



CLOROSUR
IX TECHNICAL SEMINAR
November 13, 2014

Performance of Flemion F-808X series and Introduction of F-8080K and F-8081HDK for KOH production.

AGC 化学品カンパニー
旭硝子株式会社

AGC Chemicals
ASAHI GLASS CO., LTD.

AGC Chemicals
Chemistry for a Blue Planet



Developments of Flemion

AGC

- Higher durability against impurities
- High stability of CE
- Lowest and stable CV

+

- Low KCl in KOH

F-8020 SP &
F-8051

F-8000 Series

(1) Performance data in
commercial cell

F-808X

F-8080
F-8080HD
F-8081
F-8081HD

F-8080K

(2) new membranes
for KOH production

F-8081HDK

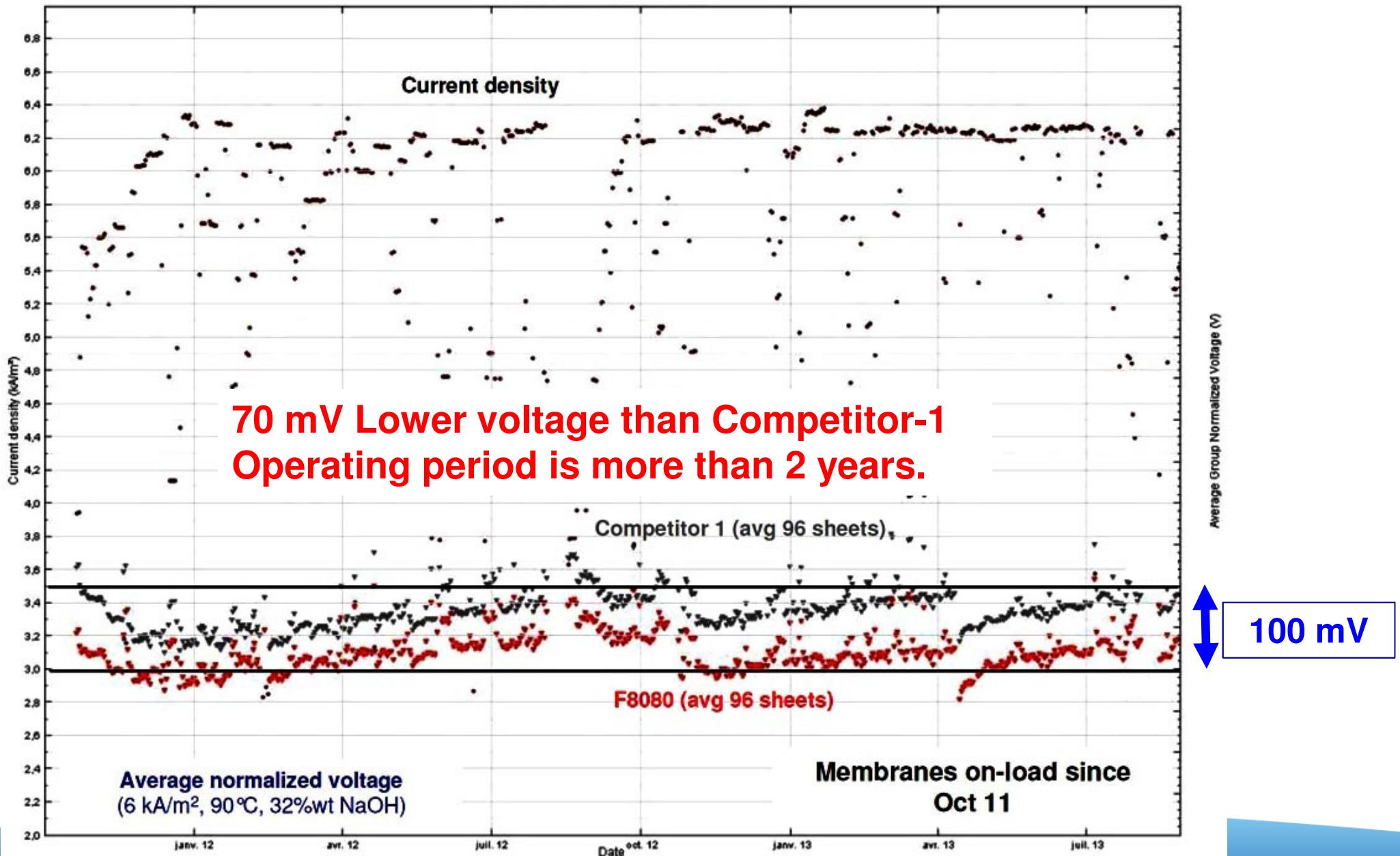
Membrane for

NaOH
Production

Membrane for

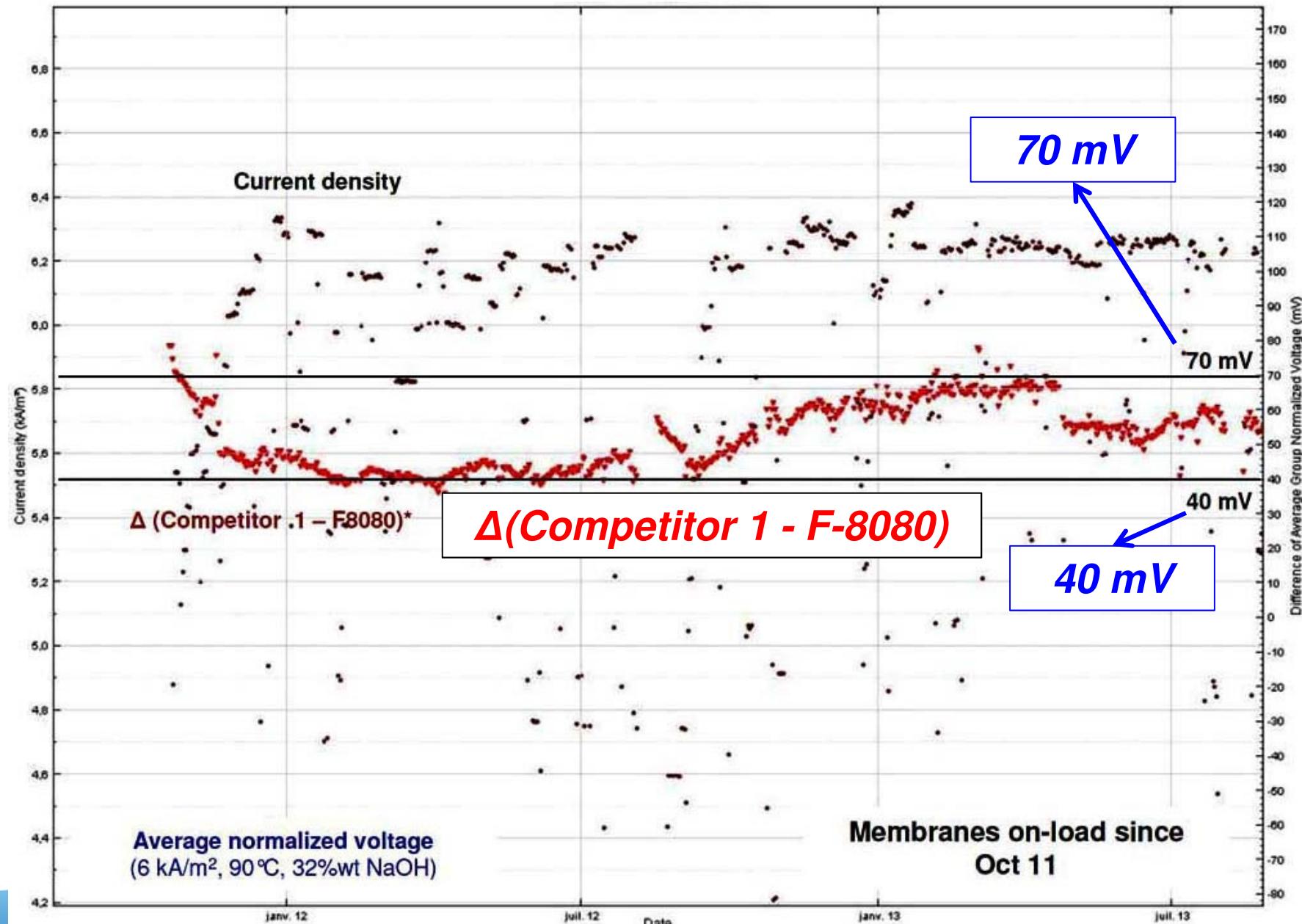
KOH
Production

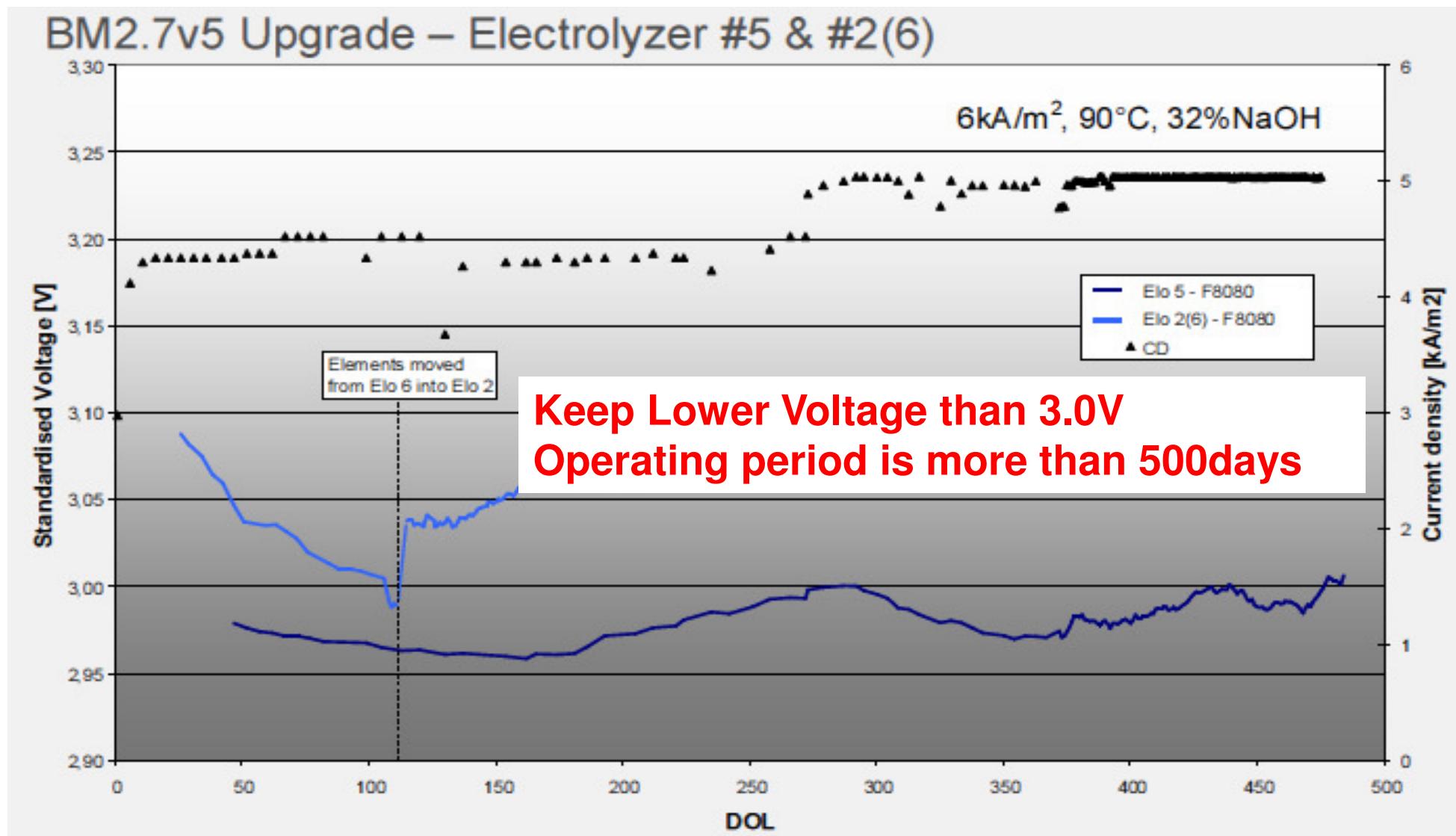
Performance Data of Flemion F-8080 Series



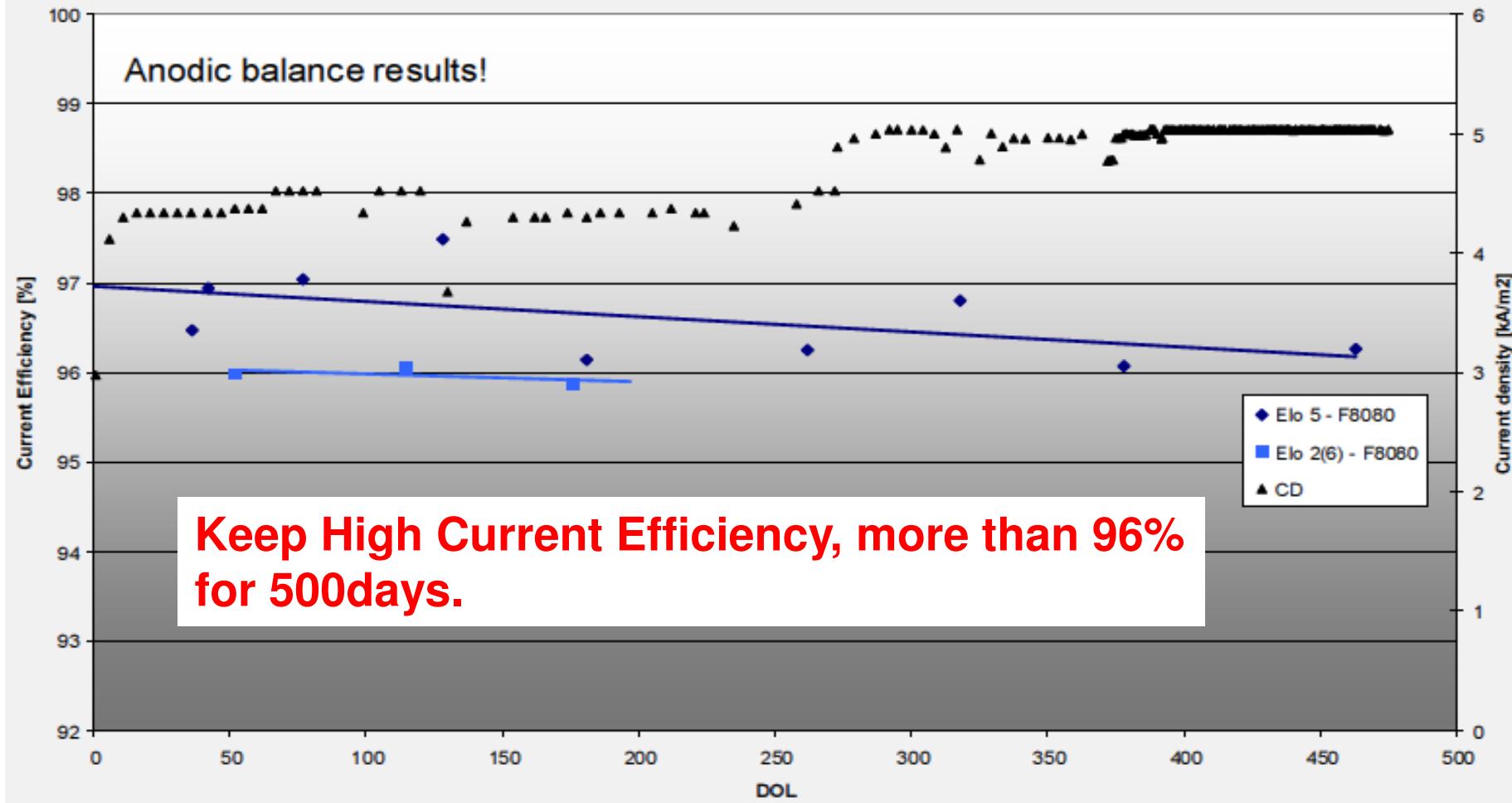
n-BiTAC Plant I -- Voltage Difference C1

