

**MGM’s POLYTECHNIC, AURANGABAD**

**2020-2021**

Micro Project Report

On

**“Case study on Tool steels”**

Submitted in partial fulfillment for ‘I’ Scheme second semester of

**Diploma in**

**MECHANICAL ENGINEERING**

**By**

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Under the guidance of

**Prof. Lahane U.S**

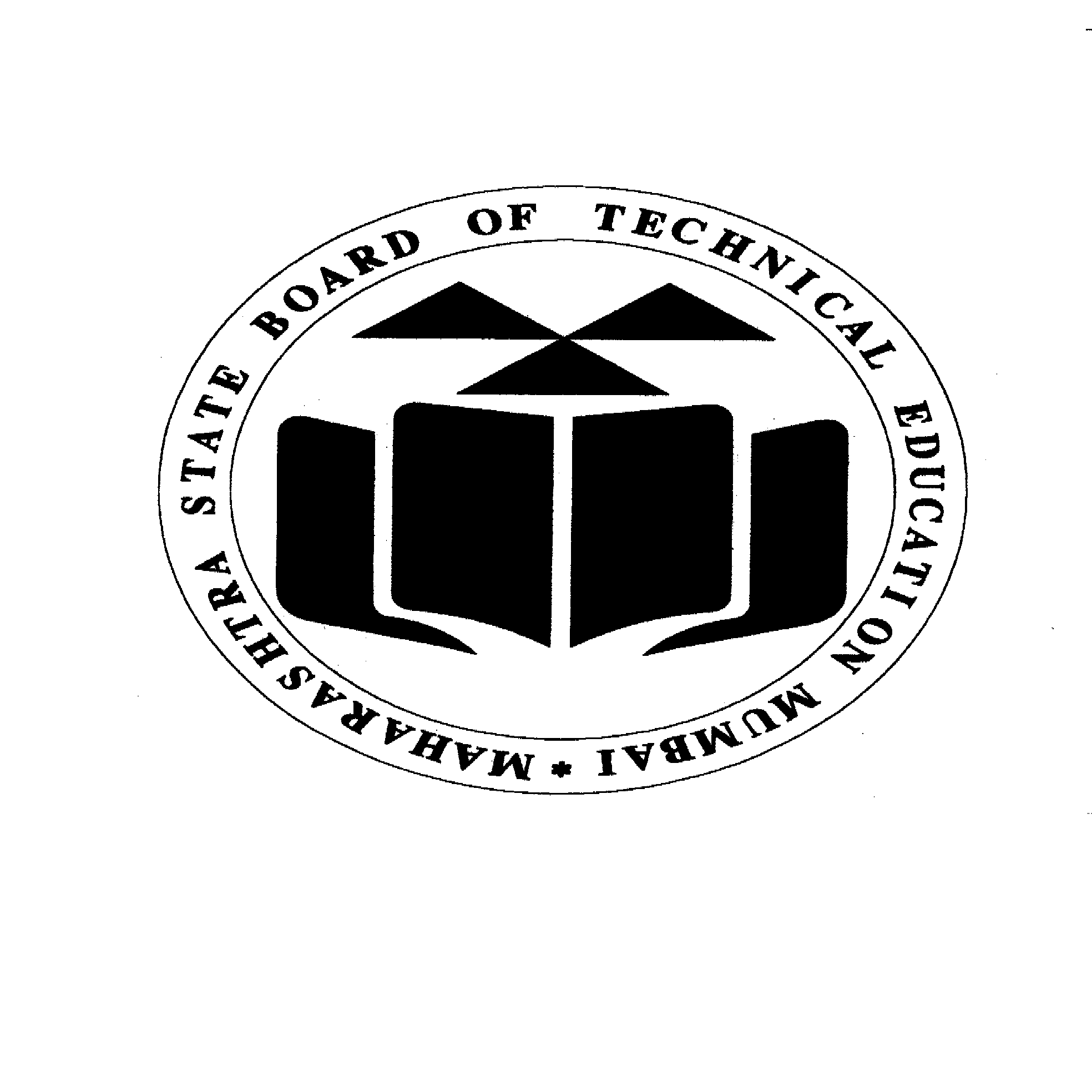
(Lecturer in Mechanical Engineering)

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**Certificate of Completion**

