

## **Plasma Treatment of Brass Valves to Improve Bonding with Rubber** (DST Order No. DST/TSG/TC/2008/16)

Department of Science and Technology has financially supported a project “Development & Demonstration of Eco-friendly Plasma Surface Modification System for Treatment of Brass Valves” and Industrial partner contributed 50% of equipment cost . The project has been carried out at FCIPT, Institute for Plasma Research and has been successfully completed. The objective of this proposal was to scale up eco-friendly plasma etching process for treatment of brass valves to improve rubber to brass bonding by designing and development of an industrial scale (5000 valves per batch) system along with Industrial Partner.

FCIPT has successfully commissioned and demonstrated the plasma treatment on 5000 valves per batch with total valves treated were more than 7.0 lakhs at M/s Triton Valves, Mysore. Plasma (i) activates the brass surface (ii) generates oxides ( $\text{Cu}_x\text{O}/\text{Zn}_y\text{O}$ ) and (iii) Creates nano-textures. Subsequently, plasma treated brass valves were molded with rubber and tested for rubber to brass bonding. Brass reacts with sulfur-containing intermediates resulting in the formation of interfacial non-stoichiometric sulfides. All valves have shown excellent bonding with rubber. Further, this rubber-brass bond is very durable and has high resistance to dynamic and thermal aging (during service, the inside of the tire can reach a temperature of about  $120^\circ\text{C}$ ). The plasma process can (i) saves water (ii) no effluent treatment required (iii) reduce consumption of chemicals (iv) eliminate chemical storage & usage problems.



**Figure 1: Plasma Treatment of Brass Valves**



**Figure 2: Plasma Treatment System to Treat Brass Valves at M/s. Triton Valves Ltd., Mysore**



**Figure 3: Visit of DST expert team to M/s Triton Valves Ltd., Mysore to evaluate the Project**