S.D.M. COLLEGE OF ENGINEERING & TECHNOLOGY DHAVALAGIRI, DHARWAD-580002

(AFFILIATED TO VISVESWARAYA TECHNOLOGICAL UNIVERSITY)

Report on Valve Design Internship

"Internship work carried at DesignSense Software Technologies Pvt Ltd:

"Worked under Design Team."

"This report is submitted in partial fulfilment of the requirements for the Bachelor of Engineering degree in Mechanical Engineering."

Report Submitted By:

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Semester: 7Th
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Department of Mechanical Engineering

CERTIFICATE

This is to certify that the Internship at **"DesignSense Software Technologies Pvt Ltd"** "Worked with the Design Team" as Bonafide work carried out by Deepak Nagarajasa Pawar (2SD22ME414) submitted in partial fulfilment of the requirements for the award of the degree of Bachelor of Engineering in Mechanical Engineering at S.D.M. College of Engineering and Technology, Dharwad, Karnataka. (An autonomous institution affiliated to Visvesvaraya Technological University, Belgaum, Karnataka), during the year 2025-2026.

INTERNAL GUIDE:
Dr. SunilKumar .S. Honnungar

HOD Mechanical department
Dr. AnilKumar H C

DECLARATION

I hereby declare that this report on Valve Design Internship at “DesignSense Software Technologies Pvt Ltd” "Worked with the Design Team." Is carried out by me under the guidance of Dr. Sunilkumar.S Honnungar, Department of Mechanical Engineering, S.D.M. College of Engineering & Technology, in partial fulfilment of the requirements for the Bachelor of Engineering degree in Mechanical Engineering, SDM College of Engineering & Technology, Dharwad. I also declare that I have not submitted this dissertation work to any other university for the award of any other degree.

ACKNOWLEDGMENT

I would like to thank our guide Dr. SunilKumar S Honnungar Department of Mechanical Engineering, S.D.M. College of Engineering & Technology, for his constant support, invaluable advice, and guidance. I would like to express my earnest, profound gratefulness to the Internship committee - Dr. Anilkumar H. C and Prof. V. R. Shivannavar for helping us throughout the project period in every manner. I would like to thank Dr. Ramesh L Chakrasali, Principal and Dr. Anilkumar H. C, HOD, Department of Mechanical Engineering, & Deans of S.D.M. College of Engineering and Technology, Dharwad, for being a constant presence of inspiration and support. I would like to express my sincere gratitude to the management and staff of DesignSense for providing me with the opportunity to undertake my internship in their esteemed organization. I am especially thankful to the HR department for their continuous support and guidance throughout the internship period. I would like to extend my thanks to all the engineers, supervisors, and fellow employees who generously shared their knowledge, helped, and made my learning experience enriching and enjoyable. Their encouragement and cooperation played a vital role in the successful completion of my Valve Design Internship

Abstract

This report summarizes the internship completed at DesignSense Software Technologies PVT. LTD, Bengaluru, during which I gained hands-on experience in CAD software development, customization, and process automation. Founded in 2013, DesignSense is a company specializing in CAD solutions, acting as the national distributor for BricsCAD and developing popular add-ons like GeoTools and CAD Power.

Over the internship period, I worked on projects involving CAD workflows creating automation scripts, assisting in CAD customization for engineering design tasks, and improving productivity features for DWG-based design. I also learned about the documentation and support needed for software tools used in mechanical, GIS, and infrastructure design.

Through this experience, I developed technical and professional skills including CAD modelling, software tool use, collaboration with software and design teams, and understanding customer requirements in the engineering domain. The internship provided insight into how modern engineering design firms integrate software automation and CAD customization to make workflows efficient and reliable.

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Chapter 1: Introduction to DesignSense Software Technology PVT LTD

DesignSense Software Technologies PVT. Ltd.

Fig 1: DesignSense Logo

1.1 Company Profile:

Founded: November 27, 2013
Location / Headquarters:
#365/8, “Hasmitha Avenue”, First Floor,
16th Main Road, Jayanagar 4T Block,
Bengaluru – 560041, Karnataka, India

Legal Details:
Private Limited Company, non-government.
CIN: U72900KA2013PTC072162
Authorized Capital: ₹1,900,000; Paid-up Capital: ~₹1,064,820

Registered with ROC Bangalore.
Mission / Vision:
To simplify engineering and design processes by reducing cost and complexity, improving productivity for users in design, CAD, and construction. They focus on engineering/collaboration tools that connect design data, workflows, and people.

1.2 Key Products and Services:

Product / Service	Description / Purpose
BricsCAD partner & distributor in India	They are the nationwide distributor for BricsCAD and Bricsys products.
GeoTools	Application / add-on for geo-data users; mapping, GIS, survey workflows, etc.
CADPower	A toolkit of over 400+ productivity tools / routines, to automate repetitive CAD tasks and improve drafting / CAD functionality.
Ayoga	A cloud-based collaboration and project management product, integrating Web, Mobile, CAD, and IoT for construction industry needs.
CAD / BIM / CAD Customization & Automation Services	Bespoke/custom tool development, automation of workflows, support & consulting in CAD platforms including BricsCAD, AutoCAD, etc.

1.3 Industries Served:

Architecture & Engineering & Construction (AEC)
Mechanical, Electrical, MEP, Infrastructure, Civil works
GIS / Surveying / Mapping
Government / Public sector projects and regulatory users

1.4 Geographical Reach:

1. Primarily based in India (Bengaluru, with an office in Hisar)
2. Also serves international customers (GeoTools, CADPower distributed overseas)

1.5 Other Notable Details:

1. The company evolved from earlier work as a CAD tools/development service provider (including under earlier names) before taking on its current product portfolio.

2. They emphasize productivity enhancement, workflow automation, and enabling design data interoperability.

3. Contact Info:
   Head Office – Bengaluru: +91-8073279755 / info@thedesignsense.com
   Hisar Office – Hisar, Haryana: Phone +91-9650984168, Email pradeep.kumar@thedesignsense.com

Chapter 2: DesignSense Product Portfolio

2.1 BricsCAD® Software Suite

DesignSense is the official distributor for BricsCAD in India, offering a range of solutions for various design needs:

BricsCAD Lite: A lightweight 2D drafting tool.
BricsCAD Pro: A comprehensive 2D/3D CAD solution.
BricsCAD Mechanical: Tailored for mechanical design and detailing.
BricsCAD BIM: Building Information Modeling for architectural design.
BricsCAD Ultimate: An all-in-one solution combining all features.

