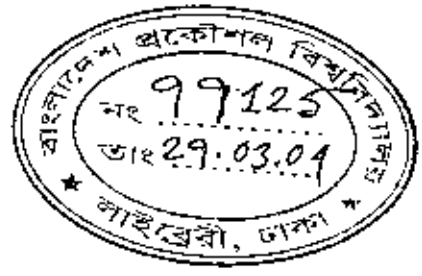
Master of Engineering in Industrial and Production Engineering

A thesis titled

Accuracy test of lathe machine and their development in Bangladesh



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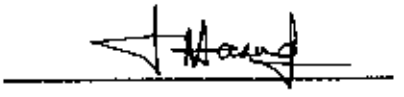

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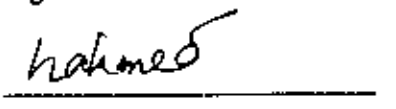

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Abstract

Most of the lathe machines in Bangladesh are not go through the generalized regular accuracy tests. Thus they are not as much as accurate as the manufacturing specification. Because, these lathe machine are not properly maintained. To check the accuracy of the exiting machine tools in different area of Bangladesh. We select most common and widely used lathe machine under investigation. Then we select some lathe machine in different geographical location of Bangladesh. Some of them are very old, some are new and some are from different country of origin.

Some suitable accuracy test was develop to check the accuracy of the exiting lathe machines. Bed straightness and machining accuracy were measured for different lathe machines. The results are compared with different lathes. According to result it is found that each machine are required proper maintenance to run with high accuracy.

Contents

List of Figures

List of Tables

Chapter 1

1.1 Introduction:

Today, every product known is a product of machine tools. If not used directly in the manufacture of a product, machine tools are required to produce the material and equipment necessary for its processing or growth.

The most common machine tools are lathes, milling machines, drilling machines, shapers, and grinders. There are many varieties of special-purpose machines used in manufacturing which are adapted from one or more of the basic machine tools.

According to the National Machine Tool Builders Association, "a machine tool is a power driven machine not portable by hand, used to shape or form metal by cutting, impact, pressure, electrical techniques, or a combination of these processes"

Without machine tools, the population of the world could not feed or clothe itself. Without machine tools, modern man would cease to exist. Without machine tools, modern civilization could not exist.

Machine tools are those that we can get desired shape, size, dimensional accuracy by removing excess material in the form of chips with the help of wedge type device is called machine tools.

For the various operations that must be performed in the metalworking shop, there are many different types of machines, each designed to do work of a specific nature. Actually, there are over 500 different machine tools, each built in a variety of sizes and forms. For each type and size of machine tool, there are many special work-holding devices called attachments.

Machine tools are grouped in accordance with their uses, their sizes and the degree of accuracy required from them. Experience shows that lathe beds wear

more rapidly in the center than at the ends, moreover, the overhanging weight of the carriage and the cutting resistance forces the front shears (apron side) down and lift the rear shears. Hence, the tolerance must be directed in oppositions to this deformation. The front shears of a new lathe are there fore permitted to be arched or humped upwards only, while the rear shears may be less convex or even slightly concave.

To avoid the undesirable combination of a maximum convex tolerance for the front shears and a maximum concave tolerance for the precision of operation is the most outstanding characteristics of today's machine tools.

Dimensional accuracies during the past 50 years have progressed from one thousand of an inch, to one ten-thousandth of an inch, and now approach a millionths of an inch. This is about one three-hundredths the thickness of a human hair. Such precision makes it possible and feasible to produce hundreds of identical parts, all so much alike that they may be freely interchanged or substituted in assembly or repair, without hand-fitting.

Lathe machine is the common machine tools. We found the location of machine tools in our country. We see the maximum machine in our country is "Lathe Machine". In rich resign and poor region in our country lathe machine is available. We have collected the original condition of lathe machine in our country. Some lathe machine is very old, they working from twenty years ago but their accuracy is not bad, surface flatness is also good, these machines are meintenance by workers and unskilled labour but their accuracy is still good.

The lathe machine is a power-driven machine tool used to turn and cut metal. It is one of the oldest and perhaps most important machine tools ever developed.

Besides lathe machine in our country is available in any workshop, also its price is limited so we can bye or arrange a lathe machine for our good quality product.

So choose the lathe machine out of other machine tools.

A lathe can perform many different operations. A few of the more common operations are facing, straight turning, taper turning, parting, necking, thread cutting and forming.

Lathe size is determined by swing and length of the bed. The swing is twitch the distance from the live center point of the spindle to the top of the bed, or the largest diameter that can be turned over the ways of a lathe. The length of the bed includes the part the headstock rests on. It determines also the distance between centers.

The Bed is the bese or foundation of the lathe. It is a heavy rigid casting made in one piece. It is the "backbone" of the lathe and holds or supports all the other parts. Located on the top of the bed are the ways. More expensive lathe have a combination of V ways and the flat ways. Less expensive lathe has flat ways only.
Accuracy of the ways determines the performance that can be expected from a lathe. Ways must be true and accurete so that the headstock, tailstock, and carriage are always in true alignment.

