

SEATS MATERIALS AND THEIR PERFORMANCE IN BALL VALVES

INTRODUCTION

The valve's performance depends on the proper functioning of its components, including the valve seats that provide a sealing surface, preventing fluid leaks in the processes. Proper selection of seat material is essential to ensure good performance and depends on various factors, such as chemical compatibility with the fluid to be used, temperature and pressure range, valve design, etc.

There are three main groups of seats: soft, hard and metal seats for different service conditions. Soft seats are more flexible and offer effective sealing, while hard seats are designed to withstand adverse conditions such as high pressures. Metallic seats provide excellent mechanical strength and operate at extremely high temperatures and abrasive media.

SOFT SEATS

PTFE (Virgin)

Polytetrafluoroethylene (PTFE) is a synthetic fluoropolymer that is chemically stable with a low coefficient of friction and high purity. It is non-reactive, non-toxic, resistance to a wide range of corrosive chemicals, which makes PTFE seats chemically compatible with a large brand of fluids. However, it presents large deformation under high and repetitive loads. It is suitable to low pressure range (up to CL600).

TFM1600 (Reinforced PTFE)

TFM is a modified version of PTFE, where a small modification to PTFE molecule enhances its mechanical properties such as tensile strength and wear resistance. TFM seats are chemically resistant and high purity and appropriate for many applications due its chemical compatibility. It is suitable for medium pressures (up to CL800).

C-RPTFE (PTFE reinforced with 25% carbon)

Reinforced PTFE is a composite material produced by adding fillers to virgin PTFE, such as carbon and glass fibers, to enhance its properties. These seats are ideal for applications where improved mechanical properties, chemical resistance and thermal conductivity are required. It is suitable to medium/high pressure (up to CL900).

UHMW PE

UHMW PE (Ultra-High Molecular Weight Polyethylene) is a high-performance thermoplastic polymer with high toughness and abrasion resistance. It is not suitable for withstanding high temperatures and can degrade when in contact with oxidizing chemicals. It is suitable to medium/high pressure (up to CL900).

HARD SEATS

DELRIN

DELRIN is a high-performance thermoplastic polymer also known as polyoxymethylene (POM). It presents dimensional stability, mechanical strength, and a low coefficient of friction. However, it is not suitable for applications requiring resistance to abrasion, or for services that involve exposure to acids, as it may degrade. It is suitable for high pressures (up to CL2500).

DEVLON

Devlon is a thermoplastic polymer that operating across a wide temperature and pressure range. It has dimensional stability, high resistance to wear and abrasion, and various chemical agents. Additionally, is an excellent life performance in seat applications contributing to soft valve closure and reducing wear. It is suitable for high pressure (up to CL2500).

PEEK

PEEK (polyether ether ketone) is a high-performance thermoplastic polymer with excellent mechanical, thermal, and chemical properties. PEEK seats are commonly used in applications that require dimensional stability even under extreme conditions, such as high temperatures and high mechanical strength under high pressures. It is suitable for very high pressure (up to CL6000).

METAL SEATS

Metal seats are commonly manufactured from stainless steel and metal coated with TCC (Tungsten Carbide Coating) or CCC (Chromium Carbide Coating). Stainless steel seats provide corrosion resistance and contribute to the valve's durability due to its high mechanical properties. TCC and CCC seats can operate at very high temperatures and are often applied in hazardous environments to enhance wear resistance. It is suitable for very high pressures.

CONCLUSION

In conclusion, to make the appropriate selection of seats, it is necessary to understand how the materials react to service conditions. The pressure and temperature range, and fluid compatibility are crucial parameters to ensure the good performance of the seats and, consequently, the operational efficiency and reliability of the valve. As support, we provide information on Vinco products in various applications, where it is possible to identify the proper materials for the type of fluid, considering their respective working conditions.

Seat material	PTFE 	TFM1600 	C-RPTFE 	UHMW PE 	
Temperature Range	-200°C to 260°C	-200°C to 260°C	-200°C to 260°C	-50°C to 90°C	
Pressure Range	Low pressure Up to CL600/PN100	Medium pressure Up to CL800/PN138	Medium/high pressure Up to CL900/PN150	Medium/high pressure Up to CL900/PN150	
Seat material	DELRIN 	DEVLON 	PEEK 	TCC	CCC
					
Temperature Range	-50°C to 100°C	-50°C + 170°C	-40°C to 280°C	-50°C to 250°C	-200°C to 450°C
Pressure range	High pressures Up to CL2500/PN420	High pressures Up to CL2500/PN420	Very high pressures Up to CL6000/PN1000	Very high pressures Up to CL6000/PN1000	