This is to certify that Mr./Ms. .. **DHAKNE RAMAKANT MAHENDRA , MOHAMMED SAAD SAYYED ,JADHAV SWARAJ MILIND** with Enrollment No **1915010275 , 1915010276 , 1915010277** has successfully completed his/her Micro-Project entitled **" Case study on Tool steels**" in the Course/Subject of " **Mechanical Engineering Materials** **[22343]** "in the second semester during his/her tenure of completing the Diploma programme in Mechanical Engineering From MGM's Polytechnic institute with institute code 1501**.**

**Prof. Lahane U S Prof. Bhalekar B.D**

**Guide HOD**

Mechanical Engineering Mechanical Engineering

**Dr. B.M. Patil**

**Principal**

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**Annexure – I**

**Micro-Project Proposal**

**Case study on Tool steels**

1. **Aims/Benefits of the Micro-Project**

* Case study on different types of tool steels and learn about how they made

**2.0 Course Outcomes Addressed**

* Select relevant tool steel for the given application with justification

1. **Proposed Methodology**

* First we collect all the information about our micro project
* We also discuss the some related points about our topic with our faculty
* We have done we make a plane to make a report on the topic
* We make the report and shown to the respected faculty
* And then we make the finalized report on that
* At last we have given our report to the faculty

**4.0 Action Plan**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S. No.** | **Details of activity** | **Planned Start date** | **Planned Finish date** | **Name of Responsible Team Members** |
|  | Finalization of Micro Project Team | 13th Oct 2020 | 15th Oct 2020 | Mohammed saad |
|  | Finalization of Topic | 16th Oct 2020 | 17th Oct 2020 |  |
|  | Literature Survey | 18th Oct 2020 | 19th Oct 2020 |  |
|  | Submission of Micro-Project Proposal (ANNEXURE-I) | 19th Oct 2020 | 20th Oct 2020 | Swaraj jadhav |
|  | Proposed Methodology | 21st Oct 2020 | 24th Oct 2020 |  |
|  | Collecting Resources Required (raw material) | 25th Oct 2020 | 27th Oct 2020 |  |
|  | Making of Prototype/Working Model | 28th Oct 2020 | 31st Oct 2020 | Ramakant dhakne |
|  | Submission of Micro-Project Report (ANNEXURE-II) | 1st Nov 2020 | 2nd Nov 2020 |  |
|  | Presentation via PPT to Institute | 3rd Nov 2020 | 5th Nov 2020 |  |

**5.0 Resources Required**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S. No.** | **Name of Resource/material** | **Specifications** | **Qty.** | **Remarks** |
|  | Google chrome | Research of the topic | 1 |  |
|  | Wikipedia | Information of the topic | 1 |  |
|  | Microsoft word | Writing of the report | 1 |  |

**Name of Team Members with Roll Nos.**

1. DHAKNE RAMAKANT MAHENDRA , ( 22113 )
2. MOHAMMED SAAD SAYYED ( 22114 )
3. JADHAV SWARAJ MILIND ( 22115 **)**

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**Annexure – II**

**Micro-Project Report**

**Case study on Tool steels**

1. **Rationale**

* Tool steels are a family carbon and alloy steels having distinct characteristics such as hardness, wear resistance, toughness, and resistance to softening at elevated temperatures.
* Tool steels comprise carbide-forming elements such as chromium, vanadium, molybdenum and tungsten in different combinations. They also contain cobalt or nickel which improves their high-temperature performance. They are generally heat-treated to improve the hardness and used for stamping, forming, shearing and cutting metals and forming of plastics. They are classified according to their composition and properties into various categories

1. **Aims/Benefits of the Micro-Project:**

* [Tool steel](https://www.metalsupermarkets.com/metals/tool-steel/) is a type of carbon alloy steel that is well-matched for tool manufacturing, such as hand tools or machine dies. Its hardness, resistance to [abrasion](https://www.metalsupermarkets.com/metal-glossary/abrasion/) and ability to retain shape at increased temperatures are the key properties of this material. Tool steel is typically used in a heat treated condition which provides increased hardness.

