BLUESTAR’S LATEST CHLOR-ALKALI ELECTROLYZER TECHNOLOGY

Bluestar (Beijing) Chemical Machinery Co., Ltd.

MAY 2025, Barcelona

蓝星（北京）化工机械有限公司
Bluestar (Beijing) Chemical Machinery Co., Ltd.

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COMPANY PROFILE

ORGANIZATION RELATIONSHIP

Rank 54 on
"Fortune Global 500" 2024

sinochem
In science we trust

SINOCHEM HOLDINGS

BLUESTAR

NATONAL BLUESTAR

BLUESTAR
蓝星（北京）化工机械有限公司
Bluestar (Beijing) Chemical Machinery Co., Ltd.

BCMC

IN SCIENCE
WE TRUST

DEVELOPMENT COURSE

2014-2017

Czech Chlor-alkali project start-up. Step into Euro-market; Join North America Chlor Association

2014

NBZ-2.7(Ⅱ) membrane electrolyzer start-up.

2013

Russian market -- 100KTPY NaOH project.

2009

The 1st Zero-Gap membrane electrolyzer.

2002

Build Engineering team

1993

The 1st bipolar electrolyzer

1984

Membrane electrolyzer tech introduced to Domestic Market

1966

Company established, engaged in pressure vessels, diaphragm electrolyzer manufacture.

2016-2019

Italy project start-up,

Engineering design and Contracting qualifications

2020

Latin American market -150KTPY Chlor-alkali EPC project in Mexico

2021

New generation high-efficiency low-consumption electrode implied in Hungarian market

2022

ADANI 770 KTPY Chlor-alkali EPCM project in India,

NBZ-2.9 membrane electrolyzer start-up

2023

Skid mounted chlor-alkali EPS project signed in Serbia

2024

NBZ-3.4 membrane electrolyzer start-up

And moving on...

MAIN PRODUCTS

After years of efforts, BCMC has developed from traditional Chlor-alkali equipment, pressure vessel products to 4 business units: electrolysis, Molten Salt Energy Saving(MSES), biomass and special valves.

BU	Electrolysis business	MSES	Biomass	Special valves
				
Product	▪ Chlor-alkali technology & equipment ▪ Chlor-alkali electrode updation ▪ Electrolyzer digital and intelligent transformation ▪ HCl electrolysis technology & equipment ▪ Copper foil electrode ▪ AWE electrolysis for Hydrogen	▪ MSES technology and equipment ▪ Molten salt heat absorption technology & equipment ▪ Molten salt heat exchange technology & equipment ▪ Thermal power plant carbon-reduction technology & equipment ▪ 0-carbon park green steam technology & equipment	▪ Biomass comprehensive utilization technology &equipment ▪ Wood vinegar applied for modern agriculture ▪ Wood vinegar ecological deodorization products ▪ Wood vinegar ecological soil improvement products	▪ Angle valve ▪ Hard sealed plug valve ▪ Wearing resistance valve ▪ Special material valve

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LATEST ELECTROLYSIS TECHNOLOGY BY NBZ-2.7 SERIES ELECTROLYZER

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ELECTROLYZER BUSINESS SUMMARY

C&A INDUSTRY

- 2020 DOMESTIC MARKETSHARE=38%
- 2021 DOMESTIC MARKETSHARE=39.1%
- 2022 DOMESTIC MARKETSHARE=43.2%
- 2023 DOMESTIC MARKETSHARE=52.1%

