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Bar-coding System for Machine Shop

Thesis 2015

Abstract

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Bar-coding System for Machine Shop, 26 pages

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The main objective of the thesis was to make a bar-coding system for Konepaja Astex Gear Oy machine shop. Since there was no system of tool arrangement or database of mechanical tools in the company prior to the project, therefore it was a well needed system for machine shop to be more productive and manage its mechanical equipment in much better and effective way in order to meet the demands of the modern standards of the metal industries. The desired system was meant to serve the easiness for the workers to find the metal tools in the machine shop's storage which are then used in CNC and lathe machines. The project and its daily activities were intensely monitored by Astex's customer service manager, Alexey Vanderev.

In order to get the intended results, it was important to use some database software, for that purpose, the machine shop bought a software called Saltbox Tool Manager and along with it, there came a Barcode printer and a Bar-code scanner. Plenty of small plastic boxes were bought as well to place those mechanical tools in them and hence give them some identity. Tool shelves were already in the company to be filled with well arranged tool boxes.

At the end of the project, the desired results were accomplished. And it was proved by the new Bar-coding system in the machine shop that workers found it much easier to find the mechanical tools from the storage. It saved their time and company's time as well. And due to the new database system in the company, it was a lot simpler to know the place and the user of the particular tool.

Keywords: Database, mechanical tools, barcoding system

Contents

Abstract.....	2
1. Introduction.....	4
1.1 Motivation	4
1.2 Technical Background	4
1.3 History of Barcode Technology.....	5
2. Background of Machine Shop.....	5
2.1 System used in Machine Shop Prior to the Bar Code System	6
2.2 Benefits of Barcoding system to Machine Shop.....	7
3. Saltbox Tool Crib Software	8
3.1 Zebra Desktop Printers	9
3.2 Wireless Barcode Scanner	10
4. Barcoded CNC Tools.....	11
4.1 End Mills	11
4.2 Face Mills.....	12
4.3 Drills.....	13
4.4 Taps.....	14
4.5 Abrasives	15
4.6 Tapping Chucks	16
4.7 Dial Indicator	17
4.8 Collects	18
4.9 Boring Tools.....	19
4.10 Burrs or Rotary Files.....	20
5. Learning Experience.....	22
6. Future Work in Machine Shop	23
7. Conclusion.....	24
References.....	26

1. Introduction

In the current business surroundings, keeping yourself competitive is crucial to your prosperity. Bar-coding database technology is an efficient approach to enhance the net profit and to satisfy the reasonably competitive difficulties your business encounters every day.

Along with data-collection engineering, bar-codes offer a speedy, precise and effective ways to gather, process, transfer, report and control data in a number of industrial sectors. Retail stores, bundleshopping and delivery, production, health care and many other service programs could take advantage by utilizing bar-coding system.

Bar-code is basically an easy technology. Nevertheless much like the cycle or perhaps the wheel, easiness of the idea is intensely reliant on the complete performance. Bar-code engineering technology provides bar-code laser printers, bar-code readers, bar-code labels as well as bar-code networking gadgets. Each of the equipment, plus the techniques and also computer software that let work everything with each other.

1.1 Motivation

The objective of the thesis is to create a bar-coding system for Konepaja Astex Gear Oy machine shop, so that it is convenient for the workers to find the desired CNC machine tool and save the time to be more productive. For that reason, a computer software named Saltbox Tool Manager is used. A part from software, a bar-code printer and a reader are also used.

1.2 Technical Background

The barcode is usually a perceptible machine readable rendering of data associated with the item to which it is connected. At first barcodes automatically produce information by numerous widths along with spacing involving parallel outlines. Afterwards they developed are into dots, hexagons, rectangles as well as other geometric designs in a 2D dimension. Barcodes at first were scanned through specific perceptible scanners known as barcode readers. Later on, scanners along with

interpretive software package became on devices including desktop models and smart phones on the market.

Barcode started to be more effective once they were utilized to automatize grocery store checkout techniques, an activity which is already pretty much wide spread.

1.3 History of Barcode Technology

In the year 1948, Bernard Silver at the Drexel Institute of Engineering, was a graduate pupil in the city of Philadelphia in the United States. A domestic grocery chain operator had asked an investigation to the staff of Drexel Institute of Engineering for an experimentation into a technique of an automatically reading item's details while checking out for sell. Bernard Silver combined with his graduate friend Mr. Norman Joseph Woodland to participate on a project.