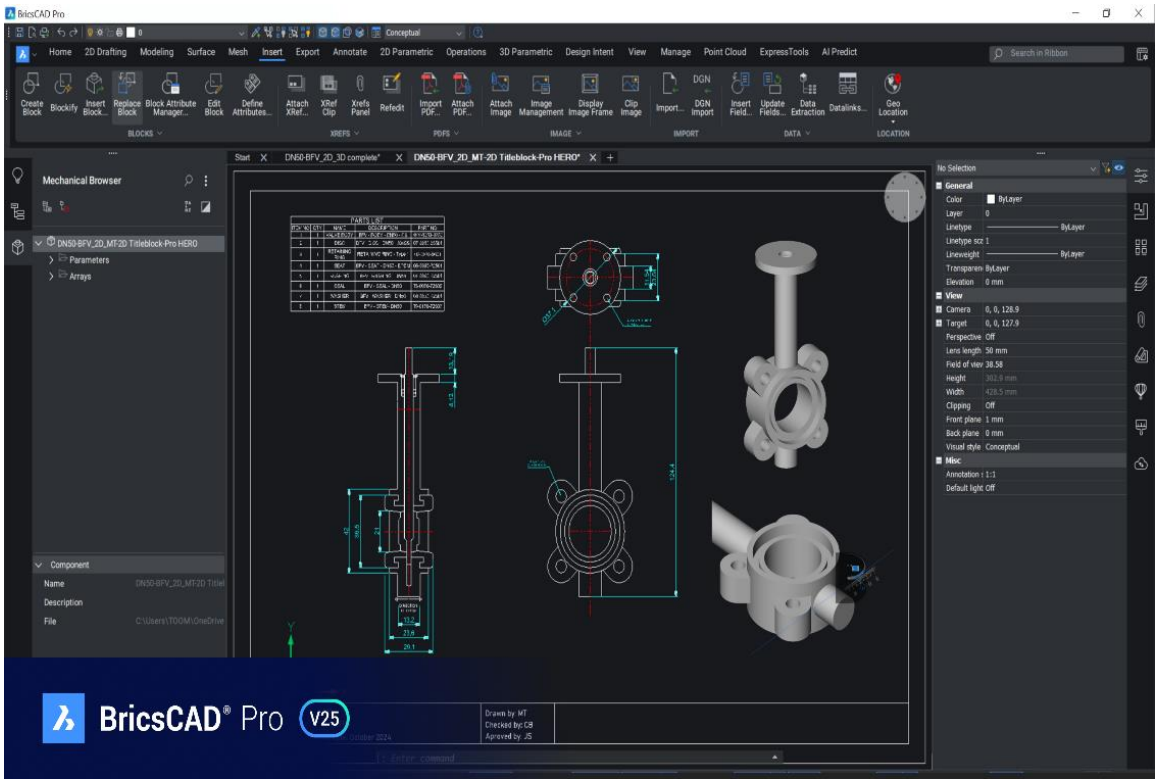


Fig 2.1: BricsCAD Interface

2.2 CADPower™

A powerful add-on for BricsCAD and AutoCAD, CADPower enhances CAD productivity with over 400 tools for tasks like:
Drawing cleanup and optimization.
Batch processing and automation.
Customization and scripting support

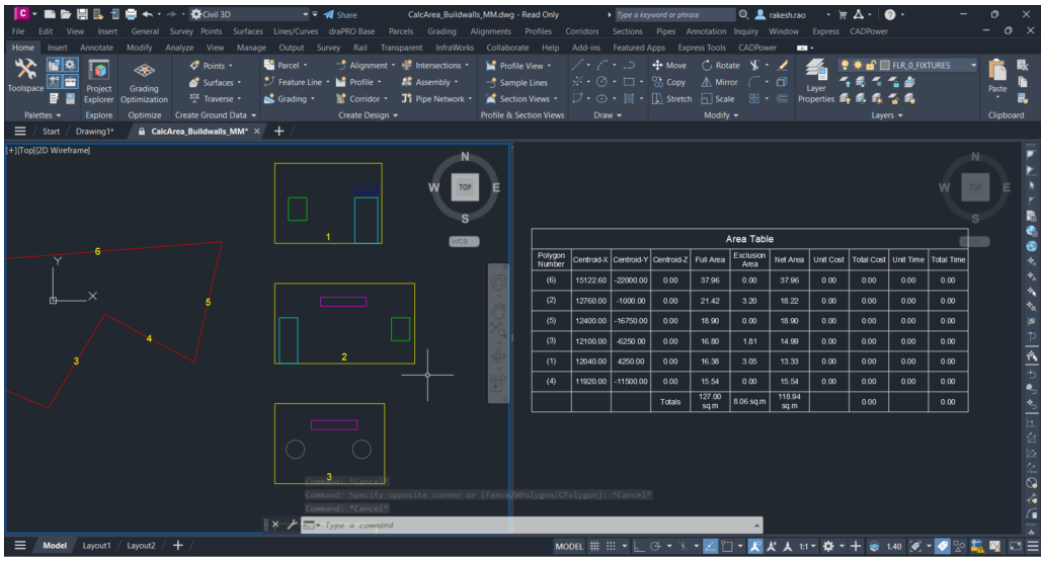


Fig 2.2: CADPower Interface

2.3 GeoTools™

GeoTools is a suite of tools designed for GIS and mapping professionals, offering functionalities such as:
Coordinate transformation and projection.
Map scaling and annotation.
Data extraction and reporting.

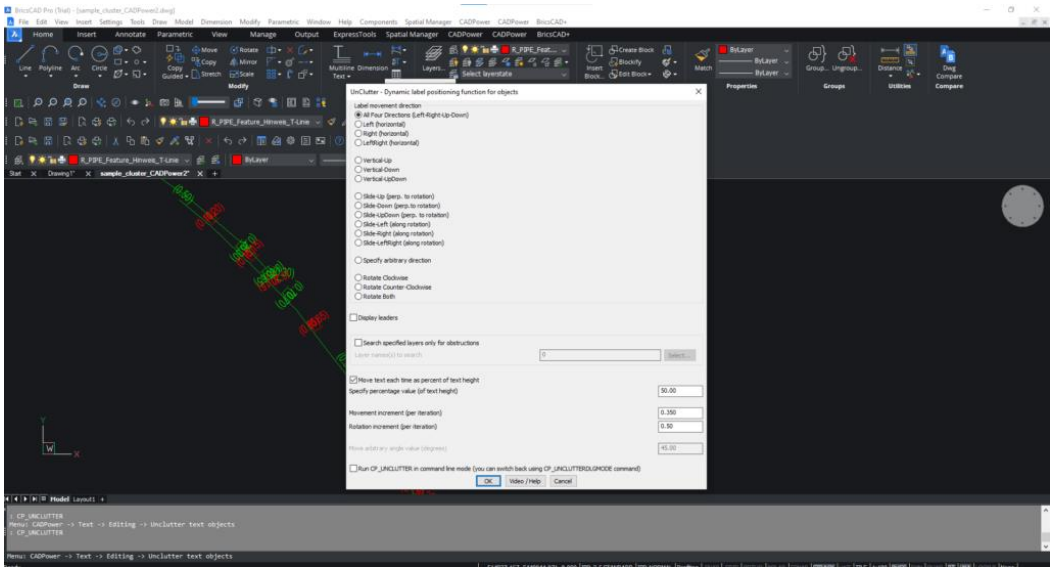


Fig 2.3: GeoTools Interface

2.4 AX3000 - MEP Engineering

A specialized solution for Mechanical, Electrical, and Plumbing (MEP) design, AX3000 provides:

Tools for building services engineering.
Modules for ventilation, heating, sanitation, and electrics.
Energy performance simulation and certification.

2.5 Custom CAD Solutions

DesignSense offers tailored CAD customization and application development services for various platforms, including:

AutoCAD
BricsCAD
ZWCAD
ARES Commander
GstarCAD
ProgeCAD

Work Assigned by the company DesignSense

Chapter 3: About Valves

3.1 Details About Valves:

What is Valve: A valve is a mechanical device used to control, regulate, or direct the flow of a fluid (liquid, gas, or slurry) by opening, closing, or partially obstructing passageways in a piping system.

Valves can be operated manually, electrically, pneumatically, or hydraulically, and are essential components in a wide range of industries such as water supply, oil and gas, chemical processing, and power generation. The design and type of valve used depend on the nature of the fluid, pressure, temperature, and required flow control.

Valves perform several key functions:

1. Start or stop flow
2. Regulate or throttle flow
3. Prevent backflow
4. Control pressure

3.2 List of different types of valves with their purpose and uses:

1. Gate Valve

Purpose: To allow or stop full flow; not for throttling.
Uses: Water supply, oil & gas, power plants.
Design Note: Straight-through flow, low pressure drop.

2. Globe Valve

Purpose: Throttling and regulating flow.
Uses: Cooling systems, fuel oil systems, chemical plants.
Design Note: Has a disc that moves perpendicular to the seat, allowing precise flow control.

3. Ball Valve

Purpose: Quick shut-off; on/off control.
Uses: Gas pipelines, domestic water supply, chemical tanks.
Design Note: Spherical ball with a hole; rotated 90° to open/close

4. Butterfly Valve

Purpose: Fast operation, flow isolation or control.
Uses: HVAC, fire protection, water distribution.
Design Note: Rotating disc, lightweight and compact.

5. Check Valve (Non-return Valve)

Purpose: Allows flow in one direction; prevents backflow.
Uses: Pumps, compressor lines, water/sewage systems.
Design Note: Automatically operated, no handle required.

