

PM Synchronous Frequency Converter AIO & PM Electric Pulley Technology

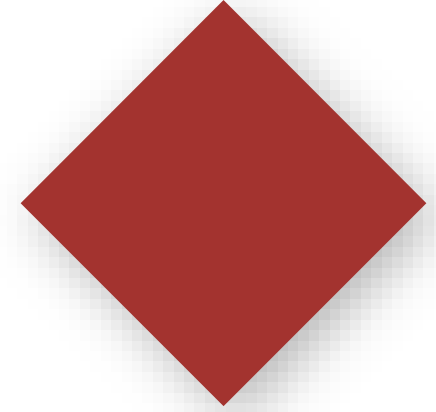


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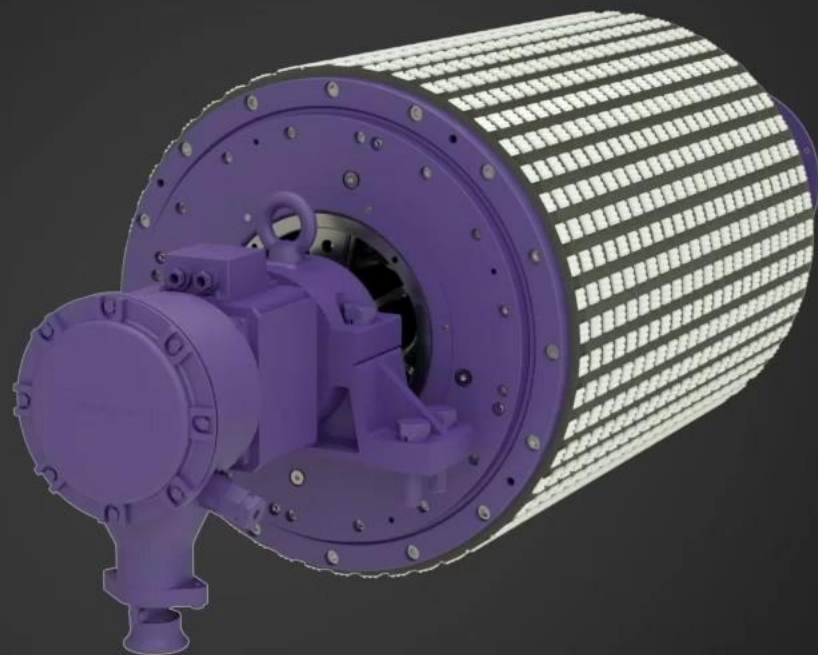
Company Profile

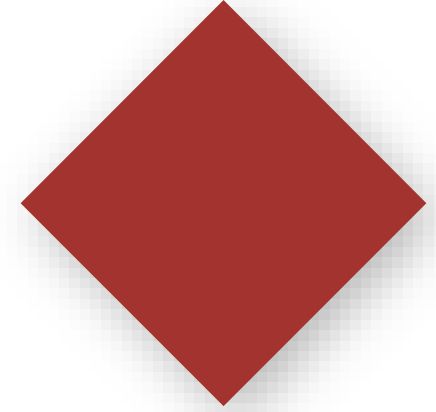
Braving the Challenges, Pioneering PM
Frequency Converter Technology

Company Profile



ZhiXin Electric (China) Co., Ltd. is mainly engaged in the research and development, design, production, sales and maintenance services of electrical transmission and control equipment in the field of industrial automation. The company's research and development center is based in Tianjin and the production is based in Dalian. The company's core products, permanent magnet synchronous variable frequency speed control integrated machine and permanent magnet electric pulley system, have achieved outstanding results in the field of high-end transmission equipment for mine, oil, metallurgy, ports, chemical industry, and engineering machinery.



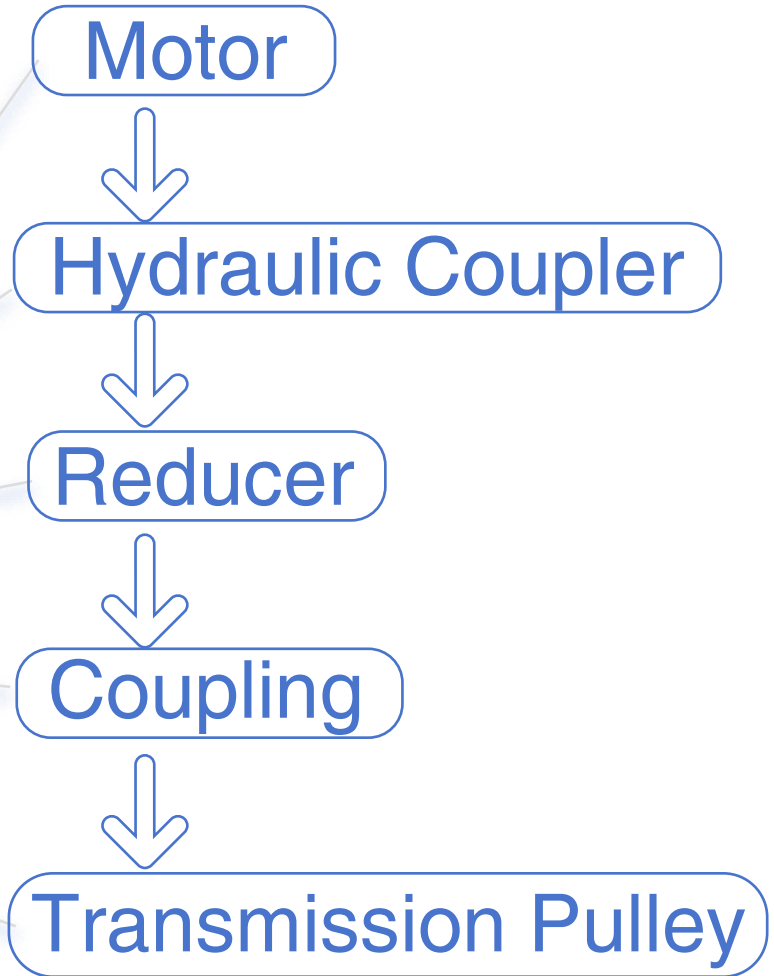
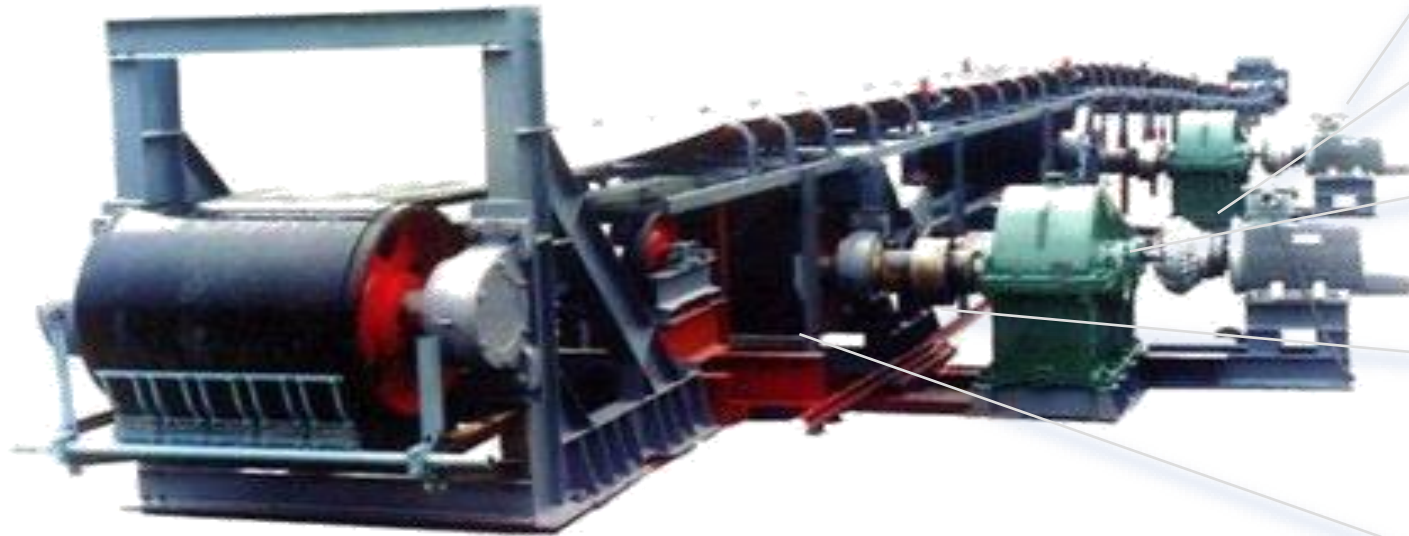


