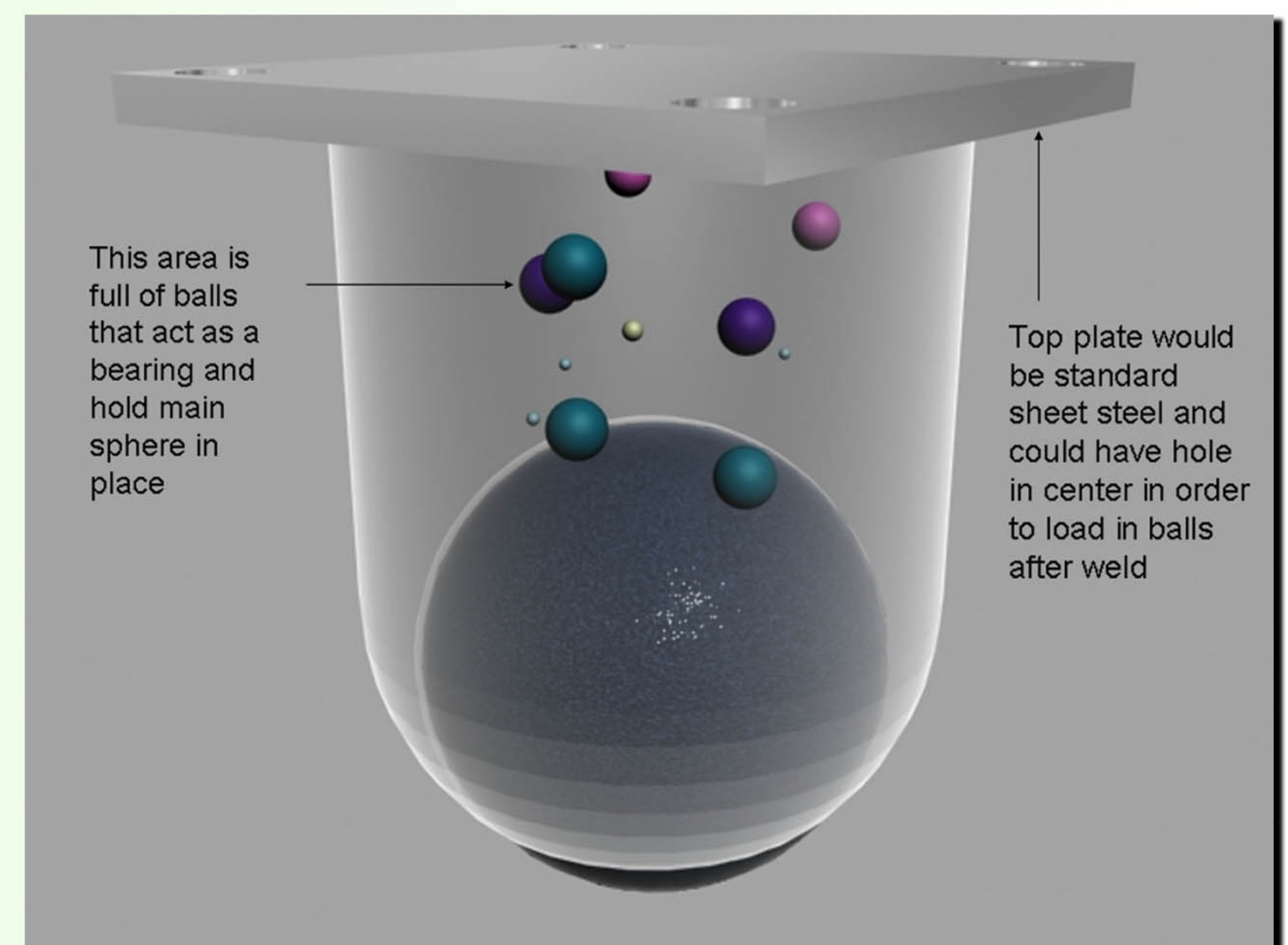
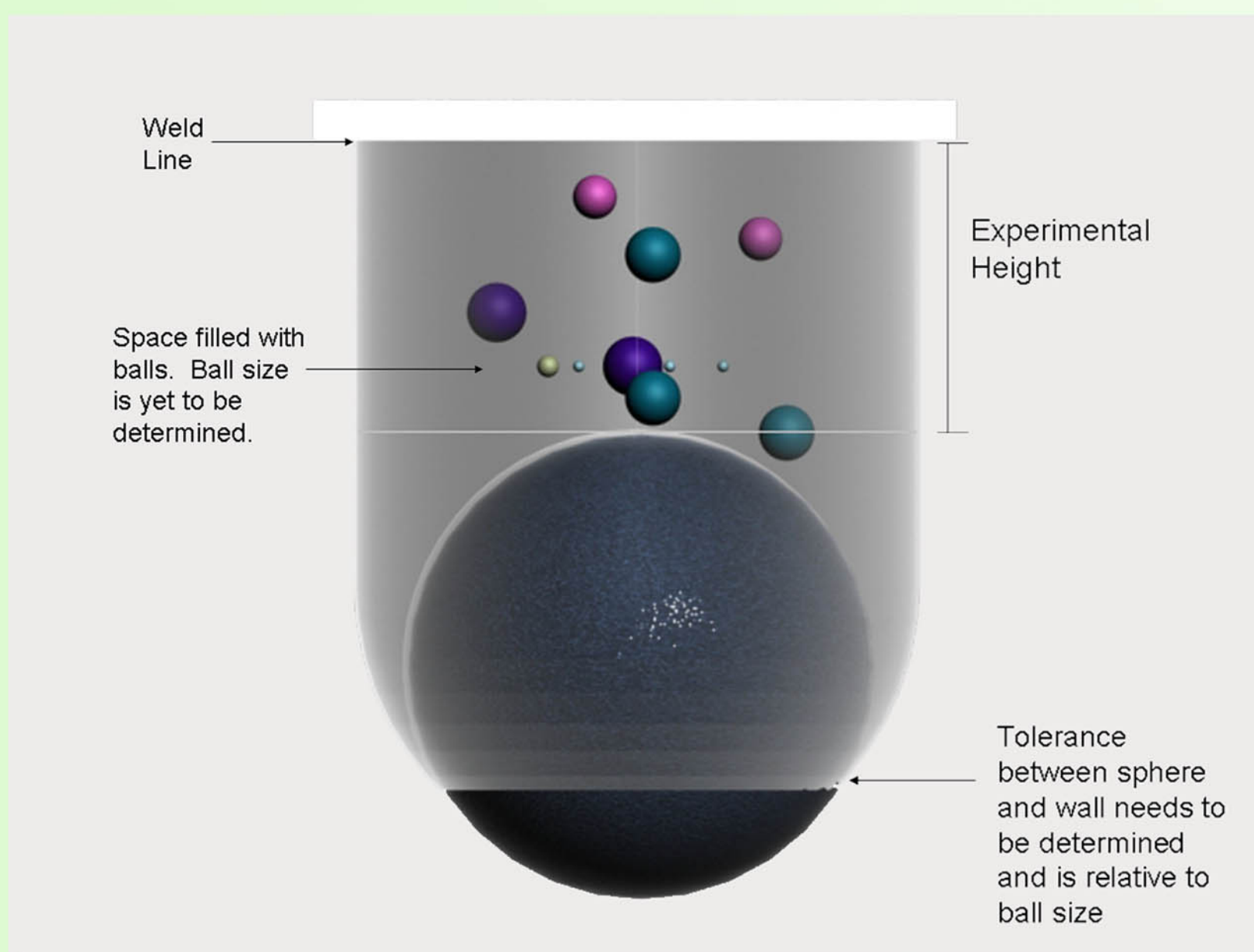


