribution of real contact area could be also determined by this model. 2005 elsevier b.v. all rights reserved quality of glassing also obtained for good looking component. the abrasive belt is available in various size in the market. belt grinding machine may be dry wet belt or combination belt. belt grinding machine is used for heavy stoke removal or for light polishing work depending upon the type of belt grade used. this oblique grinding machine is used for the grinding of any oblique surface. the grinding can be done for the stationary object. the angle grinding is done based on the position of the two adjustable rollers in the machine shown in figure -2. the flexibility of the belts are adjusted using the screw. thus, the finishing will be smooth and any angled parts are finished.

III. METHODOLOGY

This study is focused once land rival grind in go faces hard ended steel surfaces of aero nautical gears with the aim to define optimal grinding strategy and the related set of safe process parameters to avoid risk of grinding abuses that could cause scraps. A gearbox is a transmission system based on gears train providing speed and to roué conversion from arrogating power resourced another device, usually reducing the high reneging gees pied to allowed speed increasing the torque in this process. In particular this happens in turbine propeller engine (turboprop), where the propeller turns much slower than the driving turbine shaft (e.g., 2000 RPM v s 30000 RPM, see). A gear box consists of arousing, usually divided in two or more parts that provide support for the gear drive assembly that transfers power from the engine to external propeller/rotor or to engine accessories. The main mechanical components of the drive gear assembly are gears, shafts, bearings and some other parts like seals, lubricant nozzles, keys, bolts, nuts, elastic ring sand soon. The housing has also the functional oil container and gives passage way for lubrication of the gear drive as simply. The gears have a crucial role in transmission system there for ether quality is very important for the life me and consequently maintenance of the gear box. The design of transmission gears requires high knowledge and it is a balance between various requirements and restrictive constraints. In helicopter gearboxes could be completely integrated merging the engine accessory gear box, the main rotor gear box (main root retrains mission) and the tail rotor gearbox. In

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the helicopter this gearbox system is not redundant, and its failure will result, in most cases catastrophic, in fact it leads to a complete loss of control of the helicopter, rarely amice safe auto rotation action avoids an ending in a crash. In-Flight Shutdown (IFSD) could lead to loss of the aircraft. A serious accessory gearbox failure leads to IFSD and consequently an emergency landing. Any failure shall be investigated according to airworthiness regulation and as adores ton sequin Cathleen tire fleet could be ground.Typical gearbox gears are straddle mounted gear shafts. The terms "straddle design" means that the gear is provided with as haft that extends from both sides of two other face to support the bearings Unlike many other designs, gear shafts with integral bear in graces are assembled with bearings that not. Due to this design the gear shaft with in tetra bearing races 21 are very compact with the advantage to reduce dimension and weight of then tire gearbox system. on the left a bearing with its race mounted on the gear shaft, while on the right side the bearings do not have any inner race and the rolls are directly.

Gears haft with integral bearing races includes a shaft with a housing to accommodate at bear in grills. Machining of this integral bearing race that includes an abutment shoulder, require spirit heal grinding done by stilted wheel, because the verticality enwall must bet a gen it all y ground to avoid scratches.

Inferno nautical companies there are basically two types so machine forty landrace plunges grinding: - Traditional machines - CNC machines In the category of traditional grinders, you can see for tsunami chin while for the modern CNC category Studier machine. The Fortuna technical machine requires big effort from operator, in terms of manual skill, knowledge and attention. While Studier S41 works with a CNC programmer that reduce the actions needed by the operator in particular the LCD display gives helps to the operator with feedback from the grinding by an in-process continuous check. A curious feature of Fortuna grinder is a button to control feed by a set of manually pulse. It boasts many technical features, such as the revolutionary Studier-Guide system with high precision axis movements with linear motors, extremely fast direct drives' an even a larger Varian to grindings wheel type.

IV. WORKING PRINCIPLE

A cylindrical grinding machine is used to precisely shape the exterior surface of a work piece. The cylindrical grinder is a type of grinding machine used to shape the outside of an object. The cylindrical grinder can work on a variety of shapes however the object must have a central axis of rotation. This includes but is not limited to such shapes as a cylinder, an ellipse, a cam, or a crankshaft. Grinding Wheel: Rotates to grind the work piece. A grinding wheel is basically a precision tool composed of abrasive grains held together by a bonding material. The abrasive grains provide the wheel with its cutting ability which helps in finishing the material to the required dimensional accuracy and surface finish. The work piece is securely held between the headstock and tailstock, with rapid rotation between these centres. The grinding wheel, responsible for the actual grinding, rotates in the opposite direction at variable speeds relative to the work piece and is affixed to the wheel head. The work piece is securely held between the headstock and tailstock, with rapid rotation between these centres. The grinding wheel, responsible for the actual grinding, rotates in the opposite direction at variable speeds relative to the work piece and is affixed to the wheel head. Mechanical linear actuators have rotary motion as their input by using a handle or control knob, and they convert it into linear motion. The motion is converted by using screws, more commonly known as lead screws, wheel, and axle, or cams but lead screws are the most prevalent of all.

Fig 2: Mini abrasive belt grinding machine

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V. CONCLUSION

Grinding standard allows identifying stable setoff parameters and therefore adorers bust process mainly to avoid grinding abuses difficult to be detected that could cause failures during flight. The cylindrical grinding process standard herein defined has as its goal to achieve an expected scrap rate for new components launch equal to zero, with reference to grinding abuses. Thus, it's pursued to avoid undesired previous scenarios were some scraps duets grinding burns have been occurred, leading to high economic losses. To identify grinding burns limits, This DOE would be also beneficial to find limits that could lead to higher productivity, and at the same time to test the potentiality of power and acoustic monitoring as new methods to prevent grinding abuses. The target is to have scrap rate due to work piece burns equal to zero on components ground with CNC machines. This target can be achieved by the definition of a standard set of process parameters that creates as face cons is tent to accuracy, in terrify and damage to learner quire mends and by robust control of these parameters.

There for ethos and here under fined in targeted with three as bed spread sheets is helpful in process definition of grinding input parameters with the purpose to reduce iterations for grinding technological validation for new parting production "NPI". Continuous improvement shall be pursued on process control methods to identify the optimal parameter settings and to further prevent grinding abuses. Process monitoring (e.g., grinding power monitoring) could be helpful for this purpose, thus the idea of its in salvation on CNC grinders

- Learning by experience
- Use technical product and processes men agreement system
- Improve comprehend scion fem. chemical drawing
- Effective communication, interfacing with a large variety of employees and managers in their roles
- Balart far complex companion ironmen, developed by functions in global

VI. REFFERENCE

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