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Background Situation

Braving the Challenges, Pioneering PM
Frequency Converter Technology

Traditional Belt Conveyors



Overall Efficiency of the
Transmission System

70%

Shortcomings of Traditional Transmission System

Oil leakage,
high maintenance
requirements

Oil leakage, loud noise,
gear wear, high
maintenance
requirements, not
suitable for low-speed
operation



Small braking
torque,
numerous links,
poor reliability

Loud noise
Low efficiency

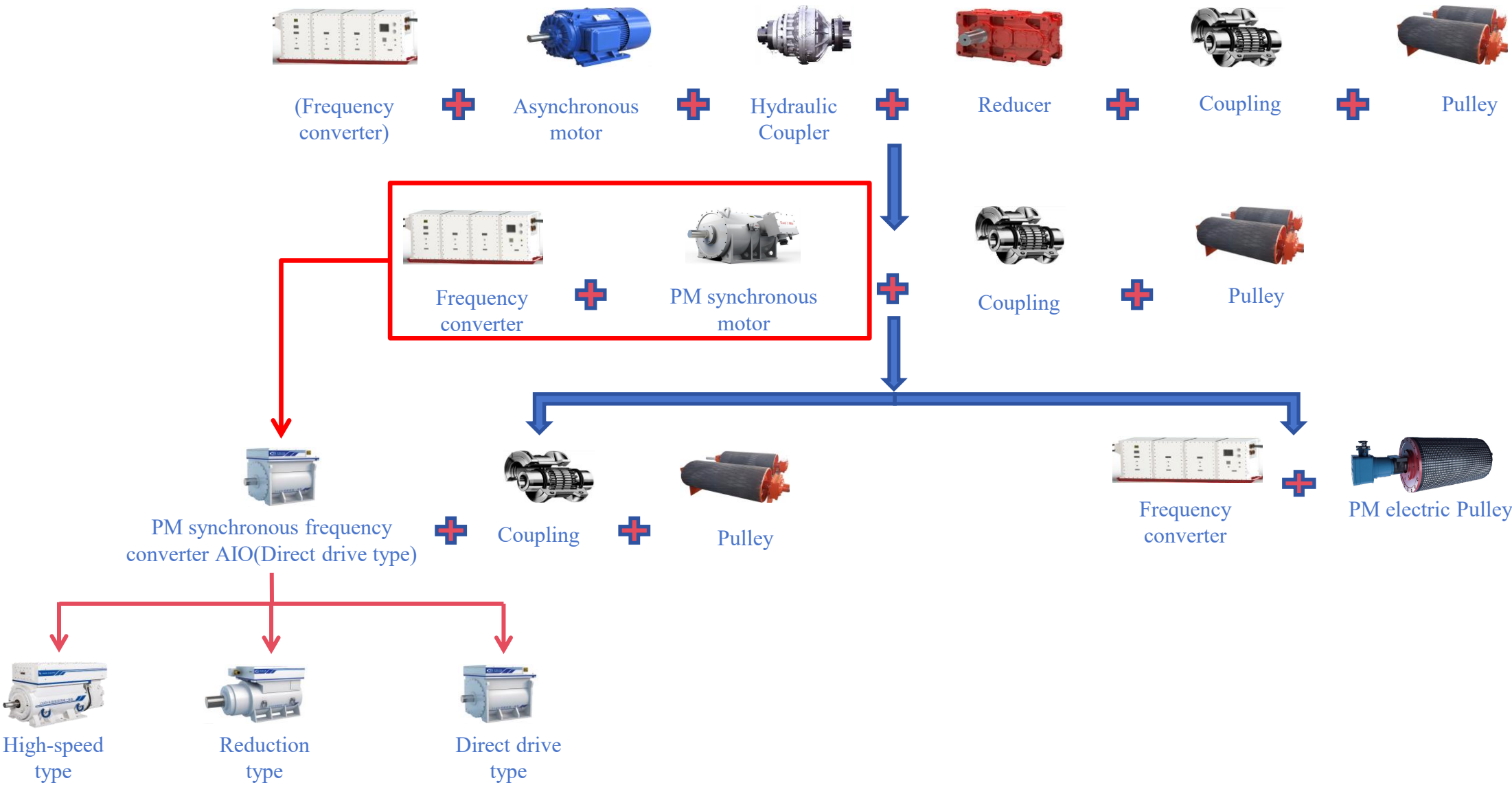
Poor reliability

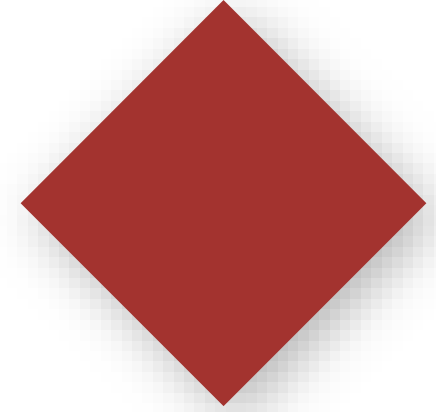
Heavy maintenance

High operating costs

Background Situation

Development History of Belt Conveyor Transmission System





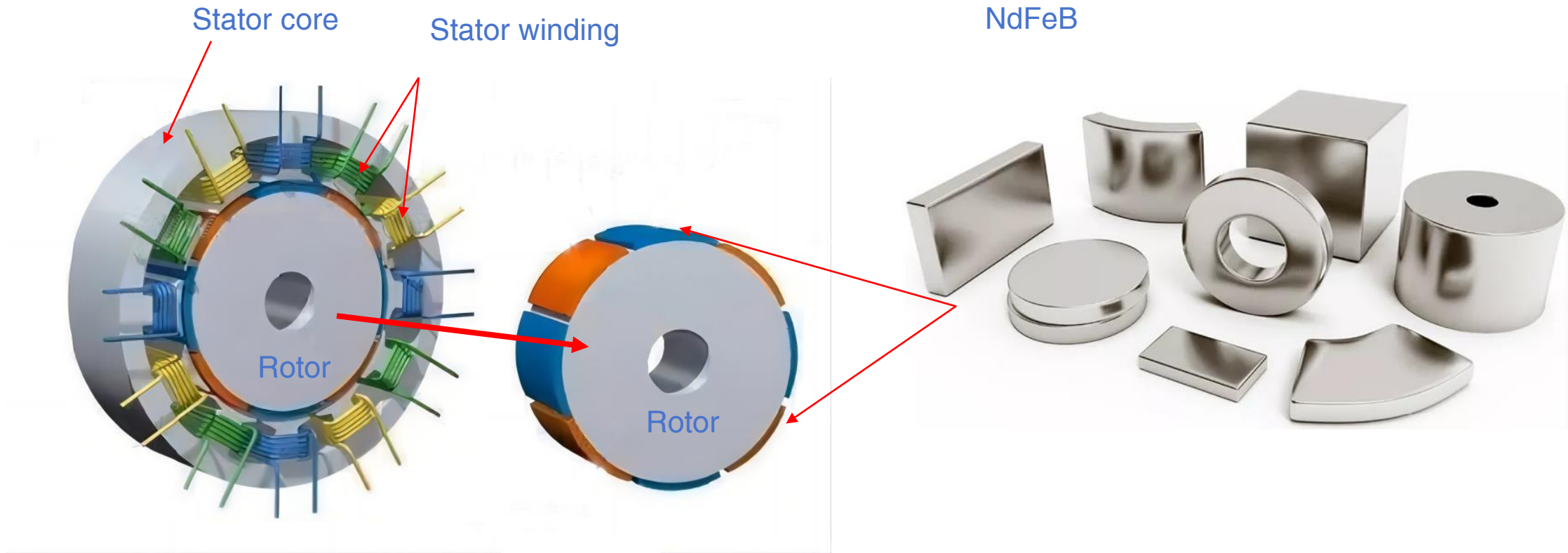
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Characteristics of PM Motor Technology

**Braving the Challenges, Pioneering PM
Frequency Converter Technology**

PM Technology Principles

NdFeB is a superior PM material with exceptional performance. When stored under suitable conditions of temperature, humidity, and free from strong external magnetic fields, radiation, and other factors affecting magnetic performance, the magnetic properties of NdFeB permanent magnets can be maintained almost indefinitely.