6. Plug Valve

Purpose: On/off control; good for frequent operation.
Uses: Oil pipelines, chemical service.
Design Note: Cylindrical or tapered plug with a hole.

7. Pressure Relief Valve

Purpose: Protects system from overpressure.
Uses: Boilers, gas storage, pressure vessels.
Design Note: Opens automatically when pressure exceeds limit.

8. Needle Valve

Purpose: Precise flow control in small lines.
Uses: Instrumentation, calibration lines.
Design Note: Long tapered needle-like plunger allows fine adjustment.

9. Diaphragm Valve

Purpose: Isolation and throttling of corrosive/slurry fluids.
Uses: Pharmaceutical, food processing, chemical handling.
Design Note: Flexible diaphragm seals the valve body.

Fig 3: Types of Valves

3.3 Merits & Demerits of Valves

Merits

1. Flow Control: Precisely regulate fluid or gas flow.
2. Safety: Prevent backflow, overpressure, and system damage.
3. Durability: High-quality valves can last long under tough conditions.
4. Versatility: Suitable for different fluids, pressures, and temperatures.
5. Automation: Can be integrated with automated control systems.

Demerits

1. Cost: High-quality or specialized valves can be expensive.
2. Maintenance: Require regular inspection and servicing.
3. Pressure Loss: Some valves can cause pressure drops in pipelines.
4. Size and Weight: Large valves can be heavy and cumbersome to install.
5. Potential Leakage: Poorly maintained or faulty valves may leak.

3.4 Top Valve Manufacturers in India

Table: 1 List of companies

Company	Location / HQ	Key Products / Types
L&T Valves Ltd.	Mumbai (India)	Gate, globe, check, dual-plate check valves; trunnion-mounted ball valves; triple-offset butterfly; plug valves; knife gate; etc. For oil & gas, petrochemicals, power, chemicals etc.
Kirloskar Brothers Limited	India (Kirloskarvadi etc.)	Sluice / gate valves; butterfly valves; non-return/check valves; air valves; globe; ball valves; large-size valves (up to large diameters) for water, infrastructure, irrigation etc.
Oswal Valves Ltd.	India	Gate, globe, check & ball valves; cryogenic valves; hydrogen valves; pressure seal valves; fugitive emission valves.
Amtech Valves	India	Piston valves; gate; check; globe; needle; plug; pinch; pressure reducing; safety; diaphragm valves etc.
VIP Valves Pvt. Ltd.	India	Gate, globe, butterfly, ball valves; check valves; dual-plate check; actuated valves; manual / motor-operated etc.

Chapter 4: 2L Engineers Company R & D Documents of Valves

4.1 DESIGN & DEVLOPMENT OF VALVES

1. Design Input & Reviews
2. Design Output & Reviews
3. Design changes & Modification
4. Design Verification
5. Design Validation Inspection (Applicable or not)
6. Final Approval

4.2 DESIGN & DEVLOPMENT INPUTS & REVIEWS

1. Environment & Operational Condition
2. Methodology assumption
3. Legal requirement
4. Material
5. NDE Requirements
6. Testing

4.3 DESIGN & DEVELOPMENT CALCULATONS

1. Calculations of Valve torque,
2. Seat torque,
3. Bearing torque,
4. Key strength calculations,
5. Finding the weakest section outside primary boundary disc thickness calculations
6. body shell thickness calculations

4.4 BUTTERFLY VALVE 2D DRWAWING

1. WHAT IS BUTTERFLY VALVE
   A valve consisting of a rotating circular plate or a pair of hinged semicircular plates, attached to a transverse spindle and mounted inside a pipe in order to regulate or prevent flow

4.5 BUTTERFLY VALVE 2D DRAFTING

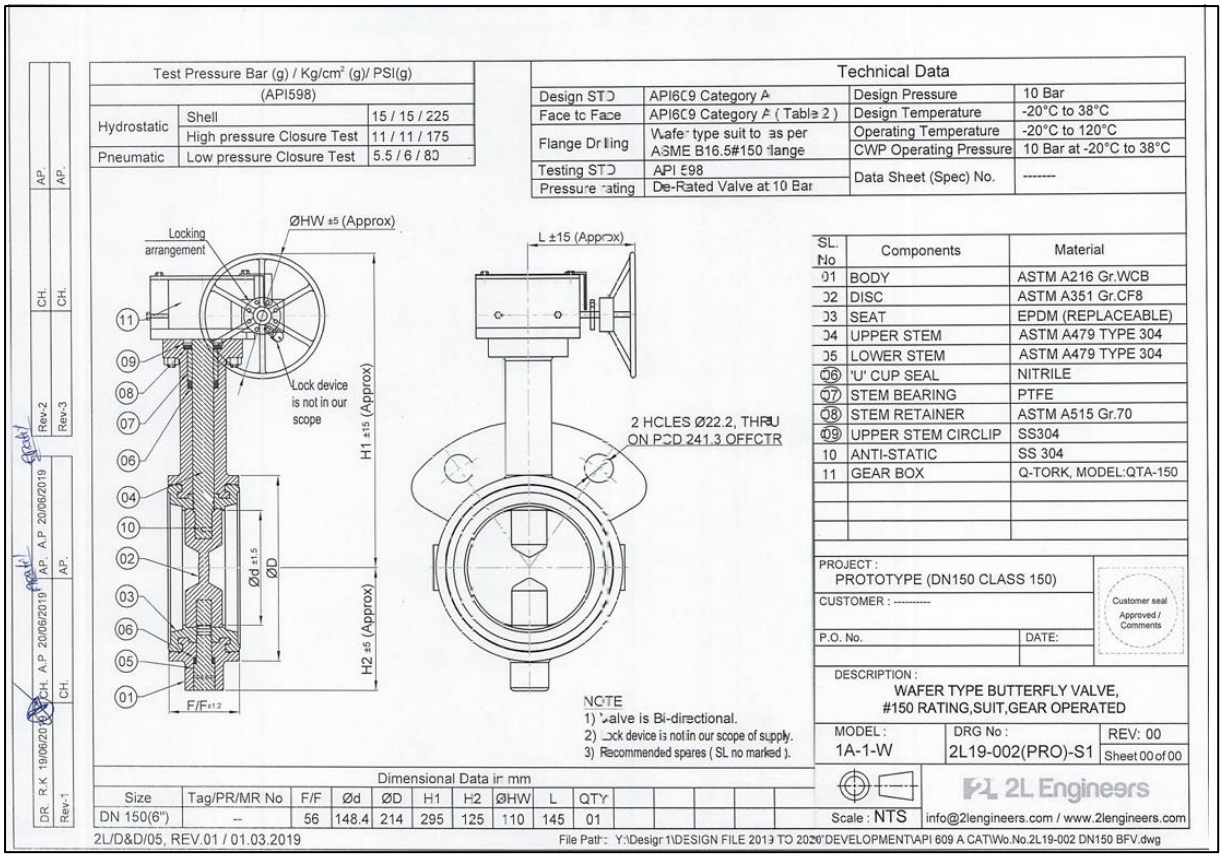


Fig 4: 2D Drafting

4.6 DESIGN & DEVLOPMENT VERIFICATION & FINAL REVIEW

1. Design & development verification of a butterfly valve involves simulations, material validation, and prototype testing to ensure it meets performance, safety, and regulatory requirements, such as API standards.
2. The final review includes a comprehensive report detailing the design, testing, and post-test inspections of the valve and its components for wear and damage to confirm its suitability for the intended application.

4.7 VALIDATION & FINAL APPROVAL

1 Validation and final review approval of a butterfly valve involves several stages, including submission of technical documentation and drawings for design approval, performance testing to verify functionality and pressure integrity, and adherence to relevant standards and specifications.

2 The process typically culminates in the submission of final documentation, including test reports and certification, for the customer's final review and approval before the valve is accepted and released for service.

