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# Qingdao Huashida 3LPE Steel Pipe Anti-Corrosion & Internal/External FBE Anti-Corrosion System

## Marketing White Paper

Rooting in China · Serving the World ·
Building a Safe Barrier for Energy Transportation

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# Executive Summary

With the accelerated development of energy infrastructure under the Belt and Road Initiative and the growing demand for renovating and upgrading aging pipeline networks in China, the pipe anti-corrosion equipment industry is evolving toward high-speed, intelligent, large-diameter, and green solutions. As the most dominant protective technologies today, 3LPE and internal/external epoxy anti-corrosion directly determine the safety and efficiency of energy transportation through their equipment performance.

This whitepaper systematically reviews the development background and technological trends of the global anti-corrosion equipment industry, with a focus on analyzing the current status and breakthrough directions of the two main technological routes: 3LPE and internal/external epoxy coating. Leveraging its deep expertise in the field of high-end plastic machinery equipment, Qingdao Huashida Machinery Co., Ltd. has emerged as a leading enterprise in this sector.

Huashida masters the core technology for ultra-high-speed production lines, achieving a single-line efficiency of 800 m²/h — two to three times the industry average. It enables full-diameter coverage from Φ25 to Φ4200mm and has obtained certifications according to major global standards such as API and EN. Currently, Huashida's products serve top-tier clients including Sinopec and Saudi Aramco, covering vast markets across Central Asia, the Middle East, and Africa.

In the future, Huashida will continue to pursue its strategy of "Chinese Technology, Global Equipment," promoting the domestic substitution of high-end anti-corrosion equipment while expanding its global reach, thereby contributing China's strength to safeguarding the world's energy arteries.

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# I. Industry Overview & Development Background

Pipe anti-corrosion is a core safety assurance link in fields such as energy transportation, municipal infrastructure, marine engineering, and nuclear power/petrochemical industries. Long-distance oil/gas pipelines, urban pipeline networks, submarine pipelines, and industrial process pipes operate long-term in complex corrosive environments involving soil, seawater, acids/alkalis, and microorganisms. Anti-corrosion equipment and process directly determine pipeline lifespan, maintenance costs, and system safety.

With the upgrading of global energy infrastructure, oil and gas projects along the Belt and Road are being launched intensively, and the continuous release of domestic demand from projects like the national pipeline network, petrochemical refining, marine engineering, and old pipeline network renovation, anti-corrosion equipment is being driven towards high-speed and high-efficiency, intelligent integration, large-diameter capabilities, green and low-carbon solutions, and full-spectrum coverage. 3LPE anti-corrosion and internal/external FBE anti-corrosion have become the mainstream technical routes due to their reliable protection, long lifespan, and suitability for harsh operating conditions. Industry competition is shifting from single machine supply to complete line solutions, intelligent manufacturing, and full lifecycle services. Leading enterprises build barriers through technological expertise, qualifications, delivery capabilities, and overseas presence.

# II. Current Status & Development Trends of 3LPE Anti-Corrosion Equipment Technology

2.1 Current Status:

The 3LPE (Three-layer Polyethylene) anti-corrosion coating is a composite structure consisting of a fusion-bonded epoxy (FBE) primer layer, a copolymer adhesive intermediate layer, and an outer polyethylene layer, offers balanced protective performance and high industrial maturity. It is the mainstream process for buried pipelines. A full-spectrum processing capacity, covering diameters from Φ25 mm to Φ4200 mm, has been established in China, with mainstream efficiency around 200-250 m²/h. However, there is still room for improvement in high-speed large-diameter processing, intelligent control, interlayer bonding stability, energy consumption, and consistency.

2.2 Development Trends:

2.2.1: High Speed & Efficiency: Single line efficiency leaps to 600-800 m²/h, increasing production capacity by 2-3 times;

2.2.2: Large & Extra-Large Diameter: Covering Φ600-Φ4200mm, suitable for cross-sea, deep-sea, and national trunk pipelines;

2.2.3: Intelligent Manufacturing: Online inspection, closed-loop control, digital twin, unmanned operation and maintenance;

2.2.4: Composite Process Integration: 3LPE + internal FBE/paint, continuous O-type coating, integrated elbow/pipe fitting systems;

2.2.5: Green & Low-Carbon: Low VOC, energy-saving extrusion, improved material utilization, optimized recycling;

2.2.6: International Standard Compliance: Meeting global access requirements such as EN, DIN, API, NORSOK.

## III. Current Status & Development Trends of Internal/External FBE Anti-Corrosion Equipment Technology

3.1 Current Status:

Internal/external FBE powder coating, applied via electrostatic spraying/vacuum suction and thermosetting, achieves friction reduction, anti-corrosion, and erosion resistance on the inner wall. With 3LPE on the outer wall for dual protection (external 3LPE + internal FBE), it is widely used in drinking water, oil & gas, chemical, and nuclear power applications. Current industry pain points: uniformity of inner coating, edge coverage, curing temperature control, large-diameter inner wall spraying, rapid curing and high-speed production.

3.2 Development Trends:

3.2.1: Solvent-Free/Powder Coating: Zero VOC, environmentally compliant, improved adhesion and corrosion resistance;

3.2.2: Intelligent Spraying: Constant pressure and flow, closed-loop

3.2.3: Integrated Internal/External Coating lines: Combined production of external 3LPE/PP with internal FBE powder coating;

3.2.4: Longevity: Coating life upgraded towards 30+ years, suitable for deep-sea/nuclear/hydrogen energy applications;

3.2.5: Customization: Complete equipment for elbows, pipe fittings, field joint coating, and site construction.

