INTRODUCTION OF DISHED END PLANT

1) What are the dished ends? And its functions.

- Dished ends (also called tank heads, end caps, or vessel heads) are curved end closures used to cap or seal the open ends of pressure vessels, tanks, or pipelines.
- Instead of leaving a flat end, which would be weak under internal pressure, the ends are “dished” or curved to distribute stress more evenly — making the vessel stronger and safer.
- They are manufactured by pressing, spinning, or welding plates into specific shapes (like hemispherical, ellipsoidal, or tori spherical forms) depending on the design pressure and application.

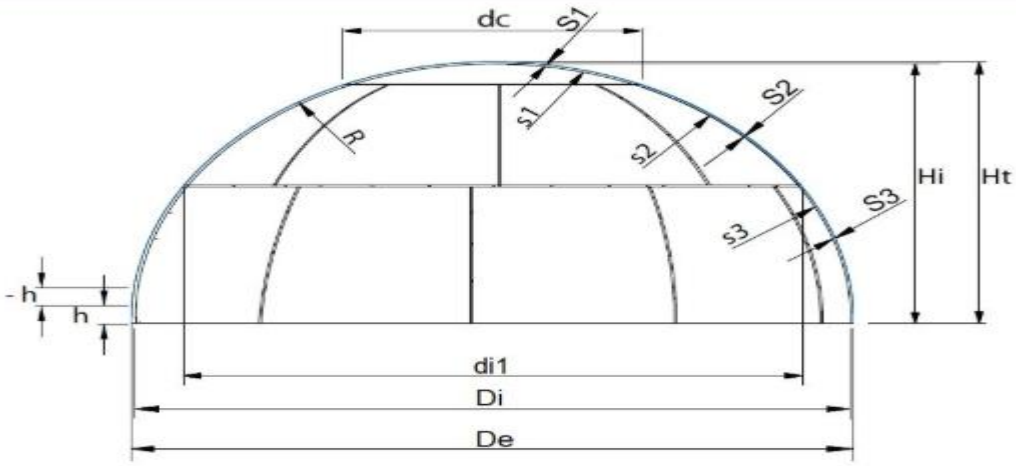
➢ Main function of dished ends:

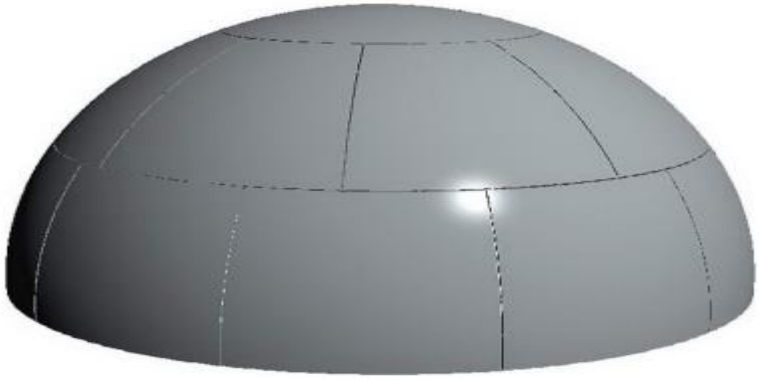
1. To close the ends of cylindrical vessels
    - They act as an end cap that seals the vessel and contains internal pressure.
2. To withstand internal or external pressure
    - The curved surface distributes stress evenly, minimizing weak points compared to a flat end.
3. To provide structural strength
    - The dish shape allows thinner material to handle higher pressure than a flat plate could.

2) What are the types of dished ends?

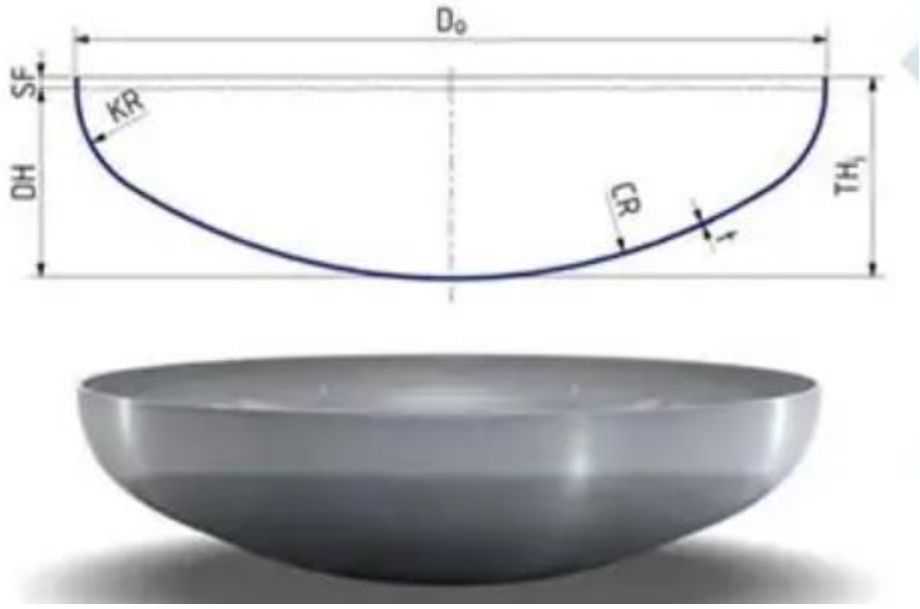
There are mainly three types of dished use in fabrication process.

