

Industrial Exposure to Press Working and Welding Processes Under Industrial Training.

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Abstract:

Industrial training plays an important role in developing practical skills and providing students with direct exposure to manufacturing processes used in industry. This paper presents an industrial study of press working and welding processes carried out during industrial training at Inspire Metal Engineering, Ahilyanagar MIDC. The training provided practical exposure to sheet metal operations, press machines, dies and punches, material handling, welding equipment, fabrication practices, inspection procedures, and workplace safety.

Press working is an important manufacturing process used for producing components from sheet metal through operations such as cutting, bending, punching, blanking, piercing, and forming. During the training, the working principles of press machines, selection of dies, positioning of sheet material, machine operation, and quality inspection were studied. Welding processes were also observed as an important joining technique used in the fabrication and assembly of metal components. Particular attention was given to welding equipment, joint preparation, electrode selection, welding parameters, weld quality, and safety practices.

1. INTRODUCTION:

Manufacturing industries play an important role in the development of engineering products and industrial equipment. Mechanical engineering students need practical knowledge of manufacturing processes in addition to theoretical concepts. Industrial training provides an opportunity to observe actual production systems and understand how engineering principles are implemented in industry.

Inspire Metal Engineering, located in Ahilyanagar MIDC, provides an industrial environment where metal components and fabricated products are manufactured using various manufacturing and joining processes. During the industrial training, particular attention was given to press working and welding processes.

Press working is widely used for manufacturing sheet metal components in large quantities. It uses a press machine along with suitable dies and punches to perform operations such as blanking, piercing, punching, bending, and forming. The process provides high production rates and good dimensional consistency when appropriate tooling and process parameters are selected.

2. OBJECTIVES OF THE STUDY:

The major objectives of the industrial training were:

1. To understand the practical applications of press working processes.
2. To study the construction and working principle of press machines.
3. To understand the functions of punches and dies.
4. To observe different sheet metal operations.
5. To understand the basic principles of welding.
6. To study welding equipment and accessories.
7. To observe different types of welding joints.
8. To understand the importance of welding parameters.
9. To study quality inspection procedures.
10. To understand industrial safety practices.
11. To relate theoretical knowledge with actual industrial practices.
12. To develop practical skills and industrial awareness.

3. INDUSTRY PROFILE:

Inspire Metal Engineering, MIDC Ahilyanagar was considered as the industrial learning environment for this study. The industrial training provided exposure to manufacturing and fabrication-related activities involving metallic components.

The training focused mainly on understanding the practical aspects of:

Sheet metal fabrication
CNC machining
Press working
Welding
Component inspection
Material handling
Production planning
Quality control
Industrial safety
Maintenance practices

4. Press Working Process

4.1 Definition

Press working is a manufacturing process in which sheet metal is cut, bent, formed, or shaped using a press machine and a suitable die-punch arrangement.

It is commonly used for mass production because the process can produce components rapidly with repeatable dimensions.

Basic Components of a Press Working System

The main components include:

- Press machine
- Punch
- Die
- Die block
- Punch holder
- Ram/slide
- Bolster plate
- Sheet metal
- Guide arrangement
- Feed mechanism
- Safety devices

4.2 Working Principle:

- In press working, the sheet metal is positioned between the punch and die. The punch moves towards the die under the action of the press mechanism. Depending on the tool design, the material may be cut, bent, or formed.
- A typical sequence is:
- **Raw Sheet → Feeding → Positioning → Punching/Forming → Removal → Inspection → Finished Component**
- The selection of punch and die depends upon the required component geometry, material thickness, material properties, and production requirements.

5. Types of Press Working Operations:

5.1 Blanking:

Blanking is a cutting operation in which the required piece is cut from a sheet. The blank obtained from the operation is the useful product.

5.2 Punching:

Punching produces a hole in sheet metal. The material removed from the sheet is generally considered scrap.

5.3 Piercing:

Piercing is similar to punching and is used to produce holes or openings of required shapes.

5.4 Bending:

Bending changes the shape of the sheet without removing material. It is used to produce angular or curved components.

5.5 Forming:

Forming changes the shape of the sheet into a desired three-dimensional geometry.

5.6 Drawing:

Drawing is used to produce cup-shaped or hollow components by forcing sheet metal into a die cavity.

6. Press Machine:

A press machine consists of a mechanism that applies force through a ram or slide to perform the required operation.

Important Press Machine Parameters:

- Press capacity
- Stroke length
- Stroke rate
- Bed size
- Die height
- Material thickness
- Production rate
- Feed arrangement
- The press capacity must be sufficient for the required operation. Proper selection of machine capacity and tooling helps prevent tool damage and improves production quality.

7. Dies and Punches:

The die and punch are important tooling elements in press working.

Punch:

The punch is the tool member that enters or acts against the sheet material to perform cutting or forming.

Die:

The die provides the required opening or forming surface against which the sheet material is processed.

Importance of Proper Die Design:

Proper die design helps achieve:
Accurate dimensions
Good surface finish
Reduced material wastage
Longer tool life
Higher production rate
Consistent product quality

8. Welding Process:

8.1 Definition:

Welding is a permanent joining process used to join two or more metallic components by applying heat, pressure, or a combination of both.

In industrial fabrication, welding is used for manufacturing frames, brackets, assemblies, structures, sheet metal components, and various fabricated products.

9. Welding Equipment:

The major equipment and accessories observed during industrial training may include:

- Welding power source
- Welding torch/electrode holder
- Welding cables
- Electrodes or filler material
- Work clamp
- Welding table
- Gas cylinders, where applicable
- Regulators and hoses, where applicable
- Welding helmet
- Protective gloves
- Apron
- Safety shoes

10. Welding Processes:

Depending on industrial requirements, common welding processes include:

10.1 Arc Welding:

Arc welding produces heat through an electric arc between the electrode and workpiece.

10.2 MIG Welding:

Metal Inert Gas (MIG) welding uses a continuously fed wire electrode and shielding gas. It is commonly used for fabrication and production applications.

10.3 TIG Welding:

Tungsten Inert Gas (TIG) welding uses a non-consumable tungsten electrode and shielding gas. It provides good control and can produce high-quality welds.

10.4 Gas Welding:

Gas welding uses heat generated by combustion of a fuel gas and oxygen to join metal components.

The actual welding processes used at the industry should be reported according to the machines and operations observed during the training.

11. Industrial Safety Practices:

Safety is essential in press working and welding operations.

Important safety practices include:

- Wearing appropriate PPE.
- Using safety guards on press machines.
- Keeping hands away from the die area.
- Using proper tools for material handling.
- Maintaining clean and organized work areas.
- Using welding helmets and protective gloves.
- Providing adequate ventilation during welding.
- Handling gas cylinders safely.
- Checking electrical connections.
- Keeping flammable materials away from welding areas.
- Following standard operating procedures.
- Reporting unsafe conditions immediately.

12. CONCLUSIONS:

The industrial training at Inspire Metal Engineering, Ahilyanagar MIDC provided valuable practical exposure to press working and welding processes. The training helped in understanding the actual implementation of manufacturing principles studied during mechanical engineering education.

The study of press working provided knowledge about sheet metal operations, press machines, punches, dies, tooling, production sequences, and quality requirements. Exposure to welding operations helped in understanding welding equipment, joint preparation, welding parameters, fabrication practices, defects, and inspection.

The training also emphasized the importance of workplace safety, quality control, productivity, proper material handling, and process discipline. Overall, the industrial exposure helped bridge the gap between theoretical knowledge and practical industrial requirements and contributed to the development of technical and professional skills required for mechanical engineering students.

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