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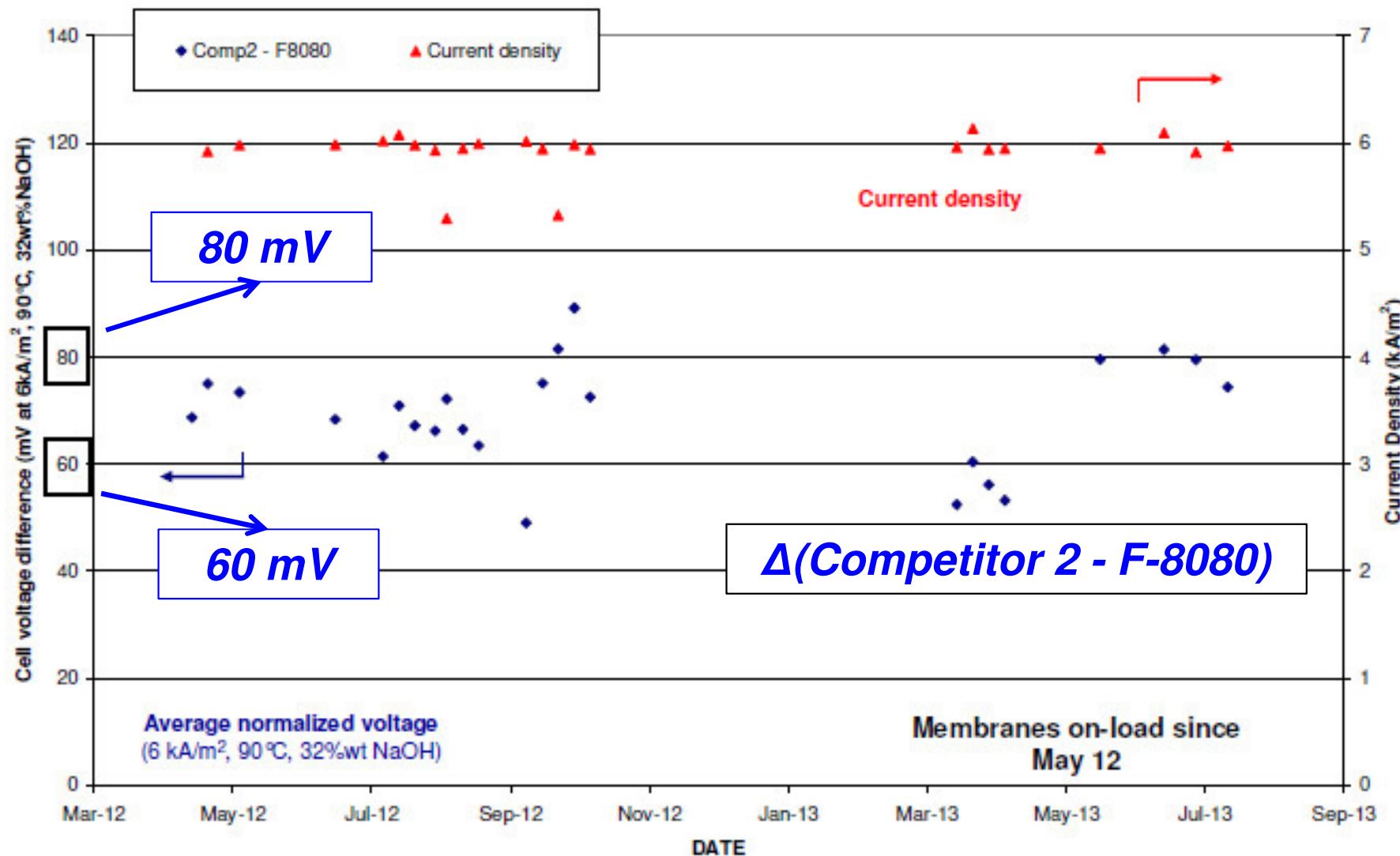