CONCEPT

- Reduce lead time
- Focused on simplifying design
- Tried starting from scratch
 - Designed 2 possible concepts
- Less parts = Less failure points
- Less manufacturing processes and machines
 - Cutting → Water Jet
 - Crimping → Roll Forming
 - Turning → CNC Machine
 - Assemble stage → Welding machine

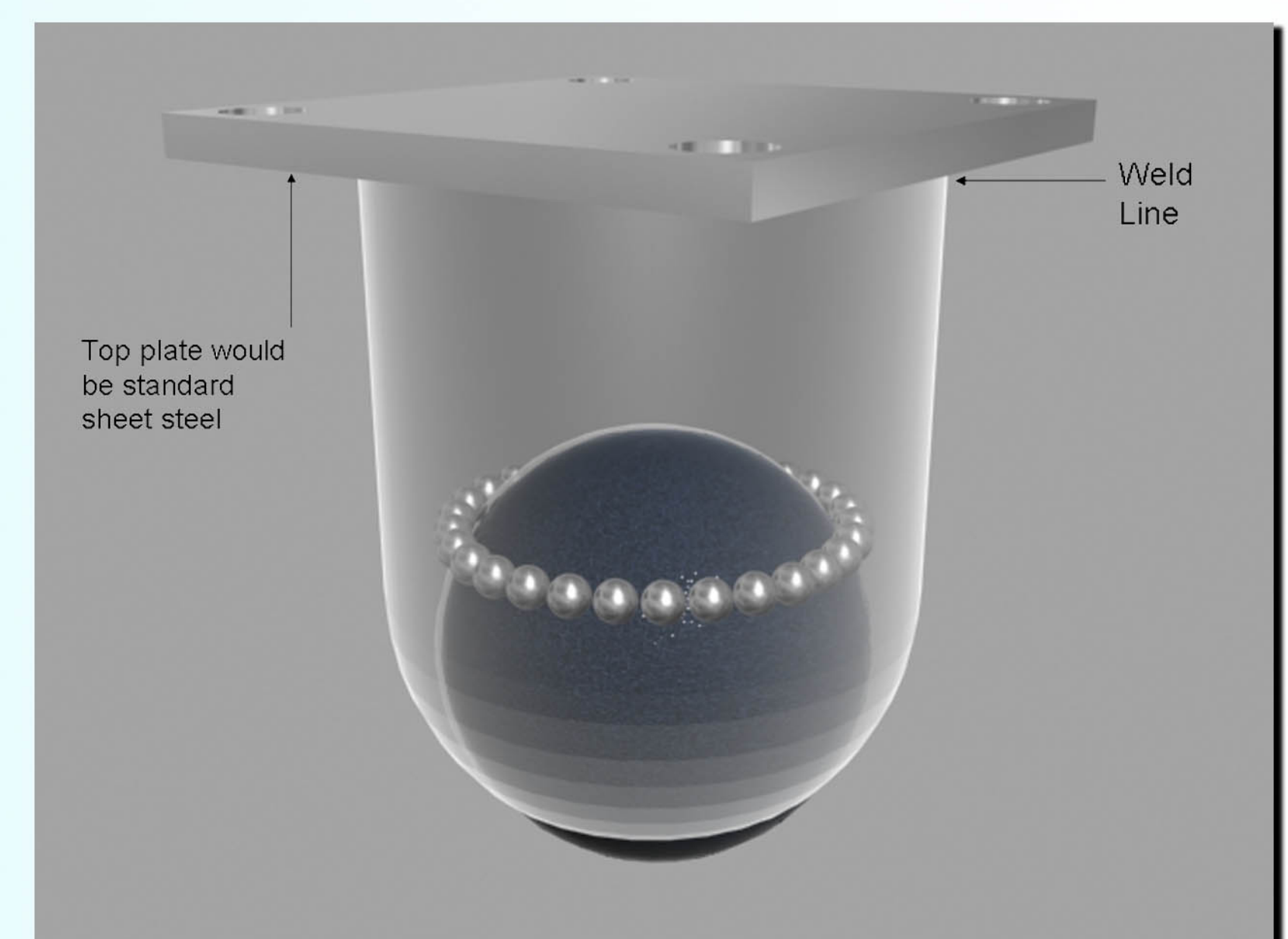
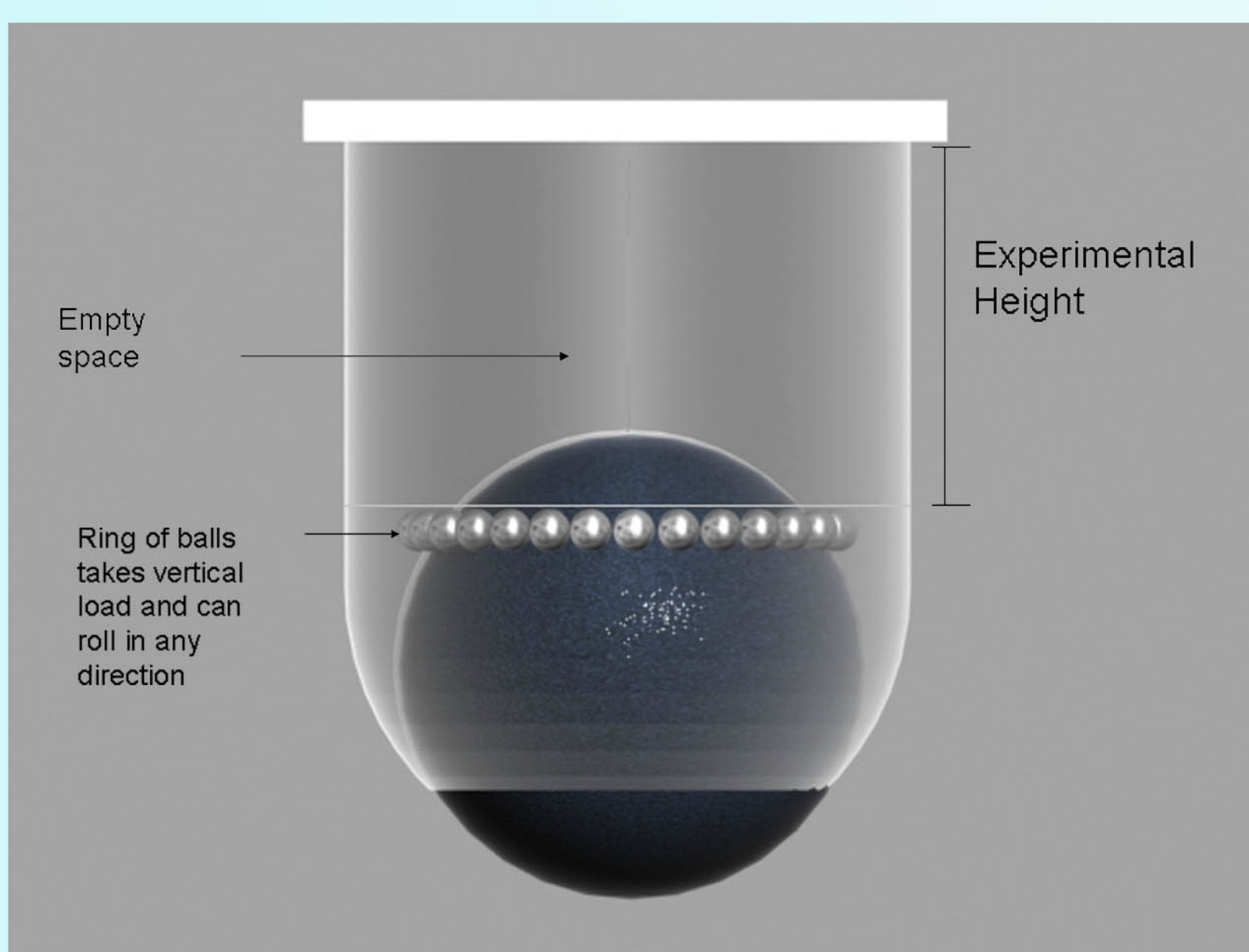
Torque Spherical Caster: Design 1



