



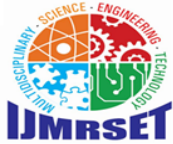
# International Journal of Multidisciplinary Research in Science, Engineering and Technology

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## International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

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# Review on Fixture Design for Clutch Release Lever

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**ABSTRACT:** This project focuses on the design and fabrication of a fixture for holding and testing a clutch release lever. The fixture ensures accurate positioning, firm clamping, and ease of operation during inspection and testing. Designed for industrial application, the fixture enhances productivity by offering consistent and repeatable results. The project combines principles of mechanical design, material selection, and manufacturing processes.

**KEYWORDS:** Fixture Design, Clutch Release Lever, Industrial Testing, Manufacturing Fixture, Quality Inspection.

## I. INTRODUCTION

Fixture design is a crucial aspect of manufacturing and fabrication processes. A fixture refers to a work holding device that rigidly holds a work piece in position during manufacturing operations such as machining, welding, assembly, or inspection. Proper fixture design ensures accuracy, precision, safety and efficiency in production. Fixtures play a vital role in holding work pieces securely and accurately in relation to the cutting tool or measuring device.

This minimizes errors, prevents damage to the work piece, and results in consistent and high-quality finished products. Additionally, fixtures reduce labor time by eliminating the need to manually position and clamp the work piece for each operation. The fixture designer must have in-depth knowledge of manufacturing processes, materials, and quality control to create effective fixtures suited to the particular work piece and fabrication methods. Fixtures are essential tools used in manufacturing and quality control processes to hold, support, and locate a work piece. For clutch release levers

## II. GOALS OF FIXTURE DESIGN

Accuracy and precision are primary goals in fixture design. The fixture must securely hold the work piece in the correct orientation and position for the machining operations to produce parts to precise specifications. Any movement or vibration during machining will negatively impact tolerances.

Operator safety is also a key consideration. The fixture design should eliminate pinch points and sharp edges. It must prevent the work piece from slipping or coming loose to avoid potential operator injury.

Ease of operation goes hand-in-hand with safety. The fixtures should allow quick, ergonomic loading and unloading of work pieces to maximize productivity. Simple, mistake-proof designs help reduce cycle times. Easy access for measurement and inspection is also important.

Well-designed fixtures make it effortless for the operator to repeatedly position work pieces accurately. This results in higher quality parts produced faster and more safely.

Elements of Fixture Design:

Effective fixture design requires carefully considering and incorporating key elements that enable the fixture to properly locate, support and hold the workpiece during manufacturing operations. The main elements of fixture design include:





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### Locating Points:

Locating points position and locate the work piece in the correct orientation and alignment for machining and fabrication operations. They are the main reference points for establishing part position. 3-2-1 location is a common principle used to fully constrain a part with a minimum number of points. It involves 3 points to locate the part's position along the X, Y and Z axes, 2 points to locate orientation around the Z axis, and 1 point to prevent rotation around the X and Y axes.

Locating points are positioned to contact the machined surfaces of the part, not the raw stock surfaces. They should be as close to the cutting tool area as possible to maximize accuracy and rigidity.

### Clamping Devices:

Clamps apply forces to rigidly hold the work piece against the locating points and prevent movement during cutting, drilling and other operations.

Different types of clamps include strap clamps, wedge clamps, swing clamps, toggle clamps, and hydraulic or pneumatic clamps.

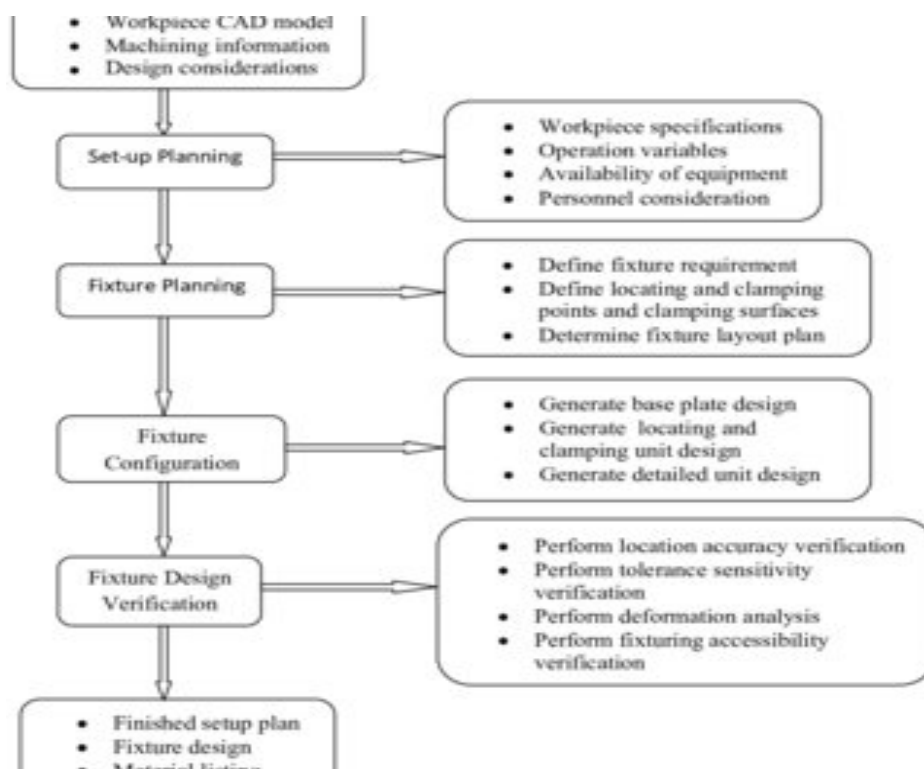
Clamps must provide adequate force but not apply excessive pressure that can distort the part. Clamp placement is also key. Quick-acting clamps allow faster loading and unloading of parts to minimize cycle times.

