



Triturbo Fan Website



Triturbo Fan Official Account

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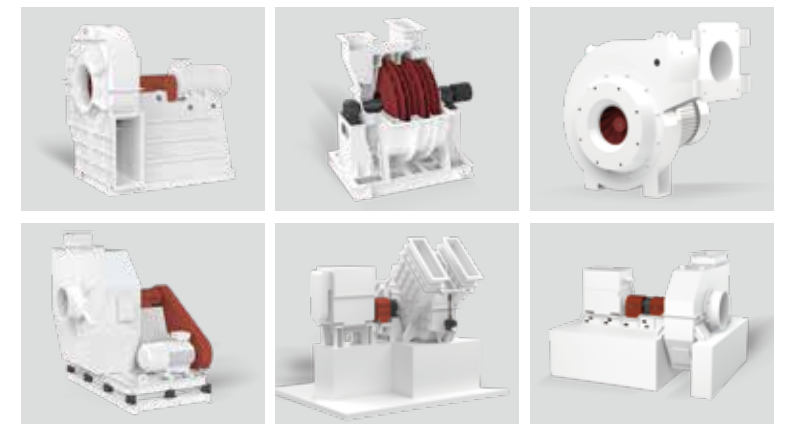
NorthGlass Group: www.northglass.com

Triturbo Fan Website: www.triturbo-fan.com

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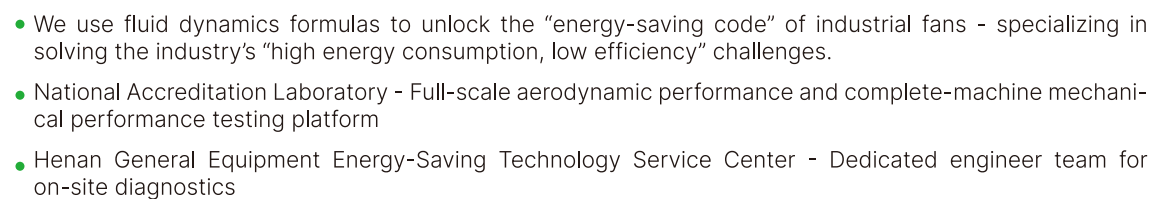
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NorthGlass • Triturbo Fan BU

Let Every Kilowatt-Hour Create Value for You



The independently developed "Triturbo Energy-Saving Technology" has been granted 15 national patents.

20 years focused on fan system energy-saving retrofit.

Complete sets exported to over 115 countries and regions.

Over 2,000 fan systems retrofitted cumulatively

The company covers an area of 50,000 m² with an annual production capacity of 10,000 units/sets. It is equipped with advanced production equipment such as laser cutting machines, CNC spinning machines, 5-axis machining centers, horizontal machining centers, CNC lathes and imported dynamic balancing machines, meeting the production needs of various customized fans; the impeller assembly balancing grade reaches G2.5.

The company's main products include high-temperature fans for the glass, metallurgy and kiln industries; specialized fans for the environmental protection, coating, papermaking and high-speed rail industries; forced and induced draft fans for boilers, power plants, cement kilns and other industries; and various non-standard high-, medium- and low-pressure fans. Taking the application of "Triturbo" technology in the ventilation fan industry as the foundation for innovation, the company aims to provide customers with high energy-efficiency-grade ventilation fan products and energy-saving, stable ventilation system technical solutions. Rooted in customer needs, it tailors customized fan series featuring high energy efficiency, low vibration and easy maintenance, which are widely recognized by the market.



Luoyang North Glass High-end Equipment Co., LTD. (This production base covers an area of 340,000m² with a building area of 220,000m²)

High-end Equipment Industrial Park "Wanli" VIP Building

Shanghai North Glass Technology Industrial Co., Ltd.

Tianjin North Glass Technology Industrial Co., Ltd.

Luoyang North Glass Triturbo Fan Technology Co., Ltd.

NorthGlass Technologies and products

Tempering Furnace

6500+ NorthGlass tempering furnaces in operation worldwide.

Triturbo Fan

100,000+ NorthGlass Triturbo Fans power efficient operations in high-speed rail and industrial applications.

Pre-processing Line for Glass Intelligent Processing Factory

300+ glass pre-processing lines, cutting machines and glass storage systems sold worldwide.

