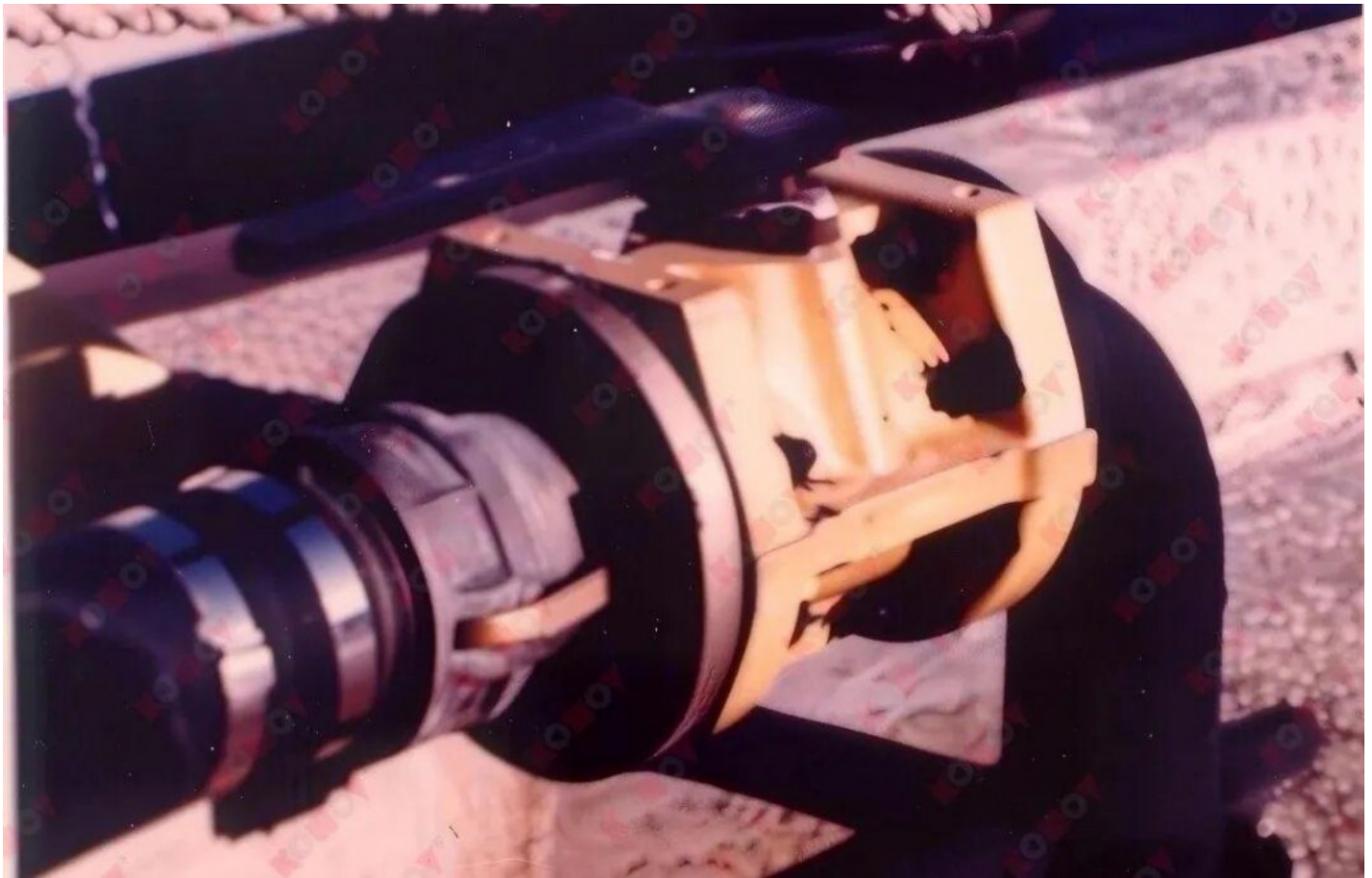


Ceramic Ball Valves Encyclopedia – Application Research



Yantai, Shandong Jul 13, 2026 ([Issuewire.com](https://www.issuewire.com)) - Metal valves have been the dominant fluid control components in global industrial operations for more than a century. Although continuous improvements have been made in structural design and material technology, traditional metal valves still face limitations when operating under severe conditions such as high abrasion, extreme corrosion, high temperature, and high pressure.