COMPONENTS

- Top plate:
 - Raw Material: Standard Steel
 - Manufacturing Process: Water Jet
 - Function: same in existing mechanism
- Thick Wall Tube:
 - Raw Material: Steel thick wall tube
 - Manufacturing Process: Water Jet/ Laser and Crimping
 - Function: contain roller balls and main sphere
- Main Sphere
 - Raw Material: Need to experiment
 - Manufacturing Process: Need to experiment
 - Function: Hold in roller balls and act as the "wheel" in current caster designs
- Roller balls: Standard steel balls
 - Function:
 - Work as a bearing and a eliminates need for torque in turn
 - Transfer vertical load
 - Holds main sphere in place

Torque Spherical Caster: Design 2



COMPONENTS

- Top plate:
 - Raw Material: Standard steel
 - Manufacturing Process: Water Jet
 - Function: same in existing mechanism
- Thick Wall Tube:
 - Raw Material: Steel thick wall tube
 - Manufacturing Process: Water Jet/ Laser, Crimping and Turning
 - Function: Act as raceway for balls and house main sphere
- Main Sphere
 - Raw Material: Need to experiment
 - Manufacturing Process: Need to experiment
 - Function: Hold in roller balls and act as the "wheel" in current caster designs
- Roller balls: Standard steel balls
 - Function:
 - Work as a bearing and a eliminates need for torque in turn
 - Transfer vertical load

BASIC CONCEPT

- Standard bearings
 - No Heat Treatment
- Less manufacturing processes and machines
 - Cutting → Water Jet
 - Turning → CNC machine
 - Assemble stage → Welding machine
 - Corrosion protection → Powder coating