High-Efficiency Electric Kilns

Utilized in sanitary ware, architectural ceramics, foamed ceramics, cast glass, Light-Stone and other sectors.

Coating Line

30+ NorthGlass coating lines sold worldwide.

Processed Glass

Cast Glass

Redefining possibilities with 15 m² monolithic panels & continuous production.

Light-Stone — Lightweight Microcrystal Stone Unit Wall

With an annual output of 500,000 Light-Stone units for integrated wall systems, NorthGlass is pioneering the era of industrialized green construction.

About Us

Founded on May 18, 1995, by Chairman Mr.Xueming GAO, Luoyang NorthGlass Technology Co., Ltd. (NorthGlass) is a pioneer in the global glass industry. Headquartered in the Luoyang National High-Tech Industrial Development Zone, we specialize in the R&D, design, manufacturing and sales of glass processing equipment and value-added processed glass products. In 2011, NorthGlass was successfully listed on the Shenzhen Stock Exchange (Stock Code: 002613), further strengthening its global presence.

Our Family

Our growth strategy includes the establishment of several subsidiaries, each specializing in different facets of the glass industry. These include:

Shanghai North Glass technology industrial Co., LTD.

Shanghai North Glass Vacuum Coating Technology Co., LTD.

Luoyang North Glass Triturbo Fan Technology Co., LTD.

Tianjin North Glass Technology Industrial Co., LTD.

Shanghai North Glass Automation Technology Co., LTD.

Luoyang North Glass High-end Equipment Co., LTD.

Luoyang North Glass Cast Glass Co.,LTD.

Luoyang North Glass High-temperature Electric Kiln Co., Ltd.

Luoyang North Glass Top Glass Industrial Co., Ltd.

North Glass (Shanghai) Top Glass Industrial Co., Ltd.

Additionally, our strategic investment in Luoyang NorthGlass Light-Stone New Material Co., Ltd. underscores our commitment to diversification and innovation across the glass industry value chain.

Our Products

At NorthGlass, we adhere to the philosophy that "Innovation has no bounds, and success is rooted in perseverance". We have consistently developed industry-leading products that set new benchmarks for the sector. Our product portfolio covers glass tempering furnaces, coating lines and high-end deep-processed glass, setting new industry standards across automation, new materials and other key sectors. Our dedication to technological advancement also includes the development of automated glass processing lines, glass cutting equipment, glass storage systems and our innovative Triturbo Fan technology. Additionally, our strategic investment in nurturing the Light-Stone industry marks our foray into the modular green building materials market, demonstrating our leadership in environmental sustainability and technological innovation.

NorthGlass has cemented its leading position in the global glass industry through relentless innovation and superior manufacturing of advanced glass processing equipment. Our flat and curved glass tempering furnaces have maintained a leading market position for 24 consecutive years, with more than 6,500 units in operation worldwide. Our in-house developed coating lines have also become a mainstream solution for glass coating manufacturers worldwide. At the same time, NorthGlass Automation's intelligent factory solutions are being widely applied in various fields such as architecture, home appliances, solar energy, and shower glass, continuously empowering the intelligent upgrade of industries.

Our high-performance processed glass products form another core business pillar, adorning iconic architectural landmarks worldwide – including Google Bay View (USA), 2050 M Street (Washington, D.C., USA), Oracle Headquarters (Austin, USA), Azabudai Hills Mori JP Tower (Japan), the Leadenhall Building (UK), Abu Dhabi International Airport, New Performing Arts Venue (Brisbane, Australia). These landmarks also include China's national Olympic venues such as the Bird's Nest, the Water Cube and the Ice Ribbon, the National Centre for the Performing Arts (China), National Convention Center (China), Beijing Daxing International Airport (China), "Sun Valley" & "Shiliupu Pier" of EXPO 2010 Shanghai (China), Beijing Library (China), Shanghai Tower (China), Nike Shanghai 001 (China), XRL Topside West Kowloon (Hong Kong, China), Two Taikoo Place (Hong Kong, China), Huawei Global Flagship Store (China), OPPO Headquarters (China), as well as flagship stores of Hermès, Louis Vuitton, GUCCI among many other notable buildings. Furthermore, NorthGlass is proud to be one of the two primary architectural glass suppliers for a world-renowned technology company, providing glass for its global flagship stores and Silicon Valley headquarters. This underscores our global footprint and the trust placed in our products by prestigious clients.