Woodland's initial thought was to work on ultraviolet hypersensitive light ink. The pair assembled a functioning prototype, however the group came to the conclusion that the method seemed to be very unstable as well as far too pricey, which made them to start from the groundwork again.

The bar code technology was first employed commercially in the year 1966, but it came quickly to the realization that there must be some kind of industry recognized set. By the year 1970, UGPIC or the Universal Grocery Products Identification code was created by a firm known as Logicon Inc.

2. Background of Machine Shop

Astex, Ltd. was established in 1988 by Esa Astikainen. The original facilities were approximately 60 m². A year after the building was demolished the courtyard wall and the first extension (150 m²) was ready. At the same time the company purchased its first CNC lathe. The machine shop kept investing in new machinery and production methods in order to develop customer-oriented operations (1).

Currently, the production facilities consist of two machining halls (1000 m²), welding shop / warehouse (200 m²) as well as external stores (approximately 200 m²). In addition, there is a separate office space of approximately 100 m² (1).

The company started as a one-man company, and the number of employees has grown steadily, Astex currently employs about 60 people and its activities are rising rapidly (1).

Astex has machining and various parts of the assemblies focused on mechanical engineering. It supplies products to both domestic and abroad. The Company's main activities are located in Lappeenranta but there is another branch office in Rakvere, Estonia as well (1).

The Company's specialties are demanding machining. Machining materials include stainless steel, steel alloys, castings, plastics, carbide, aluminum alloys and copper metals. And it also provides the facilities of designing, and when appropriate, the company engages in collaboration with customers, which ensures the customer in terms of low-cost manufacturing. In addition, low and efficient production ensures the overall low-cost service (1).

The company has the quality certification of (ISO 9001) and environmental (ISO 14001) international standards (1).

2.1 System used in Machine Shop Prior to the Bar Code System

Prior to the barcoding system, there was no particular system used in the company, workers had difficult time to search the desired tools. Sometimes it took them ages to find a needed mechanical equipment. For instance, a tool could have been in use in some other machine, or it could be in other machine hall. Since the tools did not have any specific place, so basically it was in a way homeless. And due to that reason, workers were always finding it difficult to look for a tool and from production point of view it was waste of time and for any business operating firm, time is money. And sometimes orders were getting late due to that issue and more than often too many tools were being vanished because of these mishaps. So some kind of a system was much needed in the machine shop to make life easier for machinists.

2.2 Benefits of Barcoding system to Machine Shop

The luxury of applying barcoding system and scanner helps it to be a more effective option than the regular pencil paper management. Not merely the fastness of the barcoding system makes it an appealing option, but furthermore it makes it possible to track a record of a particular tool within a company. By employing barcode system can easily spend less amount of time in various materials managing scenarios (2).

- **Inventories of Materials and Equipment**

Through a conventional storage inventory, a product's inventory might take many working days to process, but a portable barcode system means that the exactly same inventory could be done in less portion of time.

- **Check in and Check out**

The specific mechanical tools for shipments could be checked in and checked out simply by scanning and the system could provide the information whether or not the number of required tools are available in storage.

- **Track Record and Current Location**

Whenever tools or mechanical equipment are handed over among the workers or used in machine shops, the barcode system could provide the track record, current possessor and place of a specified component.

- **Improved Liability**

When the workers are aware that the tools are inventoried with the barcode system, so they will most likely keep it in shelf where it should be.

- **Minimization of Error**

Barcode blunders happen in such a modest quantity they are almost statistically unimportant, proving them a remarkably dependable means for monitoring anything. Barcode excellence significantly surpasses human capacity.

3. Saltbox Tool Crib Software

Using Saltbox tool crib management software, a company could simply know and find out what it has got in its storage and also how to locate an item from storage conveniently. This simple computer software tool crib assistant makes it possible for companies, installers and also maintenance teams to achieve command of their inventory. The beauty of this software is not just that it is designed to track an item in deposit, but also to manage mechanical equipment in right order and easily accessible way (3).

While using saltbox tool crib assistant software;

- Company knows exactly what is now available for usage
- Company knows what exactly is in stock
- Tool locating is achieved by just press of a button rather than an optimistic walk across the storage

Saltbox tool management software tends to be more than an item locating software, it provides an opportunity to genuinely control an essential as well as precious learning resource for its users and to aid the remedies for the concerns such as

- The number of particular products have been used in the last calendar year?
- Does Company have items in catalog which actually are not needed in the first place?
- What kind of tools are precisely away from services and the reason behind it?
- What were the costs for goods consumed or applied the previous calendar month?