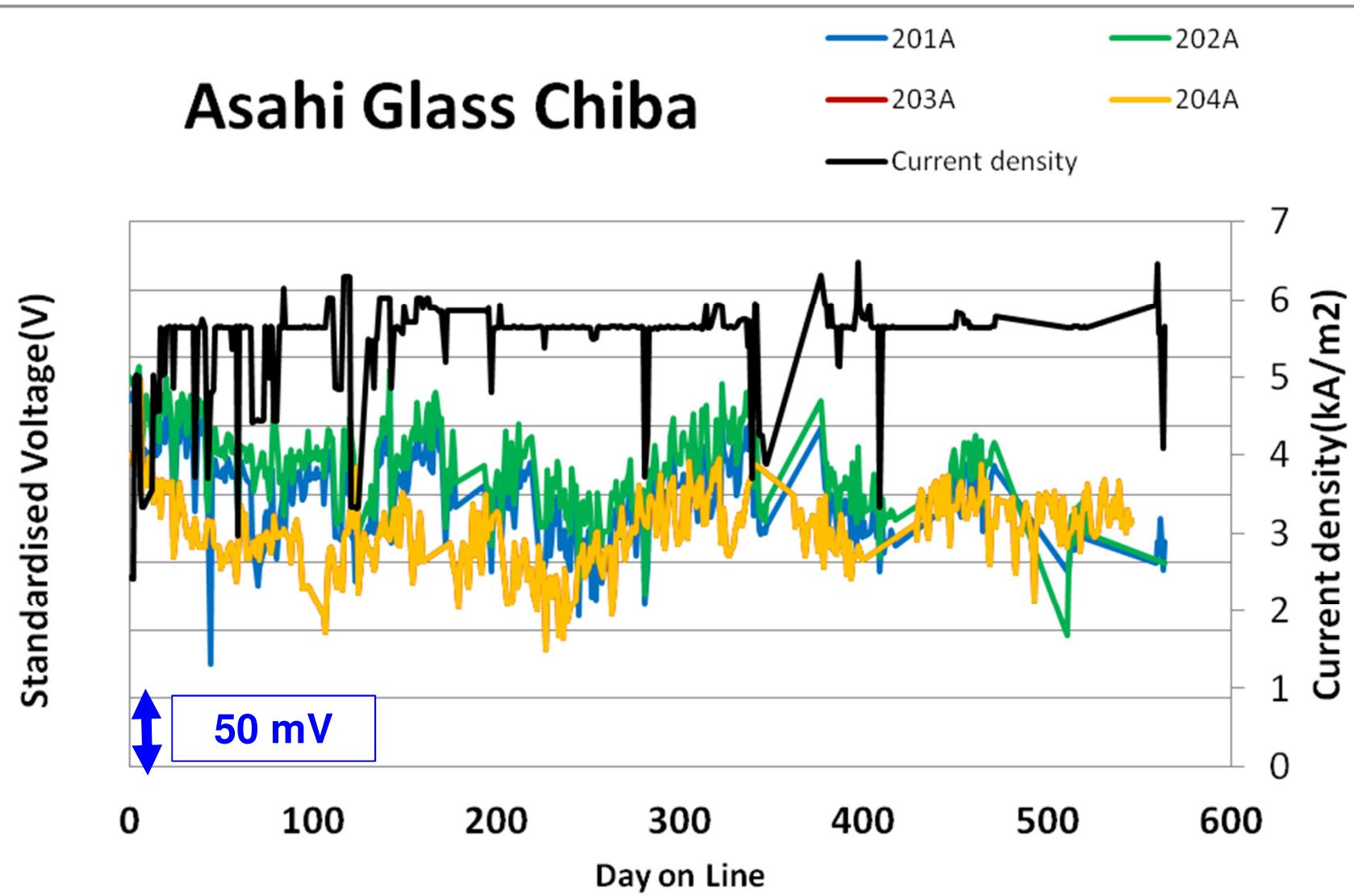
BM2.7v5 Upgrade – Electrolyzer #5 & #6

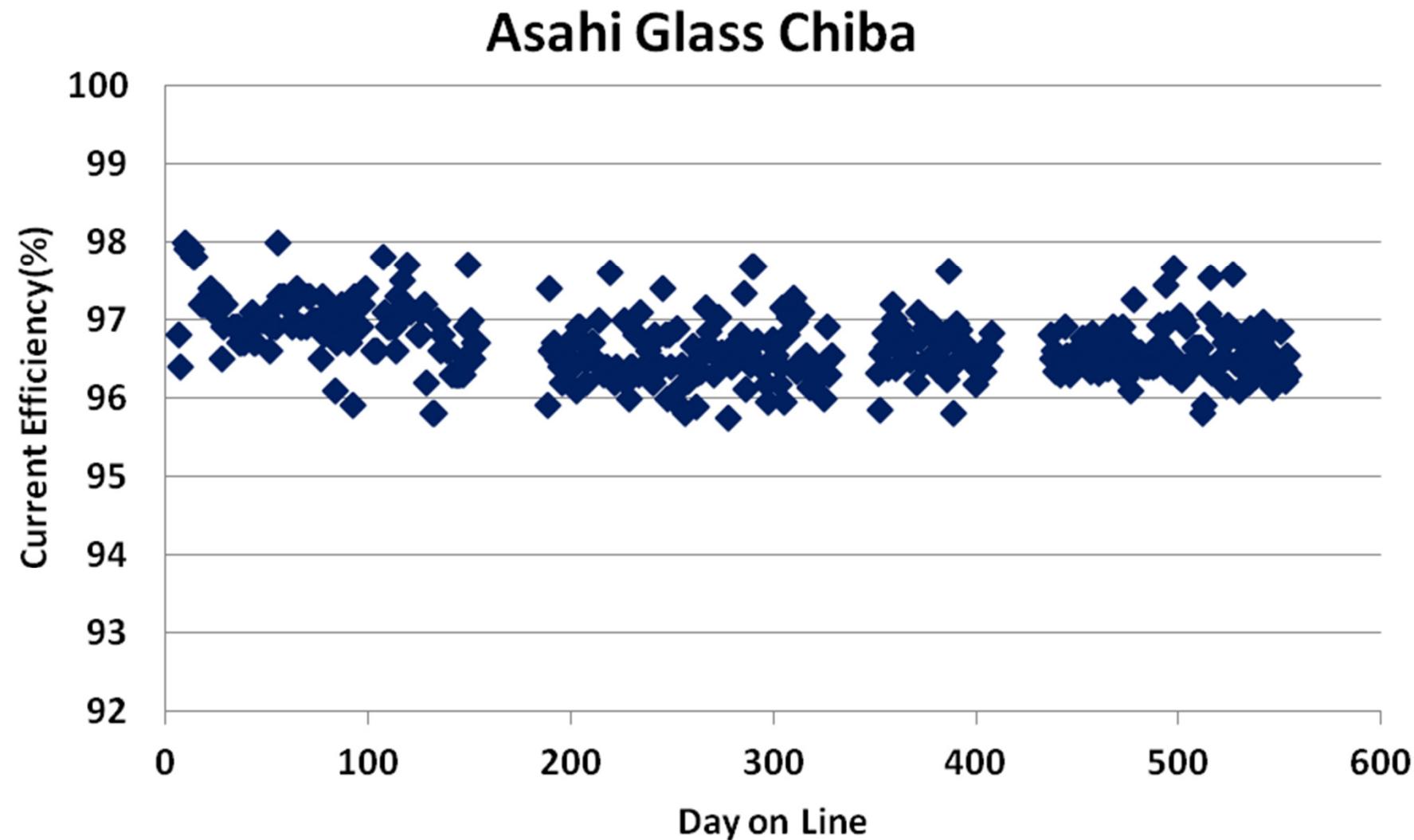


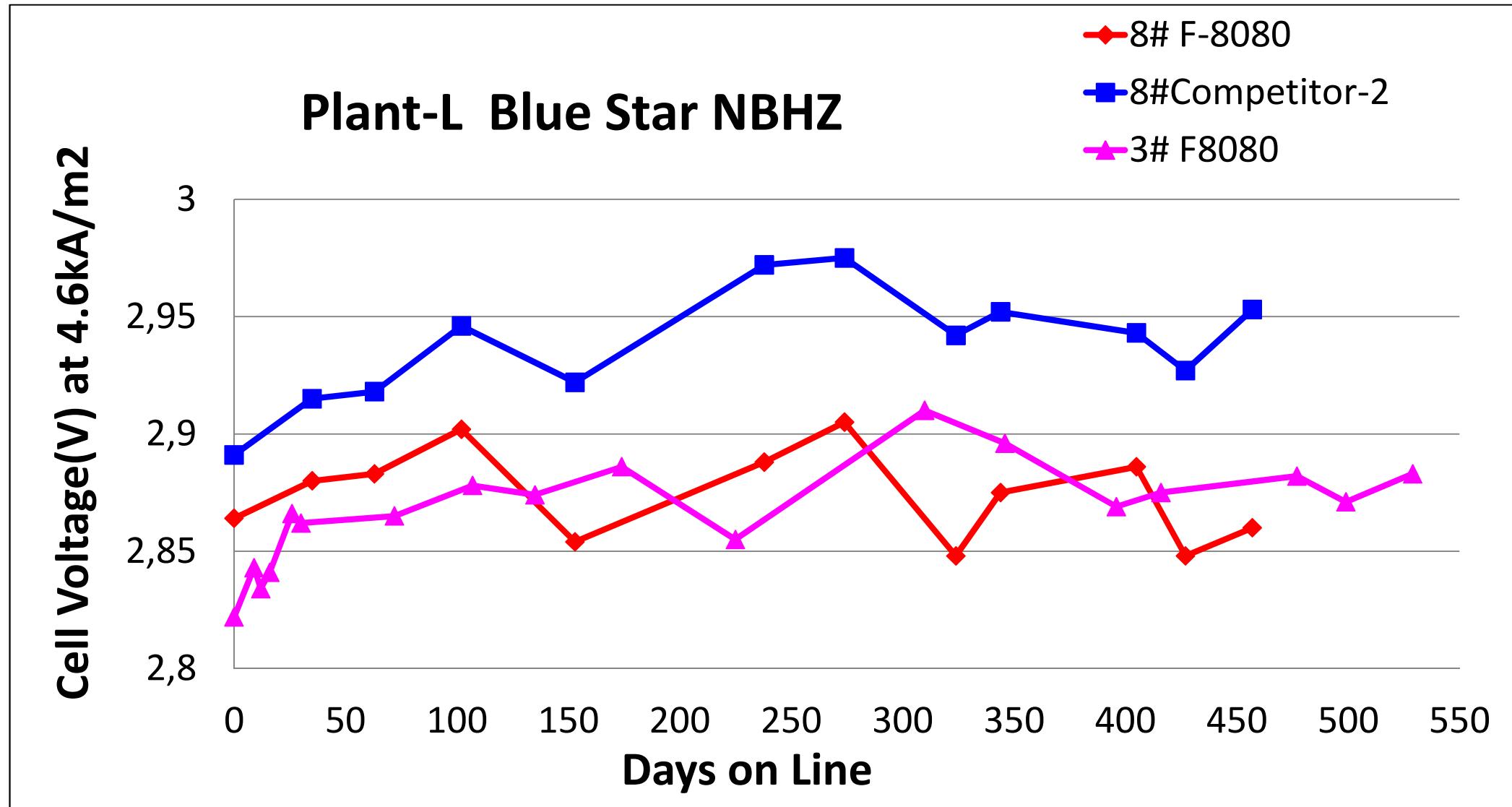
UHDE Gen5 Plant E -- Voltage Difference C2

