

# The Development of Eccentric Press Tool with Motor Drive for Increasing the Added Value Business of Kerosene Stove Builders

Zulhendri, Aidil Zamri, Yuliarman, and Yusri

**Abstract**—One way to increase the value-added business kerosene stove makers is making other products than making kerosene stoves that use basic materials such as metal plate of kerosene stove material. At the beginning of the study, manual Press Tool device has been designed and made to produce the ring plate with manual drive. The manual Press Tool has the disadvantage of low production levels with only two products per minute in average. Therefore, it is now being designed and made Press Tool with motor drive to produce an average of 25 products per minute. The tool which is being developed is not only able to make a ring plate but also other products such as ornamental trellis. Another advantages of this device, comparing to other similar tools, is the design which is much simpler and only requires lower cost of production so that the tool is able to be purchased by the domestic industry.

**Index Terms**—Press tool, added value, kerosene stove, ring plate.

## I. INTRODUCTION

Conversion program from kerosene to LPG has made the government to turn a catastrophe for the craftsmen kerosene stove. The program began in 2007 and it was the time that makes their business collapse. It is necessary to find a solution because many families depend on this business. The kerosene stove can be seen in the Fig. 1 and the rest of the slab making kerosene stoves as waste can be seen in Fig. 2.



Fig. 1. Domestic kerosene stove.



Fig. 2. The rest of the slab making kerosene stoves that can be used to make other products.

One method to increase the added value of the business by diversifying kerosene stove product, by making other products besides stoves that use basic materials such as metal plate of kerosene stove material. At the beginning of the study, an eccentric press tool device has been designed and made to produce the ring plate with manual drive. The manual system was applied in order to limit extra costs of production for the business group [1].

After a series of trial, it was found that this tool has the disadvantage of low production levels with only two products per minute in average. Therefore the problem is how to increase the productivity of the Press Tool and make not just only one type of product but also other products.

Study Purpose, (1) Developing the manual Press Tool device by adding motor drive; (2) Making the Press Tool with a simple motor drive at low cost; (3) Creating a group of kerosene stove production centers especially with metal plates based components.

## II. BASIC THEORY

### A. The Meaning of Press Tool

Press tool is a tool used to cut or shape metal plate in accordance with the desired form [2], [3]. This tool is operationally able to work as a cutting tool or as a forming tool, but sometimes it can be operated simultaneously and usually in the operation. This press tool is combined or attached to a press machine. Press machine for industrial scale can be seen in Fig. 3

The purpose of manufacturing this Press Tool is to make the components of the same size in large numbers which can be done in a relatively short period of time. So it can be said press tool is designed to save time and cost as well as production [4]–[6].

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Fig. 3. Industrial press tool machine (Xi'an Amco Machine Tools Co., Ltd.).

### B. Types of Press Tool

Based on the operating process, Press Tool can be classified into two types [7]:

- 1) Cutting Tool: A material processing is done by eliminating some or cut material according to the desired shape.
- 2) Forming Tool: A material processing which is done without reduction or removal of the material. This is only a process of formation of such folding plate to get the desired contour.

### C. The Cutting Style Calculation

The formula for cutting style is [8].

$$F_s = U \cdot s \cdot \tau_B$$

where

$F$  = cutting style (N)

$s$  = material thickness (mm)

$U$  = the length of cutting line (mm)

$\tau_B$  = the cutting tense (N/mm<sup>2</sup>)

### D. Punch and Dies Clearance

Punch and die clearances should be calculated to obtain good cutting results (no burr) and to avoid excessive friction and wear on the punch.

Clearance calculated by the equation [9]:

$$U_s = c \cdot s \cdot \sqrt{\tau_B}$$

where

$U_s$  = Clearence

$c$  = working factor (0,005-0,035)

$s$  = material thickness (mm)

$\tau_B$  = the cutting tense (N/mm<sup>2</sup>)

### E. The Pressing Style Calculation on Eccentric Press Tool

Eccentric Press tool is the tool which uses eccentric shaft principle in pressing process as shown in Fig. 4.

