

## Design of Sand Casting Teaching Aid

Yongsheng Zhou

School of Mechanical and Electrical Engineering, Zhoukou Normal University, Zhoukou  
466000, China.

### Abstract

**Sand casting is a basic process in casting production. It has the characteristics of simple production, low cost and good adaptability, and has been widely used in casting production. In this paper, a sand casting teaching aid is designed, which uses plastic parts to replace the materials and molds used in the sand casting process. Through the assembly and disassembly of plastic parts, it is possible to sequentially demonstrate the process flow of making sand molds, turning boxes, making sand molds, drawing molds, and making pouring systems. It has the characteristics of strong intuitiveness, simple operation, economical and practical.**

### Keywords

**Sand casting, teaching aid, mold release, pouring system.**

### 1. Introduction

Sand casting refers to the process of producing castings in sand molds. The main processes include the manufacture of patterns and core boxes, modeling, core making, box assembly, smelting and pouring, sand falling and cleaning [1-3]. Due to the low cost of molding materials, the simple mold manufacturing process, and the ability to complete the casting of steel and most non-ferrous metal castings, sand casting has been widely used in single-piece and mass production [4]. When teaching students the relevant knowledge of sand casting, the sand casting process takes a lot of time. Since the students have not carried out relevant experimental training projects, they lack a more intuitive understanding of the modeling process, so this paper designs a sand casting Teaching aids can simply demonstrate the main process and operation of the modeling, which is convenient to improve the classroom teaching effect [5].

### 2. The composition of sand casting teaching aids

In order to visually demonstrate the modeling process of sand casting, the sand mold after the box is cut along the symmetry plane, and the half of the sand mold with the section facing outwards is taken as an example to form a sand casting teaching aid. The sand casting teaching aid is composed of two parts, the upper sand box teaching aid and the lower sand box teaching aid, as shown in Figure 1.