We find the Number of old lathe machines that are used in different geographical position of our country. Some of them are even more then thirty years old. Collected the addresses of the workshops and industries that are using lathe machines in Dhaka and Khulna city. In Dhaka city the maximum lathe machines are found in old Dhaka region i,e dohalikhali. At present in old Dhaka region various kinds of lathe machines are available for any complex works. In this region many kinds of lathe machine are ready for sell and observe their works.

In khulna city maximum lathe machine are working in the region of shakepare. In this region many industry are use lathe machine to produce good finish product. But in khulna city no lathe machine is not ready for sell. In this region we observe their works. Many workshops works without their machine accuracy. The spindle speed is high and product is not accurate. In shakepera some workshop works continuously without their machine accuracy, unskilled labour, and also works rough environment. This machine maintenance by unskilled labour.

But some machines have good accuracy, surface flatness, table straight, spindle speed. e,t,c which is control and produce accurate product. Khulna is the industrial area of our country, so in this region machine tools should be good in quality.

The lathe machine is very necessary for industrial work or any other complex work. Our maximum industry needs various complex parts to be repair or replace by a new one. Lathe machine can solve this problem by making this part.

In khula city we collected four workshops which is used lathe machine. In this city some workshops used heavy-duty lathe machine and some workshops used high-speed precision gap-bed lathe machine from fifteen years ago.

In Dhaka city we have collected eight organizations, which are using lathe machine for their works from sixteen years ago. In Dhaka city maximum lathe machine situated in old Dhaka i,e Dhoalikhali and in khulna city maximum lathe machine are in shakepara. In Dhaka city many kinds of lathe machine are available for work and also new lathe machine is available for sell. Bangladesh makes some lathe machines, which is available in old Dhaka region. But in khulna in not ready to sell a new lathe machine.

From the analyzing data of lathe machine in Dhaka and khunla city the best quality of lathe machine depends on their regular maintenance, monitoring and test report.

The maximum price of lathe machine is also depends of their quality, if quality is best, price is also high. we see some workshops in Khulna and Dhaka city, have same price lathe machine. we have collected data of lathe machine from various organizations since two months. Also apply technique to collect data from above mentioned organization.

For this situation my project teacher help me to collect data and information.

Any type of equipment may be used as long as the specified measurement can be carried out with the required degree of accuracy.

A lathe is a machine tool, which turns cylindrical material, touches, a cutting tool to it, and cuts the material. The lathe is one of the machine tools most well used by machining.

A material is firmly fixed to the chuck of a lathe. The lathe is switched on and the chuck is rotated. And since the table, which fixed the byte, can be moved in the vertical direction, and the right-and-left direction by operating some handles .It touches a byte's tip into the material by the operation, and make a mechanical part.

In order to get an efficient process and beautiful surface at the lathe machining, it is important to adjust a rotating speed, a cutting depth and e sending speed. Please note that the important elements cannot decide easily, because these suitable values are quiet different by materials, size and shapes of the part.

The various tools and equipment used for carrying out the accuracy tests
One of the most widely used instruments today in layout, inspection, and quality control operation is the dial indicator.

The dial indicator has precisely finished gears, points, and other working parts that makes possible measurements from one –thousands to fifty melons of an inch, depending on accuracy requirements.

Dial indicators are used to measure or variation from some standards. The indicator is normally set at zero on the part or a standard of known size. When the part being measured is placed under the measuring point, the indicator hand shows the plus or minus variations of the part from standard dimension.

Dial indicator of the balanced- type. Each small division is0.0005 and two division is 0.001.The dial gauge should have clearly readable gradations on sufficiently large dial. It need not finer than 0.001 mm. (0.0004 inch) Finer graduations, which are required in special cases, should only be used if the measuring accuracy of the instrument justifies it. In such cases graduations down to 1μ (0.0004inch) may be used.I have collect dial gauge from BUET machine shop and went mentioned region for my work.

We used Tacho meter for measuring speed of machine tools, we collect from BUET machine shop. This is used to check the true running of the spindle of the lathe machine.

Test charts are complied for each type of machine tool giving details of tests to be carried out and permissible errors. They are extensively used as guide-lines for conducting tests.

1.2 Literature Review:

An unknown Frenchman is credited with developing the first useful lathe in about 1700.The man most responsible for the lathe as we know it today however was the English inventor Henrey Maudslay starting out as an instrument maker, Maudslay developed into one of the first great mainly to the improvement of screw-cutting machinery. Maudslay,s first important invention was a bar lathe mad entirely of iron (no wooden Frame) and equipped with a highly original slide rest. This device laid the groundwork for his series of increasing more accurate, self-acting screw-cutting lathes. He perfected his first model in 1800, the same year Eli Whitney initiated the American system of mass production.

Accuracy tests conclude the process of designing and manufacturing a lot-produced machine tool. These tests are simpler than all the rest and are usually conduced by the inspectors of the plant inspection department under shop conditions. Their purpose is to check the performance of the machine tool and whether it compiles with the manufacturing specifications.

According to present-day manufacturing specifications, acceptance tests include preliminary trials an idle-run test, performance tests under load, checking whether the machine tool complies with the accuracy standards, and tests to determine the rigidity and vibration-proof properties in metal cutting.

