

BLUESTAR

Ecofriendly Chlor Alkali Electrolysis Technology and Comprehensive Service by Bluestar

May 2017, Berlin

Company Introduction –
Bluestar (Beijing) Chemical Machinery Co., Ltd. **BLUESTAR**

- China National Chemical Corporation: ranked 234 in Fortune Global 500

CHEMCHINA

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- China National Bluestar (Group) Co, Ltd

BLUESTAR

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- Bluestar (Beijing) Chemical Machinery Co., Ltd. (Abbr. BCMC) was founded in 1966, and located in Beijing.

BLUESTAR
BLUESTAR is a electrolyzer manufacturer

- Business Distribution

Worldwide Presence **BLUESTAR**

Our electrolyzer share of worldwide chlor-alkali production capacity is 20%.
Total capacity of Bluestar electrolyzer for global market is 16.342 million tons.

 2011: BCMC became a member of Euro Chlor Association
 2012: BCMC became a member of RusChlor
 2014: BCMC became a member of North America Chlor Association

Projects in Global Market **BLUESTAR**



Products in Czech Republic



Discussion On Site





Why Should We Choose Bluestar? **BLUESTAR**



Key Points! **BLUESTAR**

- **Safe, reliable and economic electrolysis products- NBZ-2.7 II zero gap electrolyzer**
- **Core technologies for Chlor-alkali electrolysis and broad experience**
- **Integrated solutions for complete Chlor-alkali plant including engineering design**
- **Comprehensive service including upgrading service and intelligent & real-time control of your plant**

Bluestar Zero Gap Electrolyzers

Natural Circulation Bipolar Zero Gap Electrolyzers (NBZ-2.7 II)

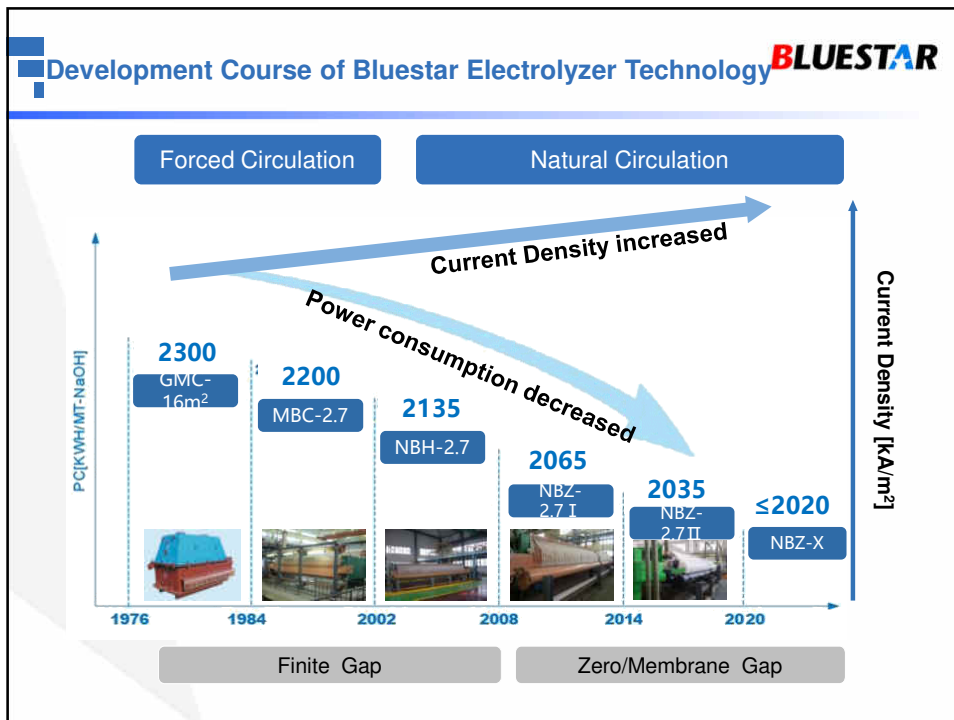
Membrane Electrolyzers' Track Record/Achievements

Annual caustic product (as 100%NaOH) with Bluestar electrolyzers amounted to:

Total capacity: 16.342 million tons ,

Zero gap: 8.5551 million tons

Covering 149 clients all over 27 provinces across China and 13 countries overseas.



Customized Electrolyzer Product

Customized electrolysis cell area, which is relied on newly designed structure of electrolysis compartment, can meet various needs of clients.