These limitations mainly result from the inherent properties of metallic materials, including reduced service life, sealing degradation, and increased leakage risks. In industries such as chemical processing, petroleum, metallurgy, mining, and power generation, these challenges can significantly affect equipment reliability, operational safety, and maintenance efficiency.

To address these issues, the industrial valve industry has been seeking new material solutions. Advanced ceramic materials, recognized as one of the most important new materials of the 21st century, have become a major research focus in materials science and industrial manufacturing.

Due to their unique crystal structures, ceramics feature exceptional hardness, high compressive strength, excellent elastic modulus, low deformation, and outstanding chemical stability. These properties provide ceramic materials with superior resistance against wear, corrosion, and extreme operating environments.

However, the brittleness and machining difficulty of traditional ceramics previously restricted their wider industrial application. In recent years, advances in martensitic phase transformation toughening, composite ceramic modification, nano-ceramic technologies, and precision manufacturing processes have significantly improved ceramic toughness and reliability.

As a result, ceramic materials have increasingly replaced traditional metallic components in demanding applications. Ceramic valves, especially ceramic ball valves, are now widely used in industries including chemical engineering, petroleum, metallurgy, mining, energy, and wastewater treatment.

Compared with conventional metal valves, ceramic valves provide longer service life, improved sealing performance, stronger resistance to abrasive and corrosive media, and better overall cost efficiency in harsh operating environments.

With continuous improvements in ceramic formulation, forming processes, precision machining, and assembly technologies, ceramic valves have gained increasing recognition as a reliable solution for upgrading industrial equipment performance.

The following sections review the major application fields of ceramic ball valves from leading domestic and international brands.

I. Brand-Specific Descriptions 1. Nil-Cor Ceramic Valves

Nil-Cor ceramic valves are widely applied in industries requiring superior wear resistance and corrosion resistance.

Chemical Process Industry

Ceramic valves are used in applications involving:

- Chlorine production
- Hydrochloric acid
- Sulfuric acid
- Industrial chemical processing

Their excellent chemical stability allows reliable operation in highly corrosive environments where conventional metal valves often experience rapid degradation.

Pulp and Paper Industry

Applications include:

- Bleaching chemicals
- Sodium hypochlorite
- Chlorine dioxide
- Lime mud
- Caustic solutions

Ceramic valve components provide long-term durability in aggressive chemical circulation systems.

Mining and Mineral Processing

Ceramic valves are used for:

- Titanium dioxide production
- Acid-containing slurry
- Electrolyte systems
- Mineral processing applications

Their high hardness and erosion resistance help reduce maintenance caused by abrasive particles.

Wastewater Treatment

Applications include:

- Sodium hypochlorite systems
- Chemical dosing
- Acid treatment processes

Ceramic valves maintain stable performance in environments containing corrosive chemicals and solid particles.

Marine Applications

Ceramic valves are applied in:

- Seawater systems
- Waste treatment systems
- Fire protection systems
- Water treatment facilities

Steel Pickling and Power Generation

Applications include:

- Acid pickling solutions
- Sulfuric acid systems
- Limestone slurry
- Fly ash handling
- Flue gas desulfurization (FGD)

Ceramic valves provide reliable operation under abrasive and chemically aggressive conditions.

Petroleum Refining

Applications include:

- Hydrocarbon wastewater
- Acidic media
- Chemical injection systems

Their corrosion resistance extends service life compared with traditional metal valve solutions.

2. FUJIKIN Ceramic Ball Valves

FUJIKIN ceramic ball valves are designed for demanding industrial applications involving abrasive, corrosive, and high-temperature media.

Coal-Fired Power Plants

Applications include:

- Flue gas desulfurization systems
- Limestone slurry
- Gypsum slurry
- Fly ash transportation
- Wastewater treatment

Pulp and Paper Mills

Used for:

- Green liquor
- White liquor
- Black liquor
- Lime mud
- Mineral fillers

Chemical Plants

Suitable for:

- Hydrofluoric acid
- Phosphoric acid
- Caustic soda

Metals and Mining

Applications include:

- Alumina refining
- Caustic solutions
- Alumina powder transportation

Steel Plants and Refining

Used in:

- Dust removal systems
- Coal powder handling
- Oil sands processing

FUJIKIN ceramic valves provide reliable sealing and long operational life in extreme industrial

environments.