Based on the picture, by using the balancing principle on point A, a formula is resulted [10]:

$$\sum M_A = 0$$

$$F_{in} \cdot L - F_{out} \cdot x = 0$$

$$F_{in} = F_{out} \cdot \frac{x}{L}$$

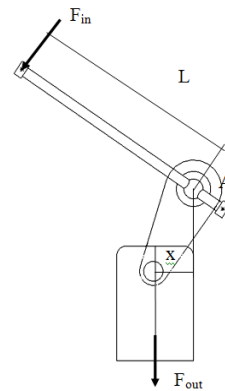


Fig. 4. The pess tool eccentric system.

where

$F_{in}$  = required pressing style

$F_{out}$  = pressing style on the punch

$x$  = shaft eccentric distance

$L$  = the length of Press Tool's lever

## III. RESEARCH METHOD

The study was began by reviewing some kerosene stove makers who have been left by buyer and even close their business due to a lot of people who have switched from kerosene to LPG gas stoves. Based on the review, a way to save the craftsmen was discussed. It was agreed then to diversify the products by making other products in addition to making the stove. This other product can be made from raw materials extracted from the remain of the plate cooker manufacturing or materials which are specially imported.

Then, the shape and size of the ring plate to be made can be set, and the the Press Tool with eccentric system for plate ring making is designed. Fig. 5 shows the shape and size of the ring plate.

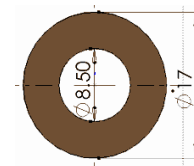


Fig. 5. Resulted ring plate.

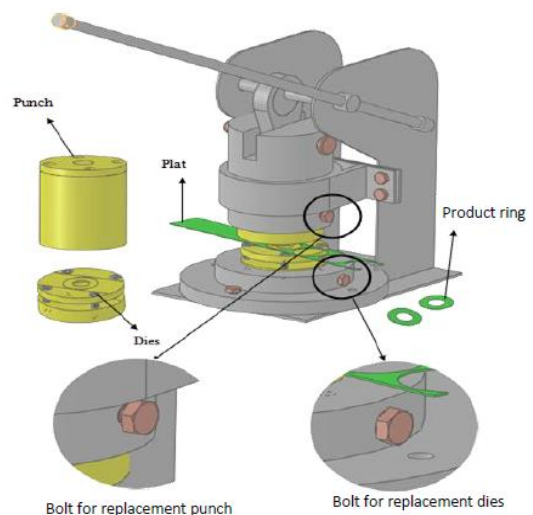


Fig. 6. The design of manual press tool.

This early design is made and manufactured by using the manual drive in order to reduce production, as show as Fig. 6.

This Press Tool is designed with punch and dies that can be changed according to the size of the ring plate to be made. This cutting process in the press tool is in the process of compound tool which is the process of cutting the blanking to make the outside diameter and piercing process for the inside diameter. All manufacturing process is done in one place and in one time emphasis. The form of the cutting can be seen in Fig. 7. and the form of dies on cutting process is shown in Fig. 8.

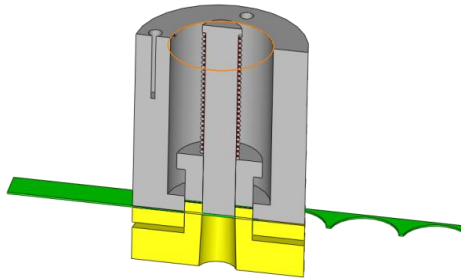


Fig. 7. Cross-sectional shape on the process of cutting compound plate ring.

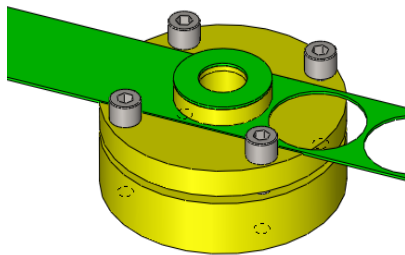


Fig. 8. The form of dies on cutting process.

The eccentric Press Tool with manual drive has been created and tested as can be seen in Fig. 9.



Fig. 9. Manual press tool.

Form ring plate is produced by the eccentric Press Tool with manual drive is shown in Fig. 10.

#### IV. RESULT AND DISCUSSION

Based on experiment manual Press Tool productivity is shown in Table I.