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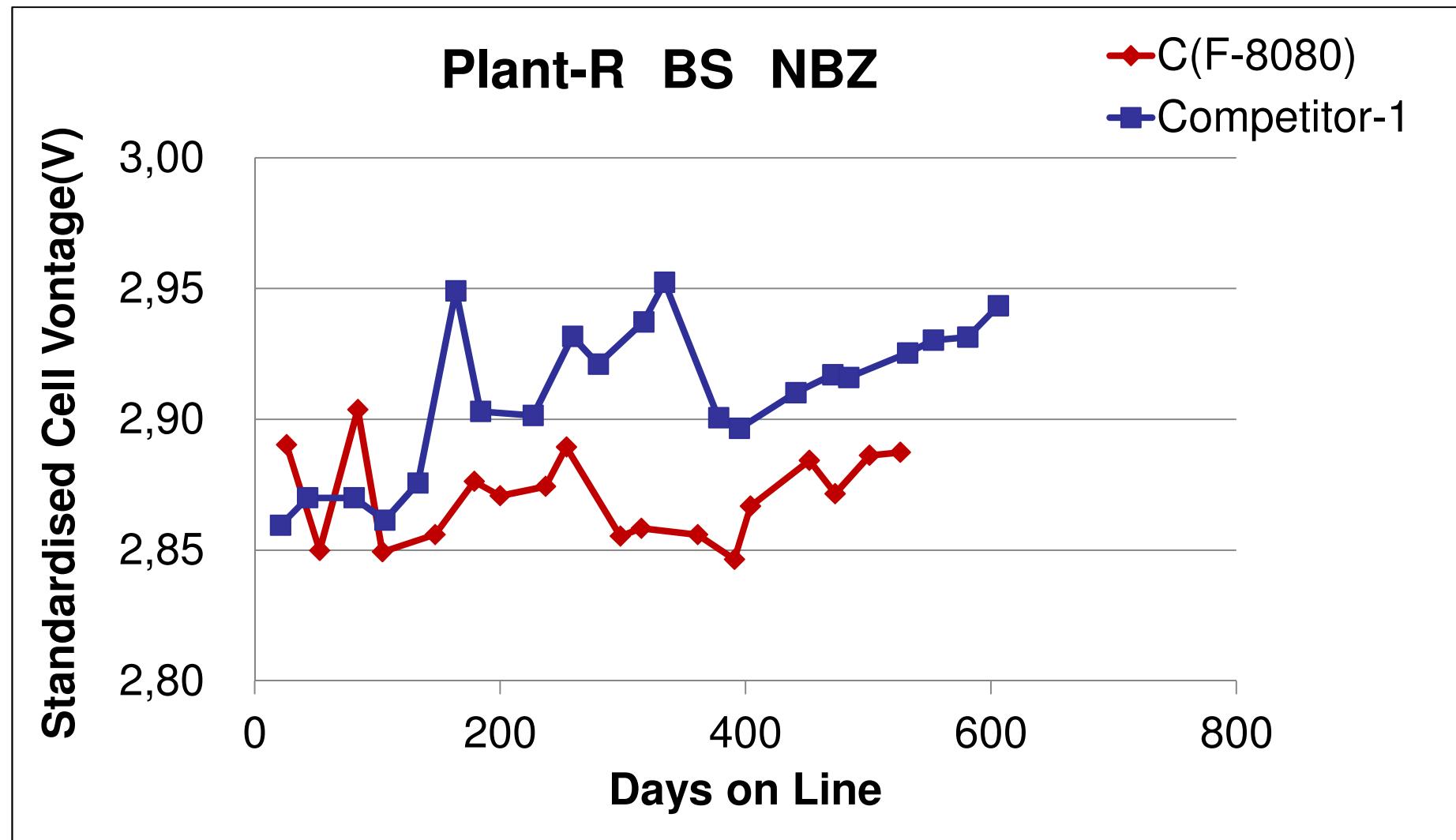