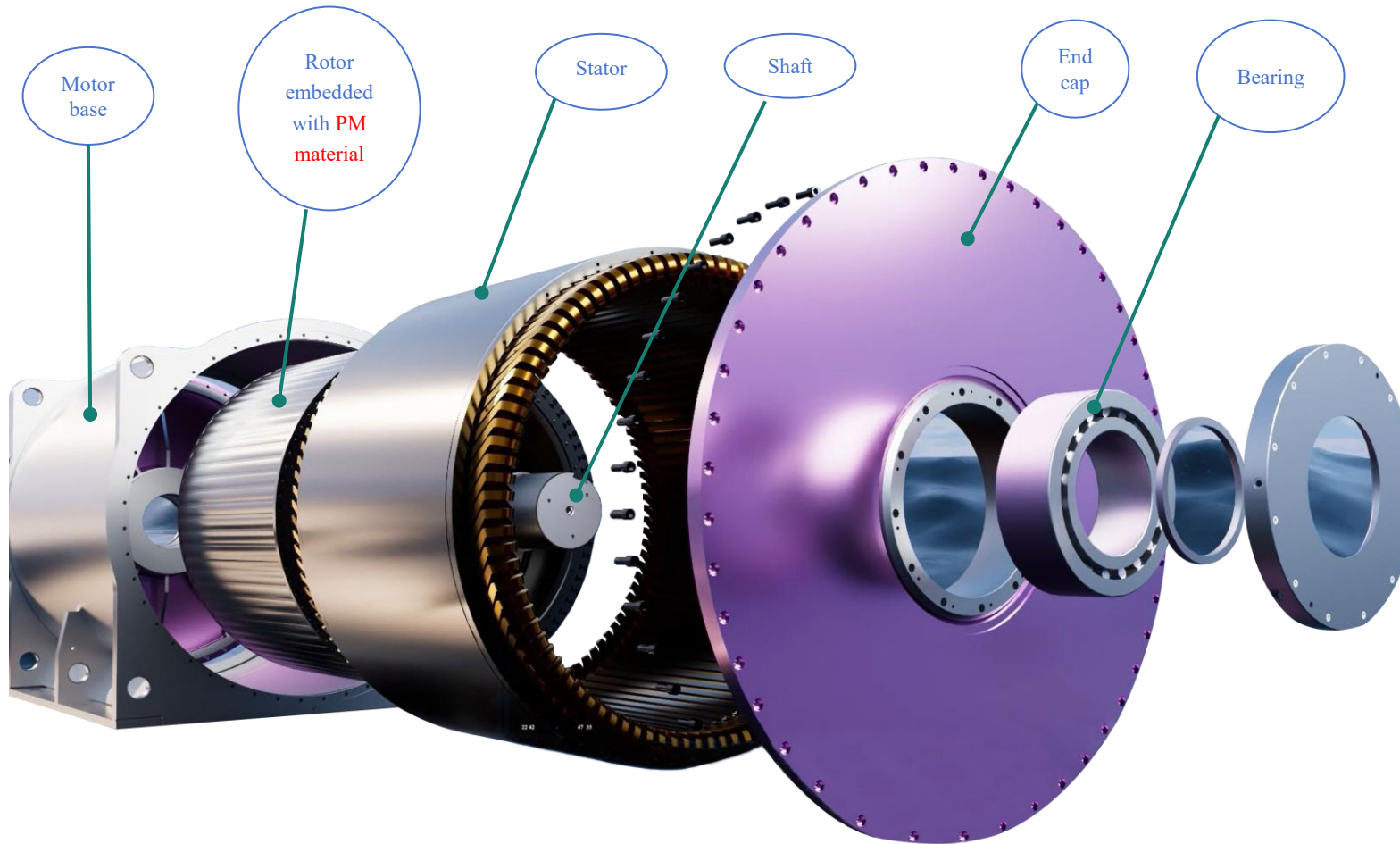


PM Synchronous Motor

Rotor embedded with rare earth PM material

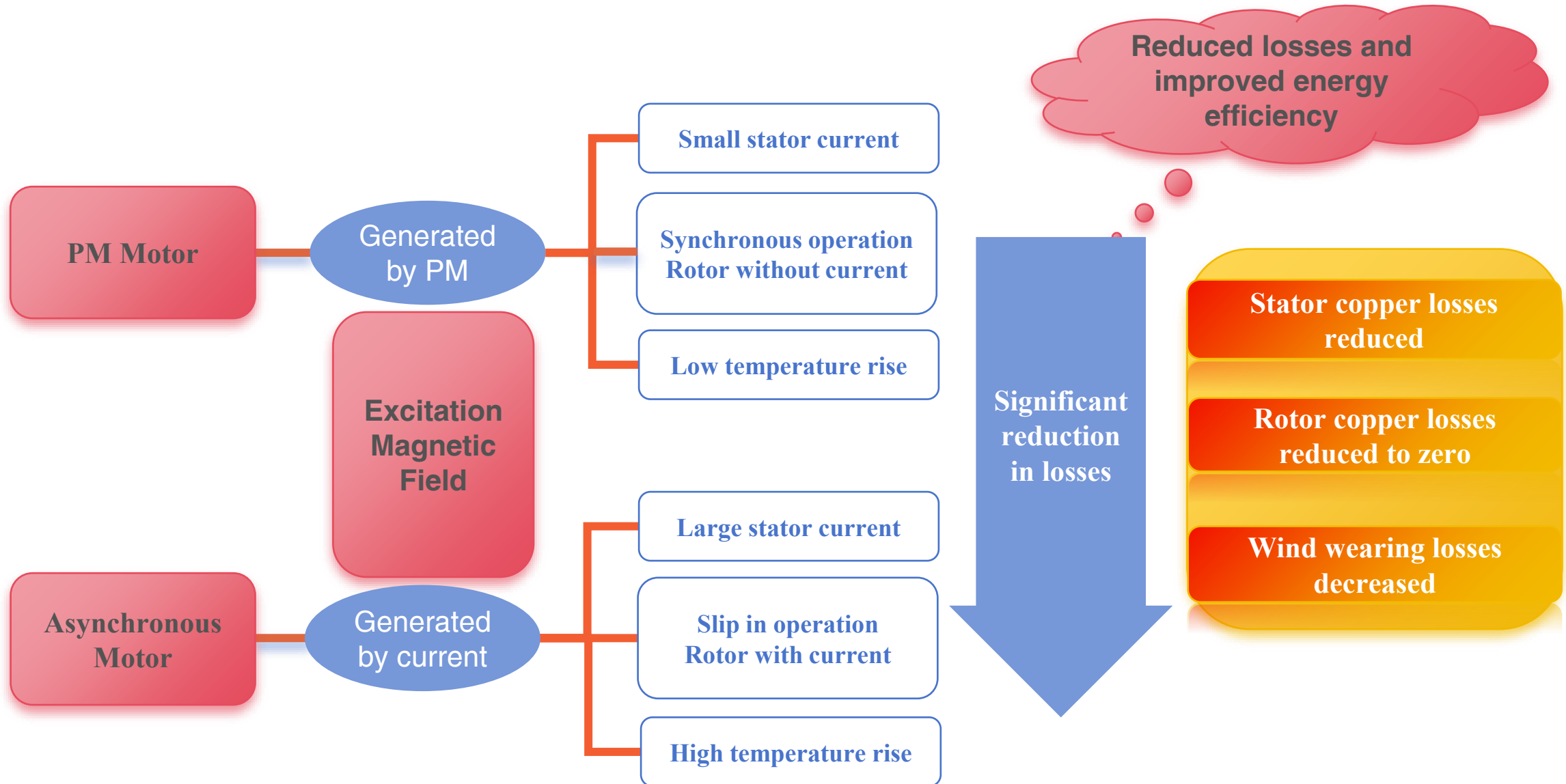
Synchronous operation of motors without slip