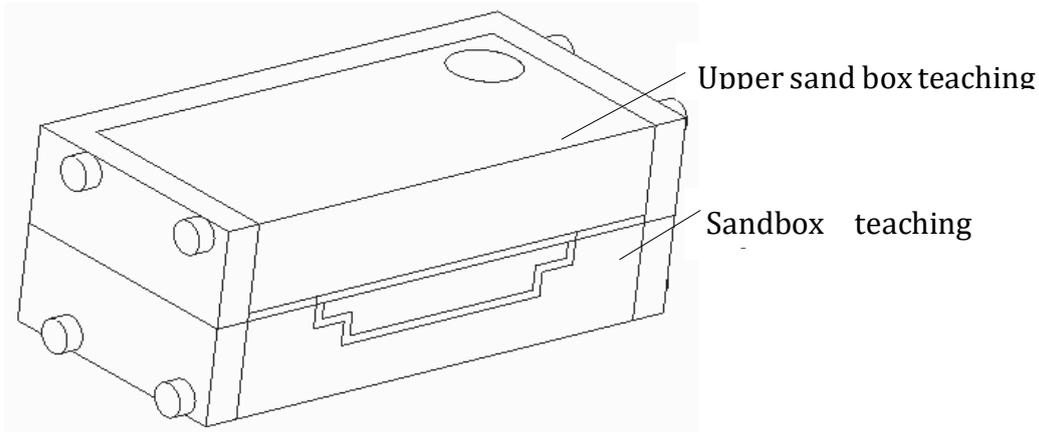


Figure1: Sand casting teaching aid

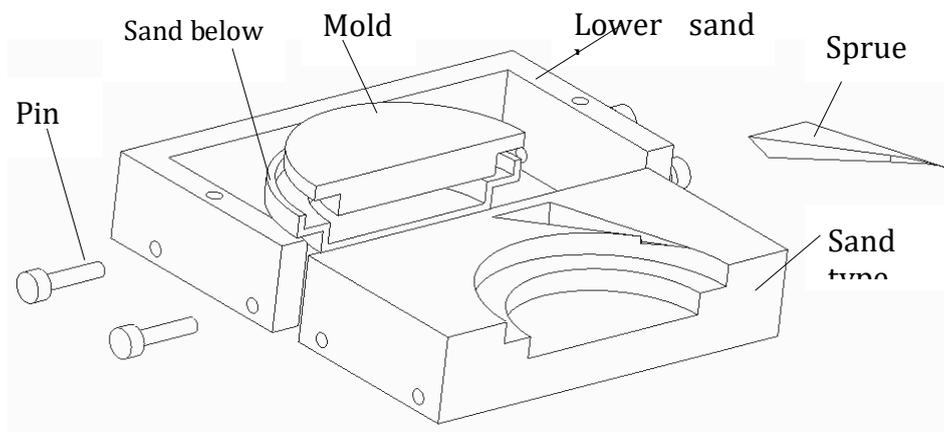


Figure2: Lower sand box teaching aid

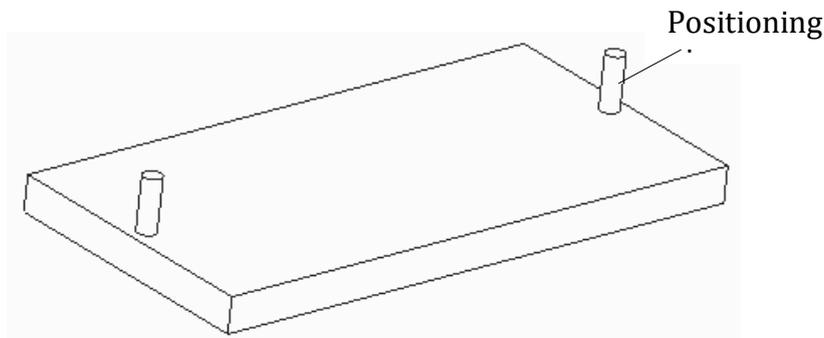


Figure3: Backplane

### 3. Composition of lower sand box teaching aids and upper sand box teaching aids

The lower sand box teaching aid is composed of lower sand box, lower sand mold, casting mold, inner runner, etc., as shown in Figure 2. There are mounting holes on the side of the lower sand mold and the lower sand box, which are fixed by pins. There are mounting holes on the top surface of the lower sand box to connect with the bottom plate and the upper sand box. The bottom plate structure is shown in Figure 3. The upper sand box teaching aid is composed of upper sand box, upper sand mold, sprue cup, cross runner, parting sand, etc., as shown in Figure 4. There are mounting holes on the side of the upper sand mold and the upper sand box, which are fixed by pins. The upper sand box, the lower sand box and the back of the bottom plate are equipped with magnets, which can be adsorbed on the blackboard during use. The structure is shown in Figure 5.