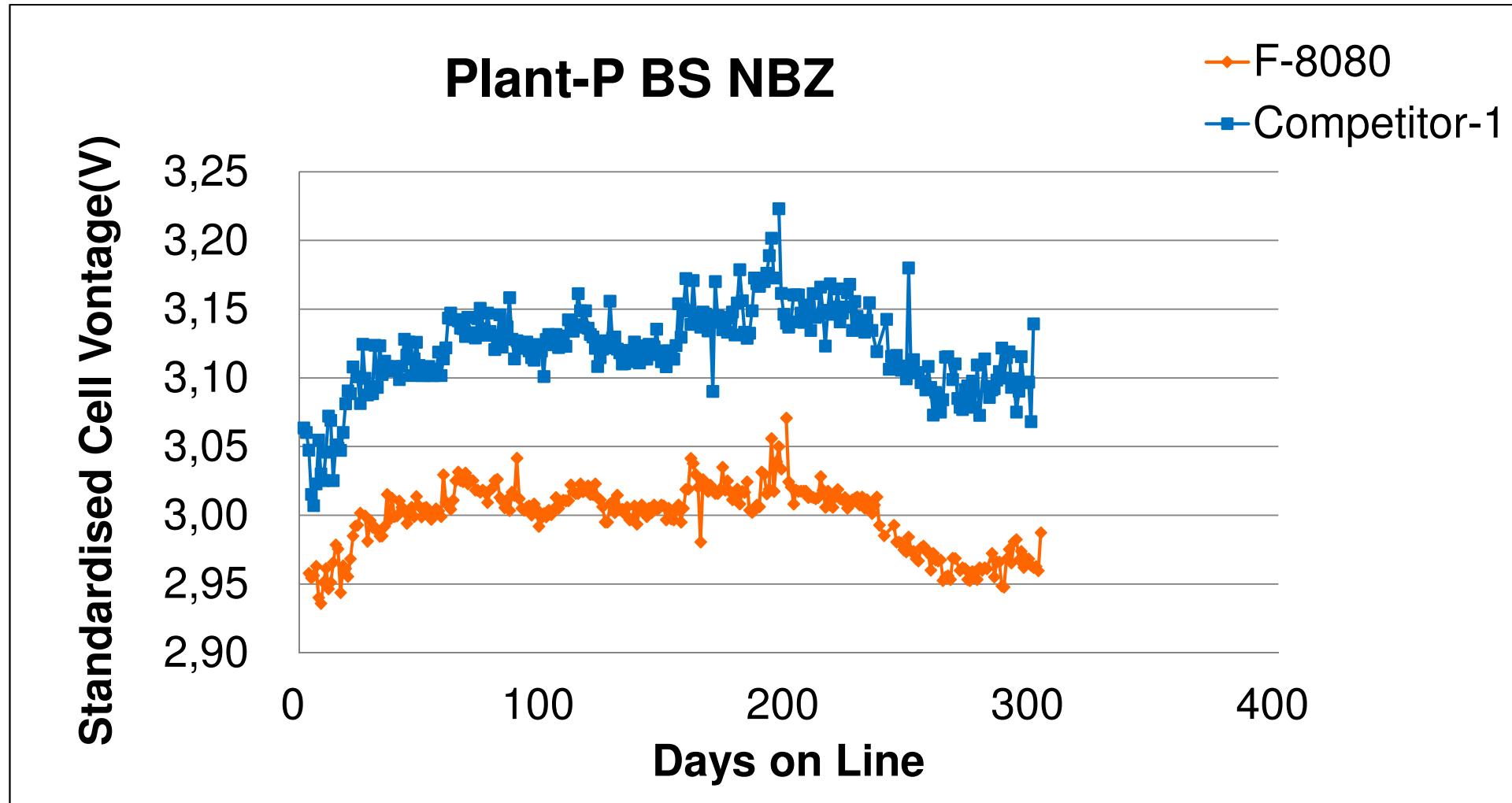




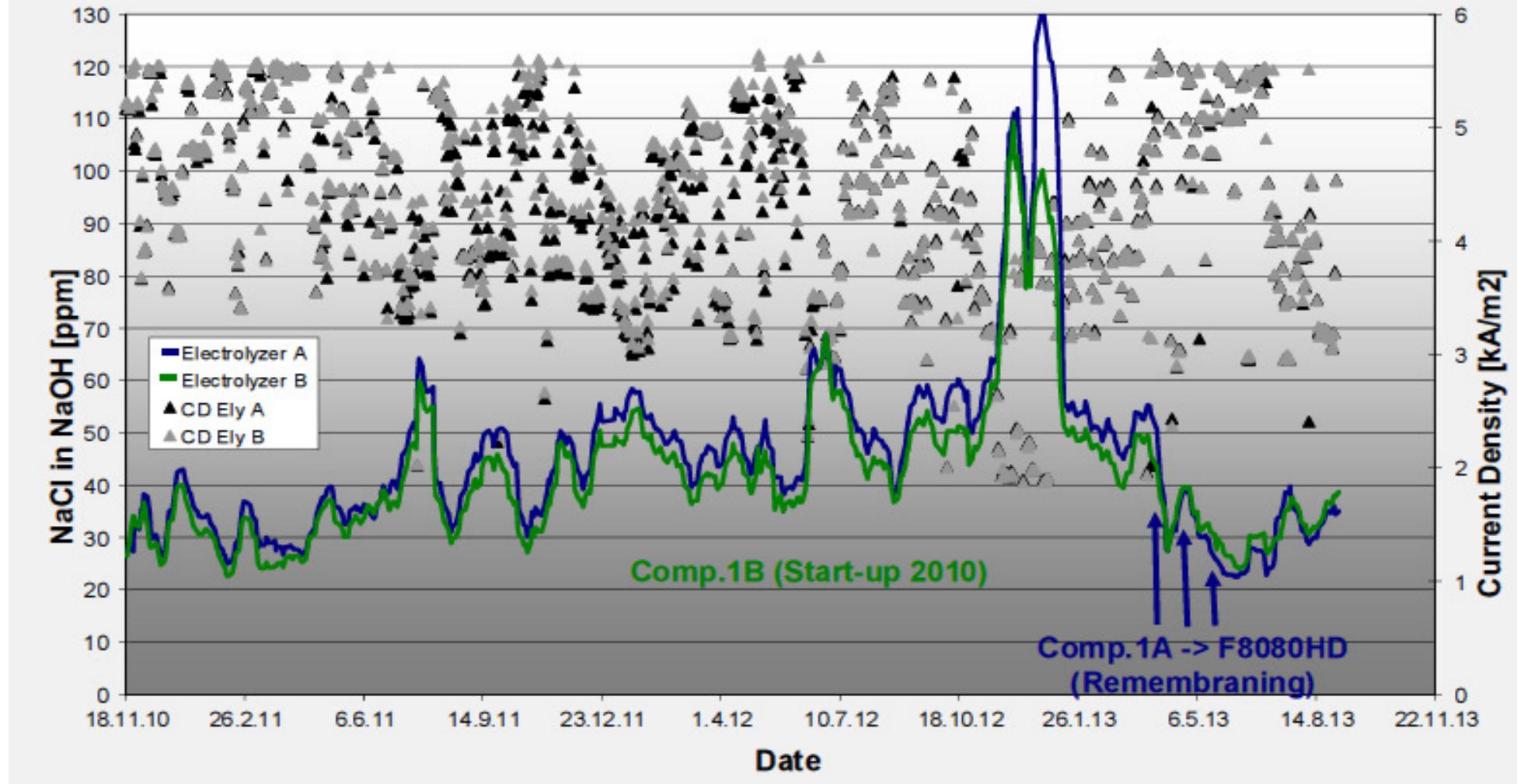
China (2) Blue Star(F-8080)

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Generation 3 – F8080HD after remembranring



Comparison of cell Voltage F-8080 vs. other's(1)

	Electrolyzer type	Cell voltage	Comparison	Current density	Current efficiency
A	UHDE Gen5up	2.97V		5kA/m2	>96%
B	UHDE Gen5	-	-80mV(vs. Comp.-1)	6kA/m2	-
C	UHDE Gen5	2.98V	-60mV(vs. Comp.-2)	6kA/m2	-
D	UHDE Gen5	3.0V		6kA/m2	>96%
E	UHDE Gen5	3.01V	-60mV(vs. Comp.-1)	6.4kA/m2	-
E	UHDE Gen5	-	-80mV(vs. Comp.-2)	6kA/m2	-
F	UHDE Gen5	-	-40mV(vs. Comp.-2)	6.3kA/m2	-
H	UHDE Gen4	3.23V	-50mV(vs. Comp.-2)	5.5kA/m2	>96%

Comparison of cell Voltage F-8080 vs. other's(2)

	Electrolyzer type	Cell voltage	Comparison	Current density	Current efficiency
I	CEC n-BiTAC	3.03V	-70mV(vs. Comp.-1)	6.2kA/m2	97%
J	CEC n-BiTAC	-	-70mV(vs. Comp.-1)	6.5kA/m2	97%
K	CEC i-BiTAC	-	-50mV(vs. Comp.-1)	5kA/m2	O2/Cl2= 0.6-0.9%
M	CEC n-BiTAC	3.02V	-65mV(vs. Comp.-1)	5.5kA/m2	O2/Cl2= 0.5%
N	CEC i-BiTAC	2.98V	-60mV	5.3kA/m2	O2/Cl2= 0.7%
O	CEC i-BiTAC	3.0V	-50mV	5.5kA/m2	-
L	BS NBHZ	-	-50mV(vs. Comp.-2)	4.6kA/m2	-
P	BS NBZ	3.0V	-100mV(vs. Comp.-1)	5.5kA/m2	-
Q	AKC NCZ	-	-70mV(vs. Comp.-2)	5kA/m2	-
R	BS NBZ	-	-60mV(vs. Comp.-1)	4.8kA/m2	>96%

F-8080 is 50~80mV lower cell voltage than competitor's membrane

Introduction of F-8080K and F-8081HDK for KOH production

Developments of Flemion

AGC

- Higher durability against impurities
- High stability of CE
- **Lowest and stable CV**

+

- **Low KCl in KOH**

F-80

New membrane
for KOH
production

F-8020 SP &
F-8051

F-8000 Series

F-8080
F-8080HD
F-8081
F-8081HD

F-8080K
F-8081HDK

Membrane for
NaOH
Production

Membrane for
KOH
Production

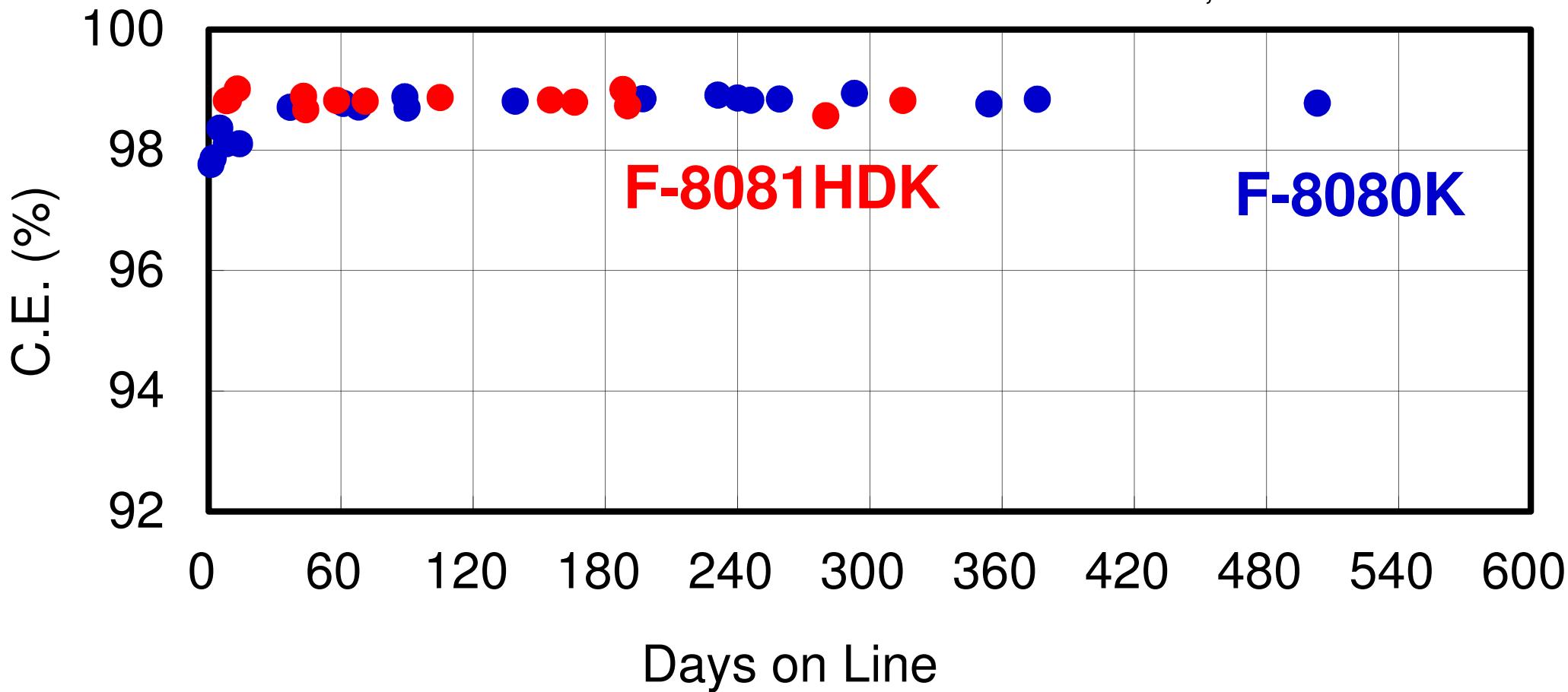
- 1. High Current Efficiency**
- 2. Low Voltage**
- 3. Low KCl in KOH**
- 4. High Resistance Against Impurities in Brine**