No excitation current or excitation windings



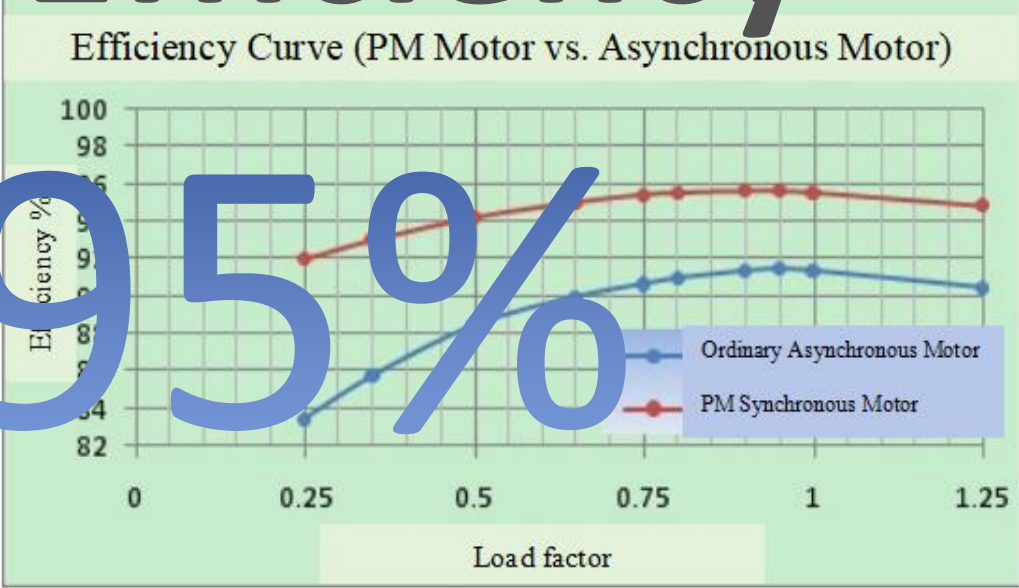
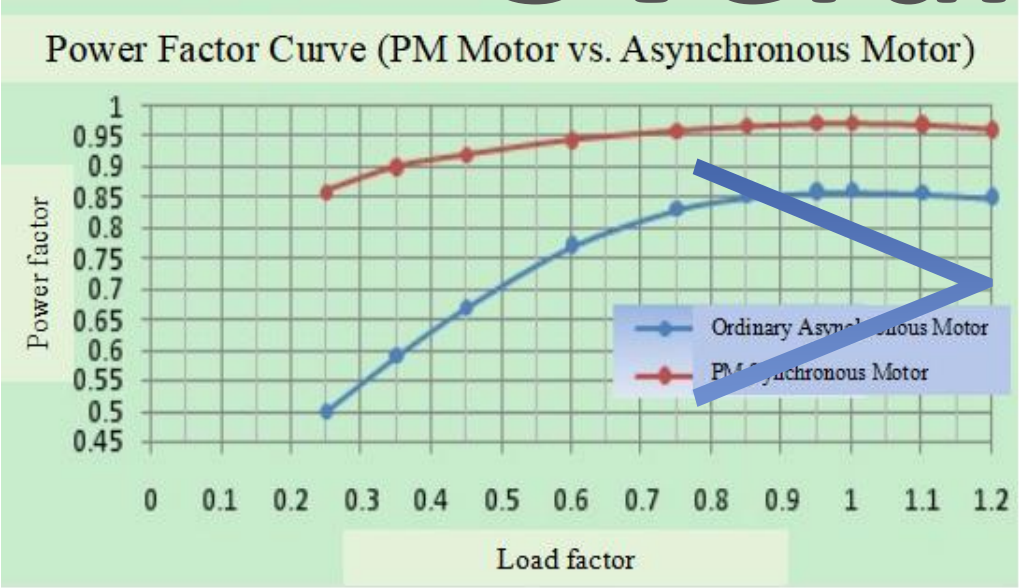
PM synchronous motors consist of components such as the stator, rotor, and end cap. The stator is similar to one in a conventional asynchronous motor (induction motor), constructed from laminated sheets to reduce core losses during motor operation. The rotor is equipped with PM material (**NdFeB**) as the excitation source, simplifying the motor structure, reducing processing and assembly costs, eliminating the prone-to-failure collector rings and brushes, and enhancing the overall reliability of motor operation. Moreover, as no excitation current is required, there is no excitation loss, thereby improving the motor's efficiency and power density.

Energy-Saving Principles of PM Synchronous Motors

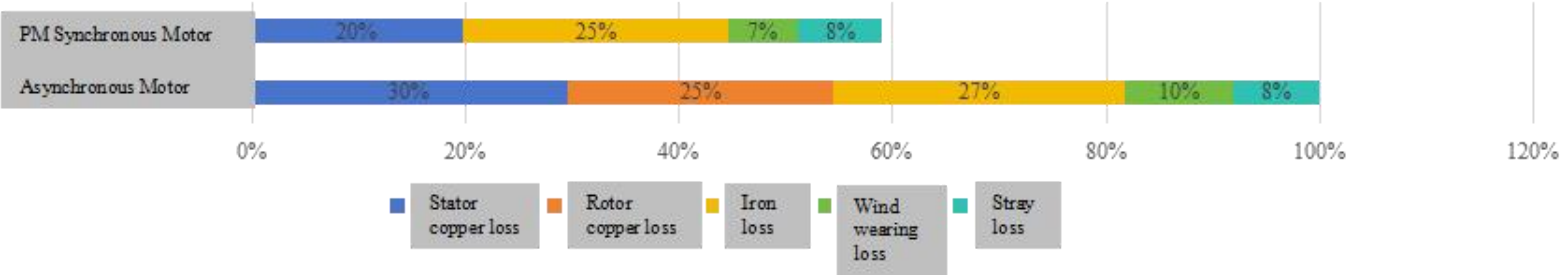


Comparison between PM Synchronous Motor and Asynchronous Motor

Overall Efficiency



Comparison in Losses



Carbon Neutrality

Energy Saving

The current problems of South Africa :

- There is a shortage of electricity in South Africa.

15%-30%

to rise in South

issued the National
a 20% reduction in

industrial energy consumption by 2030, and offering
procurement subsidies of up to 30% for energy-saving
equipment.

Advantages of PM Synchronous Motors:

Rated efficiency
improved by 1%-8%

Power factor
exceeding 0.96

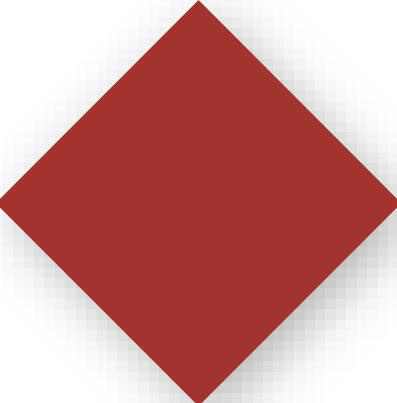
Operating current
reduced by over
10%

Temperature rise
reduced by over
20K

Energy savings in
low-voltage motor
systems: 5%-30%

Energy savings in
high-voltage motor
systems: 4%-15%



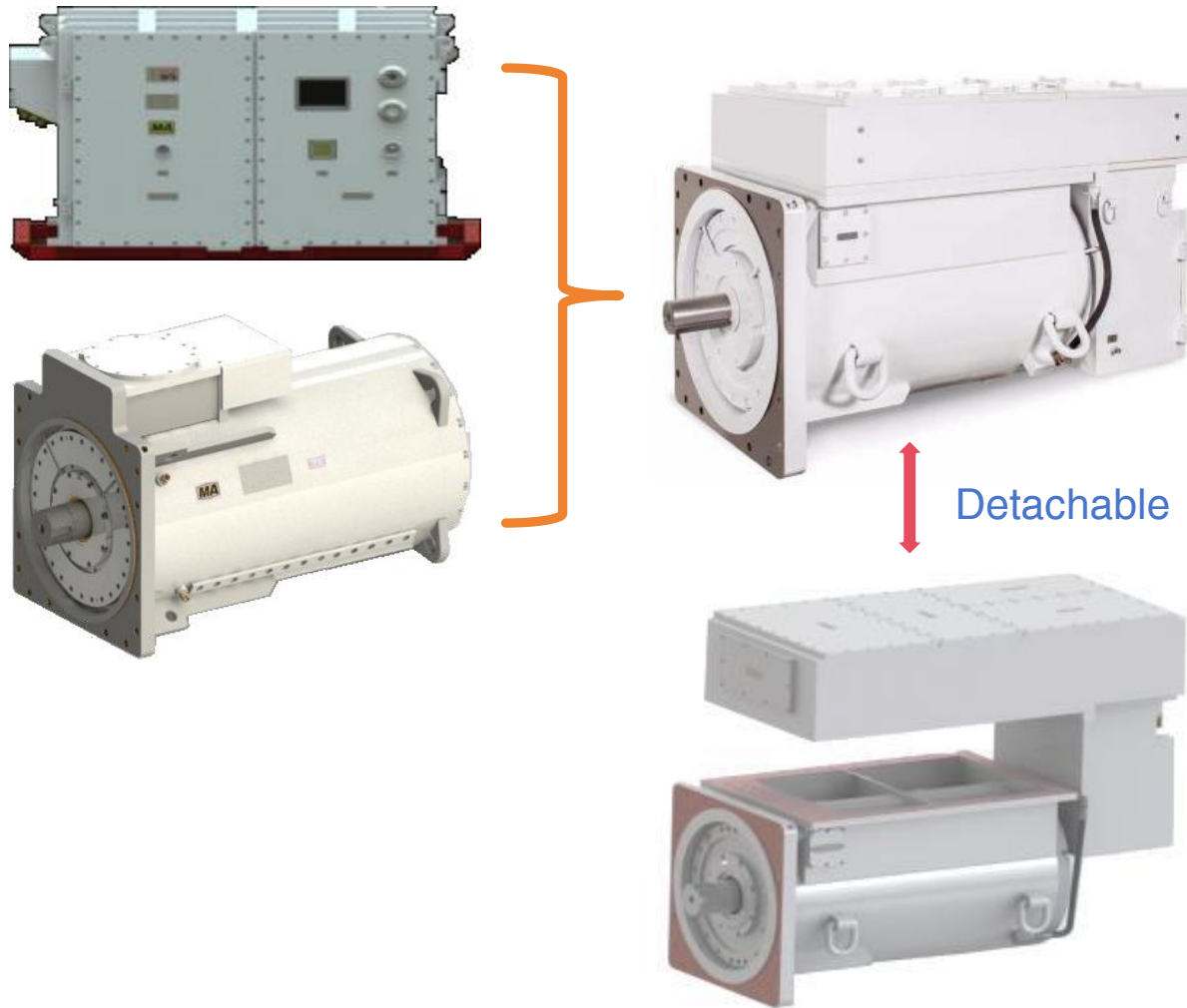


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**Characteristics and Applications
of PM Synchronous Frequency
Converter AIO**