Moreover, the machine is always carefully adjusted and aligned during assembly of on the test stand at the manufacturers works, whereas experience has shown that erection in the workshop of the user is not always carried out with sufficient care. Sometimes for reasons of economy, particularly in the case of heavy machines foundations are made too light and are not extended to a sufficient depth. Faculty erection may cause working inaccuracies, which may then wrongly be blamed on the machine.

As a rule these tests give a general idea of the quality of the machine tool without taking much time or requiring complex apparatus. Therefore, at the manufacturing plant and following overhauls and even medium repairs, acceptance tests are to be conducted without fail. For this purpose the machine tool is installed on a special foundation. With the aid of adjusting wedges of leveling shoes, positioned in the same manner as for installing the machine for regular operation.

These tests commence with consecutive changes in the main drive speeds from the minimum to the maximum values.

The machine should continue to operate at the maximum speed until the spindle bearings reach a steady temperature. The temperature should not exceed 85°C for rolling and 70°C for sliding friction bearings in other mechanisms the bearing temperature should not exceed 50°C. At the same time, the operation of the feed mechanisms checked at the low, medium and high working feeds, as well as rapid traverse motions. "Proc. Conference on specification and Tests of Metal Cutting machine Tools. UMIST, P.O., Box 88, Manchester."

The machining accuracy of a machine tool is characterized by the magnitude of the deviation of the in size, shape and ralative positions of the elements of the surfaces obtained from the corresponding parameters of the given geometrical surfaces.

At the present time, practically no accuracy standards of machine tool operation tool exist that give a single valued definition of machining accuracy. This is due to the large number of such factor, the principal ones being:

1) Geometrical (including kinematics) accuracy of the machine tool- fixture-cutting tool-work piece complex, or complex, or system, taking into account the influence of clearances and the errors of the locating datum of the work piece

2) Processing rigidity which characteristics the deformation of the system under load.

3) Stability of the system in setting up the work, traveling the units and during machining.
4) Forced vibrations.
5) Dimensional wear of the cutting tool.

In general, the tests should be carried out at the manufacturers works. It is hardly possible for the machine tool manufacturer to assume the responsibility for the consequences of treatment to which machine tools are subjected whilst stresses caused by a fall during transportation, which may result in deformations and possibly, cracks, thereby rendering the entire machine useless.

Obviously, the purchaser of a machine is fully entitled to repeat the tests in his own works, but if it is his intention to do so he should have at his disposal all the necessary testing equipment and an experience inspection staff. The manufactures test chart, a copy of which is supplied to the buyer, should serve as a guarantee that the machine have been tested in the manufacturers works under precisely the conditions under which it will later have to work.

In the majority of cases, working limits to be attained with the machine in operation are specified at the end of the test charts. These apply to finishing operation only. A finishing cut on a lathe machine, For example, has been defined as one producing a chip of about 0.1 to 0.2 millimeter (0.0004 to 0.008 inch) depth and 0.05 to 0.1 millimeter (0.004 to 0.008 inch) depth and 0.05 to 0.1 millimeter (0.002 to 0.004 inch) feed, taken with the highest speed which is permissible for the material surface must be smooth and without chatter marks which would indicate inadmissible vibration.

The degree of working accuracy of the machine, besides depending on the machine itself, is also influence by such other factors as:

1. The type of cutting tool and its condition (rake angles, hardness, eccentricity in the case of milling cutters , etc)
2. The tool holder (e.g. milling arbors)
3. The cutting speed, feed and chip section
4. The material to be machined
5. The shape, size and rigidity of the work piece.
6. The chucking or clamping equipment
7. The skill of the operator.

E. J. Goddard, A. Cowley and M. Burdekin. A measuring system for the evaluation of spindle rotation accuracy, Proc. 13th MTDR Conference, Macmillan Press Ltd. 1973

The author considers it wrong to draw a dividing line between practical and geometrical tests. The so-called practical tests check the accuracy of the finished components, whilst the geometrical tests cover the manufacturing accuracy of the machine. Both measurements are practical and both from part of one indivisible whole. Neither the user nor the manufacture can dispense with either of these tests. The reason for giving prominence to the manufacturing accuracy of the machine in the test producer lies in the fact that if covers the whole machine and can be carried out unambiguously and without difficulty. The cutting tests can only be carried out for random sixes and conditions, for otherwise the time necessary for their execution and their costs would be prohibitive.

The manufacturing accuracy of the machine and the accuracy of the finished work piece are interconnected. When a machine tool is assembled from components, which have been machined, to gauges, the unavoidable machine errors have to be adjusted during assembly in such a manner that the finished machine tool will produce work pieces within the required limits.

The assessment of the positioning or displacement accuracy involves a test which is made along the axis at the tool position and where the actual displacement, when moved to a target position along this axis, is compared with the nominal distance to that target. The difference between the actual and target positions is defined as the error at that target position.

The importance of machine tool performance and evaluation is evident from a recent major international, multi-disciplinary survey on the state of the art in the " Technology of Machine Tools". This project was financed by the United States Air Force and undertaken by a team of international experts, collectively known as the machine Tool Task Force (MTTF). The published appropriate to the understanding of the operating performance of modern machine tools and consequently complement the subject matter of this book.