Saltbox systems and computer softwares for tool management are widely used in South and North America, along with Norway, Saudi Arabia, Australia, Tanzania, Great Britain, Aruba, Puerto Rico, New Zealand, and Malaysia.

It is utilized by clients in making vehicles, development and repair sectors, petrochemical industries, food processing, transportation, manufacturing, education and learning.

3.1 Zebra Desktop Printers

Maintaining the functions running easily and efficiently is the main priority of any business operating firm. Any company which is aiming to use printers and also equipment which are reputable, durable, simple to use and also do not demand much place. Zebra's printers are generally compact, dependable, economical and user friendly.

Zebra's printers are well suited to a multitude of mid-volume manufacturing business, health care sector as well as for other commercial usage. It presents both thermal transfer as well as direct thermal printer designs. And, using Zebra's intensive customized growth abilities, you will find the proper computer printer to satisfy all your needs.



Figure 1. Zebra desktop printer

3.2 Wireless Barcode Scanner

Wireless and Instant Barcode Scanning devices use radio frequencies a lot like cord-free mobile phones in order to send scanned data back to the system attached to the basic station. The wireless range varies by type or model from 10 m to more than 70 m. Wireless and Instant Scanning device can certainly considerably improve almost any application in which a cable connection might get broken or maybe control usage of objects becoming scanned.



Figure 2. Motorola barcode scanner

4. Barcoded CNC Tools

There are numerous kind of mechanical tools used in CNC machines and metal industries. The most commonly used tools are for instance, end mills, end mill adaptors, face mills, centre drills, jobber drills, tap & dies, reamers, abrasives, saws, files & burrs, collect chucks, drill chucks, tapping chucks, reduction sleeves, spanners, hand tools, hex keys, measuring tools, dial test indicators, guages, magnetic bases, boring bars, and so on (4).

4.1 End Mills

A variety of instrument types and milling options are around for required CNC milling operation. They include flat nose, ball nose, bull nose and chamfer.

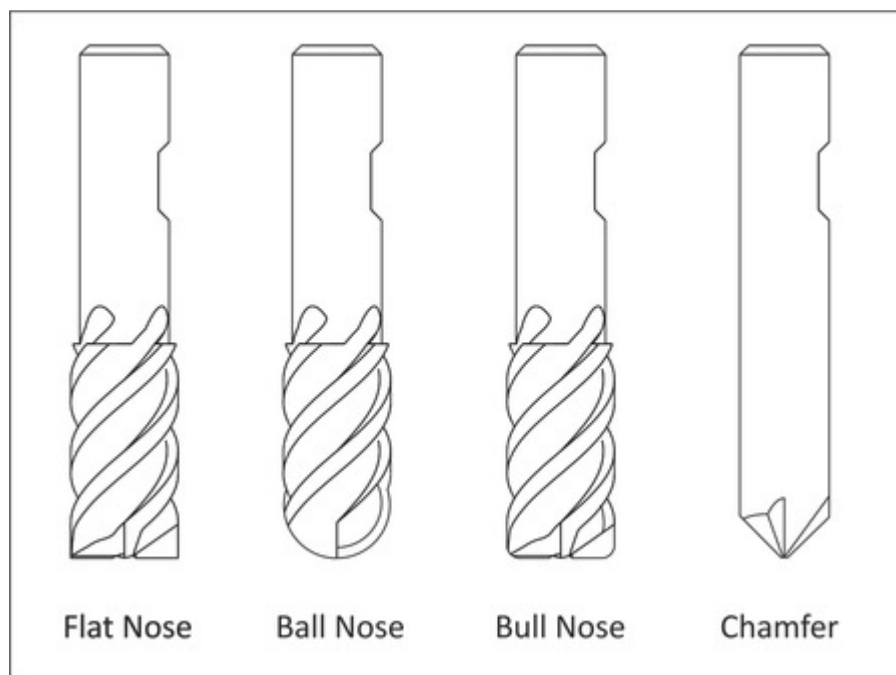


Figure 3. End mill tool types

Milling tools often have two or perhaps four slicing flutes. Two flute cutters give far more chip clearance while machining in close areas.

Milling tools tend to be possibly non-center cutting or center cutting. Center cutting tools can easily jump along into materials, whilst non-center cutting mills cannot.