**Braving the Challenges, Pioneering PM
Frequency Converter Technology**

Integrated structure of frequency converter and PM synchronous motor



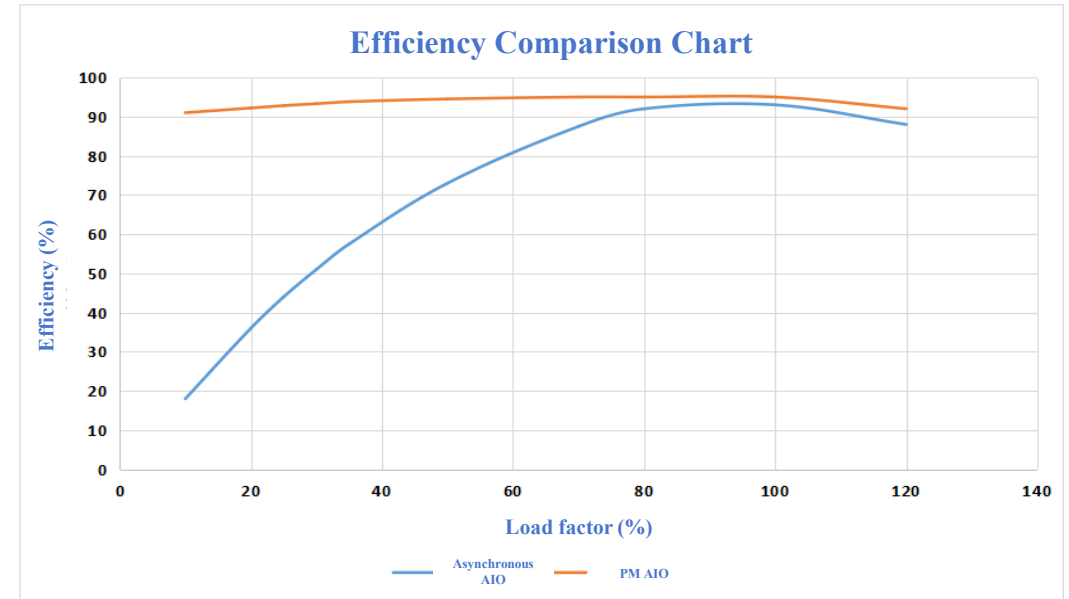
Structural Advantages:

- ◆ Compact structure, simple application. Small overall size, doesn't occupy much equipment space
- ◆ Optimal adaptation between frequency converter and motor, enhancing reliability
- ◆ Frequency converter and motor from the same supplier, simplifying later maintenance, avoiding responsibility issues
- ◆ Utilizes a detachable structure for the frequency converter and motor, facilitating easy assembly and reducing maintenance costs

Technical Advantages

High operational efficiency

The rated operating efficiency of PM frequency converter AIO is $\geq 94\%$. Efficiency at half load and light load is significantly better than similar asynchronous products. Under 60%-70% load conditions, **the efficiency is more than 10% higher than that of asynchronous AIO.**



Low production cost

Take a 1000kW variable frequency speed control AIO as an example. If it operates 16 hours per day and 360 days per year, with an average electricity cost of R3 per KWh, the calculated electricity cost savings would be as follows:

$$1000 \times 20\% \times 54\% \times 16 \times 360 \times 3 = \mathbf{R\ 1,886,240}$$

Load factor (%)	Efficiency of asynchronous AIO (η_1)	Efficiency of synchronous AIO (η_2)	Relative efficiency improvement ($\Delta\eta$)	Electricity cost savings
20%	38	92	54	1,886,240
35%	58	94	36	2,177,280
50%	70	95	25	2,160,000
70%	88	95	7	846,720
80%	93	95	2	276,480
100%	94	95	1	172,800

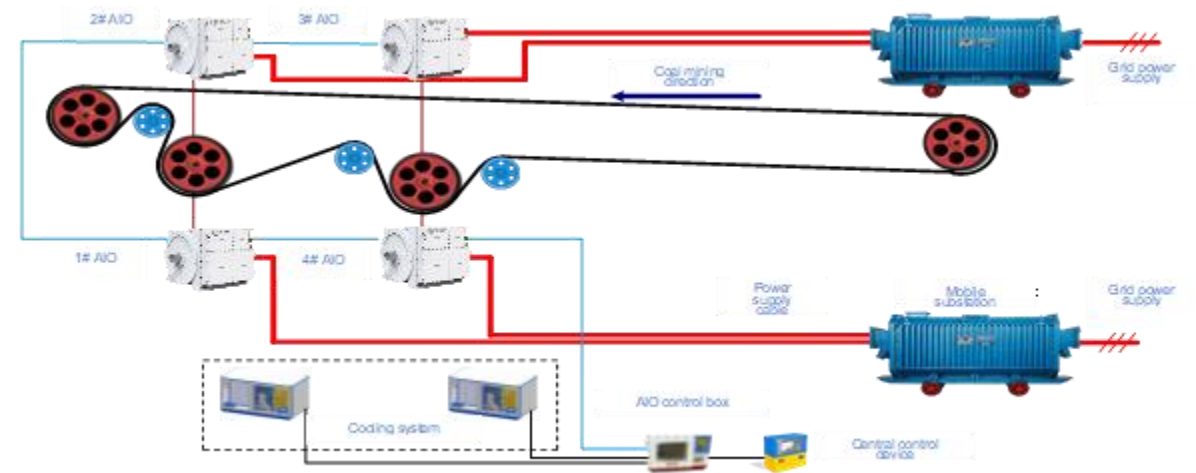
Direct drive type PM Synchronous Frequency Converter AIO Solution for Belt Conveyor

Application Scenario

The belt conveyor is driven by four sets of TYJVFT-900M1-32(1000/3300) high-voltage PM direct-drive frequency converter AIOs. These are designated for the main machine (1#) and the auxiliary machines (2#, 3#, 4#). High-speed bus communication is employed between the main machine and auxiliary machines, allowing for automatic adjustment of their outputs to achieve dynamic power balance. Control is realized through an upper computer and coal recognition device, enabling load-adaptive variable frequency speed control.

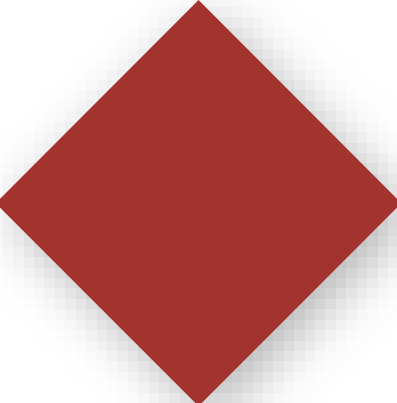
Application Effects

- ◆ The use of four sets of transmission units, following a “3 in use, 1 backup” configuration, possesses the potential to enhance the efficiency of the conveyor, with a maximum allowable capacity increase exceeding 25%.
- ◆ Direct-drive PM frequency converter AIO eliminates the need for a reducer, enhancing transmission efficiency and reducing maintenance tasks such as reducer oil changes. This shift helps make underground conditions more oil-free and requires fewer personnel.
- ◆ Characterized by low operating current and minimal temperature rise, the solution demonstrates significant energy-saving effects, with an average energy-saving rate exceeding 28%, aligning with the trend of energy-saving and consumption reduction.