1.3 Summary of the review:

The principles of the tests outlined in the previous sections are still applicable to most conventional or manually operated lathe machines. However, for modern lathe machines, which are installed with digital readout or numerically controlled systems, the inherent accuracy requirements should in general be better than those for the equivalent conventional machines.

The reasons for this increased accuracy requirement is not only the desirability for minimum operator intervention, but also the fact that machining sequences may necessitate a more demanding inherent accuracy.

The accuracy of a component produced on modern machines depends upon the interaction of many factors. Setting-up is the responsibility of the user, whilst basic alignments of the machine are clearly their responsibility of the machine tool maker.

A positioning accuracy check is now a standard test for most machines of the NC type and this procedure, together with a contouring accuracy check where applicable, is discussed in the following sections. The relevance of these basically geometric tests should not however, be underestimated since they form a basis on which to superimpose the errors resulting from functional effects.

The accuracy performance of the lathe machine is specified at the end of each chart. Recommended procedures for testing the working accuracy of lathe machine.

The accuracy obtained with a particular type of equipment employed must always be compared with the required accuracy of measurement.

1.4 Objectives of the project work:

The main objective of the present work is to make a systematic investigation in respects of precision.

Precision means the accuracy with which a job can be manufactured on a machine tool.

Precision of operation is the most outstanding characteristics of today's machine tools. Dimensional accuracies during the past 50 years have progressed from one thousand of an inch, to one ten-thousandth of an inch, and now approach a millions of an inch. This is about one three-hundredths the thickness of a human hair. Such precision makes it possible and feasible to produce hundreds of identical parts, all so much alike that they may be freely interchanged or substituted in assembly or repair, without hand fitting.

Chapter 2

Experimental Investigation:

Bed is the main element which acts as a base for the rest of the units. Bed is usually made from cast iron has more compressive strength, is a cheap material and can absorb the vibrations set up during machining.

The bed must be straight longitudinally. In the case of beds up to 10 feet long. The straightness of the latter is checked by placing the dial gauge at intervals of about 300 millimeters (12 inch) along the whole length of the bed. For the straightness test the dial gauge readings are taken in several positions along the bed.

Machining accuracy depends to a considerable extent in many types of machine tools upon the rotational accuracy of the spindle, which transmits motions to the cutting tool or to the work.

We measure spindle speed of various lathe machine by tacho meter. The maximum spindle speed is obtained 880 RPM from the mirpur ceramics and sikder enterprise. Most of the workshop set extra pulley for increasing spindle speed. Normal speed is not work properly, so they set pulley to improve speed for smooth surface finish of the product.

We also measure the surface flatness of cast iron disk by dial gauge. For the surface flatness test of cast iron disk the dial gauge readings are taken in mentioned workshops. At first cast iron disk is set in the chuck, then set dial gauge on the disk. After set the dial gauge the machine is running and obtained reading from dial gauge. The maximum accuracy of surface flatness is 0.0003 mm.

We also measure the maximum diameter of work piece that can be machined. Here at first the job is hold to the chuck then measure the dia of work piece. The maximum dia of work piece from carriage to center is 6 inch, and the maximum dia of work piece from bed to center is 12 inch.

When collecting data asked to the worker how old the machine, and what is the price of this machine. In this way collected data of various lathe machines from mentioned organization in our country.

First set the dial gauge stand on the carriage and then dial gauge set on the bed, when the carriage is move dial gauge also moves in the same direction. When set the dial on the bed it's first reading is zero position and moves the carriage, dial gauge reading also vary from 0 to 0.0005. In this following way we collect data of bed straightness and surface flatness of cast iron disk for various lathe machines in Khulna and Dhaka city. We see the schematic view of bed straight measurement and surface flatness measurement.

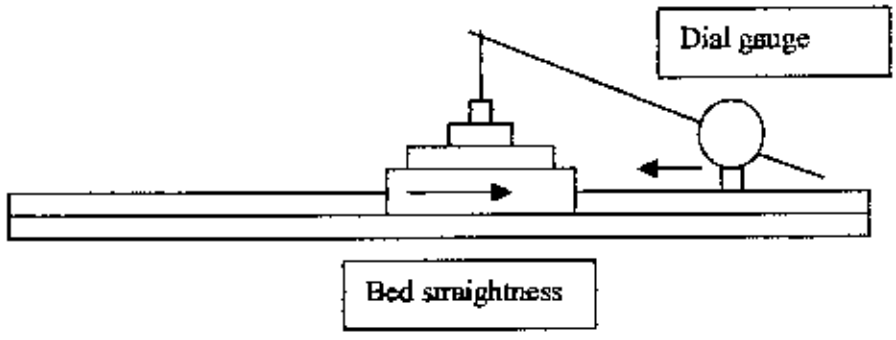

Figure.2.1 Schematic diagram of bed straightness measurement.