Backed by a comprehensive domestic and international sales and service network, NorthGlass products are available nationwide and exported to more than 115 countries and regions, including the USA, UK, Germany, France, Japan, India, Brazil, Saudi Arabia, Egypt and Turkey.

Analysis of the Six Pain Points of Traditional Fans

NorthGlass's Innovative Solutions Break the Deadlock, Delivering High Efficiency and Energy Saving in One Step

Poor Selection Adaptability

The model library is limited, and general-purpose fans struggle to meet special operating conditions.

Solution: Proprietary software enables intelligent, high-efficiency triturbo design to meet special operating conditions.

Poor Match with the Pipe Network System

Fans and pipe networks are not efficiently matched, resulting in low operating efficiency.

Solution: Fan + pipe network CFD flow field analysis optimizes selection and pipe network layout, improving efficiency by 5%–20%.

Low Motor Efficiency

Traditional asynchronous motors have low efficiency at light loads.

Solution: Permanent Magnet Synchronous Motors (PMSM) are selected for higher efficiency at light loads.

Low Intrinsic Fan Efficiency

Dual turbo design causes uneven blade load distribution and high flow losses.

Solution: Triturbo design optimizes blade load distribution and reduces flow losses, improving efficiency by 3%–15% and broadening the high-efficiency zone.

Low Mechanical Transmission Efficiency

Belt or coupling drives rely on wear-prone components and incur high energy losses.

Solution: Direct-drive transmission reduces wear-prone components, improving efficiency by 2%–5%.

High O&M Costs

Relying on manual inspections, with no real-time monitoring or automatic lubrication, maintenance is frequent.

Solution: Automatic lubrication systems, safety protection design and intelligent O&M functions reduce maintenance costs.

High-Efficiency Fan

The Triturbo Impeller: Like Installing a “Sports-Car Engine” in Your Fan



Technical Core

Three-dimensional flow channel design: Using fluid simulation to map “expressways” for airflow, preventing it from getting lost and congested.

Proven Results: 3%–15% higher efficiency than traditional fans; a single 1,000 kW fan saves enough in electricity costs annually to pay for a brand-new unit.



Key Technical Specifications

Efficiency reaches Grade 1 energy efficiency per GB 19761-2020, with no fear of energy waste during load fluctuations.



Dual Turbo Fan

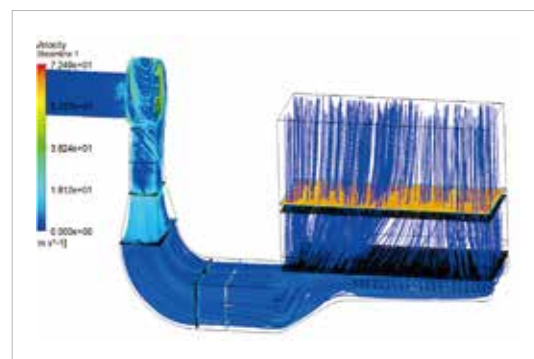


Triturbo Fan

Customized Service

Closed-loop service from diagnosis to “treatment”

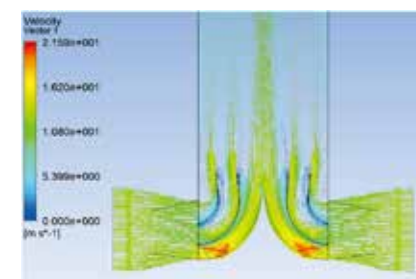
	Precise Check-Up	Real-time collection of 12 core parameters including air pressure, air volume, and vibration. CFD simulation and analysis technology to replicate actual operating conditions.
	Root Cause Analysis	Precise matching from 23 types of specialized aerodynamic models (covering extreme conditions from -50°C to 450°C). Intelligent benchmarking against a database of 2,000+ retrofit cases.
	Precise Treatment	5-axis CNC aerospace-grade machining ensures mold precision. Impeller dynamic balancing grade G2.5 ensures 15,000 hours of operation without abnormal vibration.



Pipe Network Optimization

If pipe network optimization is not sufficient, a secondary retrofit service is available.

