

OVERVIEW OF FIXTURE DESIGN FOR INDIAN INDUSTRIES

PATIL BHASKAR SAMBHAJI

Student, Department of Mechanical Engineering, Dr. D.Y. Patil College of Engineering and Innovation,
Varale, Pune, M.S., India

MHATRE SAIRAJ SUDHAKAR

Student, Department of Mechanical Engineering, Dr. D.Y. Patil College of Engineering and Innovation,
Varale, Pune, M.S., India

GAIKAR ROHIT BHAUSAHEB

Student, Department of Mechanical Engineering, Dr. D.Y. Patil College of Engineering and Innovation,
Varale, Pune, M.S., India

CHAUDHARI AAKASH DIGAMBER

Student, Department of Mechanical Engineering, Dr. D.Y. Patil College of Engineering and Innovation,
Varale, Pune, M.S., India

PROF. S. S. CHIKSHE

Department of Mechanical Engineering, Dr. D.Y. Patil College of Engineering and Innovation, Varale,
Pune, M.S., India

ABSTRACT:

Industries are looking forward for the revolution-4.0 in coming years. It is expected that, most of the processes will be designed with automation applications. Despite of this, mechanical industries are using the basic structure in processing the small mechanical parts of the product called fixture. Fixtures are contributing to make the final finishing effective and many times in other processes like drilling also. Small industries in India are looking forward for the affordable and effective changes in the process of manufacturing. Many operations like turning, shaping, drilling requires skills for the workers and any mistake done by the workers may results in severe accidents. Fixture helps in these operations by providing the support to the working piece. The metal piece needs to be stable, when mechanical operations are performed over it. This is advantageous over the safety of worker and improving the accuracy of final product.

KEYWORDS: Pneumatic Cylinders, Direction Control Valve, Solenoid Valve.

INTRODUCTION:

Fixture is the most important equipment used in mechanical industries to hold, locate and support the work piece during the operation. The purpose of the paper is to discuss how fixture helps to reduce the human effort. This paper discusses the issue of safety and failure of worker in an industry. Use of the fixture drastically reduce fatigue of the worker and also provide safe working conditions to worker. Automation has made it possible to design a fixture which works automatically with the help of some mechanical and electronic components such as pneumatic cylinder, solenoid valve, and direction control valve. This will make the machine efficient and in design process of fixture one may gain the knowledge of design, fabrication, and also about pneumatic systems. Also this can be used where valves like components are being handled manually. The fixture designing itself is very important process as a fixture is customized for each product. The accuracy and precision in the dimensions of fixture are important otherwise the final product may get affected.

PROCESS OF FIXTURE DESIGN:

Figure drawn below shows the steps in designing the fixture.

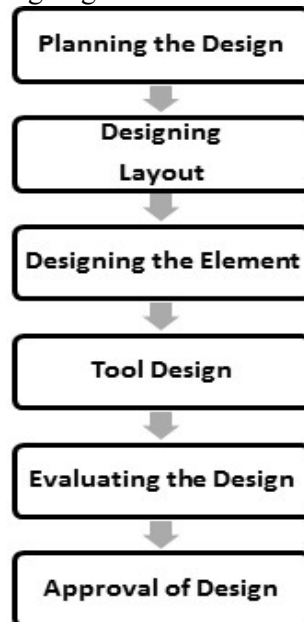


Fig.1: Steps in Design of Fixture

Designing of the fixture starts with planning stage. Depending on the requirement of the fixture the planning of developing a fixture starts with consideration of the proper parameters. The next and important stage is designing the layout for which part needs to be placed at what position in the design. Element design is one of the most important steps where the dimensions of each element need to be estimated in order to achieve accuracy in operation.

It needs to develop several arrangements of elements to be used for effective outcome. The tools needed for the operation are designed with precision of dimensions and optimum use of the material. Various designs are compared and studied for final approval with considerations of all the effects of design on effective product processing. The cost of structure development is also important concern before finalizing the design. The above stated steps can further simplified as shown below.

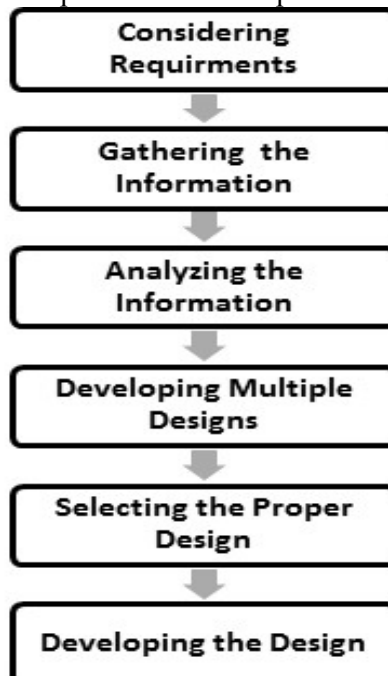


Fig.2: Simplified steps for Design of Fixture

NEED OF FIXTURE IN INDUSTRY:

Proper positioning and controlled movement of the job piece is very important when working with the mechanical parts. There is need of supporting structure which helps in the operation with proper positioning and providing safety to the workers. Fixture exactly fulfills this requirement. It is customized for each product and changes can be made in the design of better results. With the help of this structure the cost of labour required for positioning of the metal piece is reduced. Fixtures are useful for accurate operation on the piece of material to convert it to final product.