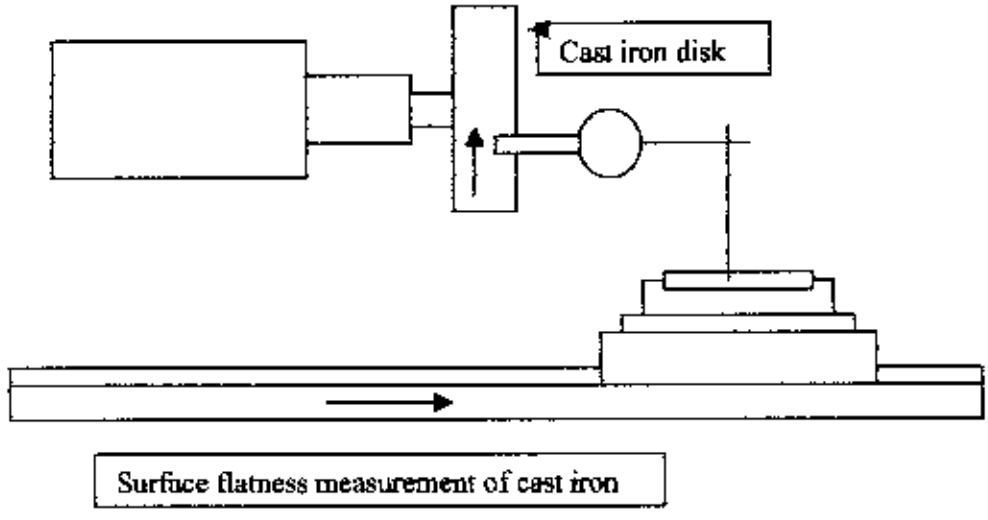

Figure. 2.2 Schematic diagram of surface flatness measurement.

Table 2.1 Various data of lathe machine in Dhaka city

Zone	Company Name	M/c	Made By	Bed straight (idle) in mm	Surface flatness(cast iron disk) in mm	Bed length in feet	Max.Spindle speed RPM	Max dia.of w/p.	Price in Tk.	Used life of lathe m/c (year)	Capacity in HP
Dhaka city	BMTF Lathe, Bangladesh, Dhaka	Engine lathe machine	BMTF	0.0005	0.0005	8.5	865	14"	1,30,000	15	4
	Daisy international ltd,Dulaikhali,Dhaka	High speed Precision GAP-BED Lathe	Pakistan	0.0005	0.0045	8.18	840	15"	1,10,000	12	3
	Alam international ltd,Dulaikhali,Dhaka	Heavy Duty Lathe Machine	Pakistan	0.00045	0.0004	8.36	860	12"	1,05,000	15	3
	Bangladesh Engineering ltd,Dulaikhali,Dhaka	Heavy Duty Lathe Machine	India	0.0004	0 0005	6.56	870	16"	1,25,000	12	2
	Pavel engineering ltd,Dulaikhali,Dhaka	Heavy Duty Lathe Machine	India	0 0005	0.0004	7 21	850	12"	1,10.000	16	2
	New star iron ltd,Dualikhali, Dhaka	Heavy Duty Lathe Machine	China	0.00035	0 00035	7.87	865	14"	1,20,000	10	2
	Gear machine ltd Dualikhali,Dhaka	High speed Precision GAP-BED Lathe	India	0 00045	0.0003	8.20	860	14"	1,20,000	12	3
	Mirpur ceramic ltd.Mirpur,Dhaka	High speed Precision GAP-BED Lathe	Japan	0.00045	0.00045	9 02	880	16"	1,30,000	16	7

Table.2.2 Various data of lathe machine in Khulna city

Zone	Company Name	M/c	Made By	Bed straight (idle) in mm	Surface flatness(cast iron disk) in mm	Bed length in feet	Max.Spindle speed RPM	Max dia.of w/p.	Price in Tk.	Used life of lathe m/c	Capacity in HP
Khulna city	Nurro engineering ltd,Shakpara,Khulna	High speed Precision GAP-BED Lathe	China	0.00045	0.0003	8.46	830	13"	1,00,000	13	2.41
	Khulna works ltd,Shakepara, Khulna	High speed Precision GAP-BED Lathe	China	0.00048	0.0004	8.53	850	15"	1,20,000	16	2
	Sikder m/c ltd,Shakpara,Khulna	High speed Precision GAP-BED Lathe	China	0.00045	0.00045	9.02	860	16"	1,30,000	16	7
	Khulna shipward machine ltd,Shakpara,Khulna	Heavy Duty Lathe Machine	India	0.0005	0.00042	8.20	860	14"	1,15,000	15	4

Chapter 3

3.1 Results and Discussion:

The results of the investigation to highlight the accuracy of machine tools. It is observed that durability is more with increase in error. From table2.1 shows the capacity of lathe machines compare with each other that are uses in the workshops. From result we get the durability is more, surface flatness are inaccurate. It also shows that various uses lathe machine compare with durability and surface flatness. durability and bed straight is also compare with various lathes machine It observed when bed straight is more accurate that machine working some years ago, but when machines becomes more old that machines is not accurate in bed straight. So this machine needs to check accuracy and to improve quality by the accuracy test.

The various components of the machine tools are checked for movements in different directions .The main spindle is tested for, concentricity, axial slip, and accuracy of axis.

Working tests are carried out on the machine tools to check whether the machine tool produce finished components within the specified limits of accuracy.

Now we discuss various data of lathe machines that collected from mentioned organization.