- Hemispherical Head:

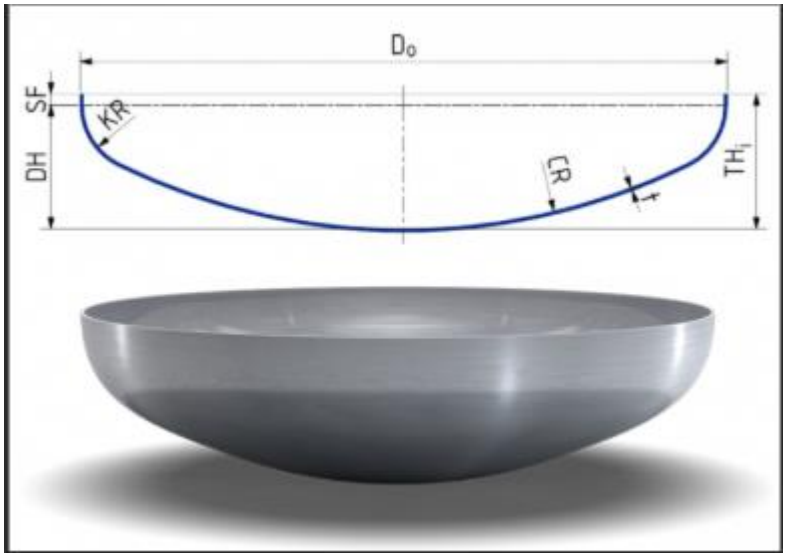




- Ellipsoidal Head (2:1 Elliptical Head):



- <u>Tori spherical Head (Flanged and Dished Head):</u>



2) Dished manufacturing range.

- Diameter range Ø1300 to Ø5000 mm
- Thickness range 6 mm to 18 mm CS and 6 mm to 18 mm in SS
- Knuckle radius 50,100,150,200,250,300,350,400,500

3) What are the Machine used in manufacturing of dished? and its function:

In manufacturing we are using major four machines which is formed into dished,

1) Welding machine
2) Hydraulic press machine
3) Spinning or forming machine
4) Edge bevelling machine

1) Welding machine:

A welding machine is a device used to join two or more pieces of metal (or thermoplastics) together by applying heat, pressure, or both. The heat melts the base materials, and sometimes a filler material is added to form a strong joint once it cools and solidifies.

2) Hydraulic press machine:

A hydraulic press is a machine that uses hydraulic pressure (liquid under pressure) to generate a large compressive force. This force is applied to deform metal plates into a desired shape — such as the dished end of a tank.

- Function in Manufacturing Dished Ends
  In the production of dished ends, the hydraulic press performs one or more of these key steps:

1. Dishing (Forming the Dish):
   - A flat metal plate (usually steel-CS, MS & SS) is pressed repeatedly with a dishing die or punch.
   - The press applies downward force to gradually curve the plate into a concave or convex shape.
   - This can be done using cold forming or hot forming (if the material is heated to improve ductility).

2. Flanging (Forming the Edge):
    - After dishing, the edge of the plate is flanged (bent at 90°) using the same or a separate hydraulic press to form the toroidal section.
    - This step prepares the dish for welding onto a cylindrical vessel body.
3. Calibration or Finishing:
    - The press can also perform final shaping, thickness correction to ensure the dish meets dimensional and strength specifications.

3) Spinning or forming machine:

- Working Principle:

- A flanging machine uses rotating rolls or hydraulic rollers to gradually bend the edge of the dished plate upward (or downward) around a rotating clamping.

Steps:

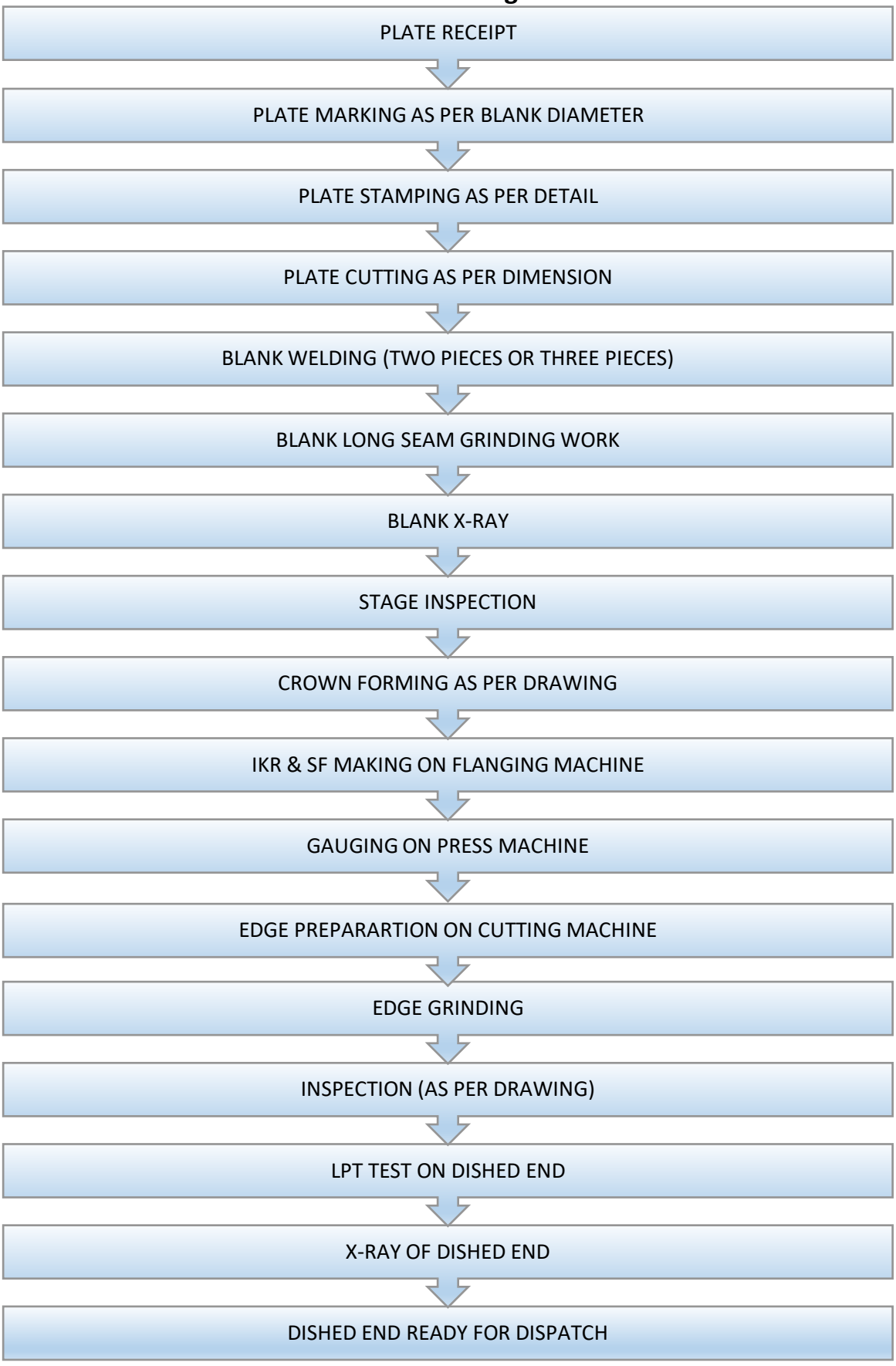
- Loading:
  The dished plate is mounted and clamped on the machine table.
- Rotation:
  The dish rotates slowly on its axis.
- Roller Engagement:
  A forming roller applies pressure to the dish edge, bending it upward to form the flange.
- Progressive Forming:
  The roller gradually moves inward and upward to achieve the final flange radius and height.

4) Edge bevelling machine:

In edge bevelling machine we have provide dished edge preparation,

1) Outside “V” edge preparation
2) Inside “V” edge preparation

5) **Process flow of manufacturing of dished ends.**



6) What are the tests involved after forming of dished?

- Heat Treatment (if required)

If the material or process demands:

- Post Forming Heat Treatment (PFHT): To relieve forming stresses or restore material properties.
- Verification: Check furnace charts, soak time, and temperature.
- Hardness Testing: To ensure values are within specification (no excessive hardening).

- Non-Destructive Testing (NDT)

Depending on design code and customer requirements:

- Dye Penetrant Test (PT): For detecting surface cracks, especially near weld seams or knuckle.
- Ultrasonic Test (UT): To detect internal defects (laminations, inclusions).
- Radiography (RT): For weld seams (if dished end is made from segments welded together). Test involved in radiography 1) X-Ray test and 2) Gamma test

7) What are inspection criteria of dished ends?

1) Visual Inspection (VT):

Purpose: Detect visible defects on surfaces after forming, trimming, and welding by LPT.

Criteria:

- Surface must be free from cracks, laps, folds, blisters, or deep scratches.
- No lamination or bulging beyond allowable tolerance.
- For welded heads, weld surface must be smooth and fully flushed.
- Any repair must be re-examined by the same method.

2) Dimensional Inspection

Purpose: Verify that the formed dished end meets the required dimension and tolerances.

Tools used: Templates, measuring tapes, ultrasonic thickness meter.