ADVANTAGES:

- Less manpower required
- Better productivity in same time
- Better safety for labor
- Quality enhancement of product
- No special skills needed to use it
- Cost effective

FUNCTION OF FIXTURE:

The fixture is mainly used to control the operation of the machines and tools on the metal jobs. It is capable of handling the following purposes.

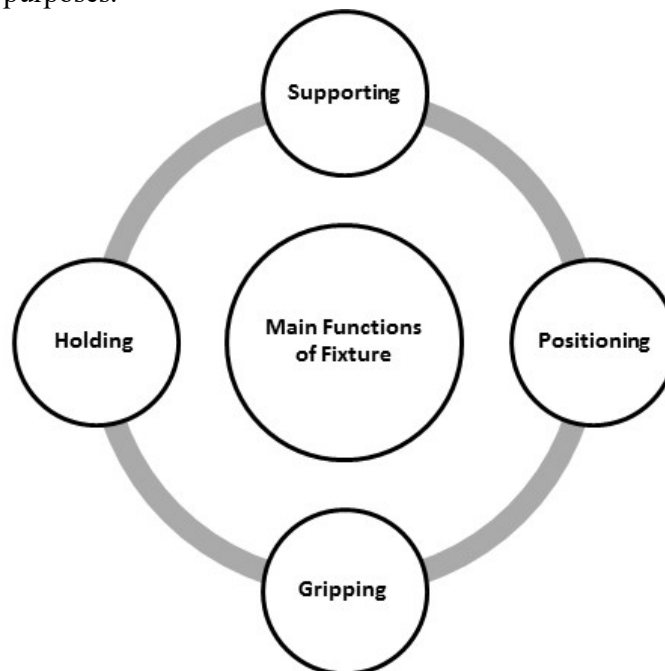


Fig.3: Main Functions of the Fixture

CONCLUSION:

The fixtures in mechanical industry are contributing the most in effectively converting a metallic part in to the final finished product. Finishing is a measure of quality of the product. Many times the product is sold in the market due to its better finishing than the same range of the products. Many designed are proposed by the researchers and industries for various ranged of products. With the help of technological developments, now days the fixture design has become very easy and effective. We have discussed about the general process of designing a fixture and the functions of it in application to the product manufacturing in mechanical industries.

REFERENCES:

- 1) Kumar, A. Senthil, Andrew YC Nee, and S. Prombanpong. "Expert fixture-design system for an automated manufacturing environment." *Computer-Aided Design* 24.6 (1992): 316-326.
- 2) Mervyn, Fathianathan, S. H. Bok, and A. Y. C. Nee. "Development of an Internet-enabled interactive fixture design system." *Computer-Aided Design* 35.10 (2003): 945-957.
- 3) Sun, Shu Huang, and Jahau Lewis Chen. "A fixture design system using case-based reasoning." *Engineering Applications of Artificial Intelligence* 9.5 (1996): 533-540.
- 4) Peng, Gaoliang, et al. "A desktop virtual reality-based interactive modular fixture configuration design system." *Computer-Aided Design* 42.5 (2010): 432-444.
- 5) Kang, Y. G., et al. "A fixture design system for networked manufacturing." *International Journal of Computer Integrated Manufacturing* 20.2-3 (2007): 143-159.
- 6) Vukelic, Djordje, Uros Zuperl, and Janko Hodolic. "Complex system for fixture selection, modification, and design." *The International Journal of Advanced Manufacturing Technology* 45.7-8 (2009): 731-748.
- 7) Roy, Utpal, and Pei-Liang Sun. "Selection of preliminary locating and clamping positions on a workpiece for an automatic fixture design system." *Computer Integrated Manufacturing Systems* 7.3 (1994): 161-172.
- 8) Dai, J. R., et al. "An approach to automating modular fixture design and assembly." *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture* 211.7 (1997): 509-521.
- 9) Li, Kailing, et al. "Development of an intelligent jig and fixture design system." *2006 7th International Conference on Computer-Aided Industrial Design and Conceptual Design*. IEEE, 2006.
- 10) Ma, W., J. Li, and Y. Rong. "Development of automated fixture planning systems." *The International Journal of Advanced Manufacturing Technology* 15.3 (1999): 171-181.