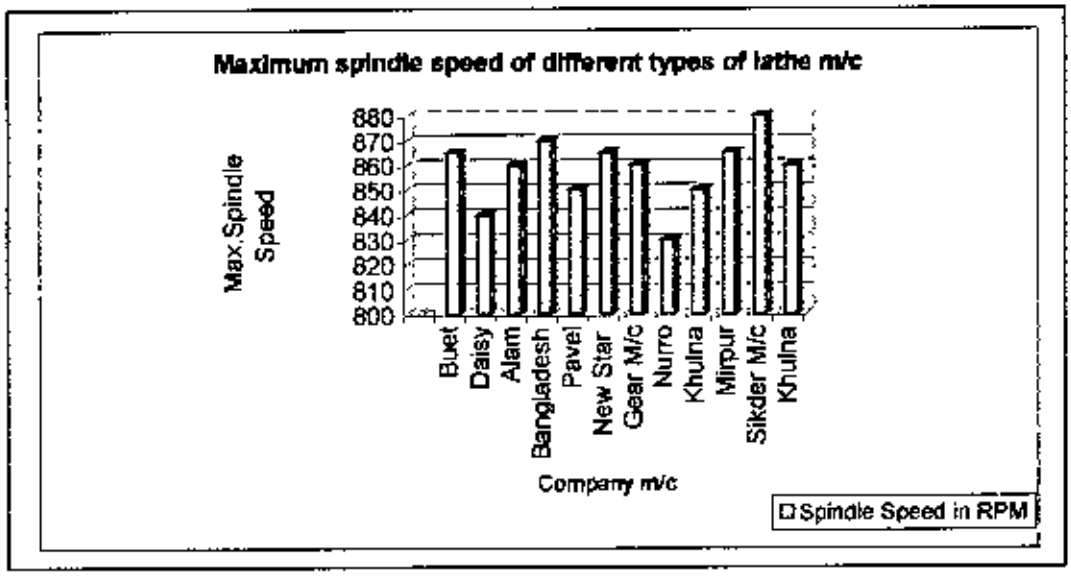

Figure: 3.1 Maximum spindle speed in RPM of different types of lathe m/c

In this graph showing various spindle speed of uses lathe machines. Here the x-axis is represented various workshops that are uses lathe machine and y- axis represented spindle speed in rpm. We measure this speed by the tachometer. First set a job (sample) in the chuck, then centering the job, and set tachometer in the job center, then we collect spindle speed. Here the maximum spindle speed is obtained 880 RPM from skider enter prise workshops. And the minimum spindle speed is obtained 830 RPM from nurro engineering workshops. This two workshops is in khulna city. From this graph we get the maximum spindle speed of various lathe machines also compare with each other.

Maximum workshops set an extra pulley in the motor to increase spindle speed for smooth surface finish and quick working.

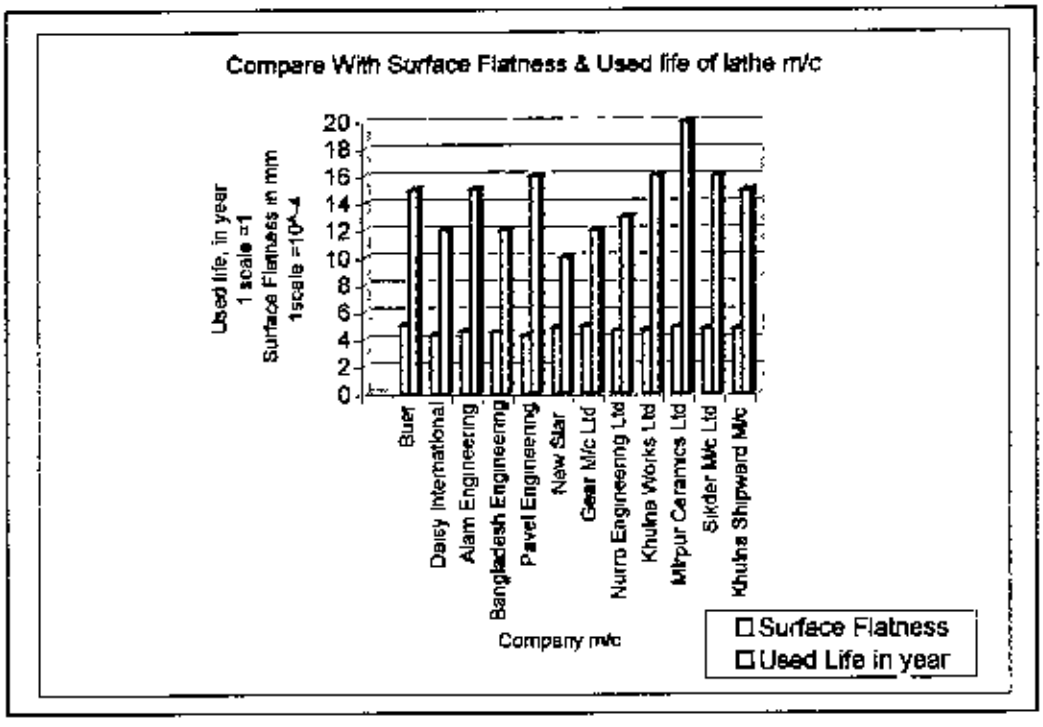

Figure: 3.2 Compare with surface flatness in mm and used life of lathe in year.