CONCEPT 2

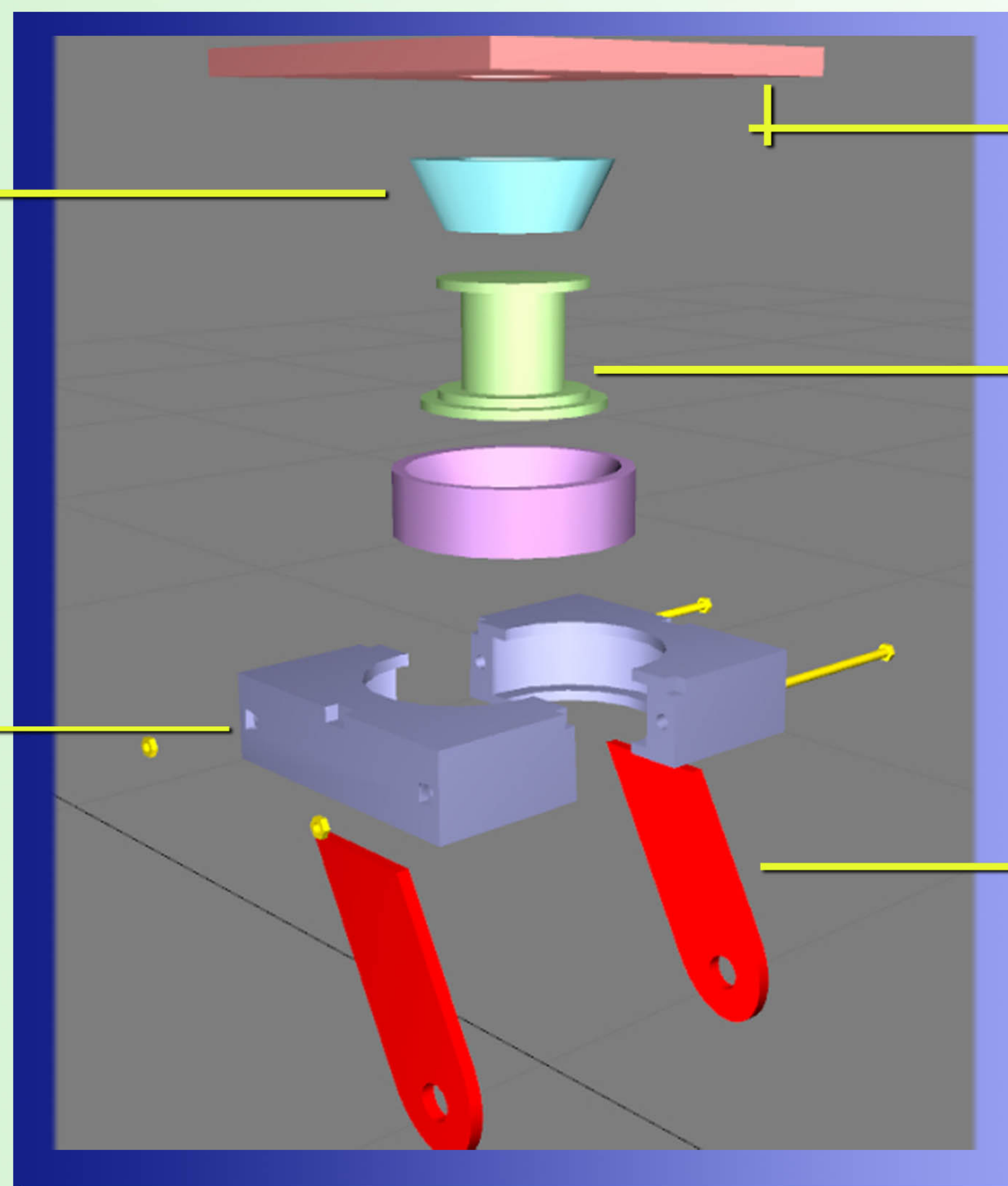
■ Bearing: Standard available in market

- Function:
 - Allow the swivel action
 - Transfer vertical load



■ Bearing Housing:

- Raw Material: Steel
- Manufacturing Process: CNC – Turning & Water Jet / Laser
- Function: Hold Outer race of bearing and fork



■ Top plate:

- Raw Material: Steel
- Manufacturing Process: Water Jet / Laser
- Function: same in existing mechanism

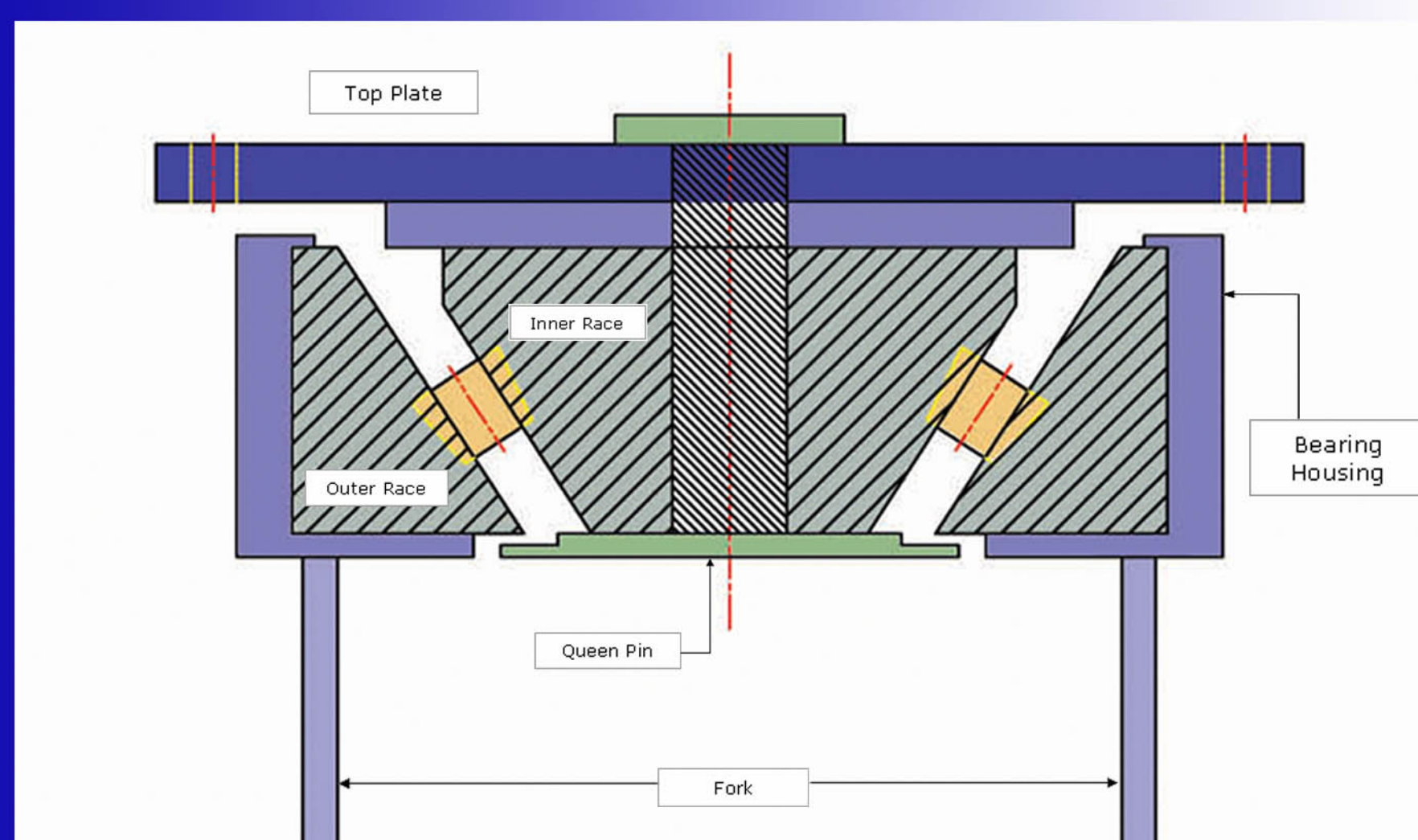
■ Queen Pin:

- Raw Material: same as used in King Pin
- Manufacturing Process: CNC - Turning
- Function:
 - Hold (Top plate/Inner race)
 - Lift fork and wheel assembly upward

■ Fork:

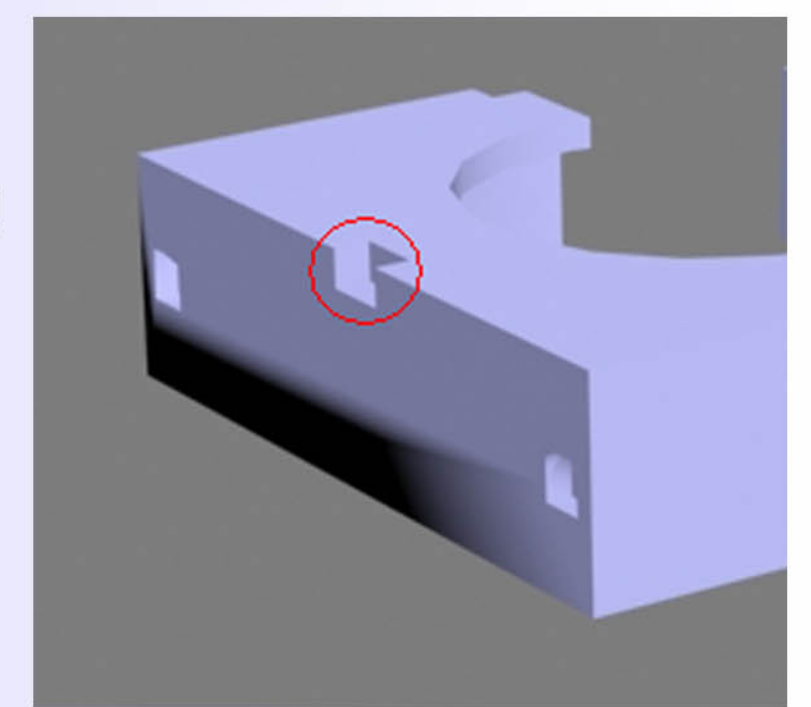
- Raw Material: Steel
- Manufacturing Process: Water Jet / Laser
- Function: same as existing

- Straight fork which needs least machining but need to be heavy.
- Bent fork, which needs only simple bending and which is moderate in weight.
- Profiled or bubbled fork which needs critical bubbling but with least material.