Chapter 5: BUTTERFLY VALVE DESIGNING

The work assigned by DesignSense included the following tasks:

1. 3D Part Modelling – Creating detailed 3D models of mechanical components.
2. Assembly Design – Integrating individual parts into complete assemblies.
3. Drafting – Preparing precise 2D technical drawings from 3D models.

5.1 3D Part Modelling

The 2D Drawing of a Body is converted to 3D model

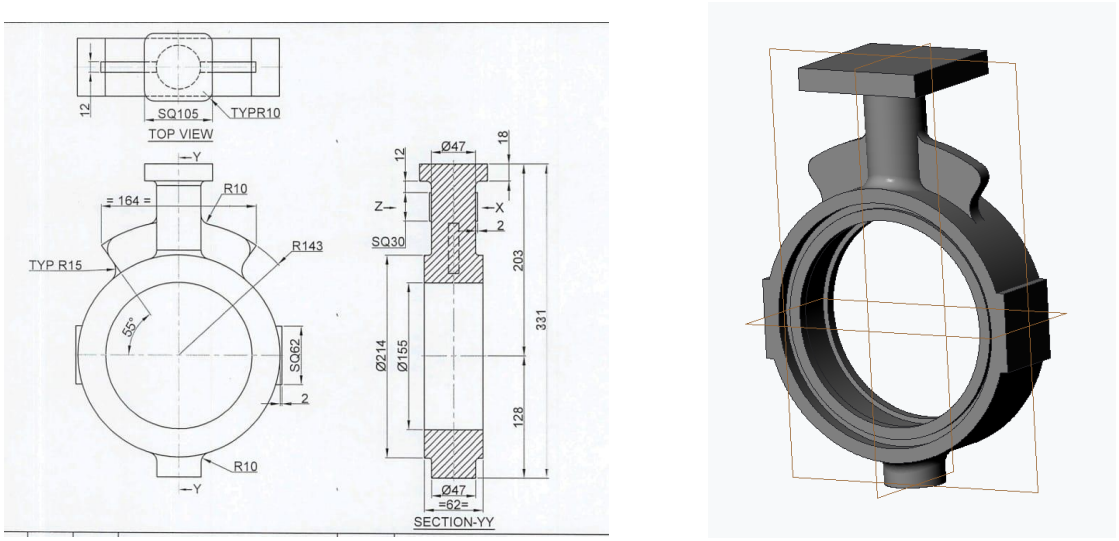


Fig 5.1: BODY DN150 (NPS 6)

The progressed 2D drawing of a Body is converted to 3D model

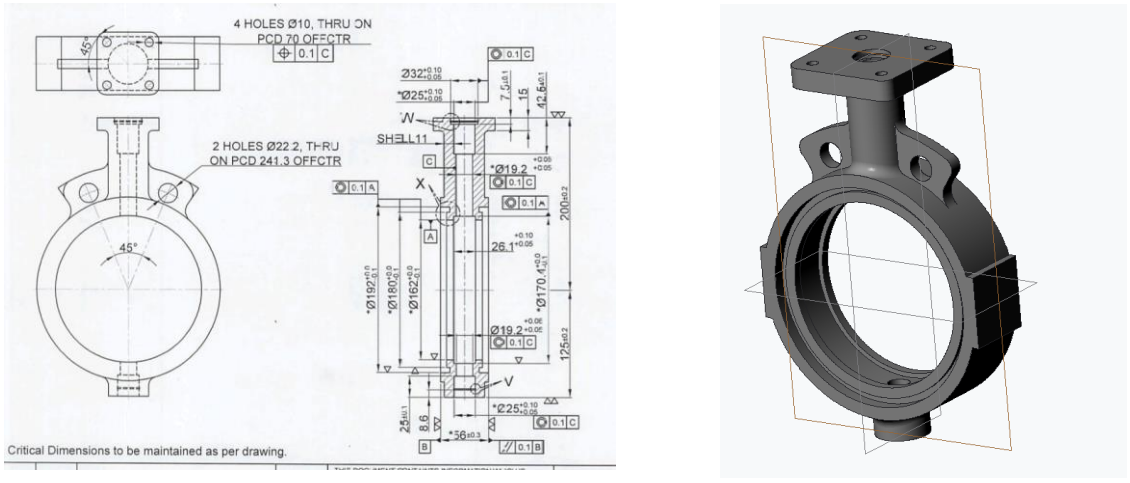


Fig 5.2: BODY DN 150 (NPS 6)

The 2D Drawing of a Disc is converted to 3D model

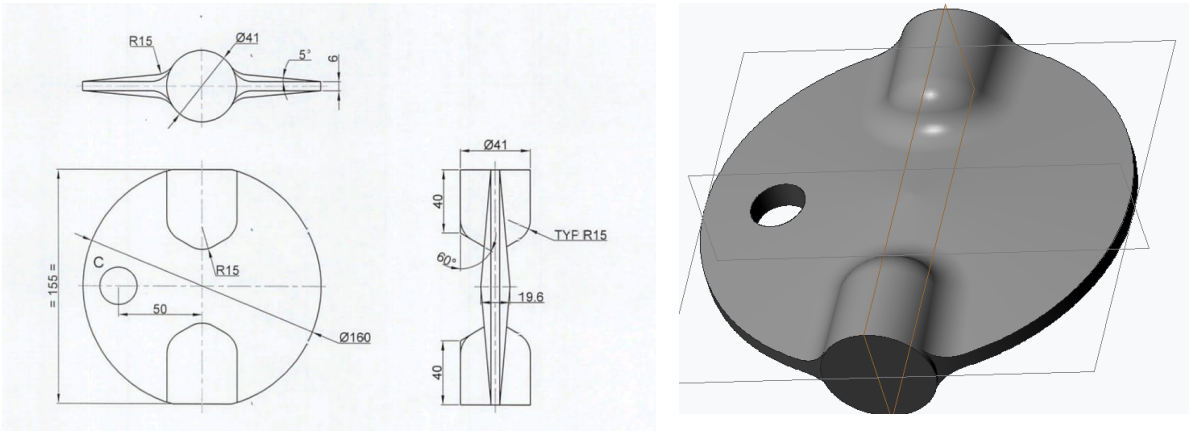


Fig 5.3: DISC DN 150 (NPS 6)

The progressed 2D drawing of a Disc is converted to 3D model

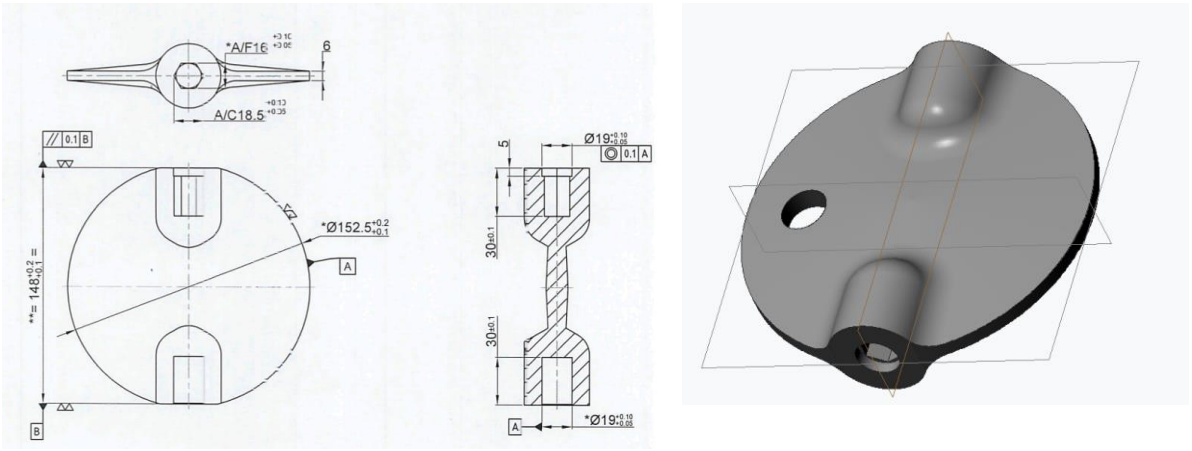


Fig 5.4: DISC DN 150 (NPS 6)