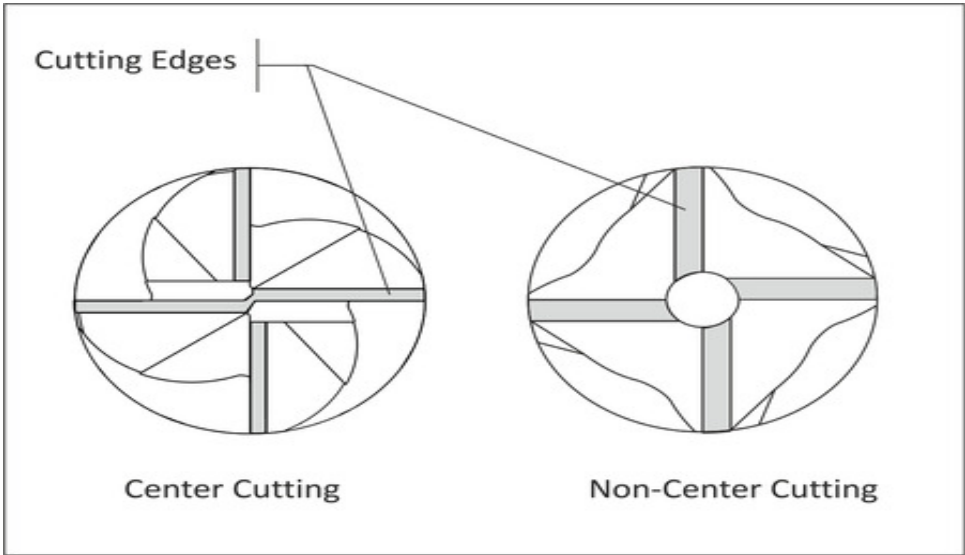


Figure 4. Top view of center and non-center cutting mill

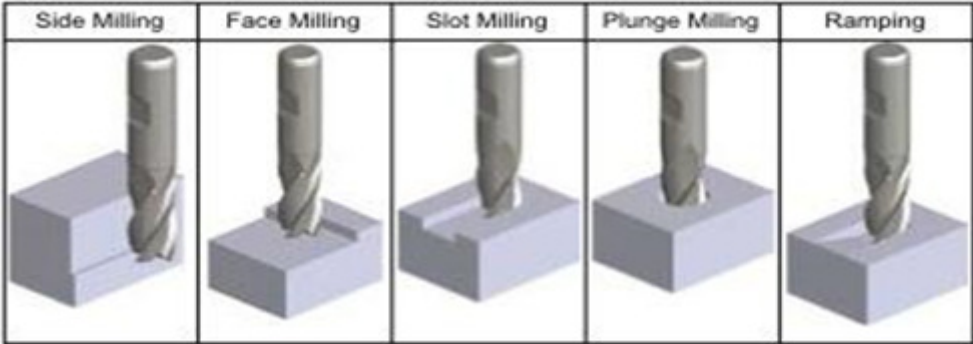


Figure 5. Application of end mill

4.2 Face Mills

A face mill always includes cutting inserts which are usually changed when worn. They are stiff and often have around eight or more than eight cutting edges, and can take off material at quick pace. They are generally employed for the first machining operations to immediately produce a flat finished face on the working part.

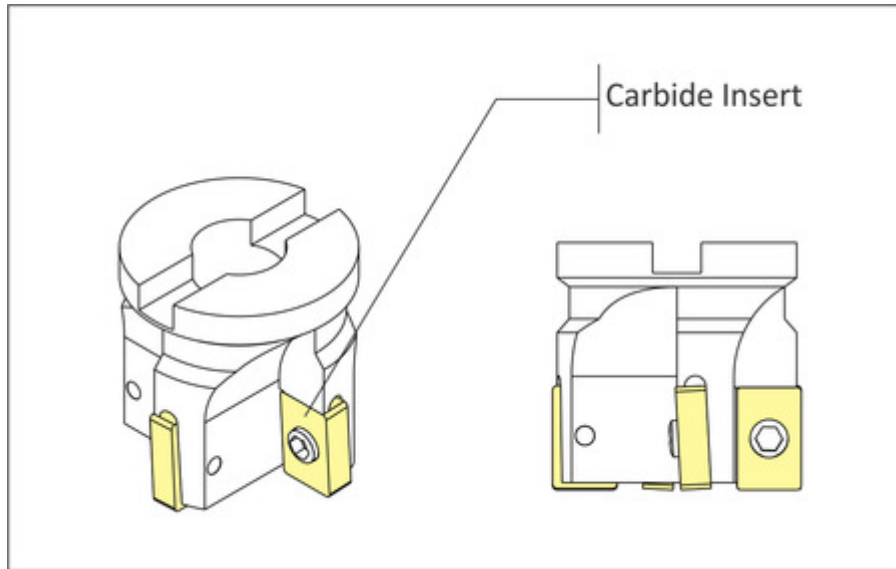


Figure 6. Face mill

4.3 Drills

A substantial range of high performance drills are used in CNC machines, Solid Carbide, Cobalt steels and Brazed Carbide, many having polished surfaces, coating, parabolic helix and through coolant (5).