4 YEARS' CONTINUOUS NO.1 DOMESTIC MARKETSHARE

C&A PLANT

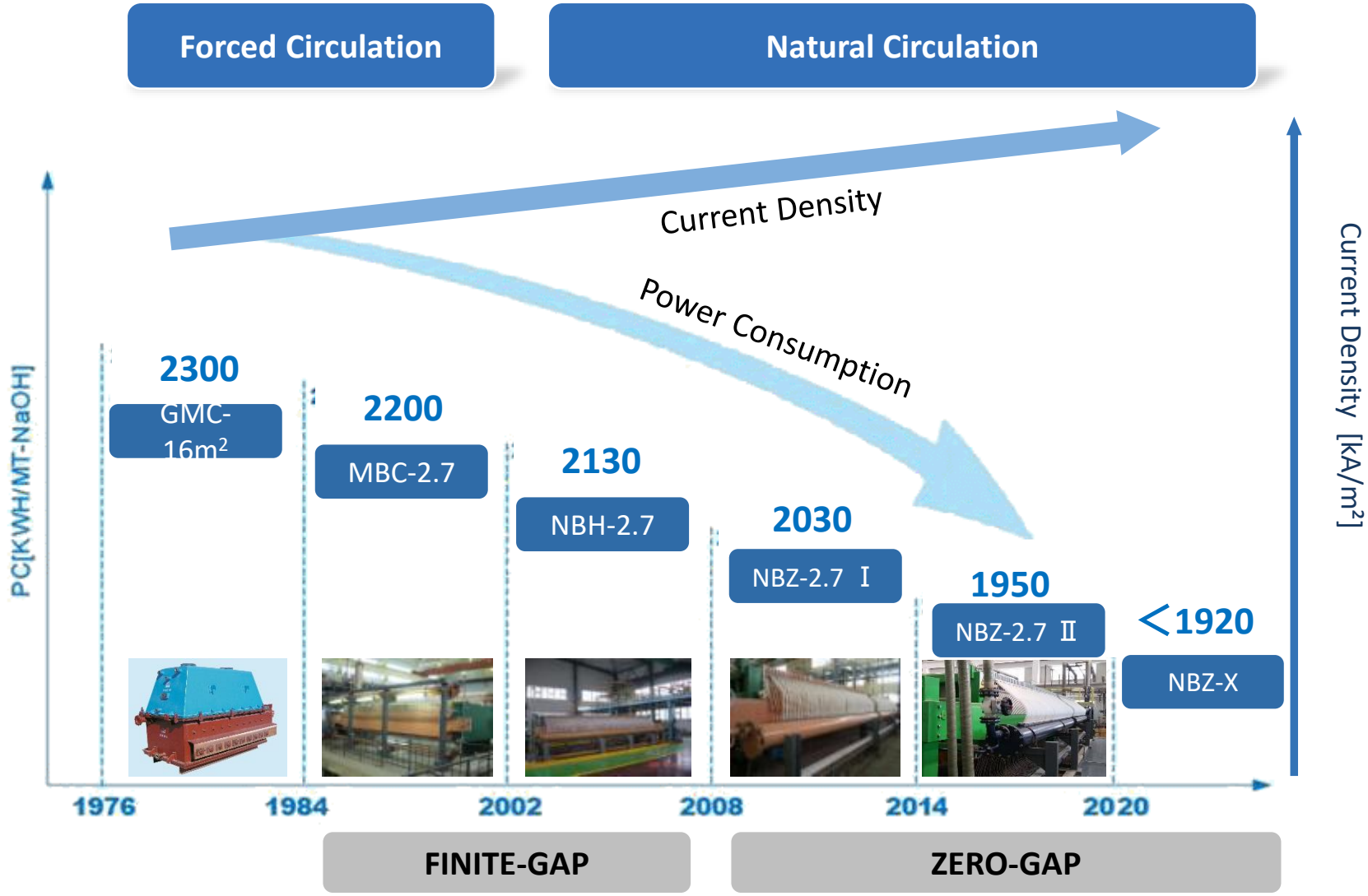
C&A ELECTROLYZER

- TOTAL CAPACITY OF BCMC ELECTROLYZER: 24M tpa
- ZERO-GAP: 17M tpa
- COUNTRY FOOTPRINT: 22 Globally

TECHNICAL DEVELOPMENT

Step Forward

Improvement

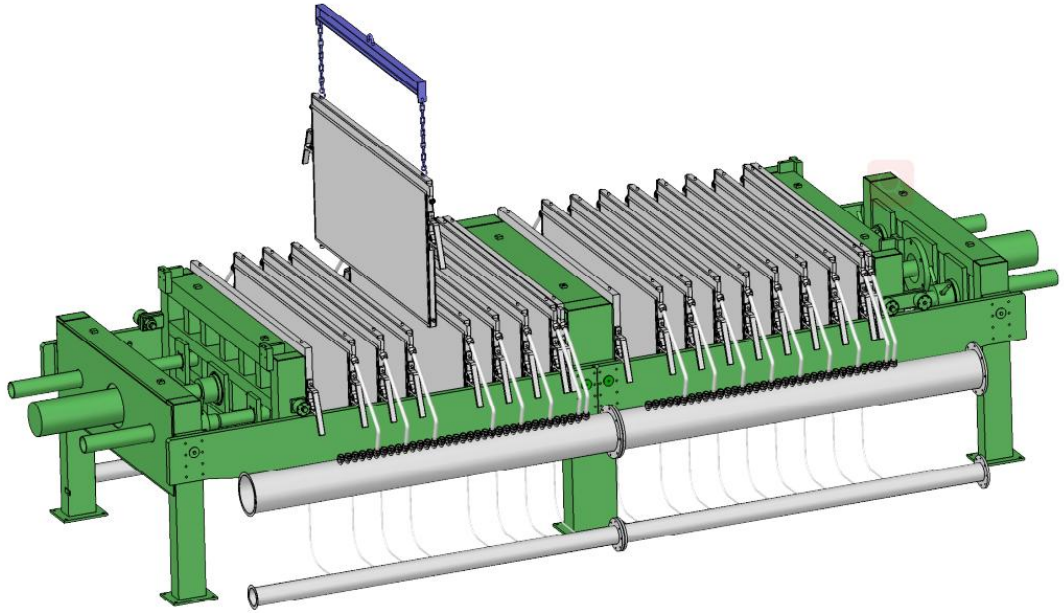


CHARACTERISTIC -- STRUCTURE

BCMC's independently developed NBZ-2.7(Ⅱ) Zero-Gap Electrolyzer have five Characteristics. The operation parameters reach