High Current Efficiency

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Commercial plant data (AGC Chiba factory)

M3 : 3.0 - 3.3 kA/m², 32 % KOH

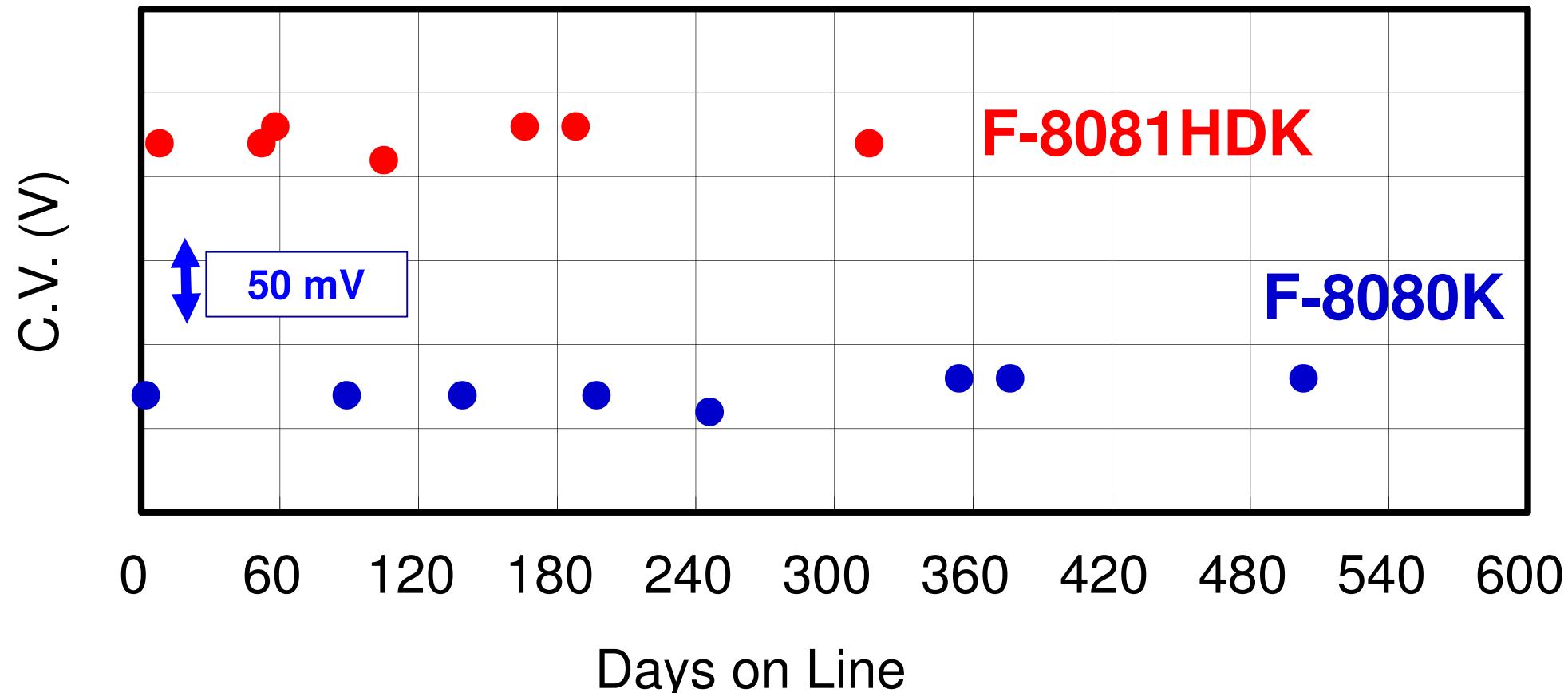


Good & Stable C.E. for 17 month

Low Cell Voltage

Commercial plant data (AGC Chiba factory)

M3 : 3.0 - 3.3 kA/m², 32 % KOH



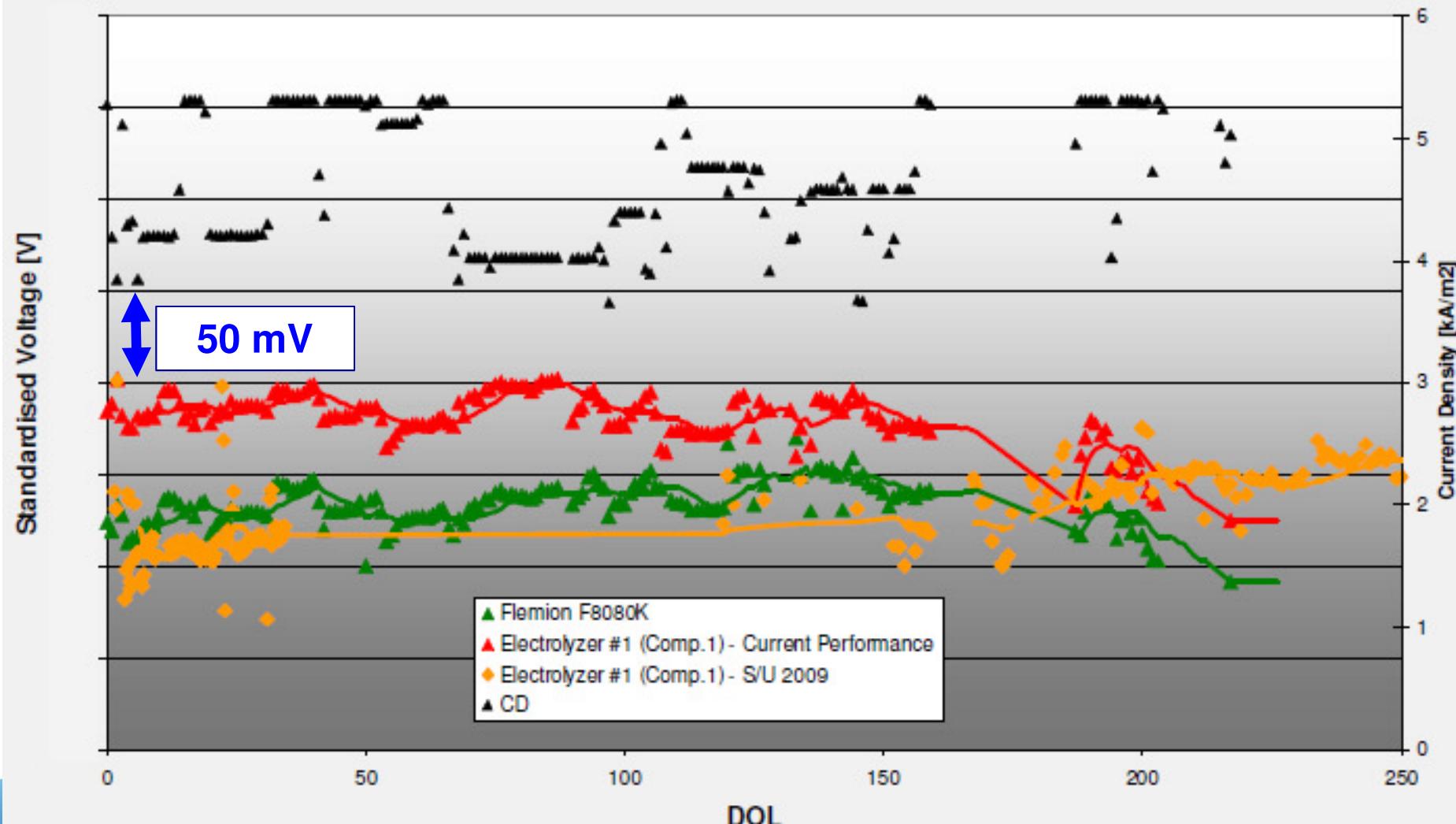
Stable C.V. for 17 month

Low Cell Voltage

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Voltage in KOH Cells in UHDE Gen5 Plant K