3. Cera System Ceramic Valves

Cera System is recognized as a leading supplier of ceramic-lined industrial valves and pipeline components. Its products are designed for extreme operating conditions where traditional valve materials cannot provide sufficient durability.

By combining advanced engineered ceramics with application-specific solutions, Cera System ceramic valves deliver excellent resistance against erosion, corrosion, and high-temperature media.

Power Plants

Ceramic valves are widely used in:

- Flue gas desulfurization (FGD) systems
- Limestone slurry transportation
- Hydrated lime slurry
- Gypsum slurry
- Fly ash handling
- Wastewater containing solid particles

These applications require valves capable of continuous operation under abrasive conditions.

Waste Incineration

Applications include:

- FGD systems
- Lime slurry circulation
- HCl washing systems
- Chemical treatment processes

Ceramic-lined valves provide reliable control in highly corrosive waste treatment environments.

Steel Production

Ceramic valves are applied in:

- Pulverized coal injection systems
- Desulfurization processes
- Lime and silica transportation
- Coke handling systems

Their excellent wear resistance helps reduce downtime in steel production lines.

Pulp and Paper Industry

Applications include:

- Kaolin
- Bentonite
- Quartz
- Mineral fillers
- Bleaching chemicals
- Green liquor
- Sodium hydroxide solutions

Ceramic valves provide an alternative solution where conventional metal valves suffer from corrosion and erosion.

Chemical Processing

Ceramic valves are widely used for:

- Acid transportation
- Metal slurry control
- Polymer processing
- Corrosive chemical handling

They can replace PTFE/PFA-lined valves or expensive special alloy valves in abrasive chemical applications.

Silicon and Semiconductor Materials

Applications include:

- Silicon powder transportation
- Polysilicon production
- Trichlorosilane (TCS) control
- Silicon chemical processing

The excellent purity and corrosion resistance of ceramics make them suitable for advanced material manufacturing.

Petrochemical Industry

Used in:

- Fluid catalytic cracking (FCC)
- Catalyst transportation
- Alumina powder handling
- Chemical processing systems

Mining Industry

Applications include:

- Copper concentrate transportation
- Mineral slurry control

- Ore dosing systems

Ceramic valves significantly improve equipment reliability in abrasive mining environments.

Pneumatic Conveying

Used for:

- Sand
- Cement
- Glass powder
- Gypsum
- Mineral materials

Fertilizer Industry

Applications include:

- Ammonium nitrate
- Phosphoric acid
- Solid chemical materials

4. Neles Ceramic Valves

Neles ceramic valves are designed for demanding industrial applications involving abrasive and particle-containing media.

Typical applications include:

- Lime mud control
- Kaolin and clay handling
- Carbonate processing
- Gypsum transportation
- Cement production
- Metal slurry control
- Catalyst regeneration
- Desulfurization systems

Their wear-resistant ceramic lining provides stable operation and reduces maintenance frequency.

5. FLOWSERVE Durco Ceramic Ball Valves

Flowserve Durco ceramic ball valves are designed for applications where conventional valves cannot provide sufficient performance.

They are recommended for:

- Abrasive slurry systems
- High-temperature corrosive environments
- Large temperature fluctuation conditions

Metal and Mining

Applications include:

- Mineral slurry transportation
- Copper and iron ore processing
- Steel wastewater treatment
- Pulverized coal injection systems

Petrochemical Industry

Applications include:

- FCC units
- Acidic oil and gas transportation
- Sulfur-containing wastewater treatment

Power Industry

Used in:

- Flue gas desulfurization systems
- Limestone and gypsum slurry systems
- Denitrification processes

Chemical Industry

Applications include:

- Hydrofluoric acid
- Phosphoric acid
- Titanium dioxide suspension
- Particle-containing polymer processing

Oil and Gas Industry

Used for:

- Acidic oil and gas wells
- H₂S and CO₂-containing environments
- Subsea transportation systems

6. FLOWSERVE NAF Ceramic Control Valves

NAF Ceramic valves combine ceramic lining technology with advanced control valve design.

They are mainly used for:

- Erosive media
- Abrasive slurry

- Corrosive chemical processes

The valves can function as both control valves and shut-off valves, providing reliable performance, high sealing capability, and reduced lifecycle costs.