the global advanced level, run stable in current density 6.0kA/㎡, power consumption will be lower than **1950** kWh/T * 。

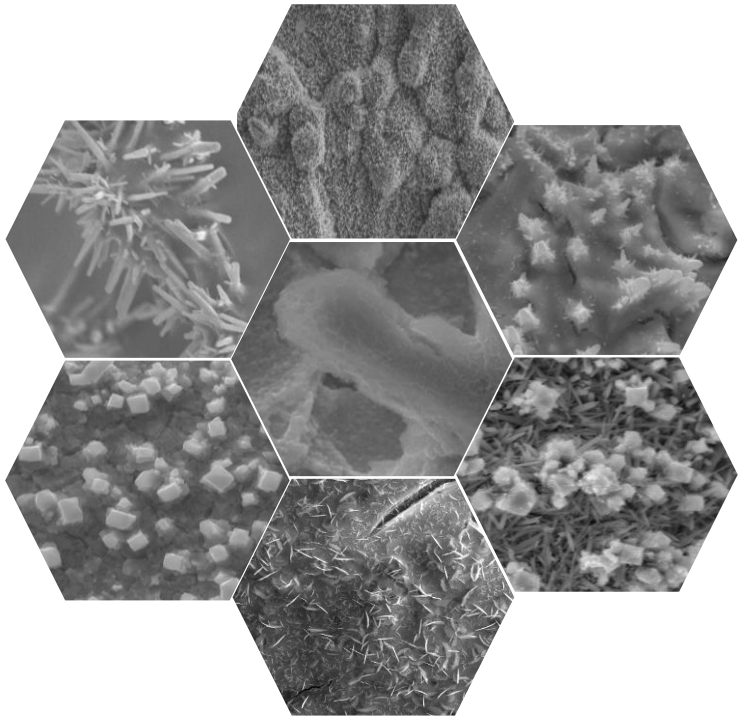
Five Characteristics of Electrolyzer

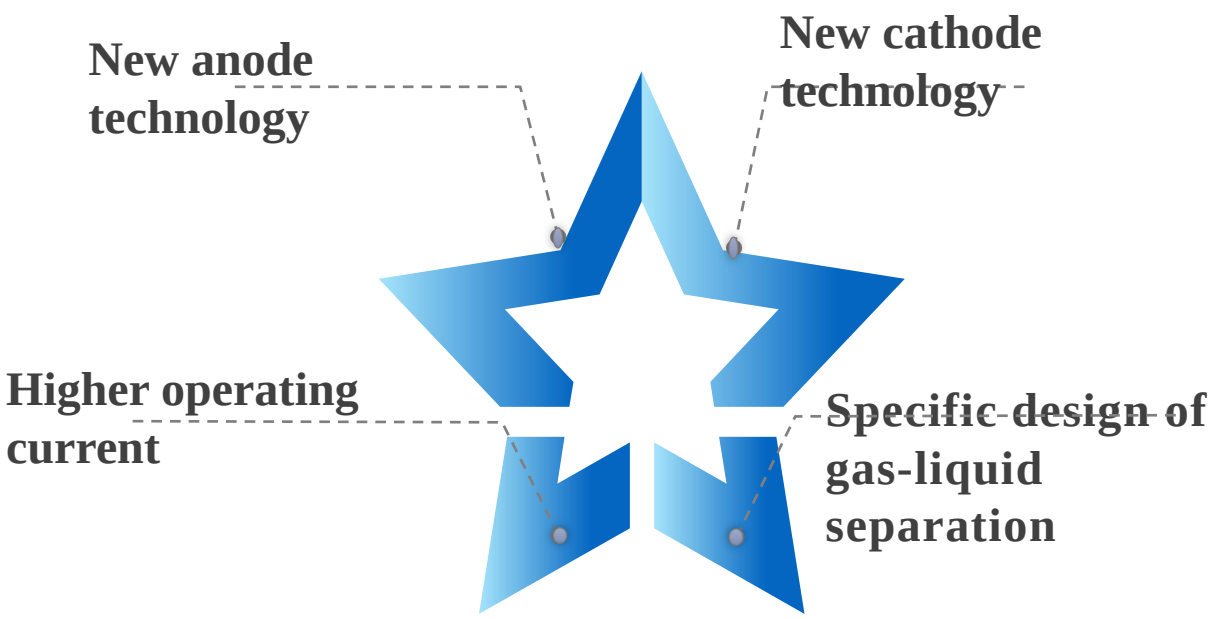
- **Brine concentration uniformly Sufficient Gas-liquid separation**
- **Excellent zero-gap structure**
- **Ti-Pd alloy anode sealing surface**
- **Advanced electrode technology**
- **Easy installation and maintenance**