1.3m²

2.7m²

3.5m²

Chlor-alkali supporting skid-mounted module:
Automatic control system module;
Brine module:
Sodium hypophosphite absorption & elimination module;
Chlorine hydrogen control module;
Hydrochloric acid synthesis module;
Dilute brine dechlorination module;
.....
Industrial related skid-mounted module:
MET
MVR

}

3.5 m²

·Newly launched project · Single set large capacity

1.3 m²

Supporting design for skid-mounted small scale equipment

·Supporting supply for other module

2.7 m²

·One-to-one replacement

·Whole set upgrading

Core Technologies

Self-developed **NBZ-2.7 high current density natural circulation bipolar zero gap electrolyser** with six major characteristics, and its operating parameters reached international advanced level:

■ Compared with fastening rod or screw, filtered press tightening evidently shorten time of replacing membrane.

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■ Improved anode circulation system ensures more uniform distribution of brine concentration.

■ Stainless steel frame has higher strength of corrosion resistance, which is more suitable for using in chlor-alkali electrolysis.

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■ New gas-liquid separation and deriving structure relieve gas accumulation and decrease pressure fluctuation

■ The Ti-Pd alloy prevents crevice-erosion on the anode-side-sealing-surface.

}

■ Zero (membrane) gap electrolyser NBZ compared with high current density electrolyser NBH 1.8-2.2 mm, decreases cell-voltage remarkably.

Uniform distribution of Brine Concentration

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Adequate gas-liquid separation inside cell

