VALSTOM-APPLICATION GUIDE-VALVE SOFT SEAT & SEAL MATERIALS

Overview

The shut-off performance and service life of valves are strongly influenced by the characteristics of the process media and operating conditions. Selecting the correct soft seat or sealing material is critical to ensure reliable operation, tight shut-off, and long-term durability.

Key factors affecting seat and seal performance include:

- Operating pressure and temperature
- Pressure and thermal cycling
- Type and aggressiveness of media
- Flow velocity and erosion potential
- Frequency of valve operation
- Opening and closing speed

Soft seat and seal materials are commonly used in ball, plug, butterfly, needle, and specialty valves, depending on service requirements

Soft Seat & Seal Material Descriptions

1.Buna-N (Nitrile / HYCAR)

Buna-N is a widely used elastomer suitable for general industrial applications. It offers good mechanical strength, abrasion resistance, and sealing capability.

Key characteristics:

- Excellent compatibility with oils, water, hydraulic fluids, alcohols, and glycols
- Good compression and wear resistance
- Performs well in paraffin-based and fatty media

Limitations:

- Not recommended for ketones, acetones, chlorinated hydrocarbons, ozone, or nitro compounds
- Limited temperature capability

Typical service range: Up to approximately +100°C

Notes: Usually black in color; discoloration may occur in sensitive applications

2.Carbon-Filled PTFE (TFE)

Carbon-filled PTFE combines the chemical resistance of PTFE with improved mechanical stability.

Key characteristics:

- Suitable for steam and high-temperature thermal oil service
- Improved wear resistance and reduced deformation compared to virgin PTFE
- Excellent chemical compatibility

Typical service range: −29°C to +260°C
Applications: Steam lines, thermal fluids, high-temperature process services

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3.EPDM

EPDM is an elastomer designed for applications requiring strong resistance to weathering and many chemicals.

Key characteristics:

- Very good resistance to water, steam (low pressure), mild acids, and alkalines
- Excellent ozone and weather resistance
- Good flexibility at low temperatures

Limitations:

- Not suitable for petroleum oils or hydrocarbon services
- Not recommended for strong acids or strong alkalines
- Not suitable for compressed air systems

Typical service range: −29°C to +107°C (up to 121°C intermittent)

4.Hypalon

Hypalon offers strong resistance to environmental and chemical exposure, particularly in demanding conditions.

Key characteristics:

- Excellent resistance to oxidation, ozone, and aging
- Very good abrasion resistance
- Improved resistance to oxidizing acids compared to neoprene

Limitations:

- Not recommended for steam service
- Not suitable for esters, ketones, chlorinated aromatic hydrocarbons, or nitro compounds

Typical service range: −18°C to +104°C
Notes: Often supplied in white, food-grade form

5.Neoprene

Neoprene is a versatile elastomer used across many industrial services.

Key characteristics:

- Good resilience and low compression set
- Resistant to animal and vegetable oils
- Good flame resistance

Limitations:

- Not suitable for aromatic hydrocarbons, esters, ketones, or many chlorinated solvents
- Moderate temperature resistance

Typical service range: −29°C to +82°C
Applications: Pulp and paper, water services, general industrial use

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6.PTFE (Virgin Teflon®)

PTFE is known for its exceptional chemical resistance and wide operating temperature range.

Key characteristics:

- Nearly universal chemical compatibility
- Excellent thermal and electrical insulation
- Suitable for corrosive and aggressive media

Limitations:

- Lower mechanical strength compared to filled PTFE materials
- Susceptible to cold flow under high pressure

Typical service range: −40°C to +204°C (application dependent)

7.RTFE (Reinforced PTFE)

RTFE is PTFE reinforced with fillers such as glass fibre to improve performance.

Key characteristics:

- Enhanced strength and wear resistance
- Reduced cold flow and permeation
- Suitable for higher pressure and temperature compared to virgin PTFE

Limitations:

- Not recommended for hydrofluoric acid or hot strong caustic services

Typical service range: −40°C to +232°C

8.TFM1600

TFM1600 is a modified PTFE grade engineered for improved sealing performance.

Key characteristics:

- Lower porosity and permeability
- Reduced cold flow compared to standard PTFE
- Smoother sealing surfaces resulting in lower operating torque

Typical service range: −200°C to +260°C
Applications: High-performance sealing in chemical and hydrocarbon services

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9.TFM1600 + Glass Fibre (GF)

This material combines TFM1600 with glass fibre reinforcement.

Key characteristics:

- Improved dimensional stability under pressure
- Increased abrasion resistance
- Suitable for demanding pressure-temperature combinations

Applications: High-pressure valve seats and critical sealing duties

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10.TFM4215 (Carbon-Filled TFM)

TFM4215 incorporates electro-graphitized carbon to enhance performance.

Key characteristics:

- Excellent stability at elevated pressures and temperatures
- Improved wear resistance
- Suitable for severe service conditions

11.Viton® (FKM / FPM – Fluorocarbon Elastomer)

Fluorocarbon elastomers are widely used in chemical and hydrocarbon processing industries.

Key characteristics:

- Broad chemical compatibility
- Excellent resistance to hydrocarbons, mineral acids, and petroleum oils
- Performs well across a wide temperature range

Limitations:

- Not recommended for steam or continuous hot water service
- Performance in hot water depends on formulation and manufacturer

Typical service range: −29°C to +149°C
Notes: Available in black, grey, or red; suitable for clean and bleached applications

Table Content:

Material	Material Type	Key Properties	Limitations	Temperature Range	Typical Applications
Buna-N (Nitrile)	Elastomer	Oil & water resistance, good sealing	Not for ketones, ozone	Up to 100°C	Oil & gas, water
Carbon Filled PTFE	Filled PTFE	High temp, low cold flow	Low elasticity	-29 to 260°C	Steam, thermal oil
EPDM	Elastomer	Water & chemical resistance	Not for oils	-29 to 107°C	Water treatment
Neoprene	Elastomer	Resilient, oil resistant	Not for aromatics	-29 to 82°C	Pulp & paper
Hypalon	Elastomer	Abrasion & ozone resistant	Not for steam	-18 to 104°C	Chemical service
Virgin PTFE	Fluoropolymer	Excellent chemical resistance	Cold flow	-40 to 204°C	Corrosive fluids
RTFE	Reinforced PTFE	Higher pressure capability	Not for HF acid	-40 to 232°C	High-pressure valves
TFM1600	Modified PTFE	Low permeability, low torque	Higher cost	-200 to 260°C	Cryogenic service
TFM1600 + GF	Reinforced PTFE	High stability & wear resistance	Not for HF acid	Up to 260°C	High-cycle valves
TFM4215	Carbon Filled TFM	High pressure-temp stability	Less flexible	Up to 260°C	Severe service
Viton (FKM)	Fluoroelastomer	Hydrocarbon resistance	Not for steam	-29 to 149°C	Refineries