



## The Technology and Application of Cold Forming

### a) The Basis of Engineering

Materials Science is a mature engineering.

Metal with the isotropic feature, all can be expected under the external force. To change the shape of metal, need imposed from outside of the load or pressure over the elastic limit to achieve the plastic state.

Cold Forming of Engineering is based on the the scalability and extension of metal.

- 1) Bending is relatively easy to understand, which are familiar by the industry.
- 2) Stretching is quite abstract, mainly due to the very small of elongation (mm scale).

Combination of the two processes can be processed into the following shape of plates:

- 1) Cylindrical, such as the curved part of bilge board.
- 2) Bowl type, such as the bow of the ball-type ball nose panel
- 3) Spiral shape, such as part or corner of the stern plate.
- 4) Saddle, such as the ship's bow before the column.
- 5) Multi-shapes, by twisting, pressure bowl, pressure saddle, etc. combined, such as supply the bits and round ships stern for ships.

### b) Tools and Equipment for Cold Forming

The necessary equipment and information of implementation of cold forming are as follows;

- 1) Model designed by software and change into operation with human-machine interface:
  - 1) Draw a line on the sheet, for example, the framework of line
  - 2) The wooden mold with the details of installation such as touching wood so that the angle of the surface resistance, such as

In order to ensure accuracy, cutting and processing of CNC machine tools required, such as the DNC plate plasma cutting machine.

- 2) If there are no conditions for a computer design tool can be hand-made molds, such as a steel bar or wood production. When repairing, time often does not allow the use of computer



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Modeling.

3) Cold Forming hardware components:

1) programmable control of the ship, there are two functions of hydraulic press

Bent functions, hydraulic press used for shipbuilding

Extend the function of rollers used for marine

2) tools and dies

Bending

Extension

Hydraulic press is the core of the cold forming. Unlike other processing, cold forming and hydraulic loading crane machine synchronous movement of the fuel tank, while allowing at the same time forging of the workpiece. The characteristics of such automated control operation of a possible increased production efficiency.

1. Press the controller is tailored for the Cold Forming of production, set up under the pressure of the pressure and depth of the basic functions of press.

2. Hydraulic pressure in the 200 tons to 1,000 tons, 500 tons of press in general to meet the needs of the majority of the shipyards

3. Roller can be used alone, can also be used as auxiliary equipment shipping press. If it is used for the latter, hydraulic hammer removable under the table, after the demolition of the location to replace the roll.

4. Roller size, usually made by the user to extend the three-dimensional form, form the basic variables are needed to extend the volume (in mm), and with the processing of thickness (in mm) of the corresponding. Forms for the realization of the pressure required to extend the volume.

c) Cold Forming process

1. Method of choice: depends on the shape of the workpiece after processing, and the shape can be visually observed from the template.

Provided by observing templates and detailed understanding of mold can be processed pieces

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of 3-D structure of the workpiece and convexity throughout the volume of distorting the impression of a skilled enough to make the necessary technology and methods of decision

2. There are two extended cold forming methods.

Not only have to rely on the work of a particular region but also a unique tool.

1) the edge of the extension can have a board warpage and the inverted arch, such as the saddle

2) the middle to extend the processing bowl, compared with the longitudinal center board to produce more extended

In general, the workpiece after the completion of the extension to the end of the work of bending. The latter is relatively simple, usually around the bend along the boards.

Strokes of the cane used to extend the rollers. Recognized as less time. However, for relatively small plate-type bow such as the ball nose, used to have round-the tools,

3) inch wide in the processing process, the workers in accordance with the model of processing, non-stop use of the model without having to worry about bending over because of excessive bending part can also come back. Similarly, the extension do not have to worry too much, because with the workpiece to allow the installation of a very small error compared to over-extend, can be ignored. When all the mold and processed after release, when the mold plate to the bottom and to match well, and die just the top of the formation of a plane (visual for the plane), cold forming have been completed.

4) the efficiency of cold-forming

Compared with thermal processing, mainly relying on cold forming equipment, more predictable. From experience, usually the product range of allowable error  $\pm 5\text{mm}$ , in addition to the inherent flexibility for the metal, so there is no problem with the assembly.

Production per tonne / hour is four times the heat molding. Taking into account the cold-forming of a person for the implementation of the operation, productivity per tonne / person-hour basis, at least 6 times the thermal forming, cold forming is much better than the heat processing