	Efficient Matching	Fan + pipe network CFD flow field analysis technology: Select fans with a “wide high-efficiency zone” to ensure 85%–110% air volume demand is met. Customized fan parameters based on actual operating conditions, eliminating energy waste caused by “design redundancy” - achieving efficient fan-to-network adaptation.
	Combined Regulation	Dual control mode of speed and air intake: Ensures fans remain in the high-efficiency operating range even during load fluctuations. CFD-optimized performance adapts to complex operating conditions, maintaining operating efficiency at least 82%.
	Rational Layout	Shorten bend lengths at fan inlets as much as possible; install long near-straight sections at inlets to minimize airflow disturbance from bends, allowing air to enter the fan smoothly. Large-curvature-radius bends and gentle-slope variable-diameter designs reduce resistance from airflow turns and abrupt diameter changes - cutting pipe network pressure loss by over 20%.
	Scientific Verificatio	CFD simulation technology pre-tests the pipe network system, identifying 90% of avoidable pressure loss locations in advance for optimization. Post-retrofit actual measurements ensure simulation-to-reality error is less than 3%, guaranteeing reliable optimization results.



Core Components

The Efficiency Code of Fans

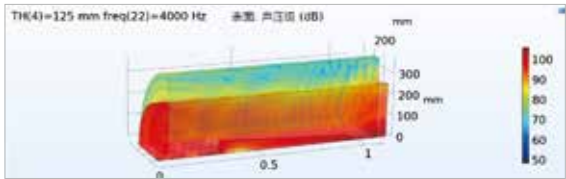
High-Efficiency Triturbo Impeller	Flow channel efficiency improvement 3%-15%	Dynamic balancing precision Grade G2.5
Stable-Flow Air Intake System	Airflow uniformity deviation < 3%	Operating noise reduction 5-8dB (A)
Structures Exclusive to Special Operating Conditions	0 Leakage	Temperature resistance up to -40°C—550°C



Frequency-Separated Noise Reduction Technology

Effectively reducing the noise generated by fan operation

	Precise Localization	Noise spectrum analysis enables frequency-separated noise reduction. Targeted noise reduction solutions are developed to avoid ineffective treatment.
	Triple Noise Reduction	Active noise reduction: high-efficiency fan design and selection. Passive noise reduction: noise reduction structure and accessory design. Vibration dampers block low-frequency transmission.
	Measured Results	Overall noise level <85 dB(A). Low-resistance noise reduction design.



Intelligent Control System

Achieving an Efficient Match Between Fan Systems and Operating Conditions

System Optimization Solutions

Selecting the Optimal Combination



Intelligent Parameter Adjustment

The system monitors air volume demand changes in real time and automatically adjusts operating parameters based on advanced algorithms - seamlessly switching between "Economy Mode" and "Boost Mode" - ensuring the fan always runs at optimal energy efficiency.



Health Warning System

Integrated high-precision vibration sensors monitor fan operating status in real time. Once vibration exceeds limits, the system immediately triggers an alarm - earlier than traditional manual experience-based judgment - effectively preventing potential failures and ensuring safe, stable equipment operation.



Cloud Collaborative Management Platform

Cloud computing technology enables real-time collection, transmission, and analysis of fan energy consumption data. Users can log in to the cloud platform anytime, anywhere via phone or computer to view detailed energy consumption curves and savings results. Data visualization makes energy-saving benefits clear at a glance - helping users achieve refined energy management.



Fan Retrofit

Option A: Replace with a Triturbo impeller, or optimize the air inlet to improve fan efficiency.

Option B: Replace the complete unit with a high-efficiency triturbo fan, enabling fan efficiency to reach Grade 1 energy efficiency per GB 19761-2020.



Motor Upgrade

Option A: Upgrade to a Grade 1 energy-efficiency motor per GB 18613, meeting national high-efficiency standards.

Option B: Adopt a Permanent Magnet Synchronous Motor (PMSM) to improve motor efficiency and operational stability.

