



## STUDY OF EXPERIMENTAL INVESTIGATION ON THE ADVANTAGES OF RECONDITIONING OF CNC LATHE MACHINE TOOL

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### **Abstract**

The machine tool reconditioning process rejuvenates the machine giving OEM performance levels. This reduces maintenance costs and losses incurred due to increased downtime. This is particularly important for high-volume operations.

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### **Introduction**

Selection of remanufacturing technologies should be based on the principle of uncertainties reduction which requires generalized expert thinking based decision making. Economic value, technical adequacy and environmental effects criteria can be used to assess remanufacturability based sustainability which is highly uncertainty dependent modeling approach. The performance of assessing using guiding criteria should be elaborated to accommodate and enhance knowledge contribution in field of selection of technology. Remanufacturing technology portfolio selection can suffer from significant managerial due to human being ambiguity in decision making which requires uncertainty to be moderated in evaluating and ranking for selecting of appropriate technology. Purchasing cost, disposal cost, operating cost and flexibility can impact technology performance largely which requires experience based experts complementation to cope with. Diversity of criteria can help management to be conducted thorough analysis to make informed decisions that accommodate ambiguity of experts in decision making. Environmental impacts and costs of

remanufacturing can be quantified in term of carbon emissions based on an overall quality coefficient that reflects the quality distribution of faults in lathe bed to set up a correlation between the carbon equivalent emissions and remanufacturing difficulty factor. An overall complex quality coefficient can be measured under different conditions of lathe to be remanufactured to describe the uncertainty in the quality. End-of-life technology routings can include whole machine remanufacturing, direct reuse of components, remanufacturing of components for cannibalization or scraping of components for materials. Matrix of step transition probability and matrix of the difficulty factors can denote each step and each complete process flow. An overall quality coefficient can be constructed to reflect the quality distribution and perform a quantitative analysis of net environmental benefits and costs. Uncertainty of faults conditions quantifying can lead to determine overall quality coefficient and the end-of-life strategy routing factor. Environmental benefits and uncertainty can be correlated to determine carbon emissions reduction in the real remanufacturing. The amount of

reduction in carbon emissions increases with the increase in the overall complex quality coefficient. Optimal remanufacturing point can fulfill the environmental responsibility to dominate environmentally friendly industrial activities

## OBJECTIVE

- To study of CNC machining operation.
- To Study optimization Of Taguchi Method
- To find out the minimum machining time required
- To find the maximum MRR.
- To find out minimum surface roughness.

## METHODOLOGY

This project helps for increasing the efficiency of machine; it also helps to reduce the losses in power transmission which helps to increase the productivity of machine. The main objectives of project is to improve the lathe machine from the point of view of better working condition to increase the production, decrease the manufacturing lead time.

- A. Scope Of Work
- B. Observation and identification of failures in lathes.
- C. A systematic study of failures can help in identifying the critical sub-system of lathes;
- D. this will be useful for identifying the condition monitoring needs of lathes.
- E. Identification of critical sub-system based on the failure data analysis.
- F. The failure data has to be collected and analyzed systematically.
- G. The failures can be rectified by servicing.
- H. If servicing is not possible then opted for replacement of parts.

Remanufacturing-upgrading methodology to convert conventional lathe into CNC machine tool

By application of remanufacturing to upgrade conventional machine lathe into CNC machine for educational and industrial training applications, cost will be at its lower level and the chance to share resources and facilities among education, training industry and remanufacturing industry can be obtained. Environmental viability is also consistent where high flexibility is supported with further reduction of power and carbon emissions through using of CNC machines technology to eliminate worn dovetail guide ways which can lead to save high added value parts of lathe. Social viability will be satisfied based on economic and environmental viabilities where human employment, development and experience accumulation can be delivered through education, training and remanufacturing industry. Mate/Insert/Bolt based emerged CNC technology assembly can reduce cost of purchasing replacing parts, material resource consumption and electrical energy consumption. Remanufacturing can restore standard quality with reduction up to 60% in energy, 70% in materials, 50% in cost and 80% in air pollution which are important parts of circular economy. Reliability of remanufactured products is a major criterion since conventional lathes are of cores with varying conditions. Cost includes machine cost and tool cost. Reliability and cost criteria are critical since they play role in realizing a successful remanufacturing process planning where they directly affect the success rate of remanufacturing. Reliability can be represented by failure rate of remanufacturing operations which are influenced by the quality of lathe to be remanufactured.

## DESIGN OF EXPERIMENT

In this study, three machining parameters were selected as control factors, and each parameter was designed to have three

levels, denoted. The experimental design was according to an L9 array based on Taguchi method, while using the Taguchi orthogonal array would markedly reduce the number of experiments. A set of experiments designed using the Taguchi method was conducted to investigate the relation between the process parameters and delamination factor. DESIGN EXPERT @ 16 Minitab software was used for regression and graphical analysis of the obtained data.

