Introduction of AGC and FORBLUE™

- Advanced Membrane Technology for Saving Energy and Enhancing Sustainable Energy

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1. Introduction of AGC Inc.
Fluorochemicals Products Line-up

Fluoroproducts

- Fluoropolymers
  - PTFE
  - ETFE
  - PFA
  - AFLAS
  - FFKM
- Performance Chemicals
  - ASAHI
  - GUARD
- Coating
  - Lumiflon
- Film
  - AFLEX
  - F-Clean
- Membrane
  - FORBLUE
- Fine chemicals
  - Medical
  - Agri
  - Intermediate
- New fluoromaterials
- Gas & Solvents
  - Refrigerant
    - R-22
    - R-134a
    - Solvent
    - AK-225
    - AE-3000
    - AC-6000

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2．Introduction of FORBLUE™
FORBLUE Family started November 2017

✓ Launched in November 2017
✓ AGC’s new brand for providing solutions for separating various chemicals
✓ Integrating AGC’s R&D resources, sales organization and marketing activities to serve “separation” market

- Perfluoro Ion Exchange Membrane
  - Chlor-Alkali electrolysis
  - NaOH, KOH

- Hydrocarbon Ion Exchange Membrane
  - Desalination
  - Acid Recovery
  - Waste water treatment

- Perfluoro Ion Exchange Membrane Tube
  - Tube type dryer
  - Pneumatic device
  - Medical Instrument

- Various application
  - Hydrogen production
  - Battery (RFB)
Application of Membrane Technology for Energy Saving and Storage

- Improvement of Power Consumption in Existing Application
  (e.g. Brine Electrolysis)

- Power Saving System in ZLD※ and Production of Drinking Water
  ※ZLD: Zero Liquid Discharge

- Application for Sustainable Energy Storage
  - Redox Flow Battery
  - H2 generation by Water Electrolysis
3. Introduction of FLEMION™

- Brine Electrolysis to Improve Power Consumption
FLEMION: Ion Exchange Membrane for Brine Electrolysis

$2\text{NaCl} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{Cl}_2 + \text{H}_2$

Depleted Brine

Feed Brine

Anode

Cathode

NaOH

Weaker NaOH

FLEMION (Ion Exchange Membrane)
Power Consumption of NaOH Production in Electrolyzer
≒2,000 kWh/ton-NaOH

※) In case that a cell voltage = 3 V and Current Efficiency = 96%

F-9010 membrane is just now applied for NaOH production.

F-9010 membrane is performing with 50 mV saving comparing to the membrane of one generation before.

Power Consumption Save
35kWh/ton-NaOH

※) Plant Scale : 0.1 million ton / year
3,500MWh/year
4. Introduction of SELEMION™

- Power Saving System for ZLD and Production of Drinking Water
The basic unit of dialyzer is composed of AEM / D room / CEM / C room. We call them “Pair”.
Application of Electrodialysis into ZLD (Zero Liquid Discharge)

Increasing TDS (Total dissolved solid) conc. from 2-3 % to 20 % by introducing ED process

→ Reducing vapor amount and EVP size
→ Cost down of total cost (initial and operation)!
Purification of Ground Water Process for Drinking Water

Ion-Exchange Membranes "SELEMION™" by AGC

Well Pump → Filter → Electrodialysis (ED) → Disinfection → Drinking Water

- **Desalination** of groundwater
- **Nitrate removal** from groundwater

Safety drinking water

**Selemion is an AGC’s FORBLUETM family product**
Development of low cost ED system

- Aim to provide **safety drinking water** in a stable manner
- Firstly target is **rural areas in India** where:
  - Frequent droughts (40% of the land is drought-prone)
  - Increased demand for groundwater for irrigation (5 times more from 1970 to 2010)
  - Groundwater with high salinity level
  - Some rural areas off-grid, climate vulnerable population
- Explore a business development of a **solar-powered groundwater desalination & purification system**
5. Introduction of S-Series

- Sustainable Power Storage System
Application of S-Series Membrane for Sustainable Power Storage System

Photovoltaics  →  Wind power  →  Some Other Renewable Power

Fluctuating Electricity Generation

S-Series Membrane
- Low Voltage under High Current Density
- High Durability for Long Run

Redox Flow Battery
- Large Capacity

Water Electrolysis To Produce Hydrogen

Electricity Consumers
(Industry, Individual, Mobility(EV))

Hydrogen Consumers
(FCV, Chemical Source, Combustion Heat Source)
THANKS