The 2D drawing of a Sleeve is converted to 3D model

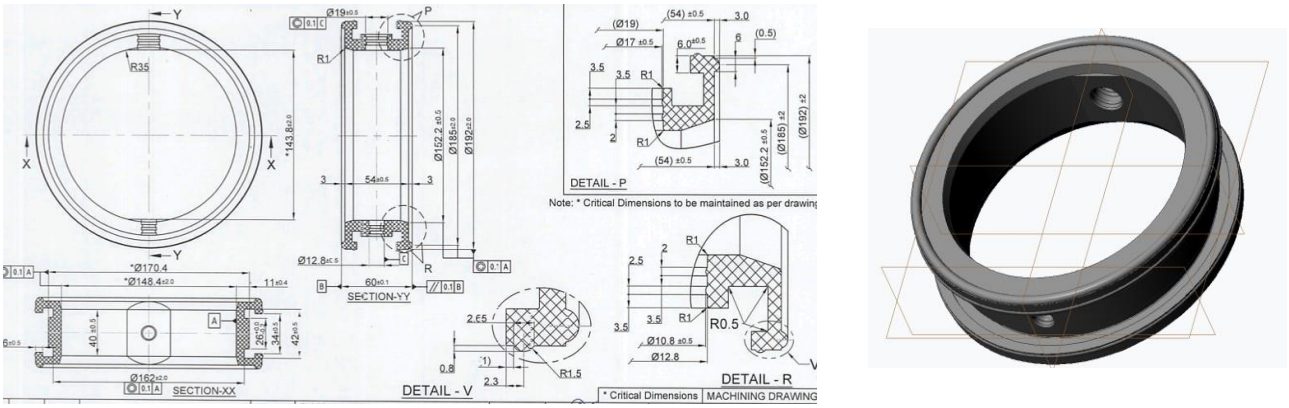


Fig 5.5: SLEEVE DN 150 (NPS 6)

The 2D Drawing of a Upper Stem is converted to 3D model

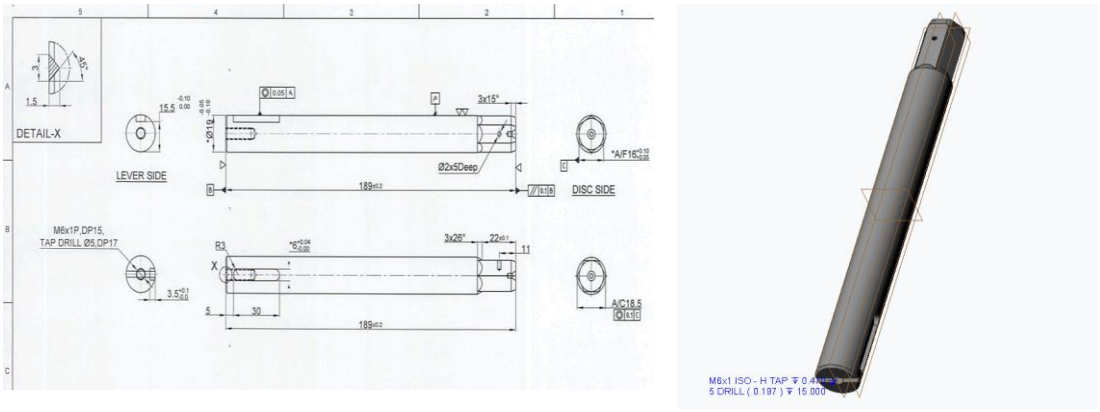


Fig 5.6: UPPER STEM DN 150 (NPS 6)

The 2D Drawing of a Lower Stem is converted to 3D model

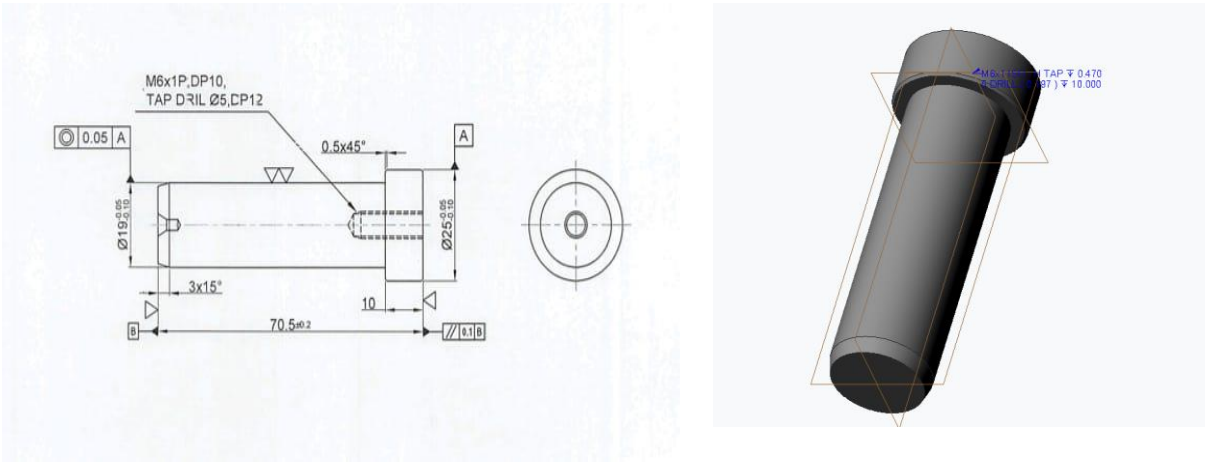
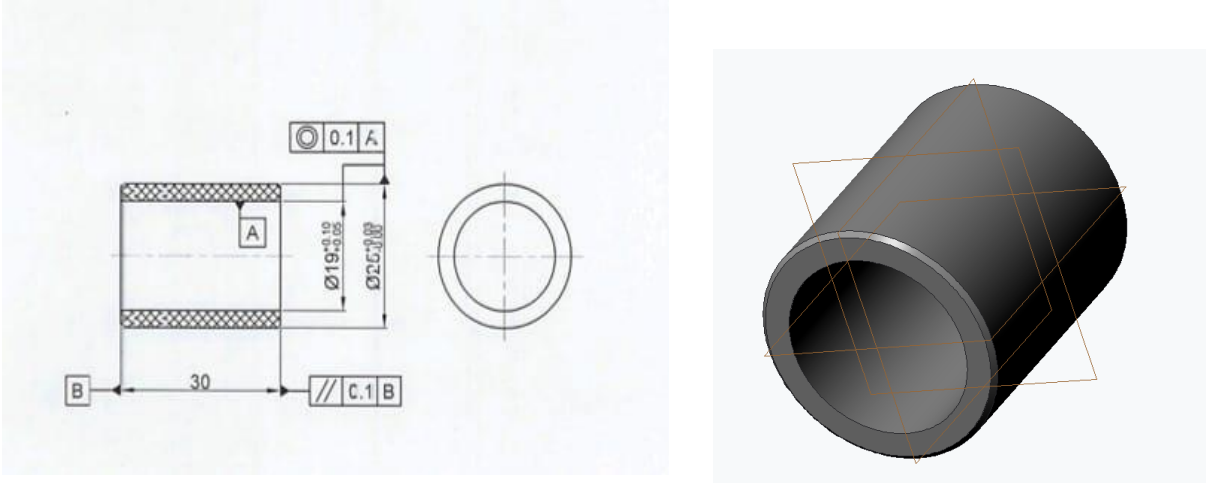


Fig 5.7: LOWER STEM DN 150 (NPS 6

The 2D Drawing of a Bush Bearing is converted to 3D model



BUSH BEARING DN 150 (NPS 6)Fig 5.8:

The 2D Drawing of a Lower Stem Bush is converted to 3D model

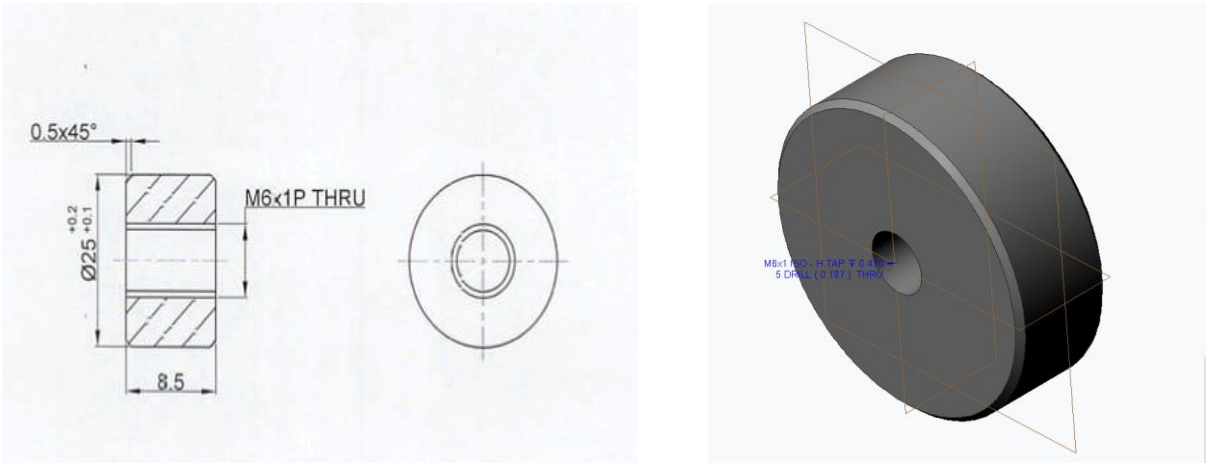


Fig 5.9: LOWER STEM BUSH DN 150 (NPS 6)

The 2D Drawing of a Stem Retainer is converted to 3D model

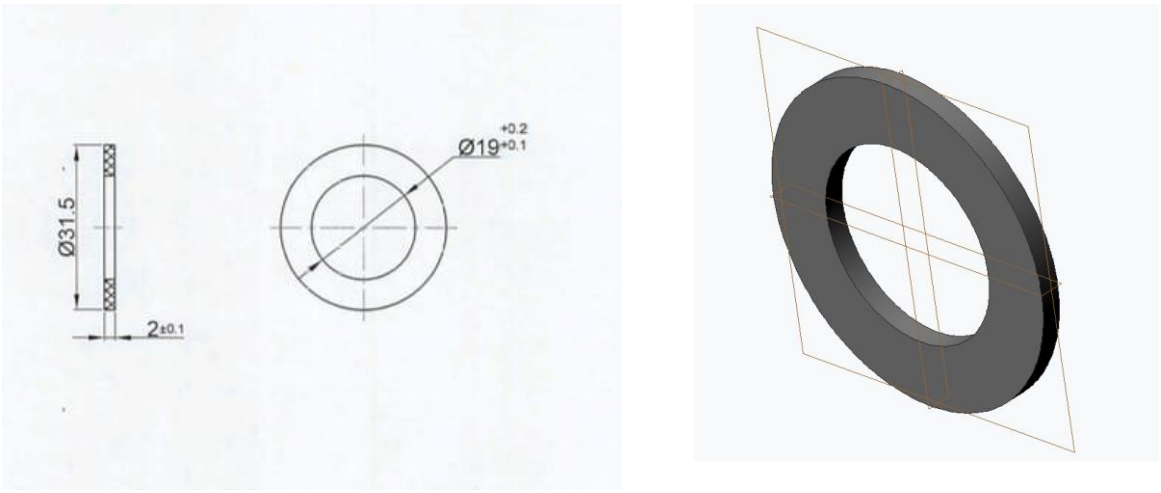


Fig 5.10: STEM RETAINER DN 150 (NPS 6)

The 2D Drawing of a Ball (ANTISATIC) is converted to 3D model

Fig 5.11: BALL (ANTISATIC)

The 2D Drawing of a Spring (ANTISATIC) is converted to 3D model

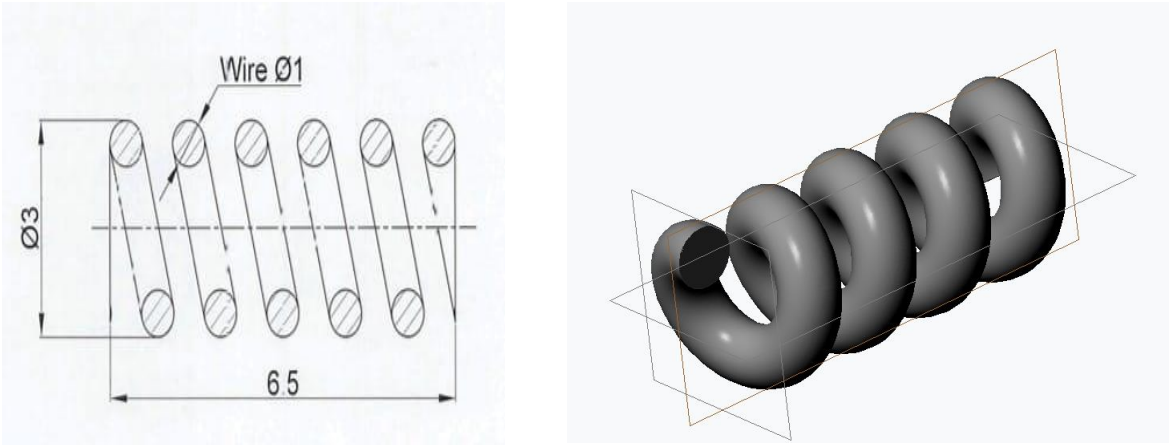


Fig 5.12: SPRING (ANTISATIC)

5.2 Assembly

All above 3D modelled parts are assembled together to create assembly of Butterfly Valve. Which is assembled as shown in 2D Drawing

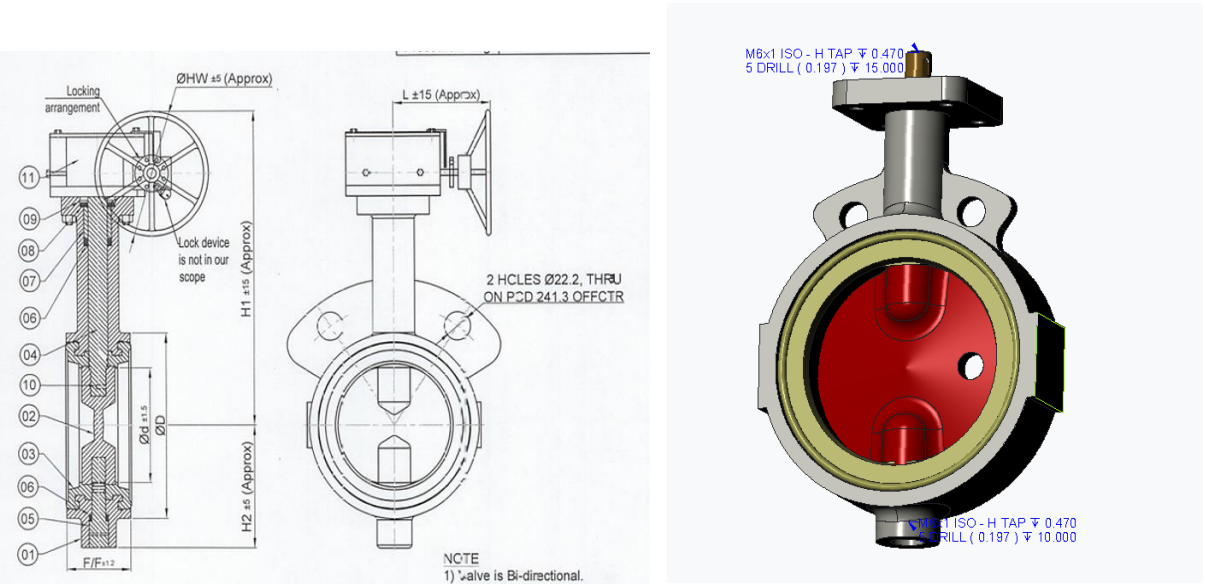


Fig 5.13: ASSEMBLY

5.3 Drafting

The assembly of Butterfly Valve is again converted to 2D drawing Showing Top, Front, & Side Views