* Match with BCMC newest electrode and newest ion-exchange membrane.

CHARACTERISTIC -- ELECTRODE



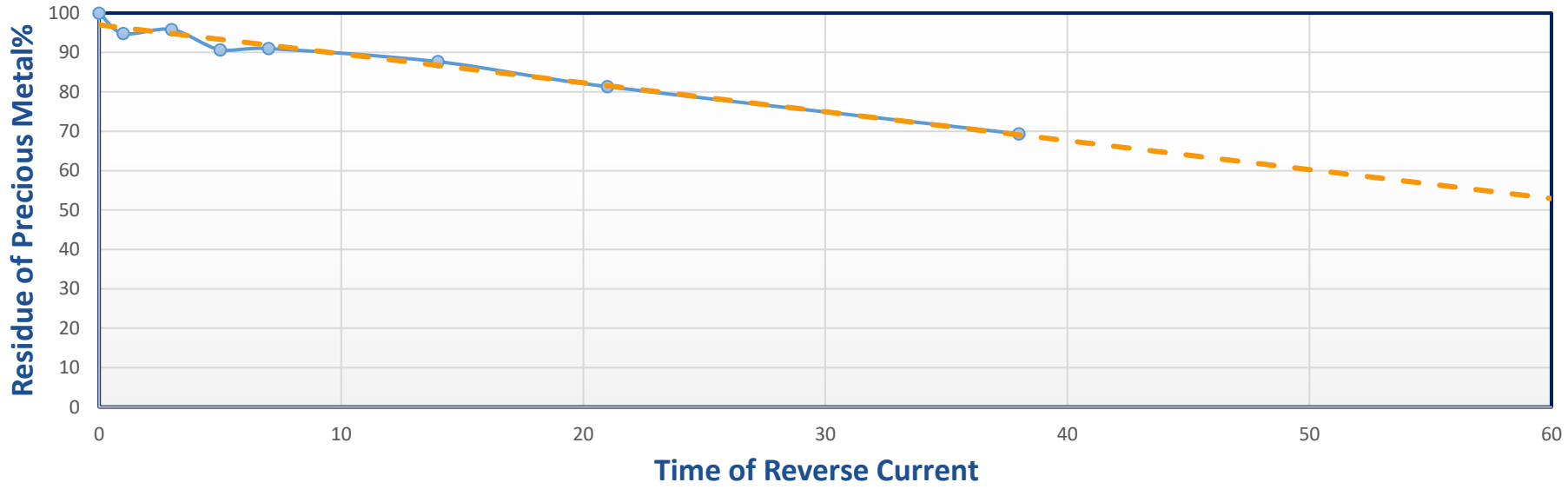


Anode developed from graphite to DSA metal, while cathode developed from stainless steel to nickel mesh. Moreover, the formula of coatings on anode and cathode mesh are upgraded from activated binary, ternary to multivariant. Both the manufacturing process and electrode catalyze activities of Bluestar NBZ-2.7II plus series electrolyzer have been continuously improved.