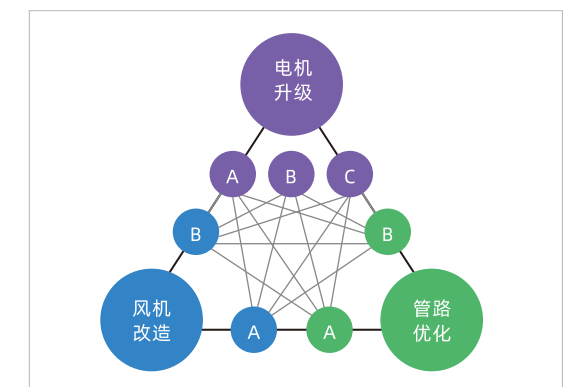
Option C: Replace with a Reluctance Motor to achieve higher electrical energy conversion efficiency.



Pipeline Optimization

Option A: Carry out local pipeline optimization to reduce energy losses.

Option B: Implement comprehensive pipeline optimization to fully improve system operating efficiency.



New Energy-Saving Paths for Photovoltaic and Float Glass Production Lines

Solving Energy Challenges with Innovation, Defining Green Production with Real Results

Pressure to Increase Output and Efficiency and Meet Standards

Fans for photovoltaic glass production lines mainly include melting furnace fans, annealing lehr fans, glass deep-processing fans and cleaning machine fans; float glass production lines include melting furnace fans and annealing lehr fans. At present, the fan systems used in the glass industry mainly have the following problems:

Low and unstable efficiency

The original fans generally have low efficiency (average efficiency about 60%), with insufficient efficiency in key areas, affecting the stability of the entire production line.

Poor fan-to-network match

Fans are poorly matched with pipe networks and fail to fit actual operating conditions, causing large amounts of energy to be wasted in low-efficiency operation.

High operating costs

Due to lagging technology upgrades, old fans consume high energy even at low loads, and their efficiency declines year by year as components age.

High maintenance costs

Traditional fans have many wear-prone components, resulting in high repair and maintenance costs.

Solutions

Precise matching optimization

Precise selection + triturbo optimization design ensure highly compatible equipment and systems, improving fan performance across multiple dimensions.

Efficient transmission upgrade: Permanent magnet motor + variable frequency control + direct-drive transmission

The PMSM directly drives the impeller structure, featuring high transmission efficiency, small size, light weight and easy installation and maintenance.

In terms of performance, the motor runs efficiently under both high and low load conditions, achieving energy saving and efficiency gains across all operating conditions,

bringing users a better experience and economic benefits.

Full-line energy efficiency management

The entire glass production line can realize intelligent monitoring + real-time cloud platform management of fans, with operating parameters optimized within seconds.

Core Results

Energy efficiency improvement

After the retrofit, fan efficiency is generally improved by 15%–30%, with a power saving rate of over 20%, and the retrofitted fans can reach

Grade 1 energy efficiency per GB 19761-2020;

Standardization

Applicable to all types of glass production lines, providing standardized energy-saving paths for glass enterprises;

Fast payback

The investment payback period is about 2 years;

Green compliance

Meets the policy requirements of The Norm of Energy Consumption per Unit Product of Glass and Cast Stone (GB 21340-2019), helping enterprises pass environmental inspections and the dual energy consumption control assessment.

Policy Support

Purchase credit

When purchasing NorthGlass triturbo fans (meeting the requirements of the Advanced, Energy-Saving and Entry Levels of Energy Efficiency for Key Energy-Using Products and Equipment), the investment can enjoy a 10% corporate income tax credit (directly offsetting tax payable), and any uncredited portion can be carried forward to the following five years.

Special subsidies

Taking the Shanghai Implementation Rules for Special Support for Energy-Using Equipment Renewal in Industry and Information Technology as an example, ventilation equipment that

reaches Grade 1 energy efficiency is subsidized at RMB 200/kW (rated power); a single enterprise can receive up to RMB 10 million in subsidies, helping enterprises reduce costs and improve efficiency and competitiveness.

Typical case

Installed power of the fan has been reduced by 35KW, and the energy saving has exceeded the standard.

Typical case

Replace fan with zero retrofit basics, efficiency increased by 20%



Ceramic Plant Quench Cooling Fan Energy-Saving Retrofit

In ceramic plant production, to improve energy efficiency and reduce consumption, quench cooling fans were upgraded. This retrofit focused on the #1 and #2 line quench cooling fans. The #1 line quench cooling fan (55 kW) was newly manufactured and installed — model XTF-7a-SY-A(2P)-55kW — replacing the original #2 line quench cooling fan (90 kW). The retrofit aimed to optimize fan performance, reduce energy consumption, and achieve significant energy savings while meeting production requirements.