1. **Course Outcomes Achieved**

* Interpreted the given equilibrium diagram
* Use the iron carbon equilibrium diagram for the given application
* Identify the given steel on iron carbon diagram
* Use relevant tool steel in different application for the industries

1. **Literature Review**

* **Classifications**
* Tools steels fall into three basic categories:
* Cold work tool steels
* Hot work tool steels
* High-speed tool steels
* Cold-work steels are further subdivided into:
* Air-hardening
* Medium-alloy cold-work steels
* High-carbon, high-chromium cold-work steels
* Oil-hardening cold-work steels
* Hot work steels are subdivided into:
* Chromium
* Tungsten
* Molybdenum hot work steels
* High-speed tool steels are divided into:
* Molybdenum
* Tungsten
* Intermediate high-speed steels
* Other types of tool steels include:
* Water-hardening tool steels
* Shock-resistant tool steels
* Low-carbon tool steels

## Low-alloy special purpose tool steels

## What Is Tool Steel?

* [Tool steel](https://www.metalsupermarkets.com/metals/tool-steel/) is a type of carbon alloy steel that is well-matched for tool manufacturing, such as hand tools or machine dies. Its hardness, resistance to [abrasion](https://www.metalsupermarkets.com/metal-glossary/abrasion/) and ability to retain shape at increased temperatures are the key properties of this material. Tool steel is typically used in a heat treated condition which provides increased hardness.
* Several grades have additional resistance to corrosion due to added chemical properties such as vanadium. Also, with certain grades the manganese content is restricted in order to minimize the potential of cracking while water quenching. Other grades offer various methods other than water to quench the material, such as oil.

## Types of Tool Steel

* The different tool steel grades include:
* Water Hardening
* Air Hardening
* D Type
* Oil Hardening
* Shock resisting types
* Hot-Working.
* The choice of Tool Steel grade depends on a number of factors, such as:
* Is sharp cutting required?
* Does the tool have to withstand impact loading (axes, hammers, picks, etc.)?
* Is abrasion resistance an important criteria?
* What type of heat treating is needed?

## Tool Steel Grades

### Water Hardening (W-Grades)

* This is basically a high carbon steel. While it generally has a lower cost it cannot be used where high temperatures are involved. This steel can achieve a high hardness, but it is rather brittle when compared to other tool steels. All W-Grade tool steels must be must be water quenched, which can lead to increased warping and cracking.
* Typical applications of W-Grade tool steel include Cold Heading,Cutting tools and knives, Embossing, Reamers and Cutlery.

### Air Hardening ([A-Grades](https://www.metalsupermarkets.com/metals/tool-steel/tool-steel-a2/))

* This is a very versatile, all-purpose tool steel that is characterized by low distortion factor during heat treatment, due to the increased chromium content. This tool steel has good [machinability](https://www.metalsupermarkets.com/metal-glossary/machinability/) and a balance of wear resistance and toughness.
* Typical applications of A-Grade tool steel include Arbors, Cams, Die Bending, Blanking, Coining, Embossing, Cold Forming, Lamination, Cold Swaging, Cold Trimming, Gages, Chipper Knives, Cold Shear knives, Woodworking Knives, Lathe Center Knives.

### D Type ([D-Grades](https://www.metalsupermarkets.com/metals/tool-steel/tool-steel-d2/))

* This is a high carbon, high chromium (air hardening) tool steel. It was formulated to combine both the abrasion resistance and air-hardening characteristics. Common applications for these tool steels include forging dies, die-casting die blocks, and drawing dies.
* Typical Applications of D-Grade tool steel include Burnishing Tools, File Cutting, Paper Cutters, Die Bending, Blanking, Coining, Cold Heading Die Inserts, Embossing, Cold Extrusion, Cold Forming, Lamination, Cold Swaging, Thread Roll, Cold Trimming, Wire Drawing, Gages, Paper Knives, Rotary Slitters, Cold Shear Knives, Woodworking Knives, Knurling tools and Lathe Center Knives.

### Oil Hardening ([O-Grades](https://www.metalsupermarkets.com/metals/tool-steel/tool-steel-o1/))

* This is a general purpose oil hardening tool steel. It has good abrasion resistance and toughness for a wide range of applications.
* Typical applications of O-Grade tool steel include Arbors, Bushing, Chasers (Thread Cutting), Collets, Die Blanking, Cold Forming, Cold Trimming, Drill Bushing, Gages, Knurling Tools.

### Shock resisting types ([S-Grades](https://www.metalsupermarkets.com/metals/tool-steel/tool-steel-s7/))

* This type of tool steel has been designed to resist shock at low or high temperatures (E.g. Jackhammer bits). Its low carbon content is required to achieve the necessary toughness. This group of metals has high impact toughness, but a low abrasion resistance.
* Typical applications of S-Grade tool steel include Battering Tools, Boiler-Shop Tools, Chisel Blacksmiths, Chisel Cold Working, Chisel Hot Working, Chuck Jaws, Clutch Parts, Collets, Cold Gripper, Hot Gripper, Cold Swaging, Hot Swaging, Hot Trimming, Chipper Knives, Cold Shear and Hot Shear.