THE ANTI-REVERSE CURRENT OF NBZ-2.7II PLUS ZERO-GAP ELECTROLYZER

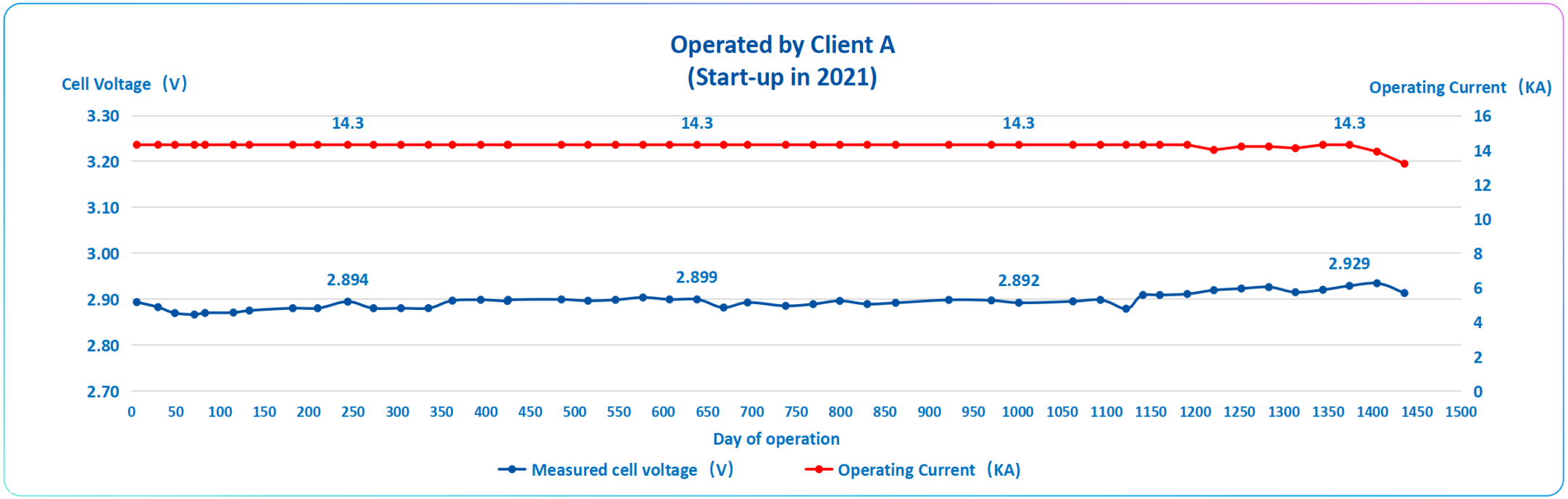
CAPACITY OF ANTI-REVERSE CURRENT

(REINFORCED TESTING IN LABORTORY)



It's been proven that the anti-reverse current of Bluestar electrode is capable for the requirement within the whole life-time period.

PERFORMANCE OF NBZ-2.7II PLUS ELECTROLYZER (1/3)



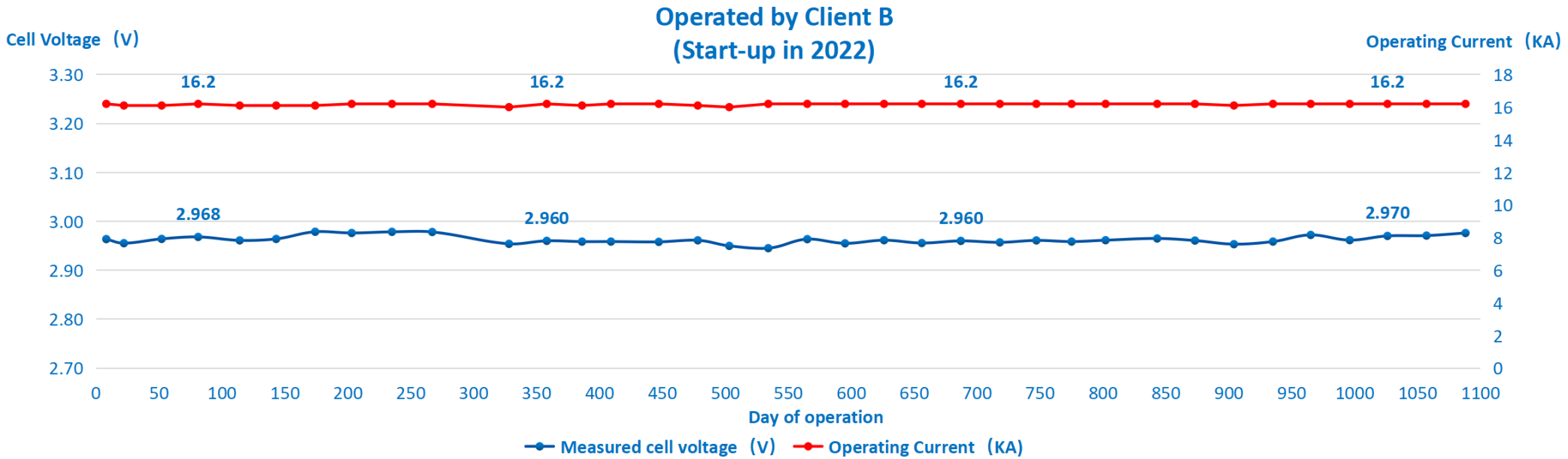
1500 days

14.3 KA

85.0 ℃

2.89 V

PERFORMANCE OF NBZ-2.7II PLUS ELECTROLYZER (2/3)