Figure 7. Starting from right, stubb drill, long series drill, jobber drill, standard drill

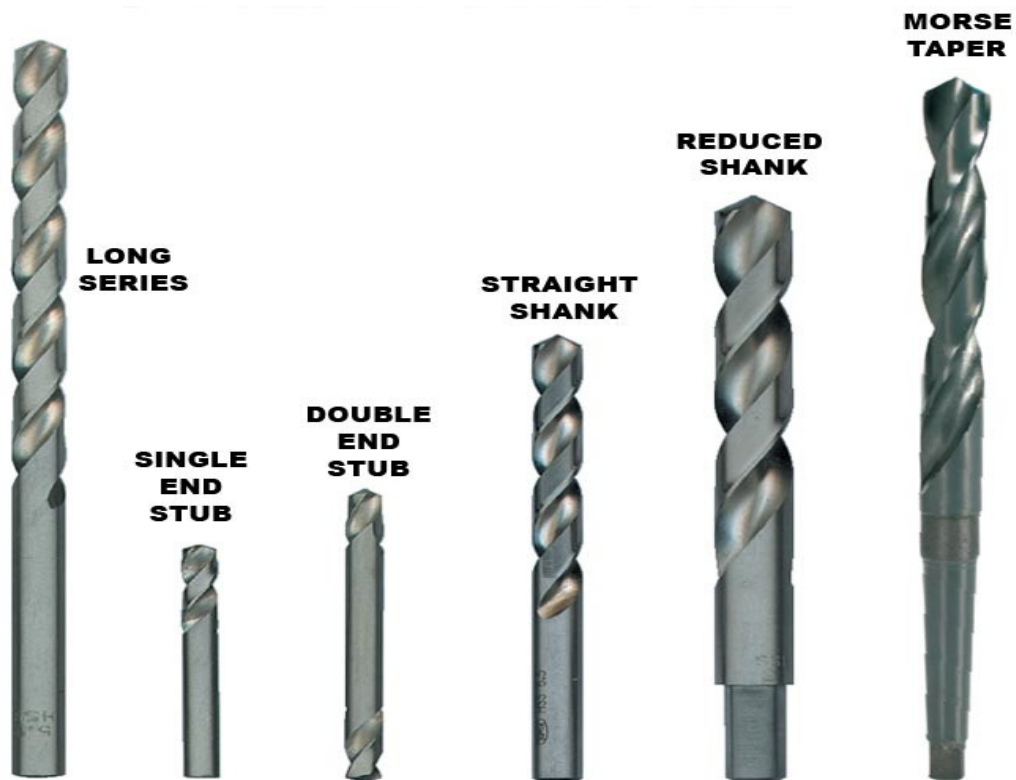


Figure 8. Common drill types

4.4 Taps

Cutting taps are used to make threads by shearing material away. Form taps (roll taps) create threads by forming the metallic work piece to shape. Form taps which do not produce chips are mostly used for soft materials which includes copper, brass, aluminum and plastics.