### Hot-Working ([H-Grades](https://www.metalsupermarkets.com/metals/tool-steel/tool-steel-h13/))

* This tool steel group is used to cut material at high temperatures. The H-Group has added strength and hardness for prolonged exposure to elevated temperatures. They are low in carbon and moderately high in additional alloys.
* Typical applications of H-Grade tool steel include Cold Heading Die Casings, Die Casting Dies and Cores for Zinc and Aluminum, Hot Extrusion for Aluminum and Magnesium, Hot Forging, Hot Gripper, Hot Swaging, Hot Trimming, Dummy Blocks (Hot Extrusion), and Hot Shear Knives.
* Tool steel is commonly used to make tools because of its hardness, resistance to abrasion and ability to withstand high pressures. Metal Supermarkets carries a wide variety of tool steel grades, shapes and sizes. Contact your nearest [Metal Supermarkets](https://www.metalsupermarkets.com/store-finder/) location, or visit our [online store](http://ecommerce.metalsupermarkets.com/MSC-Home.aspx) to inquire about tool steel.

# **Metal Supermarkets**

* Metal Supermarkets is the world’s largest small-quantity metal supplier with over 85 brick-and-mortar stores across the US, Canada, and United Kingdom. We are metal experts and have been providing quality customer service and products since 1985.
* At Metal Supermarkets, we supply a wide range of metals for a variety of applications. Our stock includes: [stainless steel](https://www.metalsupermarkets.com/metals/stainless-steel/), [alloy steel](https://www.metalsupermarkets.com/metals/alloy-steel/), [galvanized steel](https://www.metalsupermarkets.com/metals/galvanized-steel/), [tool steel](https://www.metalsupermarkets.com/metals/tool-steel/), [aluminum](https://www.metalsupermarkets.com/metals/aluminum/), [brass](https://www.metalsupermarkets.com/metals/brass/), [bronze](https://www.metalsupermarkets.com/metals/bronze/) and [copper](https://www.metalsupermarkets.com/metals/copper/).
* Our [hot rolled](https://www.metalsupermarkets.com/metals/hot-rolled-steel/) and [cold rolled steel](https://www.metalsupermarkets.com/metals/cold-rolled-steel/) is available in a wide range of shapes including: bars, tubes, sheets and plates. [We can cut metal](https://www.metalsupermarkets.com/services/production-cutting/) to your exact specifications.

**5.0 Actual Methodology Followed**

1. Firstly we have got our topic on micro project
2. We have discuss with the respected sir
3. They give some suggestion about the work
4. We also search the topic on Google for more details
5. Then we discuss the topic with the team member
6. After collecting all the data we collect all materials for the topic
7. After approval of the information we start typing report on the topic
8. We make the report and finalize the correction form the sir
9. After the all correction and details we submit the report to the respected sir

**6.0 Actual Resources Used**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S. No.** | **Name of Resource/material** | **Specifications** | **Qty.** | **Remarks** |
|  | Google chrome | Research of the topic | 1 |  |
|  | Wikipedia | Information of the topic | 1 |  |
|  | Microsoft word | Writing of the report | 1 |  |

**7.0 Outputs of the Micro-Projects** (Drawings of the prototype, drawings of survey, presentation of collected data, findings etc.)

**8.0 Skill Developed / Learning outcomes of this Micro-Project**

* We have learn about the different types of tool steel
* We also draw some drawing of the tool steel micro structure and, etc.
* We have learn how to operate the machine
* How to assemble the parts
* We also learn how to place the object on the machine
* We also see how the machine cut the steel with write calculate and readings
* We wrote the readings on the sheet and show it to the sir
* This is also use in making of different thing in the daily life
* We also learn team work and how to coordinate with the people
* We see the different types machines
* This will also use in our future for the industries application
* This is also helped in our studies for understanding the concepts

**9.0 Applications of this Micro-Project**

The major applications of tool steels are in the following processes:

* Forming, stamping, cutting and shearing of plastics and metals
* Extrusion of plastic sections e.g. vinyl window frames and pipes
* Stamping of computer parts from metal sheets
* Slitting of steel coils into strips
* Dies for compacting of powder metal into forms such as gears.