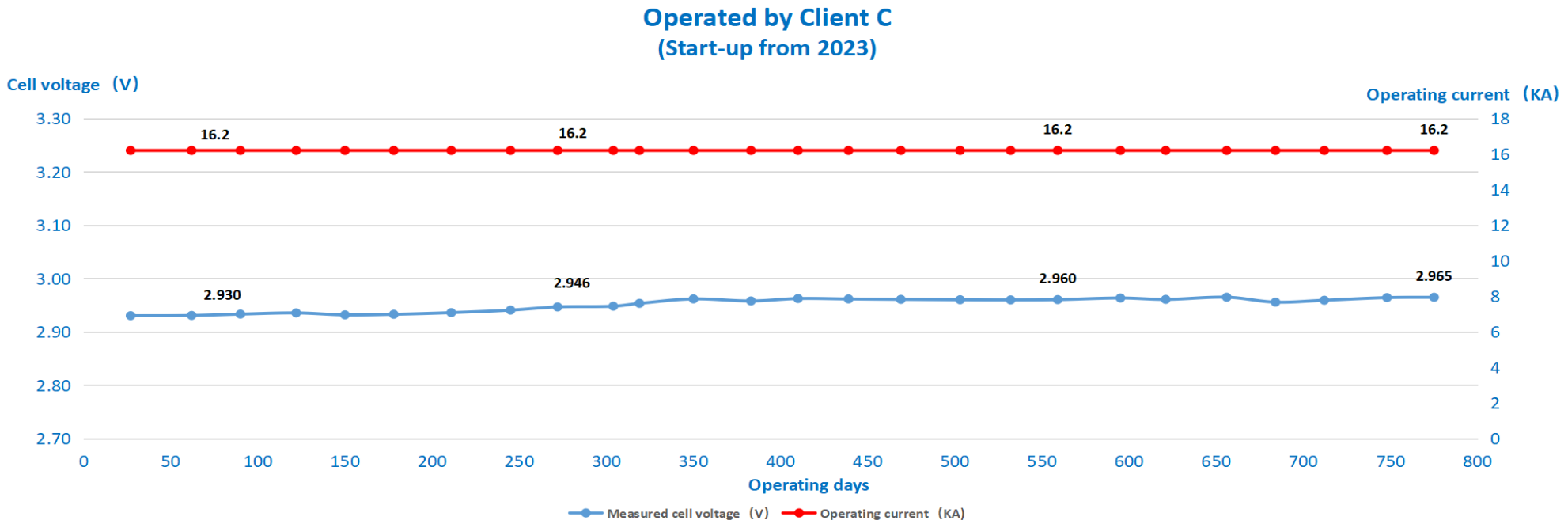
1100 days

16.2 KA

2.95 V

83.6 ℃

PERFORMANCE OF NBZ-2.7II PLUS ELECTROLYZER (3/3)



800 days

16.2 KA

2.95 V

85.2 ℃

3

BLUESTAR LARGE-SIZED ELECTROLYZER INTRODUCING NBZ-2.9 & NBZ-3.4

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LARGE SIZED ELECTROLYZER

NBZ-2.7(II)

Reliable technical approach to produce caustic soda and chlorine gas proven by the market.

NBZ-2.9

Already operated in the domestic market for years with variant dimensional data from running. Optimistic assessment by users.

NBZ-3.4

Newly introduced to the market with demo plants and commercial scale operation in domestic market.
Operated in one of the most famous chemical groups in China mainland since 2024 with optimistic assessment in terms of performance.

DESIGN CONCEPT OF NBZ-2.9 ELECTROLYZER

For upgrading NBZ-2.7 series electrolysis system

- **Effective electrolysis area increased from 2.7m2 to 2.9m2, capacity therefore increased by 7% under the same input condition (e.g. Current)**
- The existing pipe, valve and other facilities could be remained without changing. Only cell elements and the moving-end of electrolyzer chasis are requested to be undated
- NBZ-2.9 could realize the maximum capacity of the existing NBZ-2.7 electrolysis system by safety and stable operation.
- The power consumption could be decreased by using NBZ-2.9 cell element to replace NBZ-2.7 cells under the condition of same capacity request.