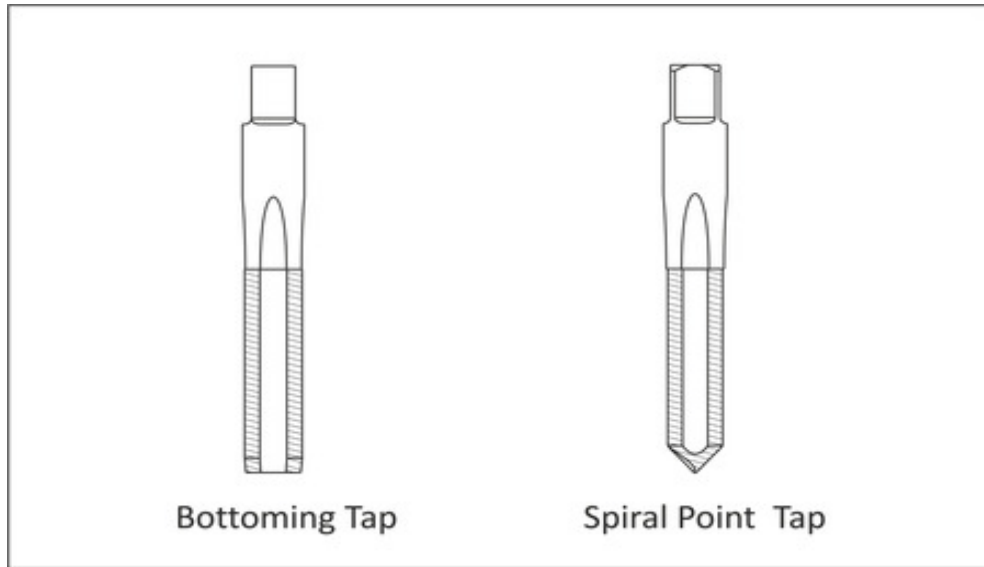


Figure 9. Types of taps

Bottoming taps are utilized to tap blind holes. Spiral point taps push the chip forward and out the bottom of a through hole.

Mostly CNC machines assist rigorous tapping, meaning that a tap could be fixed in a rigid holder. The specific tap is advanced at a certain feed rate which matches thread lead into a hole. Then the spindle stops, reverses and backs out from the pit.

CNC machines without rigid tapping demand special tapping equipment. For that is always recommended to check out the manufacturer's guidelines as the feed, speed as well as other machining variables for tapping attachments might vary then those for rigid tapping.

4.5 Abrasives

Abrasives are objects utilized to machine or smooth the surface of a workpiece by rubbing it extensively. They work in a way that they scratch out the material at the top of surface to get rid of unnecessary roughness or perhaps substances.

Abrasives are generally used in metal industries for several reasons. Sometimes they are utilized for grinding the newly cut metal, this kind of process is known as deburring. Normally deburring is performed by tumbling work pieces in a barrel alongside with the selected abrasive, which could be masked abrasive like nonwoven items, sandpaper and stones. Abrasives are employed to shine a completed item which includes hard materials like, steel, aluminum, copper.



Figure 10. Different types of abrasives

4.6 Tapping Chucks

Tapping heads as well as tapping chucks are used to serve tapping to make threads in a machine.

Tapping chucks are offered to accommodate CNC machines, typically the ER collect technique is utilized using compression as well as extendable on the collect end to make the CNC machine's spindle retard and lead it to stop, then swiftly preventing available. That avoids the breakage of the tapping tools, in particular using tapping within M10. Many operators consider tapping may be accomplished using only the collect chuck as a result of refined tapping round in the CNC machine. At times it is successful, till smaller sized taps are generally broken. Then the tapping chuck could reduce many downtimes.



Figure 11. Different types of tapping chucks

4.7 Dial Indicator

Dial indicators are precise measuring devices with a wide range of usages in machine shops. When any company moves past the fundamental machining activities, it will absolutely need to have either few or even greater amount of indicators in the machine shop.

The needle fluctuates clockwise and anti-clockwise from the middle of the dial indicator and then the rotating needle measures on the dial face. Dial pointers typically have either a 1" or 2" dimension and are adjusted in additions of 0.100".



Figure 12. Dial indicator CNC machine

4.8 Collects

Collect is mainly a holding gadget particularly, a sub type of chuck that creates a neckline around the workpiece to be clutched and applies a strong holding force on the item when it is fixed, generally by a method of a tapered outer collar. It might be utilized to hold a workpiece or a device.

There are numerous sorts of collects utilized as a part of the metalworking business. The "ER" collect framework, created and protected by Rego-Fix in 1973, is the most generally utilized clamping framework as a part of the world and today accessible from numerous organizations around the world. The standard sizes are: ER-8, ER-11, ER-

16, ER-20, ER-25, ER-32, ER-40, and ER-50. "ER" originated from a current "E" collet which Rego-Fix changed and affixed "R" for "Rego-Fix". The number is the hole opening distance across in millimeters, the outside collet width. ER collets contract over a scope of 1 mm and are accessible in 1 mm or 0.5 mm stages, so a scope of ER collets can hold any barrel shaped shank, metric or supreme. ER collets might likewise be utilized on a machine to hold workpieces.



Figure 13. Collects of various diameters

4.9 Boring Tools

In metalworking or machining, the mechanism of magnifying a hole which has been drilled already is known as boring. Boring process is usually employed to get the higher preciseness of the hole diameter.