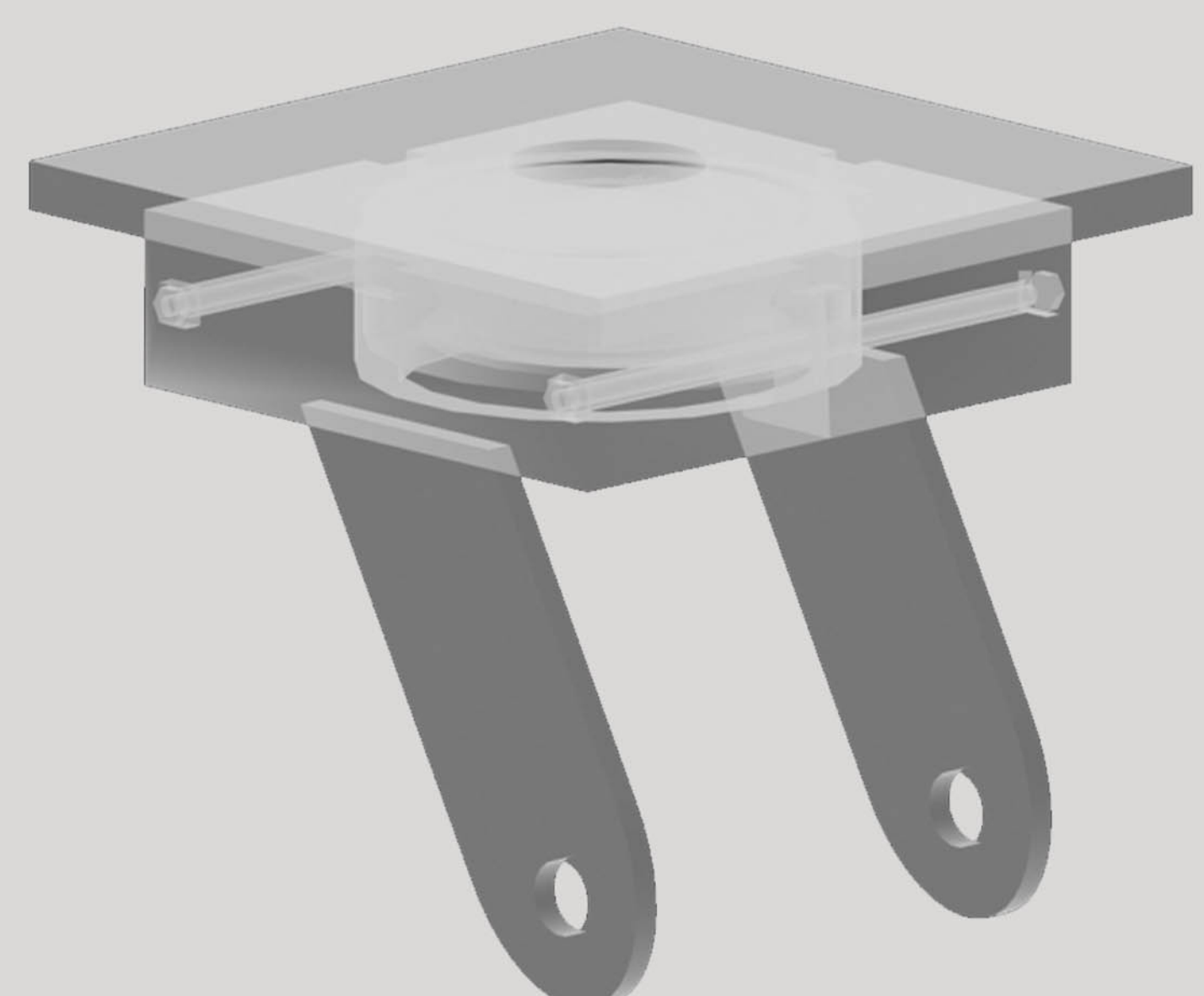
BRAKES

- Easily attached to Bearing Housing
 - Screwing
- Locking System



ADVANTAGES

- Heat Treatment is not required.
- All components can be made by turning and water jet or laser cutting, within hours.
- No special tooling required for different products.
- Customized items can be made faster by simply modifying computer programs.
- Ideal for small batch sizes of 500 to several thousand pieces.
- Low inventory.