DESIGN CONCEPT OF NBZ-3.4 ELECTROLYZER

01

Capacity Increasing

The effective electrolysis area increased from 2.7m2 to 3.4m2, while the capacity increased by 25% compare to NBZ-2.7II electrolyzer under the same input condition

02

Power Consumption Minimum

Lower current density to realize same capacity compared with smaller sized cell element, therefore decrease the power consumption

03

Flexible Loading

Same footprint however more capable to meet the variant request of capacity and power consumption.

04

Safety and Stable

More applicable to the new project which targets to realize higher capacity with limited space by safety and stable operation.

CHARACTERISTICS OF LARGE SIZED ELECTROLYZER

NBZ-2.7(II)

NBZ-2.9

NBZ-3.4

Optimized circulating structure for 6kA/m2 operating scenario

The strength of cell element outter frame is specifically designed.

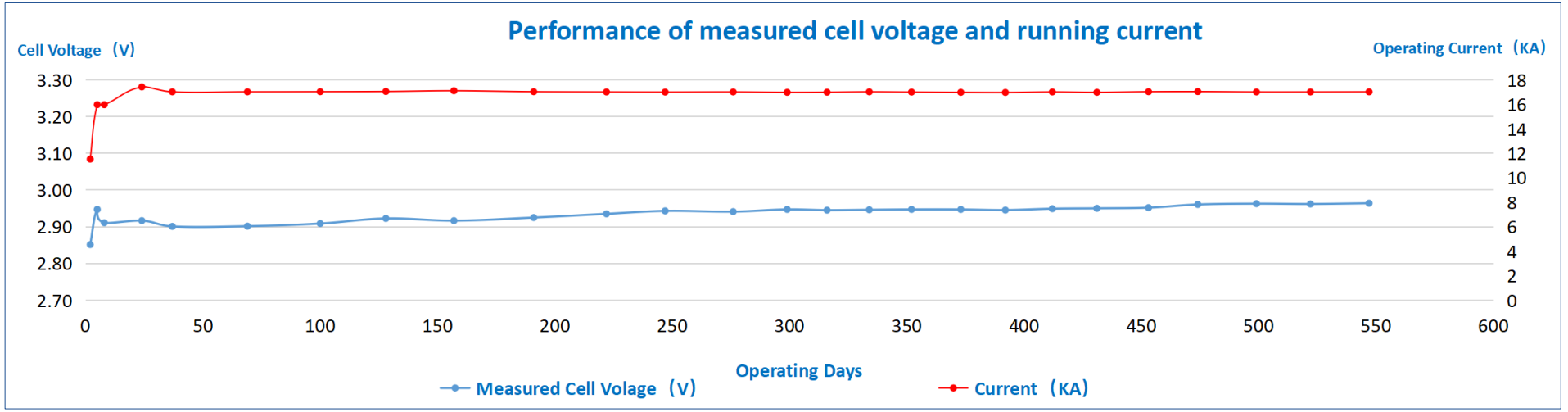
Compliant designed process package for ensuring the stable operation.

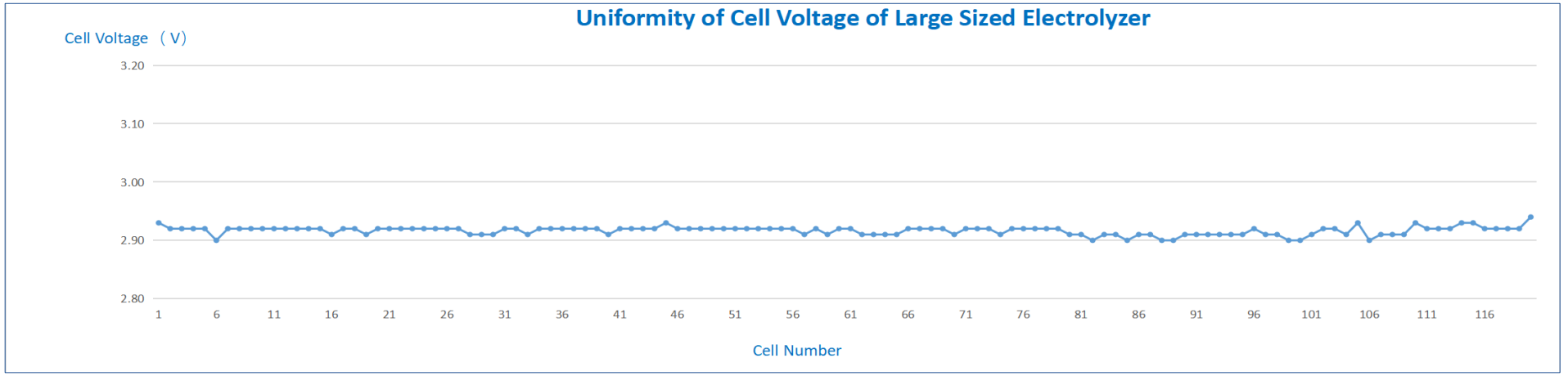
More even distribution of the liquid concentration and flow-field status