Comparison Item	Original Fan Parameters	Retrofit Fan Parameters
Total Measurement Time	17.5h	17.3h
Total power consumption	824.8kWh	339kWh
Calculated hourly power consumption	47.13kWh	19.6kWh
Calculated daily power consumption (24h)	1131.12kWh	470.4kWh
Daily power savings	/	660.72kWh
Power saving rate	/	58.4%



Steel Plant Converter Primary Dust Removal Fan Retrofit

The steel plant faced issues with severe furnace mouth smoke during operation of the converter primary dust removal fan and high fan vibration values. The original fan's rated flow was 120,000 m³/h, operating pressure 20.5 kPa, with a matched motor power of 1,400 kW. To improve the situation, while keeping the original fan foundation, installed power and interface dimensions unchanged, a high-efficiency fan replacement approach was adopted for the performance upgrade.

Comparison Item	Original Fan Parameters	Retrofit Fan Parameters
Inlet flow rate	120000m³/h	148000m³/h
Total pressure	20500Pa	28500Pa
Shaft power	1100kW	1378kW
Operating pressure	20.5kPa	28.5 kPa (39% increase)
Fan shaft vibration value	/	0.5 - 0.7mm/s
Fan operating efficiency	65%	85% (20% increase)

Typical Case

26% efficiency improvement; triturbo technology helps save 5,112 kWh per day

Typical Case

Energy Efficiency Breakthrough in “Small Spaces,” with an Efficiency Leap



Slag Vertical Mill Main Exhaust Fan Retrofit

During the calibration of the #2 slag vertical mill system, the operating throughput was 110 t/h. The original main exhaust fan had low efficiency; the high-power motor and VFD had high failure rates and required annual outsourced maintenance, offering significant energy-saving retrofit potential. Through the application of triturbo technology and replacement of fan equipment, system energy saving and consumption reduction were achieved.

Comparison Item	Original Fan Parameters	Retrofit Fan Parameters
Fan Model	SJ3100-12-1250kW	GASF I -23a-SY-F-(6P)-800kW
Output Power	732kW	519kW
Overall Operating Efficiency	60.1%	86.62% (26% increase)
Daily power savings	/	5,112 kWh
Power Saving Rate	/	29.1%
Power Savings per Ton of Material	/	1.94 kWh/ton



Thermal Power Plant Secondary Air Fan Retrofit Project

In a cogeneration expansion project, the secondary air fans serving two 75 t/h circulating fluidized bed (CFB) boilers were retrofitted. The retrofit had to improve fan performance parameters and efficiency while keeping the original motor power distribution largely unchanged and within limited space dimensions. Triturbo technology was applied successfully to achieve the expected goals.

Comparison Item	Original Fan Parameters	Retrofit Fan Parameters
Motor Power	200kW	250kW
Steam Output	57.78t/h	68.55t/h
Operating Frequency	35.4Hz	26.5Hz
Operating Air Volume	23352m³/h	25840m³/h
Shaft power	40.65kW	33.07kW
fan operational efficiency	74%	87.9% (13.9% increase)

Typical Case

Single-furnace energy consumption slashed by 18.3%; permanent magnet direct drive reshapes the benchmark for glass production energy efficiency

Typical Case

A 39.6% power-saving rate sets a model for energy conservation in cement thermal engineering



Tempering Furnace Permanent Magnet Direct-Drive Triturbo Fan Retrofit Project

For the 5 mm tempered glass production scenario of the 1E50 furnace model, the traditional equipment combination of “coupling drive + three-phase asynchronous motor + dual turbo fan” was upgraded to “permanent magnet direct drive + triturbo fan.” While keeping the same furnace model, fan size and production requirements, the parameters across all stand-by, quench cooling and cooling operating stages were optimized to achieve energy saving, consumption reduction and improved operating efficiency.



Grate Cooler Fan Energy-Saving Technical Transformation Project

For the grate cooler #08 fan of a 3,200 t/d kiln line, the original equipment had low efficiency (66.8%), high energy consumption, a high failure rate and required outsourced maintenance. Triturbo technology was used for the retrofit, replacing it with a NorthGlass triturbo fan to reduce system energy consumption and improve operational stability.