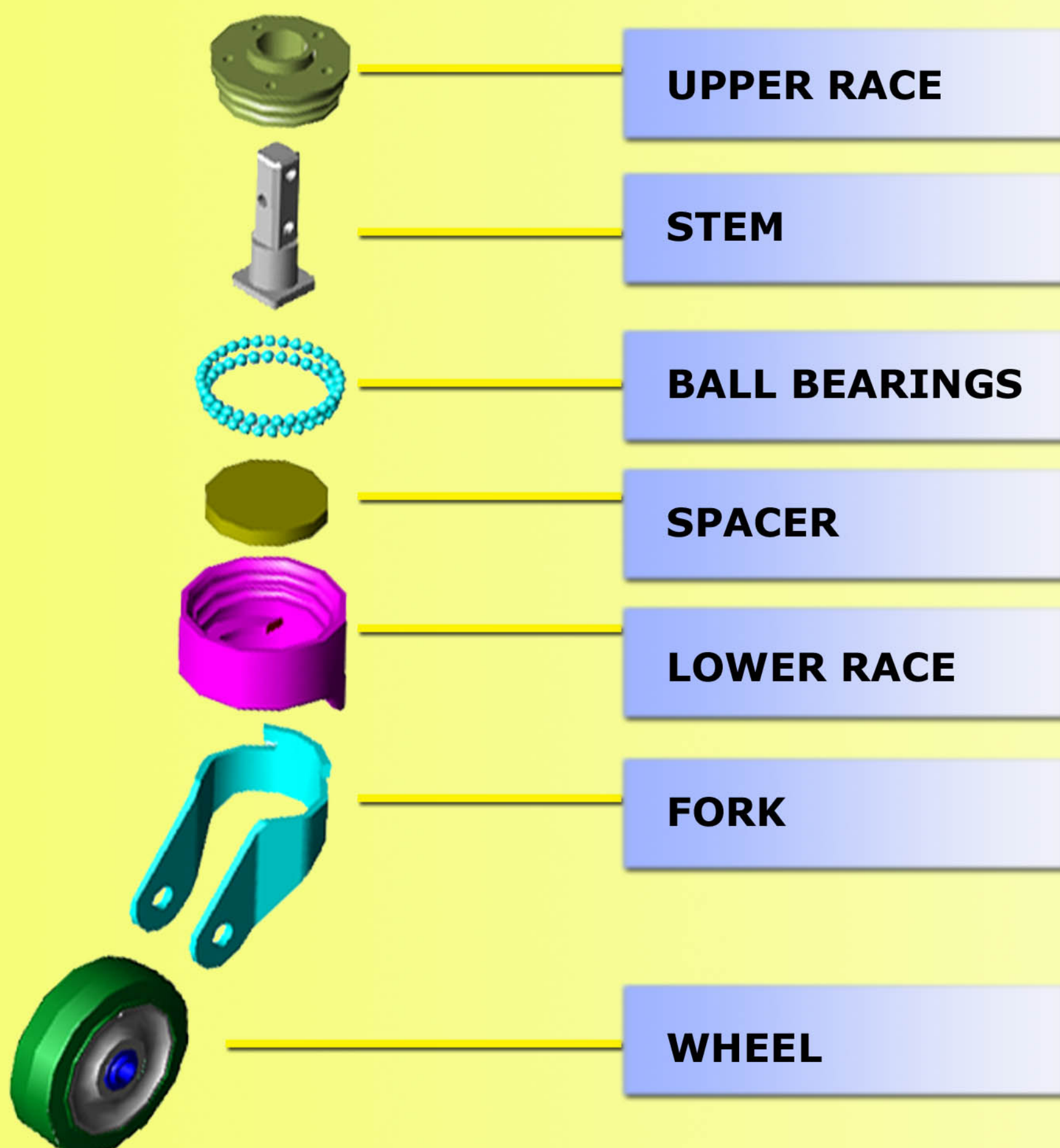
BASIC CONCEPT

- Use of CNC Turning, Milling, and Cutting
 - Creates Flexible Manufacturing
 - Eliminating need for hard tooled stampings.
 - Removes need for forging processes and associated forging dies.
 - Eliminates requirement for casting processes and required cores.
- Remove Process of Welding
 - Eliminates need for special welding fixture's
 - Reduce cost between use of skilled worker vs. assembler.