Optimized desisnged proven by client’s commerical operation.

PERFORMANCE OF BLUESTAR LARGE SIZED ELECTROLYZER

The performance of Bluestar Large Sized electrolyzer in the Plant of Client W





Current

17.4KA

Measured Cell Voltage

2.93V

Power Consumption

1910kwh/t

Temperature

83.2℃

4

COMPREHENSIVE SUPPLY OF CHLOR AND ALKALI PLANT

INTERNATIONAL

Blue Star is one of the four ion membrane electrolyzer suppliers in the world with an extensive footprints covering 22 countries

Global Capacity: 24 Million Tons Overseas Capacity: 2.5 Million Tons

47% Chinese Market Share
20% Global Market Share

22 Overseas Countries
300+ Chlor-Alkali plant

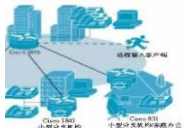
300+ C&A plants

24 Million tons NaOH Producing Capacity By Bluestar Electrolyzer

30 Overseas Plants

300M TPY Chlor-Alkali Equipment

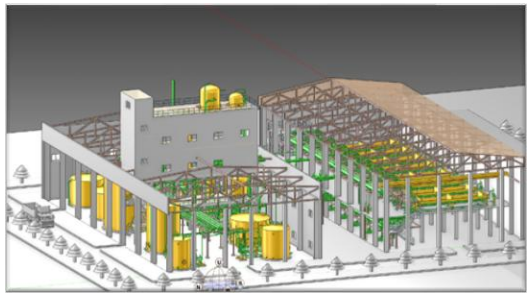
12000 M2 Electrode Production

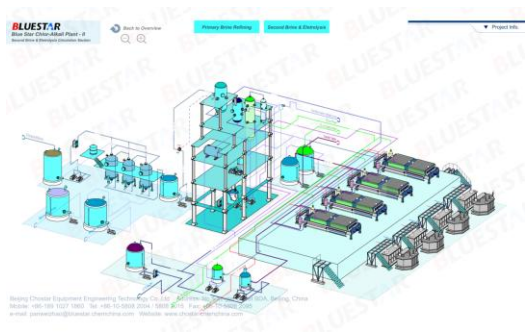


5 Chlorine associations

156 Valid Patent

ENGINEERING





Engineering service:

Engineering project management and Engineering consulting of Chlor-alkali plant;

Engineering & Procurement & Service of Chlor-Alkali section

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Basic design

Detail design

EPS

Client

We provide clients with all processes covering brine purification, electrolysis circulation, de-chlorination, gas treatment, rectifier transformer and DCS, etc.; also services from basic design, detail design, personnel training to after-sales full-aspect technology and management services, as well as whole life cycle monitoring and management of overall chlor-alkali plant process technology.

INTRODUCTION OF BLUESTAR BUILT C&A PLANTS

Background

EU: 40KTPA NaOH+60KTPA KOH with two separated system from brine treatment to gas treatment and soda evaporation;

Mexico: 170KTPA NaOH plant wholly contracted by Bluestar

Year of Operation

EU: April 2017

Mexico: OCT 2023

Design and Manufacturing Standards

EU: DIN, equipment certified by CE;

Mexico: ANSI and other American Standards

Operating Condition

EU: NBZ-2.7 cell elements partially upgraded to NBZ-2.7II technology

Mexico: NBZ-2.7II Plus technology

INTRODUCTION OF BLUESTAR BUILT C&A PLANTS

150KTPA CHLORINE EPC PROJECT IN MEXICO
PROYECTO DE IQUISA EN MÉXICO

中化 sinochem
科 | 学 | 至 | 上

BLUESTAR
中 国 蓝 星

SEE YOU AT

BOOTH NO. 54

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