Easy to install and repair

}

Zero/Membrane gap structure

Stainless Steel external frame

}

Ti-Pd alloy sealing for anode surface

Improved anode circulation system

}

New gas-liquid separation and deriving structure

Compared with fastening rod or screw

}

Zero (membrane) gap electrolyser NBZ

Stainless steel frame

}

Ti-Pd alloy sealing

Anode circulation system

}

Gas-liquid separation structure

Membrane replacement

}

NBZ compared with NBH

Fastening rod or screw

}

High current density electrolyser

Crevice-erosion

}

Cell-voltage

Anode-side-sealing-surface

}

NBZ

Anode circulation

}

NBZ

Membrane replacement

}

NBZ

Fastening rod or screw

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NBZ

Crevice-erosion

}

NBZ

Anode-side-sealing-surface

}

NBZ

Anode circulation

}

NBZ

Membrane replacement

}

NBZ

Fastening rod or screw

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NBZ

Crevice-erosion

}

NBZ

Anode-side-sealing-surface

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NBZ

Anode circulation

}

NBZ

Membrane replacement

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NBZ

Fastening rod or screw

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Crevice-erosion

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Anode-side-sealing-surface

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Anode circulation

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Membrane replacement

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Fastening rod or screw

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Anode circulation

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Anode circulation

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Membrane replacement

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NBZ

Fastening rod or screw

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NBZ

Crevice-erosion

}

NBZ

Anode-side-sealing-surface

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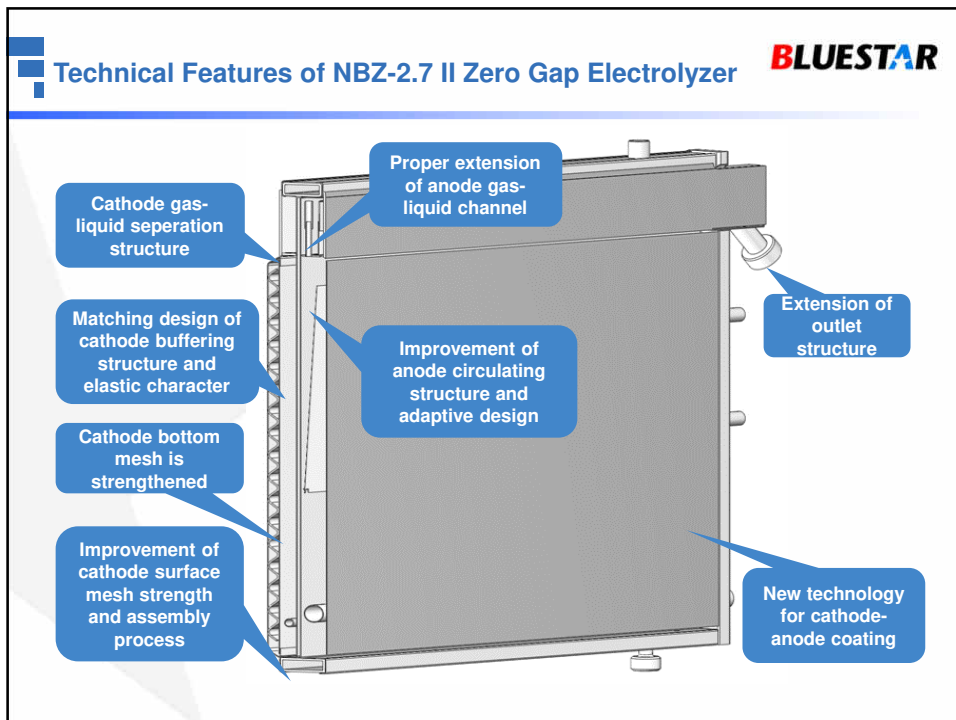
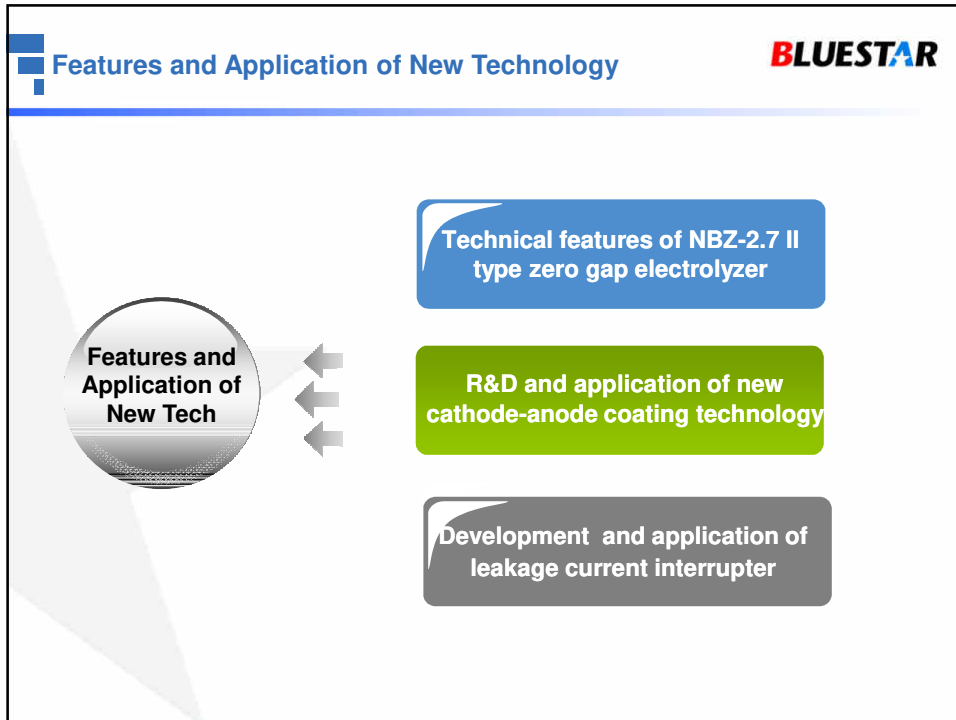
NBZ

Anode circulation

}

NBZ

Membrane replacement



Technical Features of NBZ-2.7 II Zero Gap Electrolyzer **BLUESTAR**


Upgraded gas-liquid circulation and separation structure

- More rational gas-liquid circulation, gas-liquid separation and discharging structure
- Improve electrolyte concentration distribution by improving circulation effect
- Effectively mitigate the internal differential pressure fluctuate caused by accumulation of resultant at upper part of electrolysis chamber
- Contribute to improve stability of controlling concentration, pressure and temperature while operation
- Effectively improve the operating condition of membrane

Technical Features of NBZ-2.7 II Zero Gap Electrolyzer **BLUESTAR**


Upgraded gas-liquid circulation and separation structure

Chlorine gathering




a Before improvement

Chlorine gathering improved effectively



b After improvement



Utility model patent under IP protection

The anode topside gas volume fraction contour map

Technical Features of NBZ-2.7 II Zero Gap Electrolyzer **BLUESTAR**

Matching design of cathode buffering structure and elastic character

- Defect:
 - Elastic structure at cathode side causes resistance for the gas-liquid flow in electrolysis chamber.
- Matching design of cathode buffering structure and elastic character
 - Satisfied the membrane pressure intensity and recovery performance
 - Improve the flow effect of gas-liquid close to membrane in cathode chamber
 - Customized elastic structure to achieve the optimum efficiency