Direct Drive PM Synchronous Frequency Converter AIO On Site



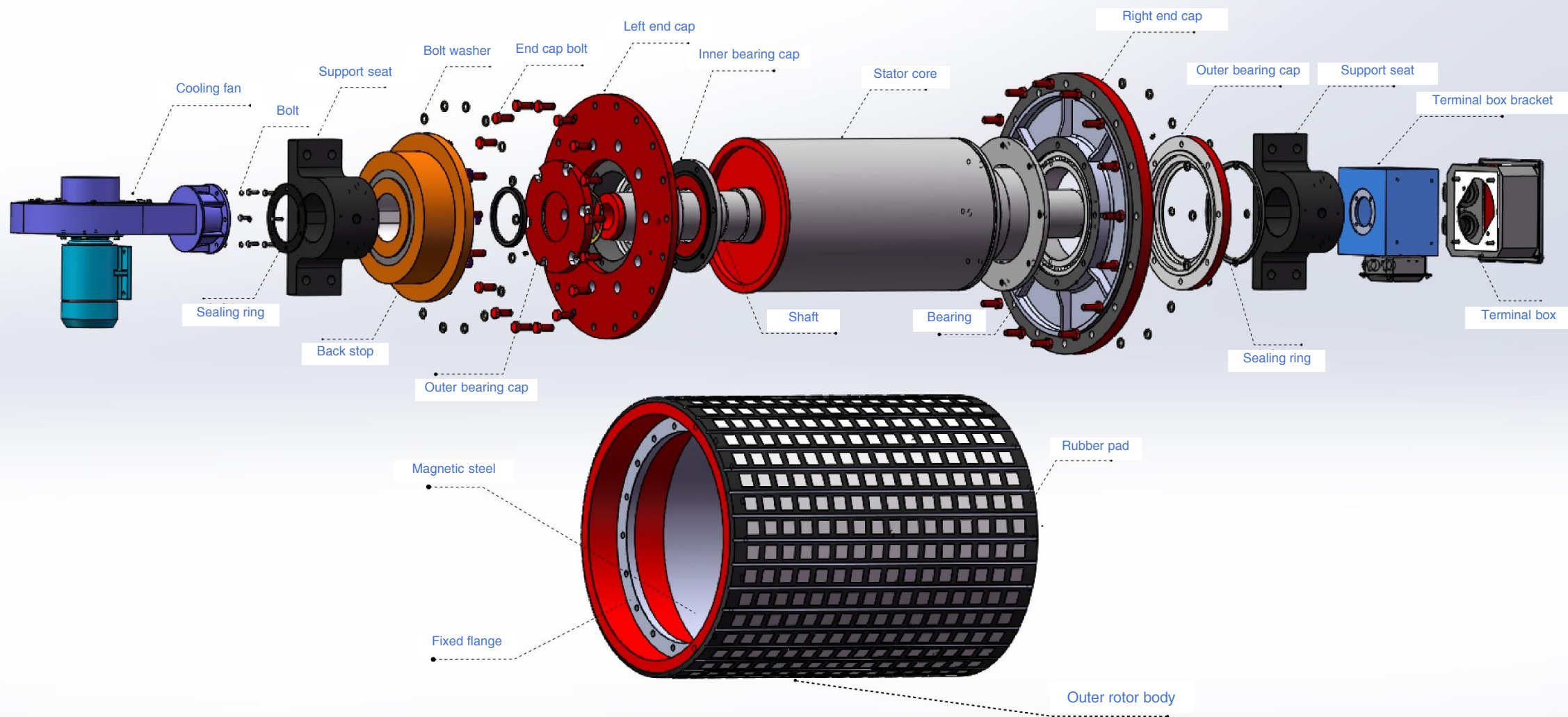


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Characteristics and Applications of PM Electric Pulley Technology

**Braving the Challenges, Pioneering PM
Frequency Converter Technology**

Structure of PM Electric Pulley



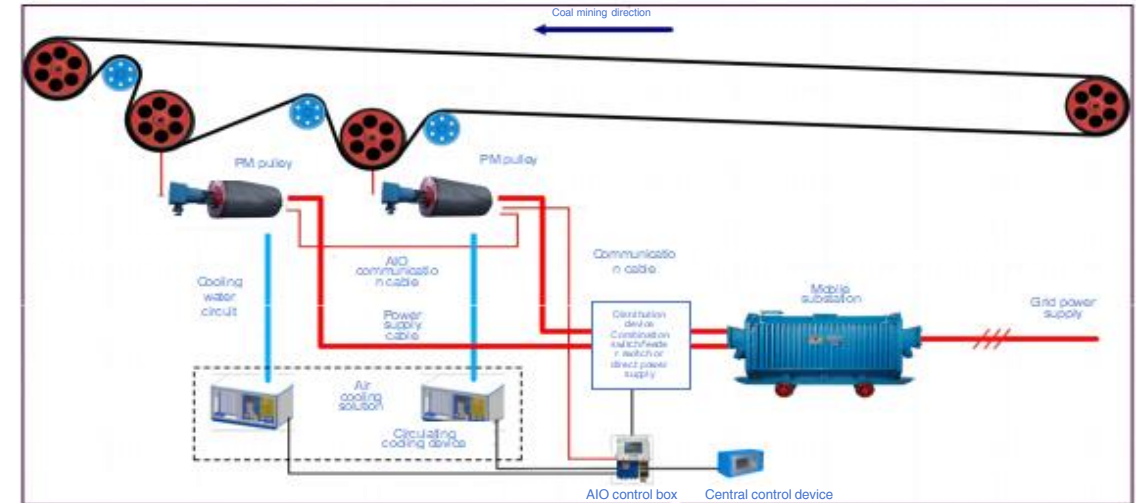
PM Electric Pulley Solution for Belt Conveyor

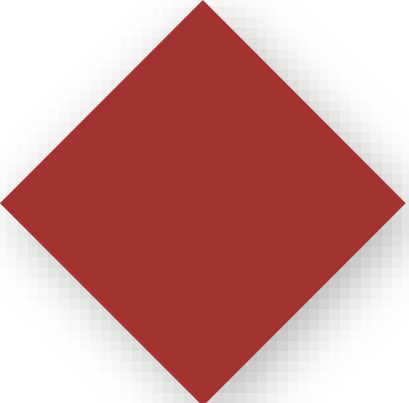
Application Scenario

The belt conveyor has a total length of 1,500 m, a belt width of 1,000 mm, and a speed of ≥ 3.5 m/s. The head is equipped with two 250kW/1100V PM electric pulleys for direct drive, eliminating the need for a motor and reducer. Multiple devices are controlled in a master-slave configuration through an intelligent AIO operation box.

Application Effects

- ◆ The integration of the frequency converter and PM pulley into a unified design results in a simple structure, stable and reliable operation, and basically maintenance-free operation.
- ◆ The reduction of transmission joints in the belt conveyor leads to significant savings in equipment maintenance costs.
- ◆ Compared to the traditional motor and reducer drive mode, it achieves energy savings of over 20%.
- ◆ The compact structure requires minimal space, saving tunnel space.
- ◆ When used in long-distance excavation tunnels, it can reduce the number of belt conveyors, lower labor costs, and demonstrate significant economic benefits.
- ◆ It supports smart mine communication interfaces, meeting future upgrade requirements.





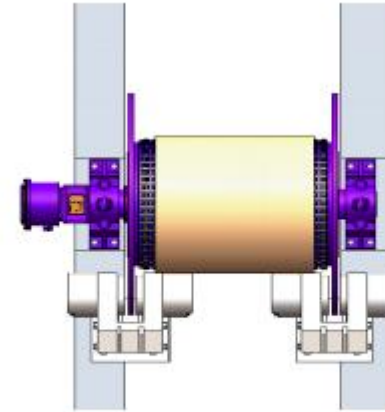
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Product Introduction

Braving the Challenges, Pioneering PM
Frequency Converter Technology



Traditional transmission mode



Permanent magnet pulley drive mode

Disadvantage

- ◆ Many mechanical transmission links.
- ◆ Low system efficiency.
- ◆ Low operational reliability.
- ◆ Occupy large space, loud noise, oil leakage pollution.
- ◆ Large amount of daily maintenance.
- ◆ High operating costs.