TABLE I: PRODUCTIVITY OF PRESS TOOL

No	Date Activity	Duration (Hours)	Product (Pieces)	Productivity (Product/mnt)
1	Oct. 8, 2012	1	124	2.06
2	Oct. 9, 2012	2	238	1.98
3	Oct. 15, 2012	1	128	2.13
4	Oct. 16, 2012	2	239	1.99
5	Oct. 17, 2012	3	355	1.97
Average				2.026

Table I explains this tool has the disadvantage of low production levels with only two products per minute in average. Therefore, it is now being designed and made Press Tool with motor drive to produce an average of 25 products per minute.



Fig. 10. Resulted ring plate.

The design of Press Tool with motor drive can be seen on Fig. 11.

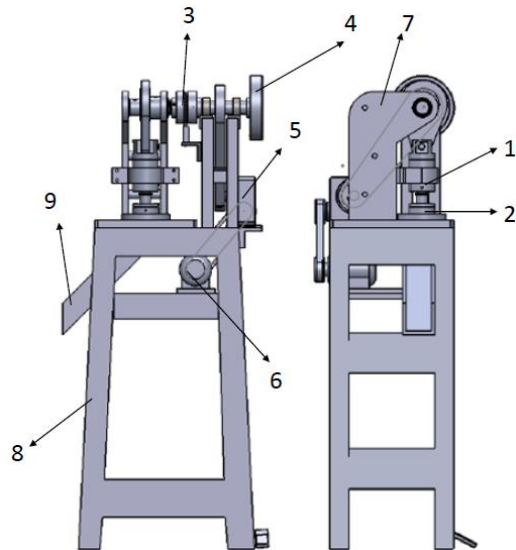


Fig. 11. The developing press tool with motor drive.

Remark:

1 = Punch, 2 = Dies, 3 = coupling, 4 = fly wheel, 5 = gear box, 6 = electric motor, 7 = skeleton, 8 = framework, 9 = funnel

The advantage of the Press Tool that is being developed comparing the Press Tool used in major industries is that the tool designed in small size (for home industry) and more

simple so that manufacturing costs are lower and the price is cheaper and affordable by the domestic industry.

The press tools which are being developed will be able not only to make a ring plate but also other products such as trellis ornament by replacing its punch and dies in accordance with the produced components. Flower ornaments shape for trellis accessories is shown Fig. 12 and the form of trellis ornament created can seen Fig. 13



Fig. 12. Flower ornaments for trellis accessories.

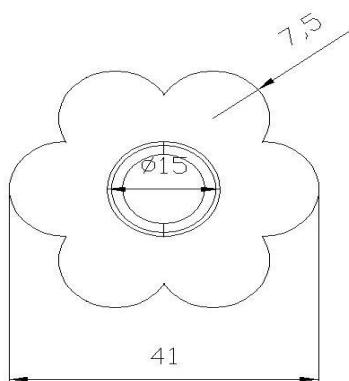


Fig. 13. The form of trellis ornament created.

So as to make the flower ornaments, punch and dies it are replaced by the desire shape as show as Fig. 14

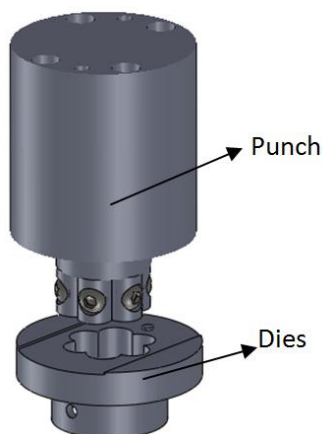


Fig. 14. The form of punch and dies to make trellis ornaments.

## V. CONCLUSION

Based on the discussion above, it can be concluded that: to increase the added value of the business group's kerosene stove makers need to diversify products to make other products made from the same metal plate. The first type of Press Tool aid has been made with manual drive and it has the

disadvantage of low production level with only two products per minute.

To increase the rate of production, it has been developed the Press Tool with motor drive, with a planned production rate of 25 products per minute. The new Press tools can also make a variety of other metal plate-based products such as a trellis ornament by changing the shape of the punch and dies components.

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