

# **Report on the Production Process of Valves at Larsen & Toubro**

## ***Introduction***

While working on my internship at Larsen & Toubro (L&T) Valves, I was able to keenly observe and learn how the industrial valves were produced. Valves serve the essential function of regulating, directing, and controlling fluid flow—gases and liquids—through opening, closing, or partly shutting passages. The valves function either by rotation, sliding, or obstruction, such as globe, ball, and gate valves. The valves, by size (to fit the pipes' radius) and by class (to withstand a set of level pressures), are produced. Additionally, materials used, thickness, and operating mechanisms depend on customer needs and the type of industrial use.

Manufacturing of valves at L&T Valves is extremely systematic and takes place only against an order placed with precise specifications. The whole process—from design and raw material procurement to machining, assembly, quality checks, and ultimate testing—is done with extreme caution. This way, each and every valve not only satisfies the customers but also meets international performance and safety requirements.

## ***The Production Process***

### **Orders and Specifications**

The process begins by taking customer orders at the sales office. The orders contain detailed information such as the size of the valve, valve type, connections, material composition, operator type (manual, automatic, or powered), pressure class designation, and color code. The information from these orders is entered into ERP software, from which engineering and design departments base drawings and production plans.

### **Design and Engineering**

The design department of the company customizes the valves to customers' specifications. The valves are prototyped, and the performance of the valves is subjected to reliability testing. Once the design is finalized, they produce a bill of materials (BOM). The BOM includes every part required, such as codes for components and a general assembly drawing of dimensions and material. The BOM is issued by the company to the client for verification, and after approval, production commences.

### **Raw Materials Procurement**

Supplies of raw materials come from reliable sub-suppliers. The sub-suppliers supply raw parts that have not yet been formed into final elements. The planning department, under the direction of the BOM, liaises with the supply chain.

management to issue purchase orders with suppliers. The raw components are made by means of the casting or forging process, whichever the material characteristics and design specifications necessitate.

### **Machinery and Precision Machining**

After receiving raw materials, they undergo cuts and finishings using highly sophisticated machinery. Workers utilize detailed engineering drawings of thickness, diameter, and tolerances. A level of accuracy at this stage is critical because a slight error in calculation will cause misplacement at assembly, and that will lead to leakage or malfunction. L&T Valves employs machines with minimum error margins for reliability and consistency in each unit.

### **Assembly**

Components are thereafter isolated and clustered for assembly after machining. Valves are either welded or bolted together based on customer requirements. The welding and drilling function automatically for greater efficiency, and the operator ensures accuracy by facilitating the process. The assembly process of every given valve ensures that operators are also able to dismantle and maintain the product for its service life.

### **Painting and Packaging**

After successful testing, valves are painted according to customer requirements. Colors signify both functionality and safety—for instance, red is used for valves controlling hazardous fluids. Painting is limited to external surfaces, leaving interior components unaffected. Smaller valves are spray-painted manually, while larger ones are machine-painted for efficiency. Once dried, valves are tagged with details such as type, size, and production origin, before being packed in wooden crates for shipment.

## ***Quality Control and Testing***

*Picture showing the quality testing using paint dye penetration*



Quality inspections at L&T Valves are intensive and ongoing in the production cycle. Quality assurance inspections commence at the raw material stage, whereby dye penetration and ultrasonic tests detect hidden flaws or cracks. Minor flaws are repaired by welding, but serious flaws lead to rejection and return of materials to the raw material supplier. A series of pre-production checks ensures that raw materials entering production have no flaws, and thereby the chances of faults at a later stage are minimized. Post-machining checks are carried out to check whether cutting, shaping, or drilled work has not introduced any damage. The accuracy at this stage is again re-certified because pinpoint errors may contribute to mis-positioning at the assembly level. Re-checking also verifies that the material's structure has not been adversely affected by the affecororigin beginning. After assembly, the valves face a series of tough performance tests. The torque test verifies that the valve operates with due effort and without undue resistance.

Electrical valves have antistatic and actuator testing to ensure they actuate accurately and safely. Special-purpose valves face cryogenic testing, in which they're placed in severe low conditions of approximately  $-195^{\circ}\text{C}$ . This test is significant mostly because numerous materials become less ductile and brittle with cold, and the valve needs to maintain its reliable operation regardless of these issues.

The most decisive of these phases is the test of hydrostatic pressure. The valves, in this case, are filled with water and subjected to 1.5 times the rated maximum. This is done intentionally beyond normal service conditions to ensure that the valve is able to resist sudden increases in pressure without leaking or failure. Cycle testing is also sometimes done, in which case valves are opened and closed repeatedly under load in order to test for years of service.

Only products that pass every quality test stage succeed in certification. Qualified products receive a "TOK" stamp, which ensures they meet internal specifications as well as international requirements. The final certification is meant to ensure that not only is the valve functioning but also durable and safe for customers to utilize.

## ***Summary***

Production of valves at L&T Valves is a highly disciplined process that begins from specifications provided by customers and ends at stringently tested and certified products. At each stage—design, raw material procurement, machining, assembling, and finishing—the process demands precision and completion of stringent procedures. Also integral is the quality control system, which checks every valve against customer requirements as well as international specifications. Combining sophisticated technology, skilled workmanship, and rigorous testing, L&T Valves keeps producing products that are reliable, safe, and appropriate for a range of industrial applications.

In the process, I personally came to appreciate how an industry giant like L&T infuses engineering brilliance, well-designed workflow, and uncompromising quality specifications to produce valves integral to today's infrastructure and industry.