### Tool Guiding Elements:

Tool guides direct and position cutting tools, drill bits, and other implements to ensure they approach the part properly and follow the right machining paths.

Common tool guiding elements include jigs, fixtures plates, bushes, and tool holders positioned around the work piece. Tool guides provide support very close to the machining operation for maximum accuracy. Their design depends on the type of operation, tools, and optimal approach angles.

### III. BLOCK DIGRAM





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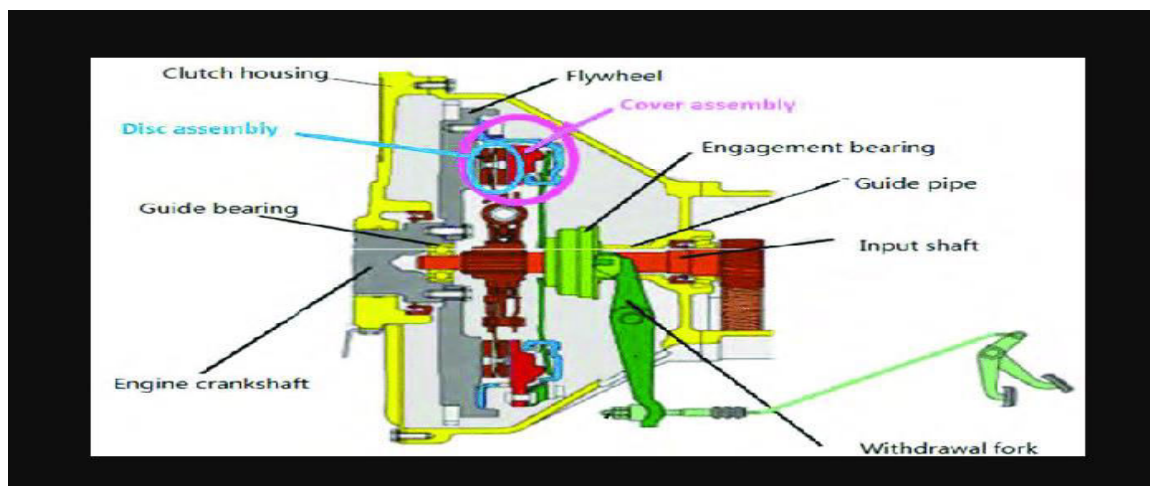
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### FUTURE ADVANTAGES

- Accurate and repeatable positioning.
- Reduced setup time by up to 30%.
- Less human intervention → fewer errors.
- Higher surface finish quality.
- Longer tool life due to vibration control.
- Increase in overall productivity.

### IV. PROPOSED METHODOLOGY

- Design is based on the "3-2-1 Locating Principle" to restrict all degrees of freedom.
- Locators: Custom pins, V-blocks.
- Clamping Devices: Toggle clamps or hydraulic clamps.
- Supporting Elements: Adjustable rests under free arms.
- Material for fixture: Mild Steel for base, hardened steel for pins.
- CAD design using SolidWorks.
- Stress analysis using FEA software (optional).
- Machining operations supported: drilling, boring, milling



### V. CONCLUSION

Overall, fixture design is an integral engineering task that enables mass-production and automation in manufacturing. Correct fixtures directly impact product quality, productivity and costs. Investing in good fixture design ultimately results in significant savings of time, effort and expenses in the long run. This makes fixture design expertise highly valuable in fabrication and machining industries

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