7. KOWOV Ceramic Ball Valves

KOWOV ceramic ball valves are designed for some of the most challenging industrial conditions. With extensive application experience, KOWOV provides ceramic valve solutions across multiple industries.

Power Industry

Applications include:

- Coal-fired power plants
- Waste-to-energy plants
- Flue gas desulfurization systems
- Fly ash handling
- Dust collection systems
- SCR denitrification systems

Steel Industry

Applications include:

- Pulverized coal injection
- Oxygen desulfurization
- Electric arc furnace systems
- Molten iron treatment

Coal Chemical Industry

Applications include:

- Gasification
- Shift conversion
- Coal washing
- Coking
- Sulfur recovery

Silicon Chemical Industry

Applications include:

- Polysilicon production
- Silicon powder transportation
- Tail gas treatment
- Slurry processing

Chlor-Alkali Industry

Applications include:

- Soda ash production
- Caustic soda systems
- PVC manufacturing
- Brine treatment
- Hydrochloric acid transportation

Industrial Chemical Industry

Applications include:

- Titanium dioxide production
- Alumina processing
- Catalyst manufacturing
- MDI/TDI production
- PTA processing

Fine Chemical Industry

Applications include:

- Fertilizer production
- Pesticide manufacturing
- Phosphorus chemical processing

Petrochemical Industry

Applications include:

- Waste liquid treatment
- Oil and gas processing
- FCC systems
- Catalyst transportation

New Energy Industry

Ceramic valves are increasingly applied in:

- Lithium extraction
- Battery material production
- Nickel and cobalt hydrometallurgy
- Lithium carbonate slurry transportation
- Cathode material manufacturing

Mining and Metallurgy

Applications include:

- Mineral processing

- Smelting systems
- Hydrometallurgy
- Sulfuric acid slurry transportation

Environmental Protection Industry

Applications include:

- Waste incineration
- Wastewater treatment
- Solid waste processing
- Sulfur recovery

Other Industries

Ceramic valves are also used in:

- Abrasive manufacturing
- Glass production
- Cement production
- Pharmaceutical processing
- Paper manufacturing

Through continuous technological innovation, ceramic ball valves have become a critical component for improving reliability and efficiency across modern industrial systems.

II. Core Challenges in the Application of Ceramic Ball Valves & Industry Solutions

Ceramic ball valves provide outstanding wear resistance, corrosion resistance, and long service life, making them an effective alternative to traditional metal valves in extreme industrial environments. However, despite their technical advantages, the large-scale adoption of ceramic ball valves has faced several challenges, including insufficient technology development, inconsistent product quality, limited industry standards, and misunderstandings regarding application requirements.

The development of the ceramic ball valve industry can be divided into several key stages.

Early Adoption: Advantages and Initial Limitations

During the early stage of ceramic ball valve development, manufacturers mainly focused on solving problems in operating conditions where traditional metal valves failed.

By utilizing the unique properties of ceramic materials, these valves successfully addressed challenges such as severe corrosion, abrasive particles, and high-temperature operation. In many specialized applications, ceramic valves significantly extended service life and reduced equipment maintenance requirements.

However, early ceramic valves also faced limitations, including higher manufacturing costs, strict installation requirements, and the need for professional operating procedures. These factors restricted their wider adoption despite their excellent performance.

The successful application of ceramic valves in demanding industrial environments established their value and created a foundation for future market expansion.

Misalignment Between Expanding Applications and Technology Development

As demand for ceramic ball valves increased, their applications expanded into more industries. However, technological development did not always progress at the same pace.

Some manufacturers failed to conduct sufficient research on:

- Ceramic material selection
- Formula optimization
- Forming processes
- Sintering technologies
- Application-specific design

As a result, some products experienced unstable performance when introduced into new operating conditions.

In addition, insufficient understanding of actual industrial environments caused some manufacturers to develop products that either lacked durability or exceeded application requirements unnecessarily.

This mismatch between product development and real-world operating conditions affected user experience and slowed broader adoption of ceramic valve technology.

Market Perception and Operational Challenges

With the increasing number of domestic ceramic valve manufacturers entering the market, product prices became more competitive. However, differences in manufacturing technology and material quality created new challenges.

Some users selected ceramic valves primarily based on price while ignoring the fundamental differences between ceramic and metal materials.

Traditional metal valve operating methods were sometimes applied directly to ceramic valves without considering:

- Installation requirements
- Operating conditions
- Material characteristics
- Maintenance procedures

Improper application reduced product performance and occasionally resulted in premature failures.