➔ Reduce the power consumption
Decrease the damage to membrane
Improve the operating condition
Prolong the service life of ion-exchange membrane

Technical Features of NBZ-2.7 II Zero Gap Electrolyzer **BLUESTAR**

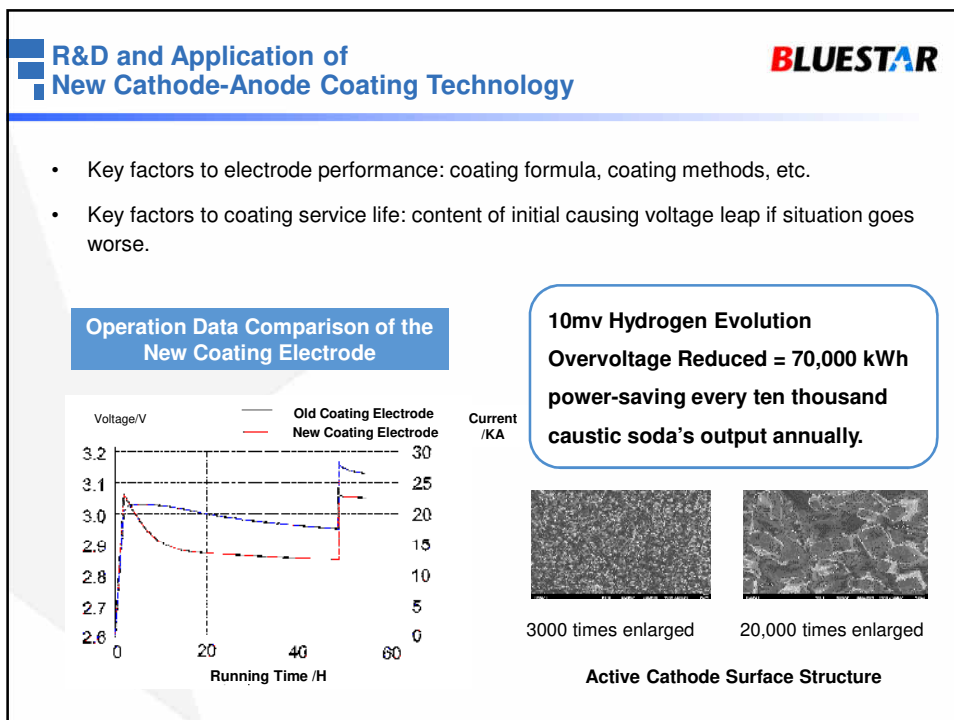
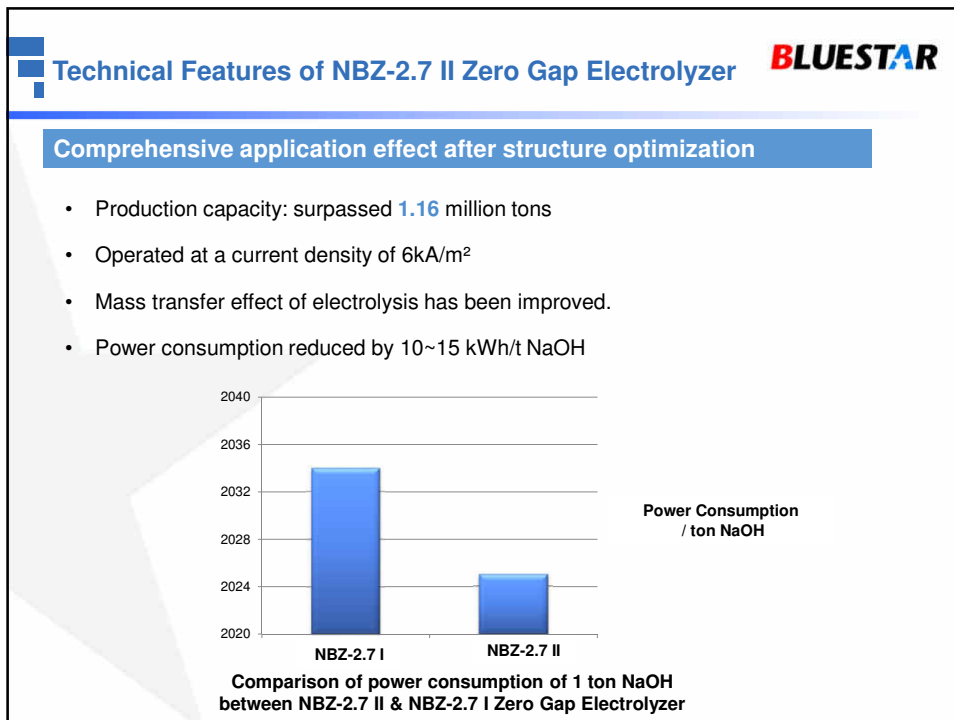
Improvement of cathode surface mesh strength and assembly process:

- ✓ Improvement of cathode surface mesh: improve the anti-corrosion property of the cathode mesh and substance diffusion effect of the cathode electrode surface
- ✓ The assembly process: **flanged edge welding**
- ✓ The advance laser cutting guarantees the processing accuracy and quality.

All above improve the contact states between cathode mesh and membrane, and the electrode surface gas-liquid flow effect.



Edge-folded



R&D and Application of New Cathode-Anode Coating Technology

- Wide recognition in worldwide
- Long-term cooperative relationship with other professional chlor-alkali equipment suppliers.
- 53, 000 cells of over 8 million tons capacity zero gap refurbishment, anode electrode replacement, etc. during 2012-2016.
- Customized R&D of professional electrode to meet clients' different needs.

Multi-cooperation

Foreign advanced electrode technology;
Major universities

Various electrodes :

Chlor-alkali electrolysis electrode;
Sodium chlorate electrolysis electrode;
Chromium salt electrolysis electrode;
Micro electrolysis electrode;
Oxygen cathode electrolysis electrode
.....

Development and Application of Leakage Current Interrupter

Application of leakage current interrupter technology

Disadvantage of leakage current:

- Increase power consumption
- Cause leakage corrosion of the electrolysis equipment
- Shorten service life of electrode and cell

It is applicable for both new equipment and old equipment refurbishment.

Advantages:

- Properly interrupt leakage current
- Greatly reduce the ration of leakage current
- Improve electrolytic efficiency of current
- Decrease corrosion risk of nozzles
- Improve operating efficiency, operating and security stability
- Considerable income of electricity saving

Equipment for annual output of 100, 000 tons caustic soda


Installed

Annual power-saving: 1.6 million kWh

Leakage Current: % Electrolysis Current


Leakage Current Breakage Current Efficiency

Brief Introduction of Engineering Services




Cost-effective Service

- Engineering design and consulting service .
- Integrated solutions for the chlor-alkali industry.
- Full-life cycle management.



Downstream Chlorine Products

- VCM, PVC, PAC, TDI, PO, calcium hypochlorite, epoxy chloropropane, chloride methane, chloronitrobenzene, sodium hypochlorite.
- Including basic design, detailed design, core equipment supply and training can also be provided.
- EPC、EPS、FO.



Upgrading and Updating Products



- By using the latest energy-saving modifying technology, we have upgraded various types of electrolyzer .
- The old equipment can be transported to China, and for the customer consideration, we also can do refurbishment on site.
- 7 million tons zero gap electrolyzers upgrading.





Density Voltage Drain Yield

- 1.Current density improvements of 1.0 kA/m² after modification
2. Average voltage reductions of 200mv after modification
3. Power drain reductions of 150kwh after modification
4. 22% improvements in yields after modification



Investments paid back in less than 2 years!

Introduction to BITS Technology

BITS Technology

- World-leading intelligent integrated solutions
- Advanced mathematical model
- Information sharing, operation experience sharing and inventory sharing
- Resource efficiently, reduces inventories and improves operation level of customers
- An information platform for the customers to exchange technologies and trade online

Monitoring Interface of BITS Intelligent Electrolysis System

Advantages of BITS Technology

Production data digitalization

- Optimize the operating data
- Keep optimal condition
- Achieving cost decreasing and benefit increasing
- Real time control

Production operation vertical integration

- Dialogue between equipments
- Improves operating efficiency

Value chain horizontal integration

- Whole value chain
- Reduce inventory and receivables
- Shorten product Delivery cycle
- Increase market reaction speed

BLUESTAR

Bluestar makes life better!

Nancy Zhao

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