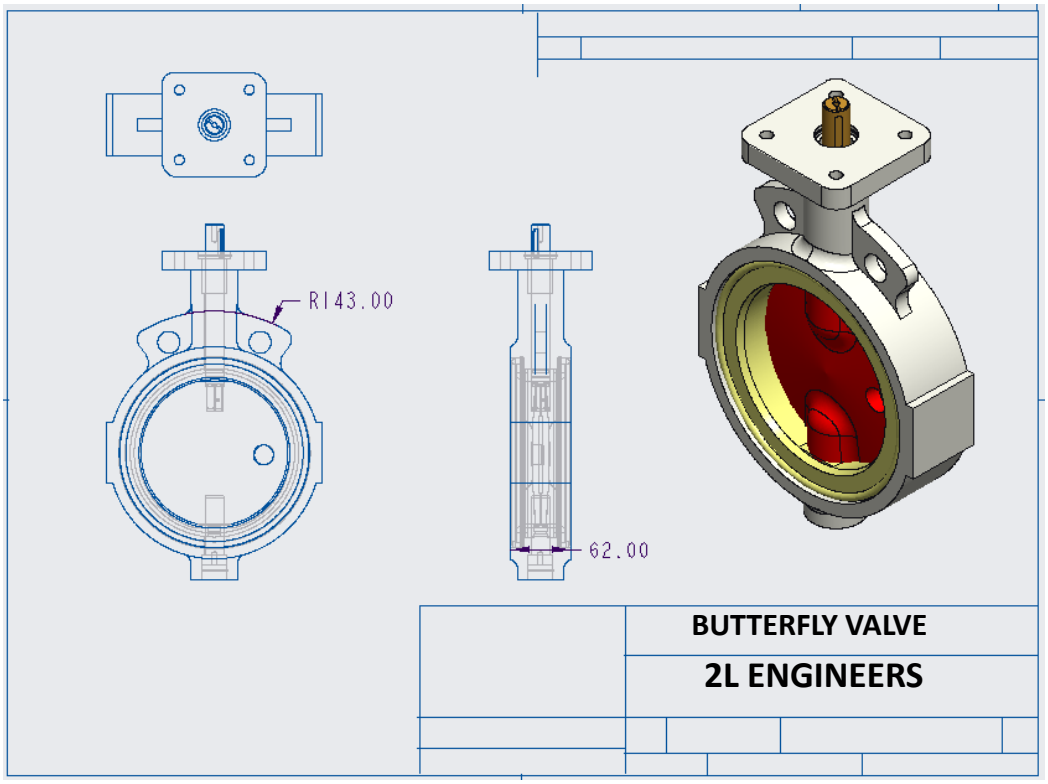


Fig 5.14: DRIFTING

Chapter 6: Industrial visit to 2L Engineers PVT LTD

6.1 ABOUT 2L ENGINEERS:

2L Engineers is Valve manufacturing company located in, Rayapur industrial Area Dharwad. 2L engineers was established in 2015, it has been committed to manufacturing high-quality valves for critical applications. At 2L, the passion for engineering and design ensures precision manufacturing and accuracy, meeting international specifications. These standards include ISO, API, NACE, ASME, ASTM, MSS-SP, BS EN, and PED, among others.

Our manufacturing facility near Hubli, Karnataka, has a rich history of producing quality valves in India. We are an ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, EIL and CE/PED certified company, with the capability to offer API 6D Monogrammed Ball Valves and Check Valves. We deliver valves to both domestic and international markets, serving specialized fields such as petrochemical, chemical, power, steel, food industry, pulp, oil & gas, wastewater management, and general industry

Over the years, 2L Engineers has developed a comprehensive range of standard and custom-designed valves for various industries. We are committed to delivering innovative valve designs with an emphasis on safety and quality at every step of the process. At 2L, every valve is built on the passion, skill, and experience of our dedicated team. Throughout product development, we focus on delivering valves with long service lives and low in-line maintenance.

For each member at 2L, excellence is not just a value—it is a discipline. We take pride in crafting our products with a great passion for engineering, ensuring high standards for our customers.

6.2 2L ENGINEERS PRODUCTS:

BUTTERFLY VALVE

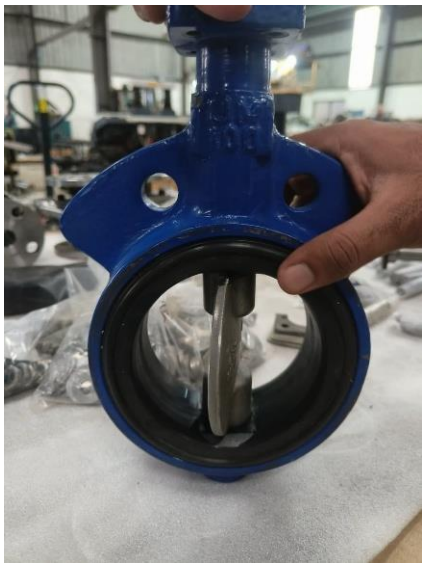


Fig 6.1: Butterfly valve

1. The wafer style butterfly valve is designed to maintain a seal against bi-directional pressure differential to prevent any back flow in systems designed for unidirectional flow. It accomplishes this with a tightly fitting seal; i.e., gasket, precision machined, and a flat valve face on the upstream and downstream sides of the valve.

2. The drawback is that wafer butterfly valves only have a small flow control range. The pressure drop across wafer butterfly valves may be greater. Wafer butterfly valves are prone to clogging due to their design

BALL VALVE

Fig 6.2: Ball Valve

1. Ball valves are the most commonly used mechanical devices for different household and industrial applications.
2. The valves have multiple types designed according to the nature of the application.
3. A ball valve is the most commonly used type of valves.
4. It uses to control the different fluids such as liquids, gases, and vapours.
5. This article explains the ball valve working, its types, applications, and parts.

GLOBE VALVE

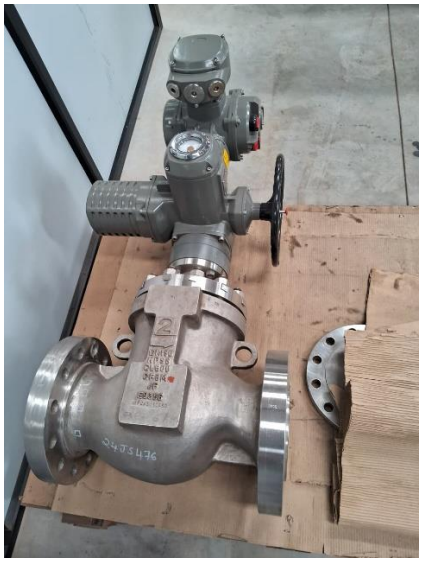


Fig 6.3: Globe Valve

1. A **globe valve**, different from ball valve, is a type of valve used for regulating flow in a pipeline, consisting of a movable plug or disc element and a stationary ring seat in a generally spherical body.
2. Globe valves are named for their spherical body shape with the two halves of the body being separated by an internal baffle.
3. This has an opening that forms a *seat* onto which a movable plug can be screwed in to close (or shut) the valve.
4. The plug is also called a disc in globe valves; the plug is connected to a *stem* which is operated by screw action using a handwheel in manual valves. Typically, automated globe valves use smooth stems rather than threaded and are opened and closed by an actuator assembly.