## RESULTS AND DISCUSSION

Scenario based analysis, remanufacturing experience based analysis and comparative literature based analysis are used as tools for modeling, analysis and discussion. Three scenarios are used to assess the re-manufacturability of lathe include: A1: Conventional technology aided conventional lathe remanufacturing A2: Emerged technology aided conventional lathe into CNC lathe remanufacturing A3: Advanced technology aided conventional lathe into CNC lathe remanufacturing Mate/Insert/Bolt fastening system will be used to assembly CNC technology to mechanical structure of conventional machine tool. Criteria to assess the most appropriate alternative of end-of-life strategy which can lead to re-manufacture upgrade conventional lathe into CNC lathe include: C1: Reuse C2: Repair C3: Recycle C4: Remanufacturing C5: Remanufacturing-Upgrading Assessment philosophy states that the most appropriate end-of-life strategy which leads to change conventional lathe into like new CNC machine tool, Fig. 29, will be of the highest weight so assessment matrix can be shown in Table 1 and represented in Fig. 30. Relation interference is also taken which means remanufacturing can be conducted as an intermediate step to be followed by upgrading so this will link strategies of remanufacturing and remanufacturing-upgrading. Reuse is also interfered with remanufacturing or remanufacturing-upgrading while repair or

recycling will not lead to change conventional lathe into like new CNC machine tool. Reuse can represent the foundation of remanufacturing-upgrading process as an effective economic and environmental alternative source of replacing components. Repair cannot lead to change conventional lathe into like new CNC lathe since there is no standard repairing to be conducted by original equipment manufacturer or repairing third party to integrate their parts in lathe remanufacturing-upgrading but can be a source of knowledge and experience. Recycling is of zero contribution but it is weighted to maintain consistency of assessment matrix. Remanufacturing can be done by original equipment manufacturer or third party remanufacturer and remanufactured lathe can be used for remanufacturing-upgrading purpose so remanufacturing is good contributor to change conventional lathe into like new.

### Processing efficiency criterion

Lathe processing efficiency can be mainly the processing time of components that compose the lathe to be remanufactured. Remanufacturing can improve the processing efficiency and the time for machining the same products would decrease. Processing efficiency can be evaluated by the processing time as shown below :  $C5 = tr/tn$  , if  $tr \leq tn$  and  $C5=1$  if  $tr > tn$  and  $tn$  represent the time required to produce the same work piece respectively for remanufactured lathe and the used ones. In general, the processing efficiency of remanufactured lathe can be improved by increased cutting feed rates, increased spindle speeds, converting manual machines to full CNC, consequently the processing time decreases.

### Flexibility criterion

Flexibility can be quantified by expert judgment and classified on group of family knowledge processing range. Remanufactured machine tool into CNC machine can conduct more processes and

produce various shapes of work-pieces since it is of flexible configuration. So the processing range is expanded and more available processes are increased appropriately while the structure is being complex configuration.

### **Ergonomics criterion**

Easy-to-clean, easy-to-use, safety, maintainability, comfort and coordination of human-machine interaction are elements of ergonomics evaluation process. Ergonomics evaluation is an expert judgment-based assessment of remanufactured lathe into CNC machine. Lathe can mainly responsible for the processing of longitudinally mass distributed parts which conventionally is driven by automatic feeding and has a bed of two rail structures as well as a manual operated tool holder. Such performance can be enhanced incredibly if into CNC conversion is carried out. The lathe can be used for decades which this can lead to: -

- Serious worn of mechanical parts.
- Distortion of geometric precision.
- Malfunction of electrical control system and cables.
- The machining accuracy cannot be met.
- Surface roughness of cylindrical turning will be Ra 6.3~3.2
- Surface roughness of internal cylindrical turning will be Ra 6.3~3.2,
- Taper of cylindrical turning will be 0.05 ~ 0.1/100. Some papers study several scenarios of performance of the lathe restoration by applying remanufacturing under governing points of: -Considering the customer requirements.
- Decision-maker preferences.
- Conditions of the machine.

### **Alternatives of Remanufacturing Upgrading Solutions**

Alternatives of remanufacturing solutions of lathe can include: - Conventional technology aided conventional lathe remanufacturing which is attributed with:-

- Lowest cost alternative restoration.
- Like-new conditions.
- No CNC system to be used.
- Damaged or worn parts replacing.

### **Advantages of these machines and more**

#### **CNC machine reconditioning and retrofitting, the benefits of these machines and a lot more**

CNC machining refers to a procedure heavily employed in the manufacturing sector, particularly when it comes to using computer systems for controlling machine tools. CNC or Personal computer Numerical Handle can assist in the manage of numerous tools like routers, lathes, mills and grinders. Nowadays, inside the scope of this post, we will go over, at length, several facets of CNC machines—their positive aspects and disadvantages along with a handful of other relevant elements of this method.

Now that you have gathered a faint concept as to what the CNC machines are, you may possibly as effectively go via the list of benefits and disadvantages of these machines— so that, you are able to make an informed choice with regard to its installation. We will begin off with the advantages.

A single of the fundamental variables which facilitate operation efficiency of the CNC tools is that operators are not necessary to switch it off frequently thereby interrupting workflow. A machine can run twenty 4 hours a day and 365 days a year to be switched off only for occasional maintenance.

Moreover, it is extremely easy to find pros offering CNC machine reconditioning and retrofitting services. You are not necessarily needed to stroll miles in order to discover them. A lot of information can be availed online. There is no dearth of service providers who can execute repairs, reconditioning, lubrication, geometric rebuilding soon after thorough diagnosis of problems in allied regions. All these

services are provided at pretty inexpensive rates. Nonetheless, in order to zero in on reliable service providers, you need to conduct due study on the background of the organizations. Make certain that you are going via the website thoroughly, comparing the prices presented by them and discovering out if at all the business is respected or not.

As opposed to difficult units like milling machines or manual lathes, which can only be employed by trained engineers, CNC units can be utilized by lesser skilled employees as well. And what more? Only one particular person can be employed to oversee the entire operation. When these machines are programmed they are very good to work on their own.

These machines are programmed to render exactly identical styles even manufactured for thousand occasions.

## CONCLUSION

The visibility programme is an effective method to identify orientations for finishing operations. However, performing roughing operations within a finishing orientation sets tends to constrain the roughing task and causes several inefficiencies. This study overcomes this constraint by formulating an alternative method to find optimum orientations for roughing operations. Implementing four roughing orientations reduced machining time and tool contact length.

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