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Development of adjustable pattern for foundry shop

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Abstract

In foundry shop orders come for making products are different in dimension for the same kind of products. So it is necessary to make one pattern for every product of different dimension although these are of same kind. So it consumes a large amount of cost. To minimize this cost an adjustable pattern has been developed. This paper will introduce the criteria of making adjustable pattern, its feasibility and economic aspect. This pattern can be adjusted according to the expected dimensions ordered. But it has some limitations of dimension range. In this dimension range product of various dimensions can be made easily. Another adjustable pattern of same kind of product yields another range of dimension. More of pattern can be made for having wide range of dimension. It is seen that one or two adjustable patterns can fulfill all of the requirements. After all, from economic calculation it is found that this adjustable pattern reduces around 50% cost for only five products.

Keywords: *pattern, drag, allowance.*

1. Introduction

In casting, a pattern is a replica of the object to be cast, used to prepare the cavity into which molten material will be poured during the casting process.

Patterns used in sand casting may be made of wood, metal, plastics or other materials. Patterns are made to exacting standards of construction, so that they can last for a reasonable length of time, according to the quality grade of the pattern being built, and so that they will repeatedly provide a dimensionally acceptable casting[1].

2. Design Procedure

Pattern making procedure is divided into two parts
1. Inner part
2. Outer part

2.1 Inner part:

- In the figure 2.1 second image is the inner part of flywheel. For various diameter of wheel like diameter 12 inch 3 parts (red colored in the figure) can be attached with the inner part of 10 inch diameter wheel to make inner part of 12 inch diameter wheel.
- Same as to 14 inch diameter wheel.

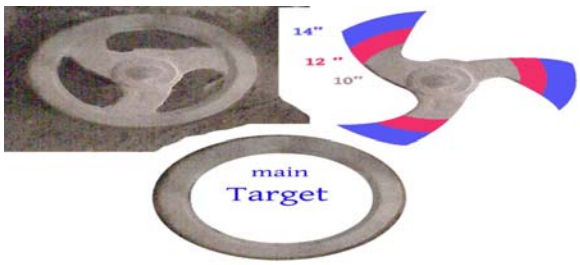

Fig. 2.1. Inner part and outer part (main target) of the Pattern

2.2 Outer part:

There is developed a criteria for making this part adjustable. This criteria has been discussed below for various diameter (10" and 14" for example) of wheel.

2.2.1 Pattern with diameter 12 inch:

- A circular part of 12 diameter is divided on its periphery into eight
- Another same part(extra part that is not used for 12" wheel) has been made
- All of the parts(8) are connected with plates and nuts

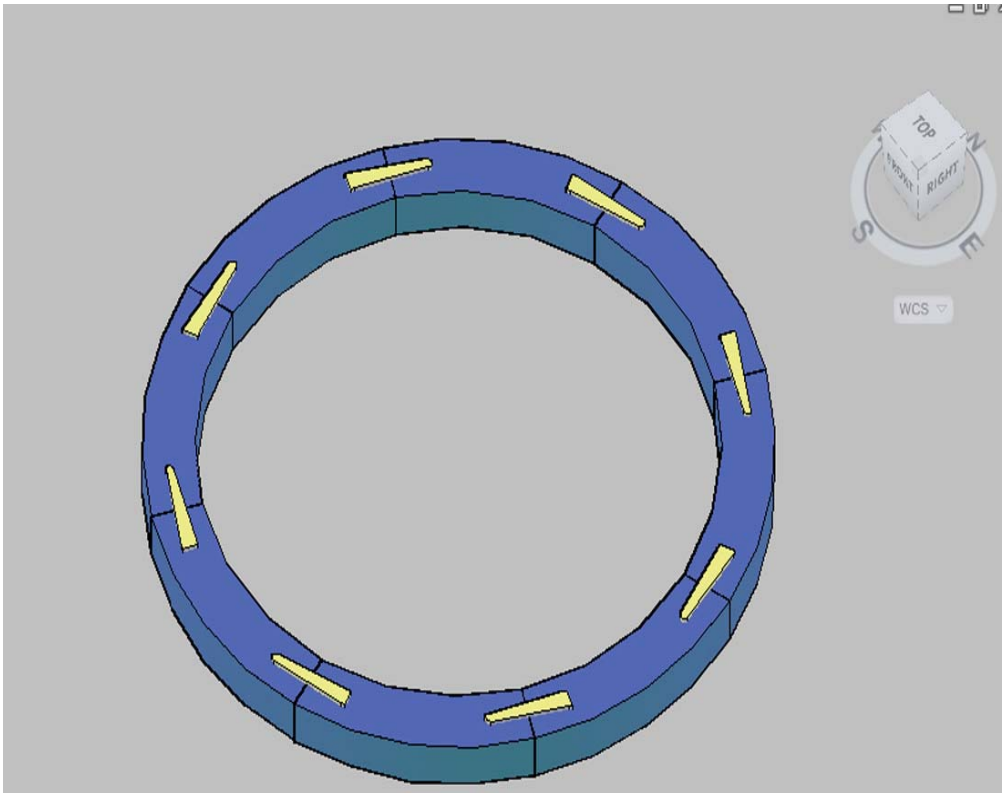

Fig. 2.2. Pattern with diameter 12 inch

2.2.2: Pattern with diameter 10 inch

- Six parts are attached with their inner corner point
- Another small part between first and last parts is added
- All of them are connected with plates and nuts**.**

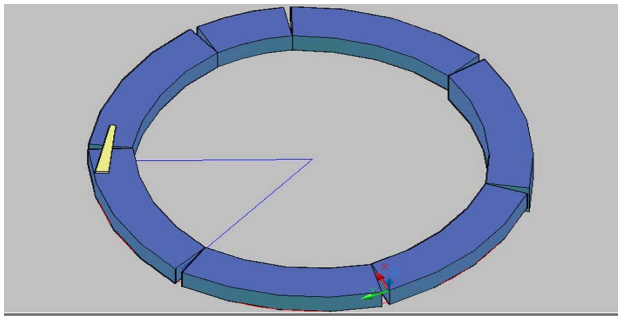

Fig. 2.3. Pattern with diameter 10 inch

2.2.3: Pattern with diameter 14 inch:

- Nine parts has been attached with their inner corner point
- Another small part between first and last parts is added
- All of them are connected with plates and nuts.