In this graph x-axis represented various workshops and y-axis represented used life of lathe in year and surface flatness in inch. We observed that used life is more surface flatness is not good. But used life is less surface flatness is not so good. Here the maximum used life in mirpur ceramics that is working from 20 years ago. The minimum used life is ten years but this machine accuracy is not good. Their maintenance is not properly going.

Here we observed that the maximum used life is twenty years but accuracy is same for all workshops lathe machines. Here the minimum used life of lathe machine is ten years but accuracy is like as others.

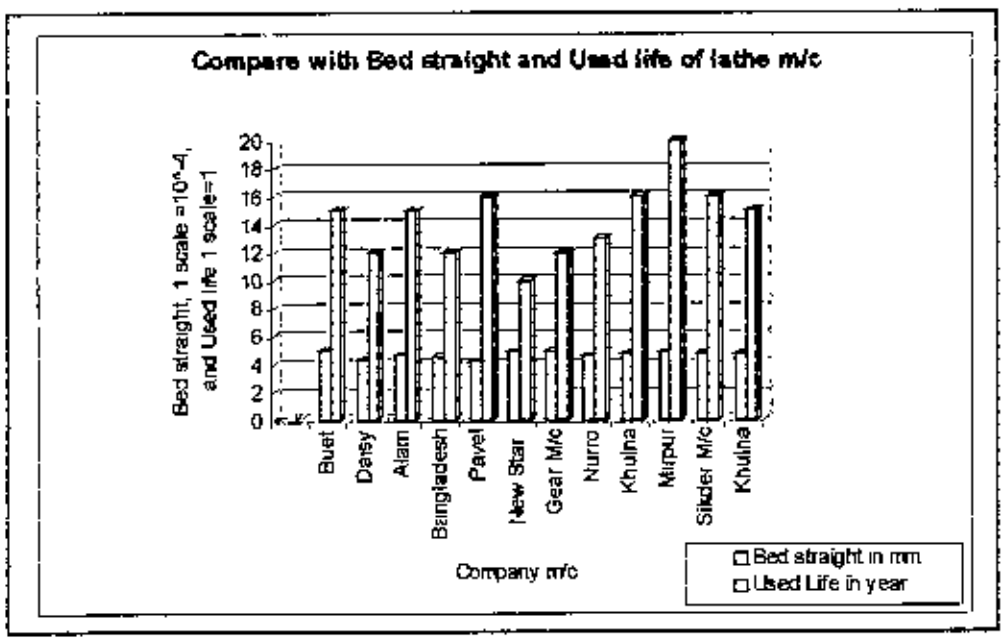

Figure: 3.3 Compare with bed straight and used life of lathe machine.

In this graph various workshops are in x-axis the used life of lathe machine and bed straight in y-axis. In this graph compare with used life of lathe machine and bed straight (idle), We found that the machine working from twenty years but his accuracy is not so good. The mirpur ceramics limited is working from twenty years, this machine accuracy is not so good but produce accurate product by their skilled labour.

Here showing used life of lathe machine is varying for various machines but accuracy or table straight is all most same for the entire machine.

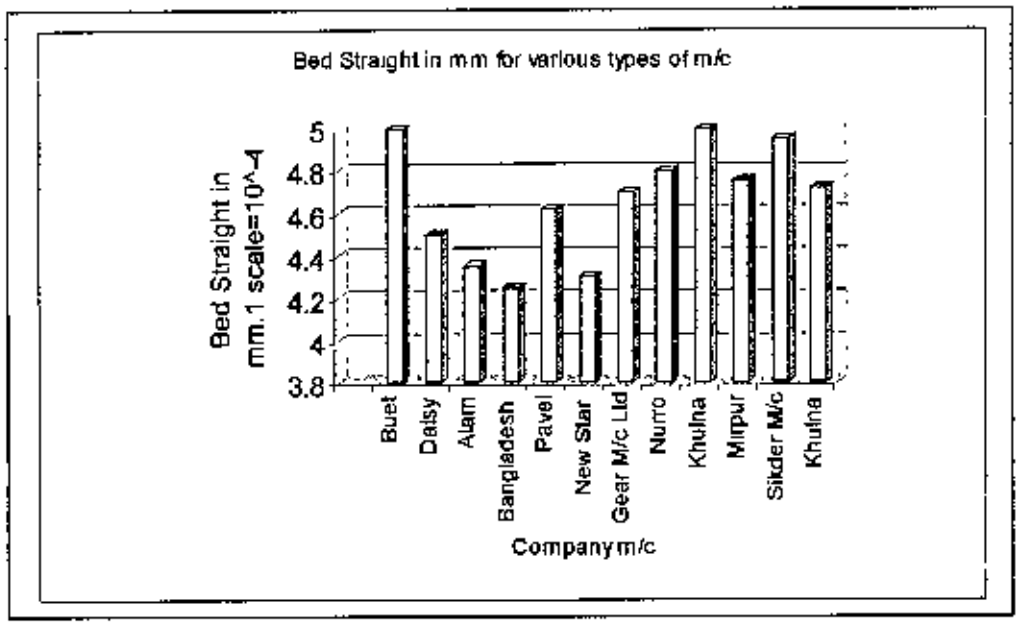

Figure 3.4 Bed straight in mm for various type of lathe m/c

In this graph x-axis represented various lathe machine and y-axis represented bed straight in mm. From various workshops we get the maximum accuracy in bed straight. We also found some machines are not accurate in bed straight, some machines bed length is not straight but they produce product. So accurate product is not produce by inaccurate machines. Here the some machines have bed accuracy is good and some machines table is not straight. I have collected accuracy of bed straight from various workshops.