Modern day boring instruments include several major parts although a few different type of designs. The boring part consists of a body, a dial screw and a bar holder. Boring equipment could be installed horizontally as well as vertically in several boring head models. Boring process can be executed on lathes, drill press or mills.

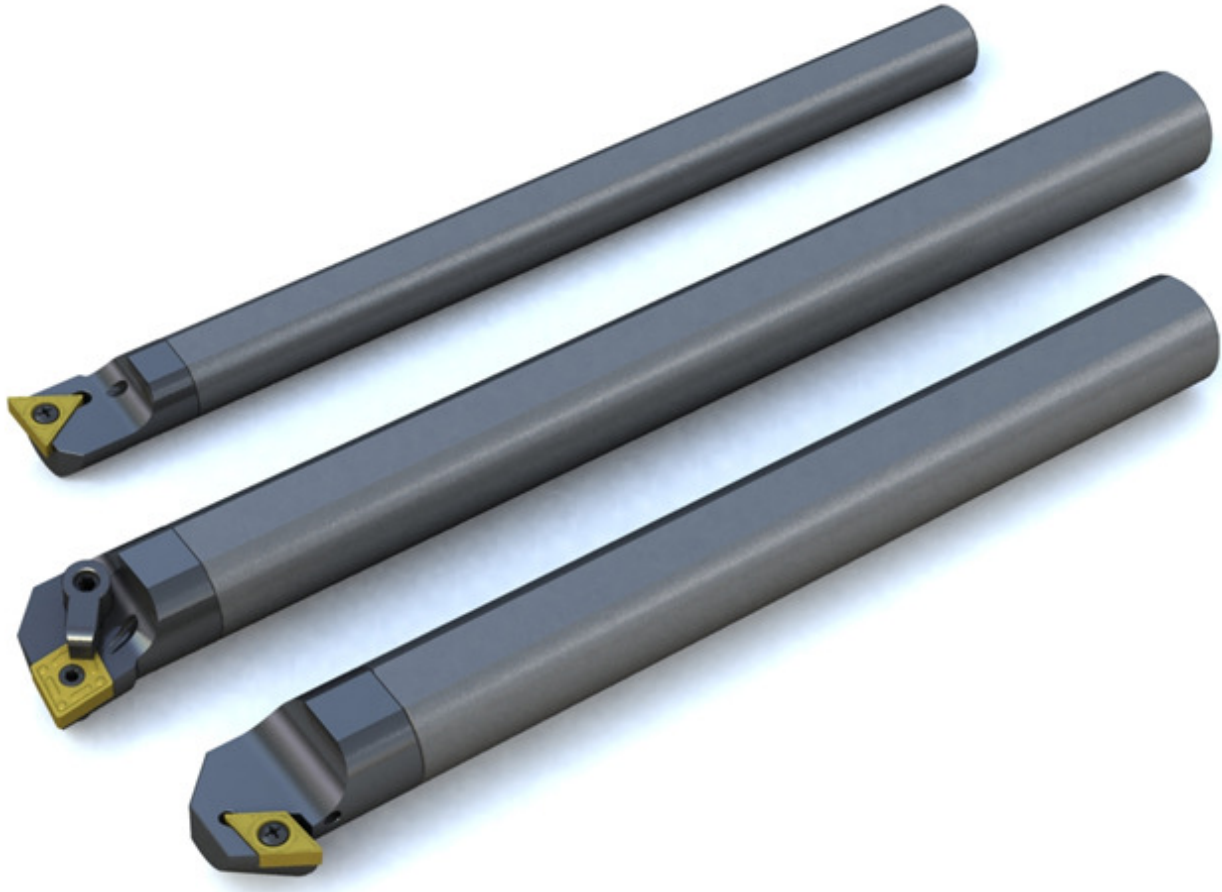


Figure 14. Boring bar

4.10 Burrs or Rotary Files

Burrs or rotary files are tiny mechanical tools utilized for cutting in machine shops. Actually, burrs (the tools) tend to be utilized in CNC workshops for cutting away the burrs (the tiny flakes of hard metal) by machining procedures.

To sustain the precise cutting conditions as well as surface speed, burrs usually are revolving with large velocity (thousands of RPM; often the prime velocity on the spindle).



Figure 15. Carbide rotary files

Apart from the above mentioned tools, there were certainly more mechanical tools which were put in the system. And there were some specific tools which were arranged in the storage but not put in the barcode system, the reason being that the company did not feel the necessity to put them for identification as they were commonly and frequently used items in the company.