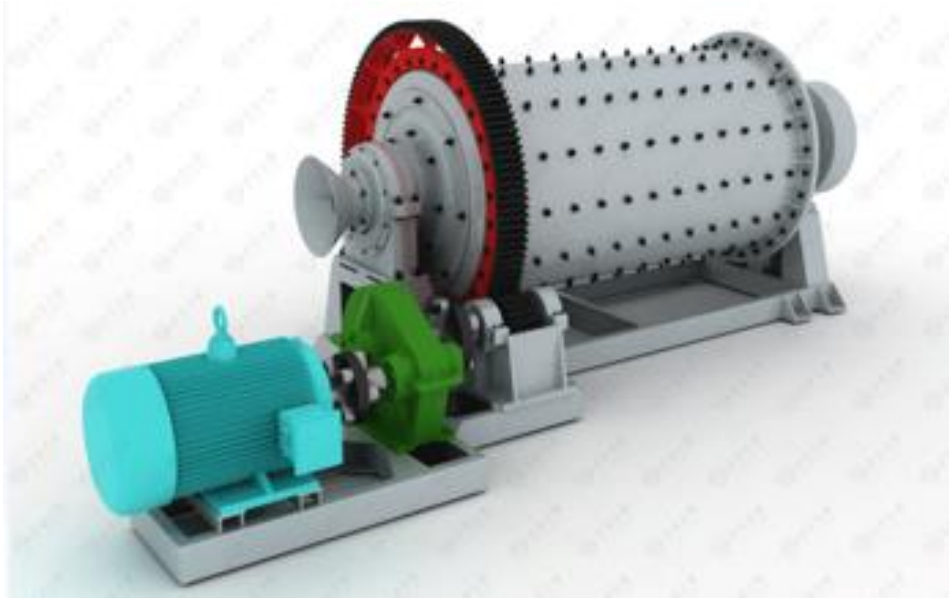
Advantage

- ◆ Efficiency $\geq 95\%$.
- ◆ Energy saving 15%-30%.
- ◆ Maintenance free.
- ◆ Powerful, starting torque 2.5 times, overload capacity 2.2 times.
- ◆ The system is simple and reliable, realizing toothless drive.
- ◆ Low noise
- ◆ Requiring minimal space

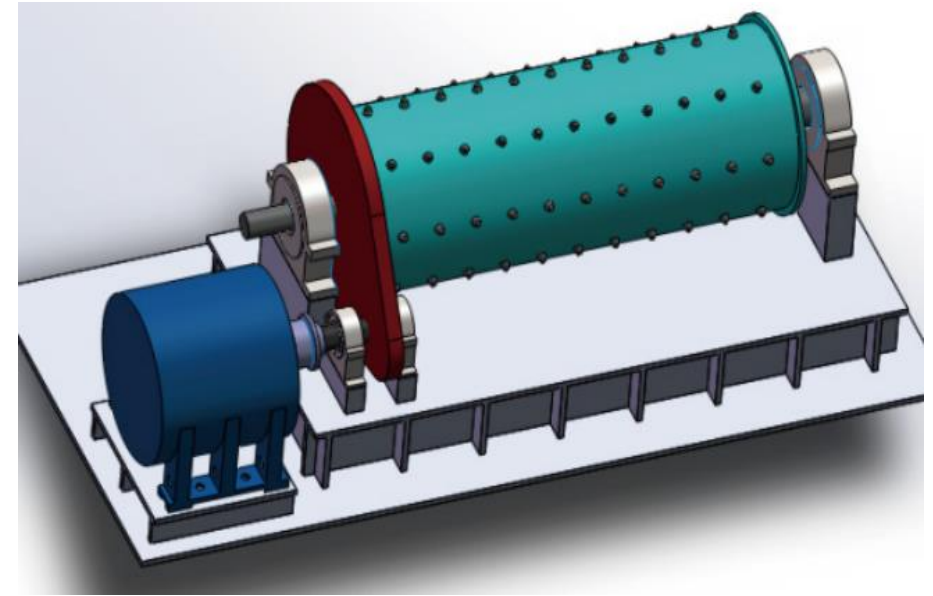
Direct Drive PM Pulley On Site



Traditional driving method



Permanent magnet direct drive method



Disadvantage

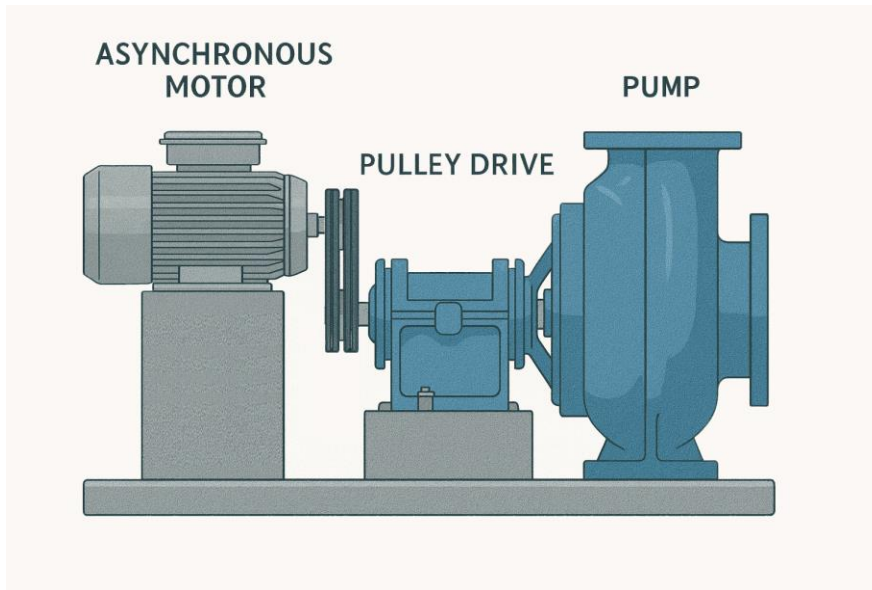
- ◆ Many mechanical transmission links.
- ◆ Low system efficiency.
- ◆ Low operational reliability.
- ◆ Occupy large space, loud noise, oil leakage pollution.
- ◆ Large amount of daily maintenance.
- ◆ High operating costs.

Advantage

- ◆ Efficiency $\geq 94\%$.
- ◆ Energy saving 20%-30%.
- ◆ Maintenance free.
- ◆ Powerful, starting torque 2.5 times, overload capacity 2.2 times.
- ◆ Low noise and requiring minimal space.
- ◆ High operational reliability.
- ◆ High control accuracy, with adjustable speed.

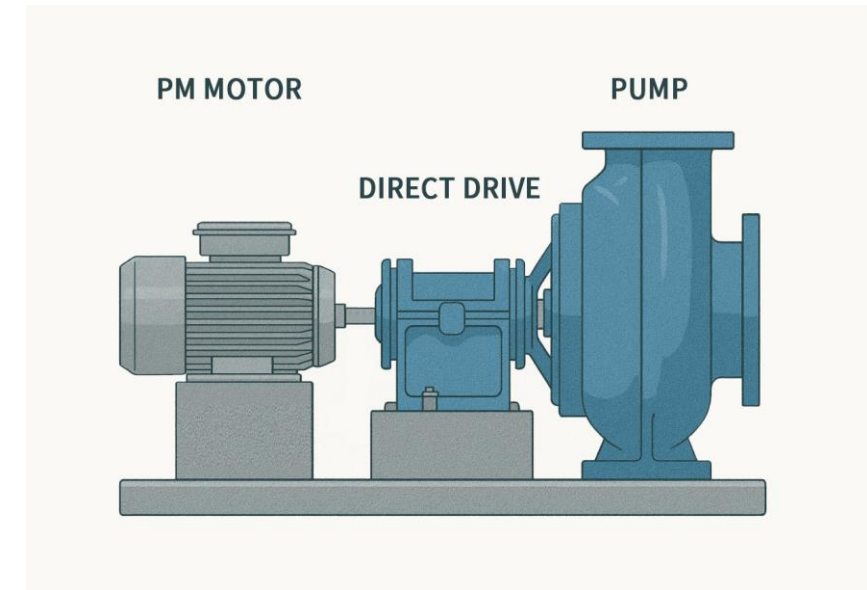
Direct Drive PM Motor On Site Ball Mill





Disadvantage

- ◆ The belts and pulley needs to be replaced frequently.
- ◆ Low system efficiency.
- ◆ Low operational reliability.
- ◆ Occupy large space, loud noise,
- ◆ Large maintenance.
- ◆ High operating costs.



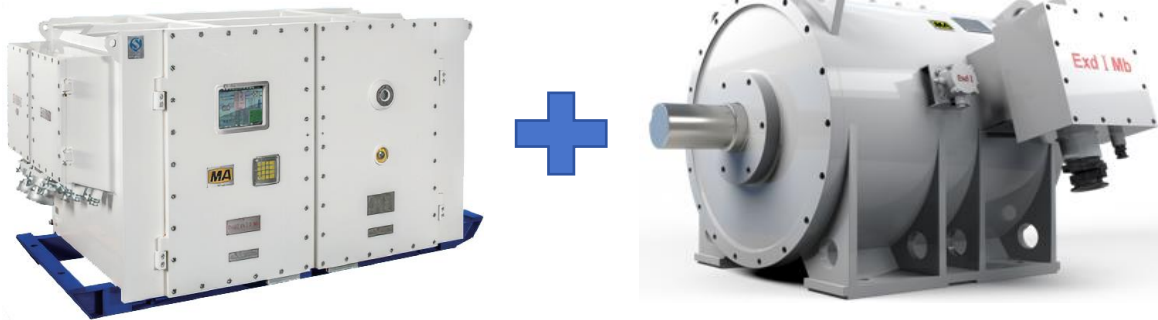
Advantage

- ◆ Efficiency $\geq 95\%$.
- ◆ Energy saving 10%-15%.
- ◆ High transmission efficiency effectively reduces impeller wear
- ◆ Maintenance free.
- ◆ Powerful, starting torque 2.5 times, overload capacity 2.2 times.
- ◆ Low noise and requiring minimal space.
- ◆ High operational reliability.
- ◆ High control accuracy, with adjustable speed.