3- PIECE BALL VALVE

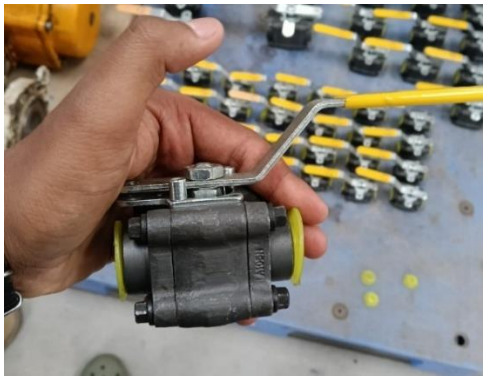


Fig 6.4: 3-Piece Valve

1. A 3-piece floating ball valves consist of three pieces, two end connections & a body.
2. The end connections are typically Flanged, threaded, or welded to the pipe. Users can easily remove the main body for cleaning or repair without removing the end connection.
3. Hence, it is vital to prevent a line shutdown if maintenance is required. Our engineers have incarnated perfection in the valve design to make it an easy & smooth functioning valve. 3-piece Floating Ball Valves are easy to disassemble for maintenance and easy swapping of internal parts.

BALL VALVE – ACTUATOR OPERATED

Fig 6.5; Ball Valve with Actuator

1. An actuated ball valve's principle is to remotely control fluid flow using an actuator—like a pneumatic, electric, or hydraulic device—that rotates the valve's internal ball via a connected stem, thereby opening or closing the bore and regulating the media's movement.
2. The actuator translates an input signal into the mechanical motion needed to turn the stem, which is directly connected to the ball, changing the ball's position to control the flow.

LEVER OPERATED BALL VALVE

Fig 6.6: Lever Operator

1. A lever-operated ball valve works on the simple principle of rotating a perforated ball, using a lever, to control flow through a pipe.
2. When the lever is turned 90 degrees, the ball's internal hole aligns with the pipe, allowing fluid to pass through (open valve).
3. The lever is then rotated 90 degrees to position the ball's solid side across the flow path, blocking the opening and shutting off the flow.

VALVE STEM WITH VALVE DISC

1. Disc valves typically function by utilizing a circular disc mounted on a central shaft or hinge.
2. The disc can move to open or close the flow path. A valve stem is a self-sealing one-way valve, commonly found on pneumatic tires, that acts as a port for adding or releasing air.
3. It consists of a body, a valve core that opens and closes to control air flow, and a cap to protect the core from dirt and moisture.

Fig 6.7: Valve Stem with Disc

GATE VALVE

1. A gate valve, also known as a sluice valve, is a valve that opens by lifting a barrier (gate) out of the path of the fluid.
2. Gate valves require very little space along the pipe axis and hardly restrict the flow of fluid when the gate is fully opened.
3. The gate faces can be parallel but are most commonly wedge-shaped

Fig 6.8; Gate Valve

6.3 2L ENGINEERS VISIT PHOTOES

Fig 6.9: Group Photo & Products

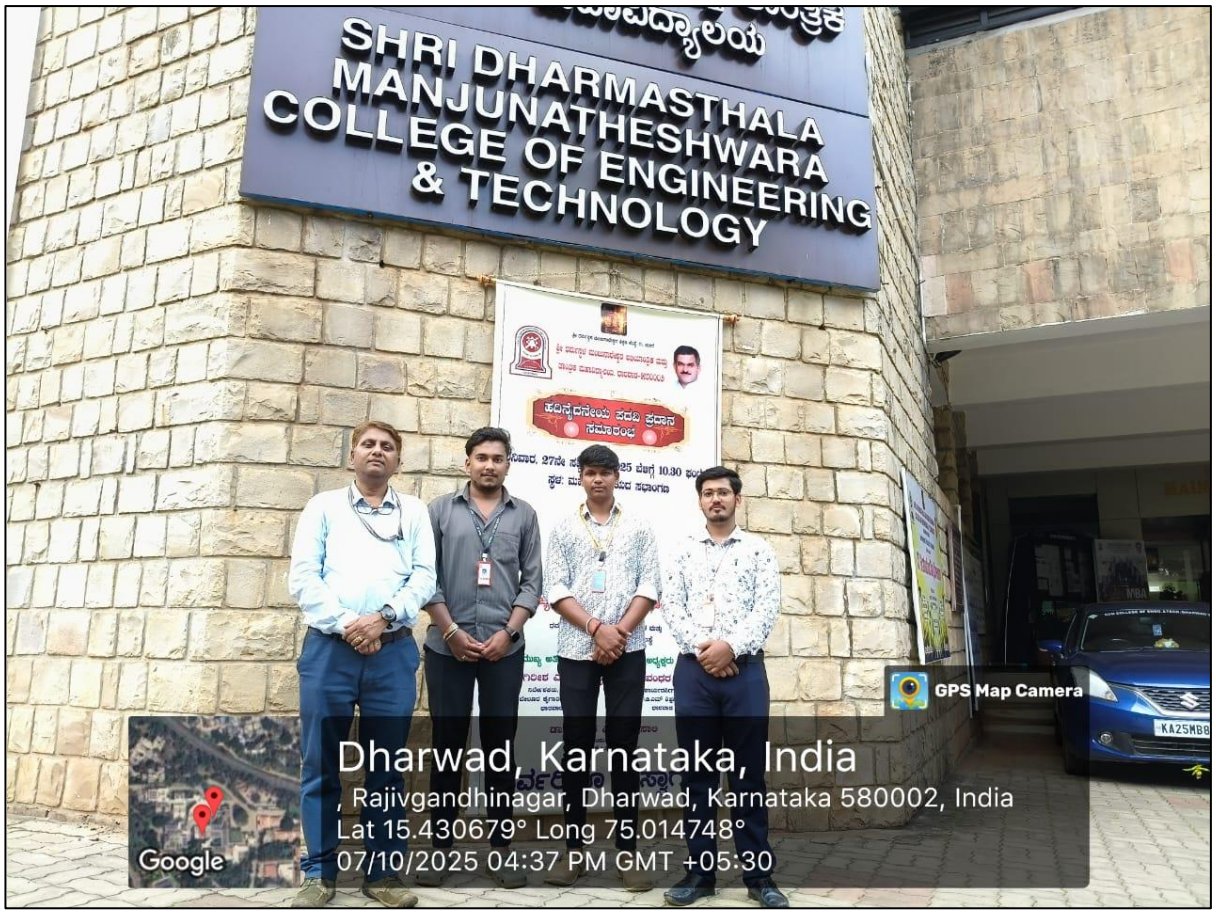


Fig 6.10: Group Photo with Guide

Chapter 7: Result & Conclusion

7.1 Result:

The internship at DesignSense Software Technologies provided valuable exposure to real-world engineering practices and the CAD software's, focusing on BricsCAD and valve design technologies.

- During the internship, I gained a deeper understanding of valve design principles, particularly through the development of a butterfly valve. This work involved performing design calculations, selecting suitable materials, and creating detailed 2D and 3D models, which helped connect theoretical mechanical concepts with practical CAD applications.

- Working with different BricsCAD versions—such as Lite, Pro, Mechanical, BIM, and Ultimate—helped build strong skills in drafting, modelling, and mechanical assembly. I also explored design automation and customization using GeoTools and CADPower, improving efficiency and workflow management.

- In addition, I participated in design documentation, verification, and testing activities, ensuring that valve designs met API and ISO standards. This experience emphasized the importance of quality assurance, accuracy, and compliance in engineering design.

- An industrial visit to 2L Engineers further enhanced my understanding of manufacturing and quality control processes, offering a complete view of how a product evolves from design to production.

- Overall, the internship was a well-rounded learning experience that strengthened my technical knowledge, software proficiency, and understanding of the engineering industry's professional standards.

7.2 Conclusion:

The internship at DesignSense Software Technologies was a valuable experience that effectively connected academic knowledge with industrial practices in mechanical design and CAD applications.

- Exposure to BricsCAD Mechanical and BIM tools provided hands-on learning in advanced CAD software and its customization for real engineering needs. Working on butterfly valve design strengthened understanding of material selection, design accuracy, and compliance with industry standards, while participation in validation and documentation improved practical design skills.

- The industrial visit further emphasized the link between design and manufacturing, highlighting the importance of quality assurance and teamwork.

- Overall, the internship enhanced both technical proficiency and professional skills, preparing me to confidently apply engineering principles using modern design tools and industry practices.

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