- Multi use of laser
 - Cutting
 - Precise heat treatment

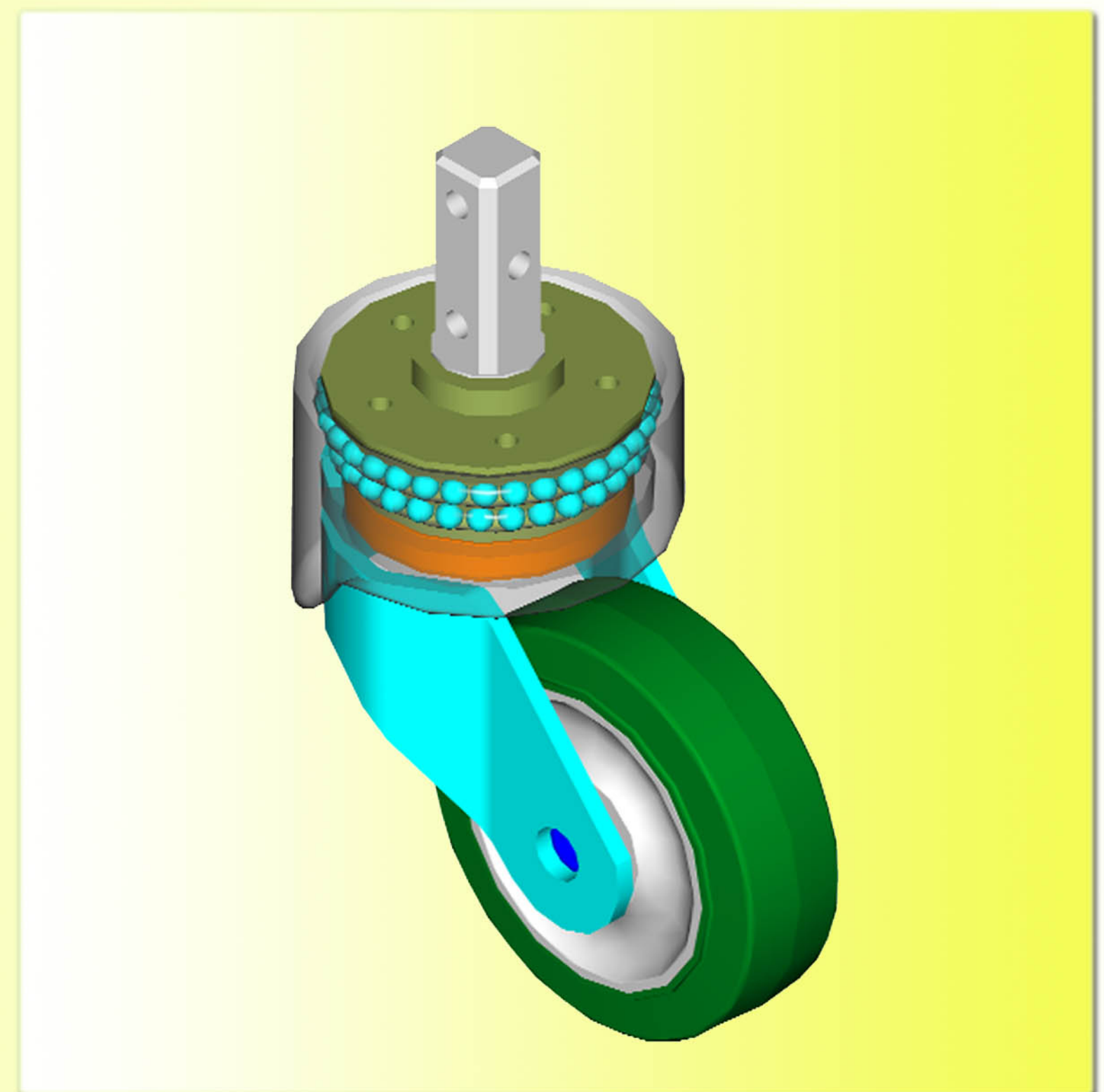
LASER HEAT TREATMENT

- Provides accurate heat treatment
 - Good for bearing racings
- No surface coating required
- Rapid self quenching with appropriate thickness....
- Relatively low-power Nd:YAG lasers can be used
- Multi function of laser for cutting and heat treating processes.

FLEXIBLE DESIGN



FLEXIBLE DESIGN 1



FLEXIBLE DESIGN 2