Permanent Magnet Synchronous Motor (Direct-drive Type)



PM Synchronous VSD AIO



VSD + PM Synchronous Motor

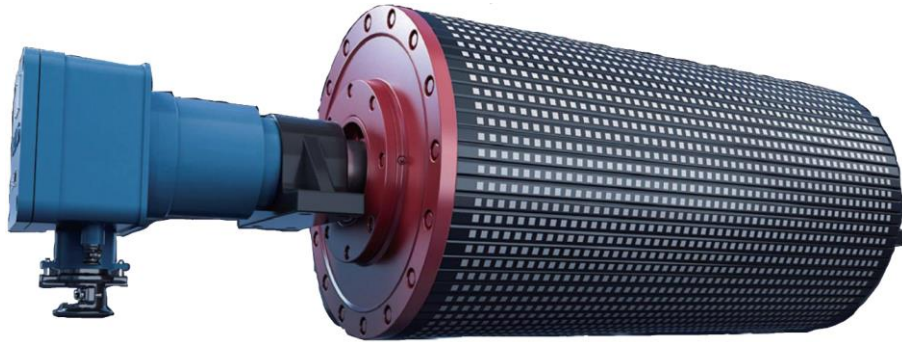
Products specifications

- ◆ Voltage range: 380V~11000V
- ◆ Power range: 55kW~3500kW

Products Features

- ◆ Starting by VSD, precise control.
- ◆ Efficiency $\geq 93\%$.
- ◆ Energy saving 10%-30%.
- ◆ Increased stability by 60%.
- ◆ Maintenance free.
- ◆ Powerful, starting torque 2.5 times, overload capacity 2.2 times.
- ◆ Operating current reduced by over 10%.
- ◆ This series of products are widely used in Belt conveyor, Ball mill, Bucket elevator, Grinding mill, Powder selector, Roller press, Agitator motor.

Explosion-Proof and Intrinsically Safe Type PM Electric Pulley



To be used in
conjunction with



Product specifications

- Voltage: 380V, 525V, 1100V
- Power range: 55kW-710kW
- Pulley diameter: 500-1600mm
- Belt speed: 1.6-5.0m/s
- Belt width: 650-2000mm

Main Technical Features

- ◆ The PM pulley adopts an outer rotor drive mode with no internal mechanical gears, directly driving the belt, eliminating the reduction system, reducing the failure rate, and improving system reliability.
- ◆ Cooling method: Water-cooled/Air-cooled

Mine Explosion-Proof and Intrinsically Safe Type Frequency Converter

Product specifications

- 525V/1100V: 45-1250kW
- 3300V: 525-3600kW

Main Technical Features

- ◆ Adaptive power balance without manual intervention.
- ◆ Equipped with automatic dehumidification function, eliminating the need for regular desiccant replacement.
- ◆ Integrated with a mobile app for automatic wireless equipment data retrieval, providing expert-level decision guidance for predictive maintenance.
- ◆ Easy maintenance with a modular design.
- ◆ High control accuracy and large startup torque. Suitable for applications such as scraper conveyors, belt conveyors, emulsion pump stations, winches, etc., where heavy-duty startup is required.
- ◆ Designed to meet the application requirements of long-distance drive, with a driving distance of up to 4000 m.



Non Explosion-Proof Frequency Converter

Product specifications

- ◆ 220V~1100V: 1.5-2000kW
- ◆ 2.2kV~11kV: 280-10000kW

Main Technical Features

- ◆ Open loop/closed-loop vector control, V/F control.
- ◆ Complete protection functions, including output phase loss protection, overcurrent / overvoltage / overload / overheating protection, etc.
- ◆ Integrated with a mobile app for automatic wireless equipment data retrieval, providing expert-level decision guidance for predictive maintenance.
- ◆ Easy maintenance with a modular design.
- ◆ High control accuracy and large startup torque. Suitable for applications such as scraper conveyors, belt conveyors, emulsion pump stations, winches, etc., where heavy-duty startup is required.



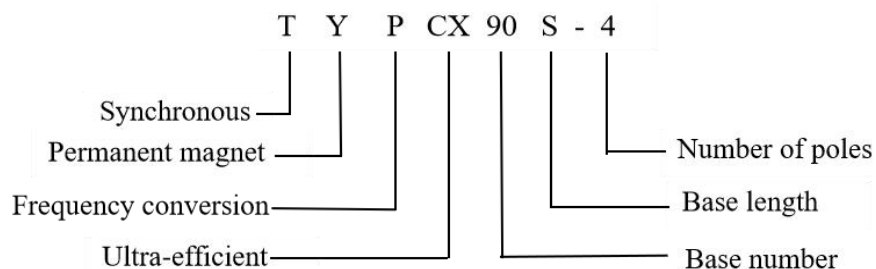
Low voltage series



High voltage series

Ultra-efficient three-phase permanent magnet synchronous motor

Product Model Example



Explanation: 1. Base Length: S-short base; M-middle base; L-long base.
2. Models with P must be started by VSD; And the models without P, it can Self starting or by VSD.



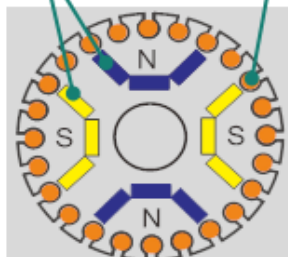
Low voltage motor



High voltage motor

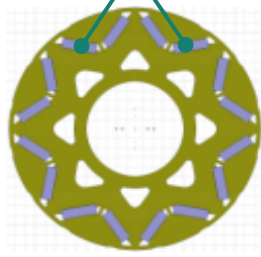
Permanent magnet

Squirrel-cage bar



Cage permanent magnet motor
rotor structure punching plate

Permanent magnet



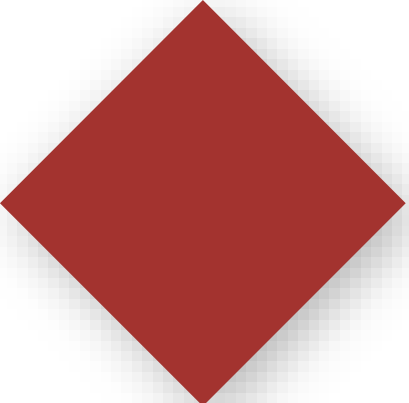
No cage permanent magnet motor
rotor structure punching plate

Products specifications

- ◆ Voltage range: 380V~11000V
- ◆ Power range: 1.5kW~5000kW
- ◆ Speed range: 20~3000r/min

Products Features

- ◆ Self starting or by VSD.
- ◆ **Energy Efficiency Level: IE5.**
- ◆ The power level and installation size fully comply with the International Electrotechnical Commission (IEC) standards, and the original motor can be directly replaced.
- ◆ High power factor, good starting torque performance, high efficiency, and energy saving.
- ◆ There are explosion-proof and non explosion-proof products available.
- ◆ This series of products are widely used in petrochemical, electric power, mining, textile and other industrial and mining enterprises, used in dragging fans, pumps, compressors, belt machines and other machinery.



7

Customer Service & Training

Braving the Challenges, Pioneering PM
Frequency Converter Technology

Customer Service



30

Answer in 30
minutes !

6

Solution
within 6 hours
!

24

Standby
within 24
hours !

Service outlets and spare parts



- We currently have a service outlets with spare parts warehouse and staffs in Johannesburg.
- It can cover the needs of customers within 500 kilometers range.
- As the volume of business grows, we will expand the number of service outlets to 5
- After diagnosing the problem, if it can be replaced, replace it. If it cannot be replaced, use the standby machine.



Customer Training



1. Each of our service outlets has a resident engineer responsible for customer training.

2. Collect more customer feedback every month and conduct monthly centralized training.

3. We can arrange to go to the factory in China for on-site learning when necessary.



ZHIXIN ELECTRIC

We looking for distributors and partners to join us



THANK YOU

Driving innovation, leading development, and working together to create the future

Focusing on green efficiency, energy-saving intelligence, and customer needs, with PM direct drive technology at the core, we are transitioning from traditional manufacturing to a manufacturing service-oriented approach. Our aim is to establish ourselves as the invisible champion covering the entire product lifecycle in specific fields.