We check bed length by dial gauge and measure accuracy.

From the result the maximum accuracy of a lathe machine is skider enterprise which is working from 20 years ago, but machine is working with accurate position, bed straight is not rough, surface flatness is good, so they produce good product by accurate machine.

A machine tool having passed the alignment tests should be examined for mechanical defects and limitations. The machine tool should be inspected to ensure that the machine tool works satisfactorily at all designed feeds and speeds. There are no vibration systems during cutting operations.
When the cutting operation is taking place on the machine, certain amount of vibrations is noted. There fore, machine is to be tested properly whether the amplitude of vibration is within the desired range.

The operation treatment of bearing should be limited to 80 to 90°C. if the temperature is increased then artificial cooling is to be provided.

The Headstock should be so aligned that arbor inserted in the spindle nose rises or inclines upwards only at its free end with respect to the bed ways, whilst inclining in the horizontal plane towards the tool post only. This will counteract the deformations resulting from the weight of the work piece and cutting force. Similarly, the tailstock spindle when fully advanced is only permitted to deflect in the corresponding directions

The slide ways of the lathe bed are not only datum faces for leveling the machine but also working surfaces for guiding the carriage and the tailstock. The quality of these sliding surfaces, of whatever design, is of vital important for accuracy of work pieces produced on the lathe. These slide ways vary in length from 12 inches to 60 feet and more. Whilst the long tables of planning, grinding or milling machines cover a large portion of the slide ways, the short carriage of the lathe leaves the slide ways wide open Special care has therefore to be taken in their manufacture. For this reason the tests on charts are specified.

This tests cover the grade of accuracy of the machine tool and also its working accuracy.

So a machine tool should have possess the following requirements

1. Low cost: The initial cost of the machine tool as well as the cost of production should be low.
2. High accuracy: The machine tool should be capable of producing high quality products at highest possible speed
3. High useful life: The machine tool render a trouble free service while retaining its accuracy for longer period
4. Low maintenance cost: The maintenance of machine tool should be easy and maintenance cost should be low.
5. Reliability: The machine tool should retain accuracy over period of its life.
6. Ease of operation: It should be ease to operate the machine tool.
7. High production capacity: It should be defined as the ability of machine tools to machine a defined.
8. Appearance. The appearance of machine tool is receiving much attention in recent years.
9. Safety: Relative promotion for the operation not only against accident, but against excessive fatigue as well as is a must in modern machine tool.
10. Ease of manufacture: It should be easier to manufacturing and assemble various parts of machine tool.

The real criterion of a machine tool is the accuracy of the work, it produces over a long period. The technical standard of design in developing a machine tool it is necessary to test the prototype thoroughly to ensure that the design meets the requirements aimed .The machine should be suitably painted. Painted surface should be uniform bright. Sharp edges and projections on castings should be removed.

1. To produce a standard quality of machine tools, skilled labour should be used for the production of components and assembly unit.
2. To produce a standard quality of machine tool there should be a code, which should acts as a guideline to the manufacturer.

3.2 Major Observations:

- Regular monitoring, maintenance, and repair is absent. Only the worker is responsible for all the works.

- Machine quality was not found as per catalogue

- Users are not interested in frequent using of the local lathe machines. The averege company uses foreign manufacture lathe machine

- Lack of technical knowledge of the users about lathe machine maintenance.

- Most of the company uses lathe machine by unskilled labour.

- Lack of appropriate training and distribution of maintenance tools.

Chapter 4

Conclusion:

As the age of machine increases the cost of maintenance rises and operational efficiency of the machine comes down. Requirements of quality and quantity of production make an old machine more or less obsolete in relationship to new demands.

From the testing result the best quality machine depends on their testing result, here the best quality machine is Skider Enterprise in Khulna than BMTF lathe machine in Dhaka city. Comparing various lathe machines with their Individual price, capacity, durability, bed straight, accuracy etc then select the best lathe machine out of twelve organizations.

Based on the investigation, the following conclusions may be drawn within the domain of the present study

1) By testing of a machine tool it can be put in a proper grade or precision class, thera by helping a purchaser to know what he can expect from the machine tool.
2) Testing helps in preventive maintenance of a machine tool.
3) Testing helps in determining the condition of the machine tool and hence its useful life.

The bed of the machine tool is normally made of cast iron to have more vibration proof characteristics. The amplitude of vibration should be within the desired range. The accuracy and surface finish of the parts produced by a machine tool depends upon many factors. One of these factors is the accuracy of the machine tools there fore, to produce parts economically and accurately it is essential that the machine tool on which the parts are produced accurate parts.

Chapter 5

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