Comparison Item	Original Fan (Coupling Drive + Dual Turbo Fan) Parameters	Retrofit Fan (Permanent Magnet Direct Drive + Triturbo Fan) Parameters	Power/ Electricity Reduction
Fan Model	GASFI-14.7a-D-315kW	GASFI-14.7a-SY-A-315kW	—
Motor Power	315kW	315kW	—
Standby State Power	20kW	10kW	50%
Quench Cooling State Power	197kW	181kW	8%
Cooling State Power	73kW	66kW	9%
Single Furnace Operating Power Consumption	4.85kWh	3.96kWh	18.3%

Comparison Item	Original Fan Parameters	Retrofit Fan Parameters
Fan Model	PCF0855	XTFIII-13b-D(4P)-185kW
Motor power	315kW	185kW
Operating power	176kW	80.7kW
Fan efficiency	66.8%	85.6% (18.8% increase)
24-Hour Power Consumption	4788度	2,893 kWh
Power-saving rate	5.26 kWh (Changzhi), 4.839 kWh (Xianyang)	39.6%
Power Savings per Ton of Clinker	—	0.49 kWh/ton

Typical Case

Inverter power reduced to 42 kW; triturbo technology overcomes the energy consumption bottleneck of roller-press fans

Typical Case

Comprehensive power-saving rate of 35.41%; high-efficiency fan clusters achieve increased industrial output and reduced energy consumption



Grinding Station #4 Mill Roller Press V-Separator Circulating Fan Retrofit Project

The #4 cement mill roller press V-separator circulating fan originally had low efficiency (65.4%) and high energy consumption. Triturbo technology was used for the retrofit, replacing it with a customized triturbo fan. While keeping the same feed rate, fan efficiency was improved and operating energy consumption reduced.

Comparison Item	Original Fan Parameters	Retrofit Fan Parameters
Fan Model	M4-73-22F	GASFI-19.5a-SY-F-L45°
Motor power	630kW	630kW
Operating frequency	26Hz	22Hz
VFD Input Power	68kW	42kW
Fan efficiency	65.4%	86.5% (21.1% increase)
Feed Rate	182t/h	187t/h
Air Volume	113664m³/h	119596m³/h
Air Pressure	1325Pa	1015Pa
Power-saving rate	—	38.24%
Daily power savings	—	624kWh



Changshou Vertical Mill Fan Energy-Saving Technical Transformation Project

The customer's eight vertical mill fans (single unit power 200 kW, total installed power 1,600 kW, total load power 1,530 kW, load rate 96%) required an energy-saving retrofit. Since replacement, the fans have been operating well. Comparing the average hourly power consumption data before and after installation, with the same output, the overall average hourly power consumption saving rate reached 35.41%.

Fan No.	Original Fan Average Hourly Power Consumption Summary / kW·h	Triturbo Fan Retrofit Average Hourly Power Consumption Summary / kW·h	Power Savings/ kWh	Power-saving rate	Remarks
M01	189. 85	124.84	65.01	34.24%	M01 fan replaced on June 5 Average hourly power consumption over 82 shifts to date
M02	185.64	116.83	68.81	37.07%	M02 fan replaced on June 7 Average hourly power consumption over 80 shifts to date
M03	194. 75	124.44	70. 31	36. 10%	M03 fan replaced on June 8 Average hourly power consumption over 79 shifts to date
M04	188. 8	119.95	68. 85	36.47%	M04 fan replaced on June 9 Average hourly power consumption over 78 shifts to date
M05	199. 50	124.14	75. 36	37. 77%	M05 fan replaced on June 4 Average hourly power consumption over 83 shifts to date
M06-M13	193	136. 21	56. 79	29.42%	Transferred to M13, replaced on June 13 Average hourly power consumption over 74 shifts to date
M07	186. 77	120.67	66. 1	35. 39%	M07 fan replaced on June 15 Average hourly power consumption over 72 shifts to date
M08	191. 55	121. 11	70. 44	36. 77%	M08 fan replaced on June 10 Average hourly power consumption over 77 shifts to date
合计	1529. 86	988. 19	541.67	35.41%	—