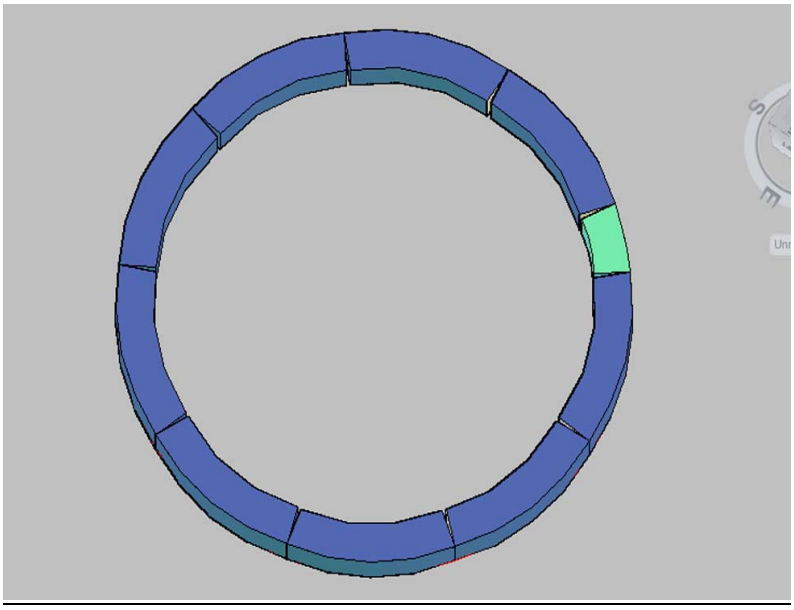

Fig. 2.4. Pattern with diameter 10 inch

3. Feasibility Analysis

- ❖ There will form some small sand stakes for gap between the two parts. From the figure 3 it is seen that there will be only .19" and .11" of extra sand stack for 10" and 14" diameter wheel successively. These can be removed easily with air flow.
- ❖ As two steel plate and nuts are used in every two pattern parts, all of the pattern parts are well tighten
- ❖ Extra allowance is very small

So making this type of pattern is highly feasible.

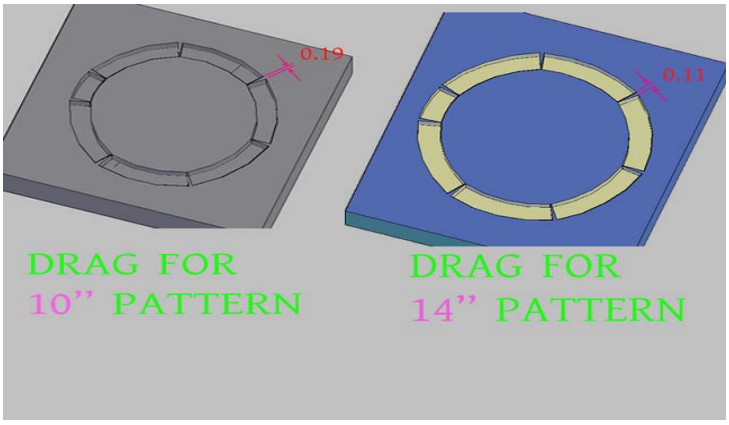

Fig. 3. Drags showing the amount of extra stack of

4. Economic analysis

Table 4.1. Data table for conventional and adjustable pattern

Conventional Pattern cost		Cost of adjustable pattern			
Number of pattern	Cost(TK)	Name of component	Cost(TK)	Extra cost(TK)	Total cost (TK)
1	200	Wood	230		
5	**1000**	Plate	200	40	**500**
		Nut-bolt	30		

In this table 'Extra cost' means cost of melting of extra material, extra machining cost and extra labour cost.

From table 4.1 we find the ratio between adjustable and conventional pattern costs is
= 460/1000
= 0.46
So cost reduction is = (1-0.46)
= 0.54
= **54%**

9. Advantages and Limitations of the system

The advantages of flexible pattern are given below:

- Yield to have many patterns from it
- Decrease overall production cost
- Minimize overall production time
- Urgent order can be taken very easily
- Increase good will of company
- Skilled operator is not necessary

Besides the advantages it has some limitations also which are given below:

- Initial pattern making time is comparatively high
- If the number of manufacturing products > (cost of conventional pattern) /(Extra operating cost), this flexible pattern is not economically feasible
- It is not possible to make feasible pattern for all types of products

11. Conclusions

The system is a cost effective system. The setup cost is only one thousand taka which can be reduced at a substantial extent. There is no maintenance cost related with the system and no electrical bill related here. Changing the setup different patterns can be made with required shape.

The operating process is very easy and also the buildup process is very easy. So the system is very much helpful as well as advantageous for light machine shop for normal operation. The low cost and easy using can be helpful for foundry shop for adopting this system.

In this project we have establish an optimized system for making product with the help of pattern. Most of the cases in foundry shop different patterns are used to make different material; it is also an expensive process. So we have made a system which can be used for making different size of part by using only one pattern. This is economical and efficient for a limited number of parts.

12. References

[1] en.wikipedia.org/wiki/Pattern_(casting)