5. Learning Experience

Right after completing all the compulsory courses at Saimaa University of Applied Sciences, I had an exciting opportunity to be an intern at Konepaja Astex Gear Oy, Lappeenranta, Finland. The internship programme happened to be an ideal opportunity for me to get a genuine insight into professional life and place my attained academic skills straight into practice as well as to obtain much more insight in how academic skills and techniques are brought in concert.

As a trainee it was my responsibility to handle constantly juggling tasks; anything from providing the desired mechanical tool to a worker as well as to put the items on their places. My main and regular duties, however, involved finding the right tools for machinists, such as the preparation of documents and updating them in the system. Moreover, it was my core duty to create the barcode for every mechanical tool in the storage and put them in the database system and update all the check in and check out of the tools. Amongst all this was just about anything could crop up, flexibility and a real hands-on, can-do attitude was necessary for this job.

During my internship at Konepaja Astex Gear Oy, I had the privilege to work with the experienced professionals and engineers. Being an intern in a company where the majority of the professionals was from different countries and cultures, not only enhanced my interpersonal abilities but also helped me to grow professionally, mentally and broadened my perspective about my career.

I believe that internship is usually an interesting and substantial encounter, essential for every engineering student to gain professional and personal by performing different assignments. Therefore, I feel that internship at any running company would be a significant and motivating step in one's individual progress and growth.

To sum up, working for the Konepaja Astex Gear Oy has been a great experience. First of all, I have had the chance to gain working experience in a metal and machining industry. Secondly, during the traineeship months, I got acquainted with the work done by the machine shops and the way it addresses its goals and objectives.

6. Future Work in Machine Shop

The RFID engineering is definitely a revolutionary answer to the present enterprise process and also managing. RFID contains the traits distinctive from this at present utilized barcode labels. In recent year, however, many giant retailing businesses and also agencies are usually operating this adoption involving RFID technologies in their business activities but the vast majority of businesses are not a lot alert to RFID technologies and the gains it might give to the company's process and also managing. On the other hand, this RFID tag price tag is still better than the barcode labels. The price tag concern is always the largest matter to the businesses who will be contemplating to take RFID solutions.

As most regarding RFID programs are nevertheless inside the preliminary phase and also followed by means of confined firms, the comprehensive execution regarding commercial use has not been achieved yet. Therefore, the proper sketch regarding RFID execution style cannot be driven based upon the confined landmark firms. RFID technologies are evolving in order to enhance the benefits for a large number of companies. Once the RFID point value plus the components expense drop with a cut-throat amount, the popularity and also determination regarding flavor firms is usually considerably different from of which at present period. RFID technology is a useful subject regarding further investigation.

7. Conclusion

Barcode engineering has been used for many years and also by time this technology has proved its worth by its performance. Testament to help here is the adaptability in which the technological innovation can be used to accommodate particular programs.

Besides the time period saved upon checking in and checking out tracking, barcodes give a beneficial opportunity to boost businesses with techniques which results into substantial financial savings as well as greater profits over a long period of time.

The exclusive desires of production and manufacturing industries are finest met having an extensive barcode monitoring system. Because of the absolute variety of components, items, as well as devices employed in most of these market sectors, barcode provides an especially effective solution. Besides all of these, barcodes help in reducing occasion invested in typical activities like stocks as well as shipment, however they likewise strengthen earnings.

In the foreseeable future, because of the demand associated with trade globalization, the down sides regarding the cross-border trade may enjoy an important position on the international economic development. While barcoding is an excellent solution to achieve the merchandise monitoring, recognition, safety verification, in addition to method automation, the study topic regarding the partnership one of the barcoding setup and also the economic reputation of each region can bring about analyze these factors on the marketplace penetration associated with barcoding technology in numerous areas.

List of Figures

Figure 1. Zebra desktop printer	9
Figure 2. Motorola barcode scanner.....	10
Figure 3. End mill tool types	11
Figure 4. Top view of center and non-center cutting mill.....	12
Figure 5. Application of end mill	12
Figure 6. Face mill.....	13
Figure 7. Starting from right, stubb drill, long series drill, jobber drill, standard drill...	13
Figure 8. Common drill types	14
Figure 9. Types of taps.....	15
Figure 10. Different type of abrasives.....	16
Figure 11. Different types of tapping chucks	17
Figure 12. Dial indicator CNC machine	18
Figure 13. Collet of various diameters.....	19
Figure 14. Boring bar.....	20
Figure 15. Carbide rotary file.....	21

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