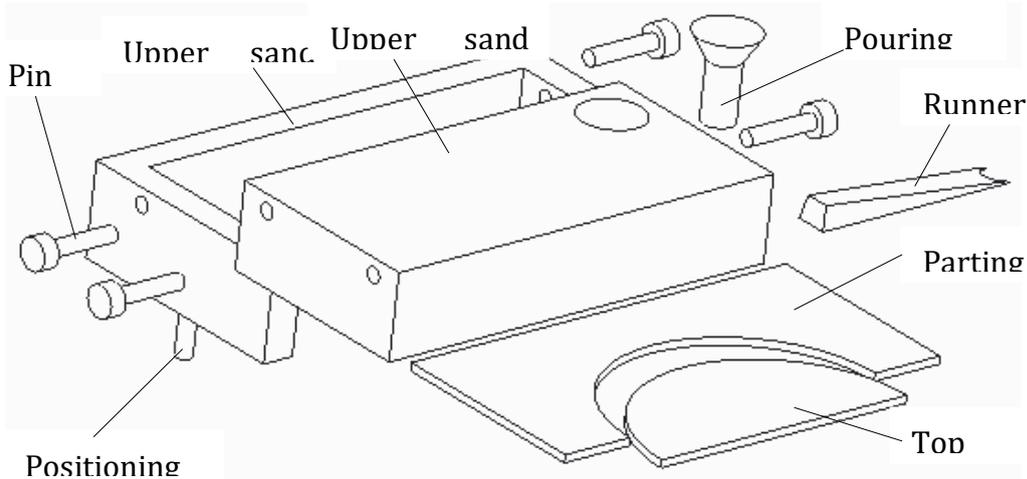


Figure4: Upper sand box teaching aid

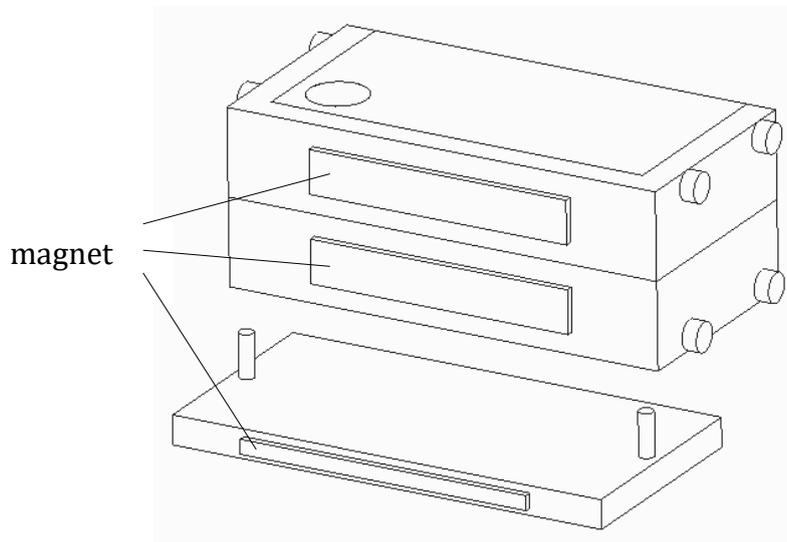


Figure5: Schematic diagram of the installation of the flask magnet

#### 4. Examples of the use of teaching aids

This article takes the modeling process as an example to illustrate the use of teaching aids. First, place the bottom plate on the desk or attach it to the blackboard by a magnet. The positioning pins of the bottom plate are facing upwards. The bottom plate is used to simulate the flat bottom surface used for modeling; The sand box and the bottom plate are installed together through positioning pins, and the casting mold, the bottom sand, and the bottom sand mold are placed on the bottom plate in sequence. At this time, the bottom sand mold includes an inner runner to simulate the process flow of making the bottom box. Connect the lower sand mold and the lower sand box with a pin, then turn it up and down at 180°, remove the bottom plate, and simulate the turning operation of the lower box.

Install the upper sand box on the lower sand box through the positioning pins on it, and then put the parting sand, upper sand, and upper sand mold in sequence. At this time, the upper sand mold includes a sprue cup and a cross runner. This process simulates the process of making the upper box. Process.

Connect the upper sand mold and the upper sand box with pins, remove the sprue cup, and simulate the process flow of taking the pouring rod; then separate the upper sand box from the lower sand box, and turn the upper sand box upside down by 180° to simulate the reversal of the box. Process flow.

Remove the casting mold from the lower flask to simulate the process flow of taking the mold. Take out the runner from the upper sand mold and take the inner runner from the lower sand mold to simulate the process flow of opening the sprue. Then re-install the upper sand box on the lower sand box to simulate the process flow of box closing.

## 5. Conclusion

(1) In the teaching process of sand casting, with the aid of teaching aids, the main process flow and precautions of modeling can be clearly displayed, which can speed up students' mastery of knowledge points and promote the improvement of teaching effects.

(2) The example in this article is only a case of teaching aids. In the process of use, it can also be based on the different molds used in the teaching, the number of sand boxes required, the location and number of vents, and the location of the riser. Circumstances, the teaching aids will be improved and adjusted.

## References

- [1] Y. Ma, B. Tang, X.Y. Xing, et al. Reform and innovation of sand casting practice teaching, *Foundry Technology*, Vol. 41 (2020) No.5, p.498-500.
- [2] M.C. Zhang, C.Y. Zhang, Y. Chen. Teaching practice of lost foam casting based on foam model making, *Experiment Science and Technology*, Vol. 14 (2019), p.117-120.
- [3] Y.L. Liu, Y. Ma. Exploration of the teaching practice of moldless casting, *Equipment Management and Maintenance*, Vol.11 (2018), p.14-15.
- [4] G.D. Niu, Y. Chen. Combined practice teaching program of foundry technology, *Foundry Technology*, Vol. 38 (2017) No.9, p.2247-2248.
- [5] M. Li, Y.M. Zhou, Z. Zhu, et al. Exploration and practice of improving the teaching effect of foundry engineering training, *Experiment Science and Technology*, Vol. 16 (2018) No.1, p.91-93.