These cases negatively influenced market confidence and created misconceptions about ceramic valve reliability.

To maximize the benefits of ceramic valves, users must evaluate operating conditions carefully and select products based on professional engineering recommendations rather than price alone.

Quality Control Challenges Caused by Rapid Market Expansion

After the 2010s, improvements in ceramic manufacturing technology enabled leading companies to achieve stable product performance across various industries.

The growing market potential attracted many small and medium-sized manufacturers. However, some new suppliers lacked sufficient technical experience in ceramic production.

Challenges included:

- Insufficient raw material control
- Lack of ceramic formulation expertise
- Incomplete manufacturing processes
- Limited quality inspection capabilities

The quality of ceramic components depends heavily on factors such as material purity, particle size distribution, forming methods, and sintering processes.

Without strict control throughout the production process, product performance can vary significantly.

In large industrial projects, low-price competition sometimes resulted in inferior products being selected. Poor-quality ceramic valves damaged end-user confidence and created barriers to wider industrial adoption.

Therefore, improving manufacturing standards and strengthening quality evaluation systems have become essential for sustainable industry development.

The Fundamental Barrier: Lack of Specialized Industry Standards

One of the biggest challenges limiting the development of ceramic ball valves is the absence of comprehensive industry standards.

Currently, ceramic ball valves still rely partly on general valve standards originally developed for traditional steel valves.

Existing standards, such as:

- GB/T 12237
- JB/T 10529-2020 Technical Specifications for Ceramic Sealed Valves
- JB/T 12797-2016 Technical Specifications for Valves Used in Coal Chemical Industry Plants

provide certain technical references, but they do not fully address the unique requirements of ceramic ball valves.

Existing limitations include:

- Insufficient requirements specifically for ceramic ball valve design
- Lack of detailed material classification systems
- Limited testing methods for finished ceramic components
- Absence of comprehensive installation and operation guidelines

Unlike metal valves, ceramic valves require specialized considerations regarding material properties, processing technology, application conditions, and maintenance methods.

Without clear standards, manufacturers lack unified production guidelines, while end users lack reliable references for selection and operation.

This has become a major institutional barrier preventing wider adoption of high-quality ceramic ball valves.

Establishing Standards: The Path Toward Standardized Growth

To address these challenges and promote standardized development, Jintai Meilin collaborated with the Hefei General Machinery Research Institute to participate in establishing the group standard:

T/CMES 20023—2025 Technical Requirements and Quality Classification for Ceramic Ball Valves

The standard aims to create a comprehensive technical framework covering the entire lifecycle of ceramic ball valves.

The main focuses include:

1. Ceramic Raw Material Classification

The standard establishes requirements for ceramic raw material quality, including purity levels and material characteristics.

This ensures consistent performance beginning from the source of production.

2. Ceramic Forming Process Classification

Different manufacturing processes are classified according to application requirements, helping manufacturers select suitable production methods for different operating environments.

3. Standardized Sintering and Inspection Processes

The standard improves quality consistency by defining:

- Sintering requirements
- Manufacturing inspection procedures
- Performance evaluation methods

These measures help ensure reliable product performance in industrial applications.

4. Application, Installation, and Maintenance Guidelines

The standard provides technical guidance for:

- Product selection
- Installation procedures

- Operation requirements
- Maintenance practices

This helps users apply ceramic ball valves correctly and achieve maximum service life.

Future Development of Ceramic Ball Valves

With the implementation of standardized technical requirements, the ceramic ball valve industry is expected to transition from experience-based development toward a more scientific and standardized approach.

A comprehensive quality classification system will help users identify suitable products according to actual operating conditions, while improving confidence in ceramic valve technology.

In the future, ceramic ball valves are expected to achieve broader adoption in key industries including:

- Energy
- Chemical processing
- Metallurgy
- Mining
- Environmental protection
- New energy manufacturing

Through continuous improvements in ceramic materials, precision manufacturing, and application technologies, ceramic ball valves will provide more reliable solutions for industrial equipment upgrading.

As industries continue to demand longer service life, higher efficiency, and safer operation, advanced ceramic valve technology will play an increasingly important role in the modernization of global industrial systems.



Media Contact

Yantai Kingway Science & Technology Co., Ltd.

*****@kingway98.com

+86-1536141344

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