# IV. Huashida Enterprise Strength & Core Technology Endorsement

Qingdao Huashida is a leading enterprise in 3LPE anti-corrosion and internal/external FBE anti-corrosion complete system. With years of deep cultivation in the industry, it has set benchmarks for stability, reliability, high speed, efficiency and intelligent manufacturing, with market share and brand influence ranking among the top.

4.1 Qualifications & Platforms:

4.1.1: Shandong Provincial “Specialized, Refined, Characteristic, Innovative" Enterprise;

4.1.2: Qingdao Municipal Science and Technology Innovation Enterprise;

4.1.3: Qingdao Municipal Key Laboratory for High-end Plastic Machinery Equipment;

4.1.4: Multiple products recognized as Shandong Provincial "First (Set) Technical Equipment".

4.2 Industry-University-Research Cooperation:

Establishes R&D systems in collaboration with the Beijing University of Chemical Technology Plastic Machinery Research Institute, Qingdao University of Science and Technology, and Qingdao University of Technology. Focuses on key technologies such as process optimization, intelligent control, material suitability, and high-efficiency large-diameter production, continuously breaking through industry bottlenecks.

4.3 Customers & Markets:

4.3.1: Domestic: State-owned enterprises such as Sinopec, Dongying Oilfield, PowerChina, China National Nuclear Corporation, China National Offshore Oil Corporation, Baoji Steel Pipe, Qingxian Julong Steel Pipe; and over 100 private pipeline companies like Hunan Tianzhuo, Hefei Huarui, Cangzhou Zhongyuan, Cangzhou Longma.

4.3.2: International: Covering Europe, Central Asia, Middle East, Africa, deeply serving the Belt and Road Initiative, with clients including Russian Oil & Gas, KazMunayGas, UAE Palma, Dubai Steel Pipe, Saudi Aramco, Nigerian Oil & Gas.

4.4 Technological Milestones:

4.4.1: Achieving an internationally leading production line efficiency of 800 $m^2/h$, representing 2-3 times the domestic average;

4.4.2: Intelligence level ranks among advanced international manufacturers;

4.4.3: Mastering global rules and standards, defining the international benchmark for Chinese anti-corrosion equipment.

# V. Huashida Product Portfolio & Core Technological Advantages

5.1 Full Spectrum of 3-Layer Polyethylene (3LPE) Anti-Corrosion Coating System:

5.1.1: Standard Diameter: Φ50-325, Φ159-820, Φ219-1420;

5.1.2: Medium-Large Diameter: Φ500-1820, Φ600-2500;

5.1.3: Extra-Large Diameter: Φ1000-3200, Φ1000-4200;

5.1.4: Specialized Lines: Continuous O-type 3LPE coating, external 3LPE with internal FBE, external 3LPE with internal paint, elbow anti-corrosion production lines (Φ50-325, Φ400-1200);

5.1.5: High-End Export Lines: High-speed spray winding, 5PP anti-corrosion, submarine cement anti-corrosion sinking pipe production lines (Φ300-1500, Φ500-1620, Φ630-3200).

5.2 Internal & External FBE Powder Coating System:

5.2.1: Complete internal/external FBE/paint spraying systems;

5.2.2: Large-diameter internal/external FBE lines (Φ600-2500, awarded Shandong Provincial "First Set");

5.2.3: Integrated with 3LPE coating lines, achieving external 3LPE + internal FBE/paint coating in a single pass;

5.2.4: Uniform coating, strong adhesion, erosion resistance, meeting both friction reduction and anti-corrosion standards.

5.3 Auxiliary Construction Machinery:

5.3.1: Heat Shrink Sleeve Production Line: Over 200 units sold domestically, highest market share;

5.3.2: Cold-applied Tape Production Line: Suitable for field joint coating, emergency repairs, and old pipeline network maintenance;

5.3.3: Exports cover Iran, Kazakhstan, Algeria, etc.

5.4 Core Technological Advantages:

5.4.1: Ultra-High Production Capacity: Line efficiency of 800 $m^2/h$, leading in productivity;

5.4.2: Full Diameter Coverage: Turnkey solutions from small diameter to Φ4200mm extra-large diameter;

5.4.3: Intelligent Manufacturing: Online inspection, closed-loop control, stable and reliable, low failure rate;

5.4.4: Composite Process: Full-spectrum integration of 3LPE/ 5PP/FBE/Paint/Elbow/Joint coating;

5.4.5: International Benchmarking: Complies with major global standards, competing alongside companies from the US, Germany, Netherlands;

5.4.6: Full Lifecycle Service: In-house R&D team + global service network, ensuring worry-free delivery and after-sales support.

## VI. Market Positioning & Global Value

Huashida, rooted in China and oriented towards the world, adopts the strategy of domestic substitution of high-end anti-corrosion equipment + global export. Closely aligned with the "Dual Carbon" goals, new infrastructure strategy, and the Belt and Road Initiative, it provides Chinese technology, Chinese equipment, and Chinese solutions for the world's energy arteries.

Domestic: Leading industry upgrades, supporting the self-reliance and control of the national pipeline network, petrochemical, and marine engineering sectors;

International: Leveraging advantages in high speed, intelligence, and large diameter to capture high-end markets, becoming a benchmark brand for Chinese anti-corrosion equipment going global.

## VII. Conclusion

Qingdao Huashida, with its full-spectrum products, core technologies, qualified platforms, global delivery capabilities, and service ecosystem, has built a fully competitive chain for 3LPE anti-corrosion and internal/external FBE anti-corrosion equipment. In the wave of industry trends towards high speed, intelligence, greenness, and globalization, Huashida continuously creates long-term value for customers through technological innovation and reliable quality, contributing China's strength to global pipe anti-corrosion efforts.