BM2.7v5b-32 – K Electrolyzer #1 - Test sheets F8080K

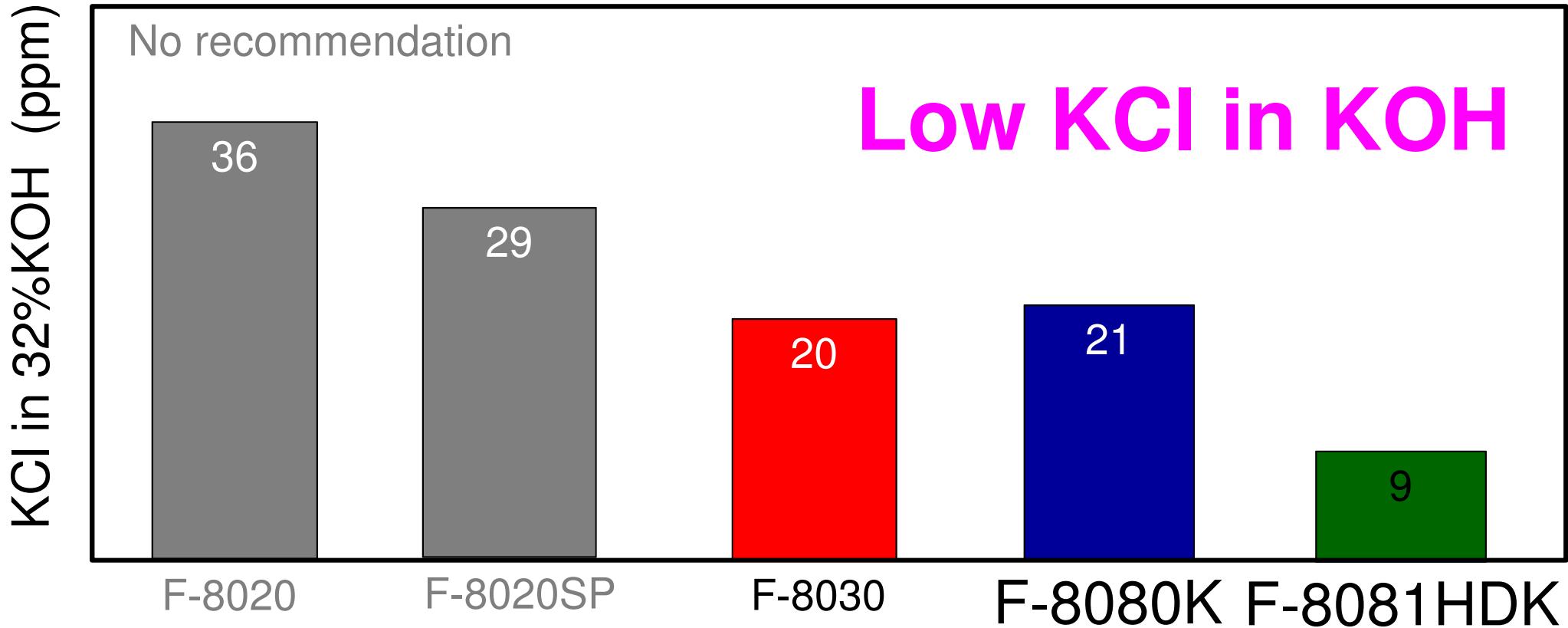


Comparison of Voltage F-8080K and other's membrane

	Electrolyzer type	Cell voltage	Comparison	Current density	Current efficiency
X	AZEC M3	2.75V		3.3kA/m2	>98%
K	UHDE Gen5		-50mV(vs. Comp.-1)	5.2kA/m2	
Z	CEC n-BiTAC	2.93V	-100mV(vs. Comp.-1)	4.6kA/m2	>97.5%

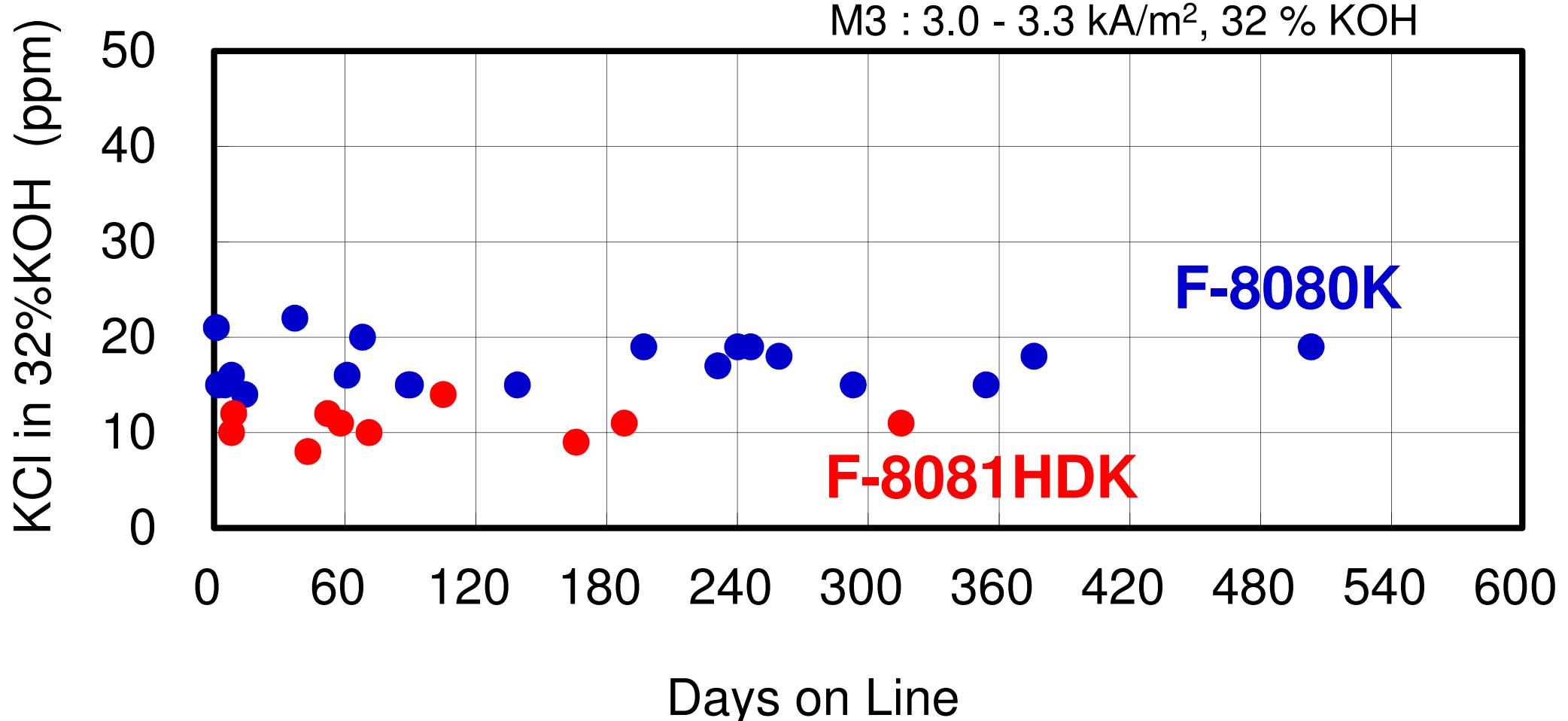
F-8080K is 50~100mV lower voltage than competitor-1, and shows high current efficiency.

0.2m² Pilot Cell, 4 kA/m², 85 °C, 32 wt% KOH, 170-180g/l



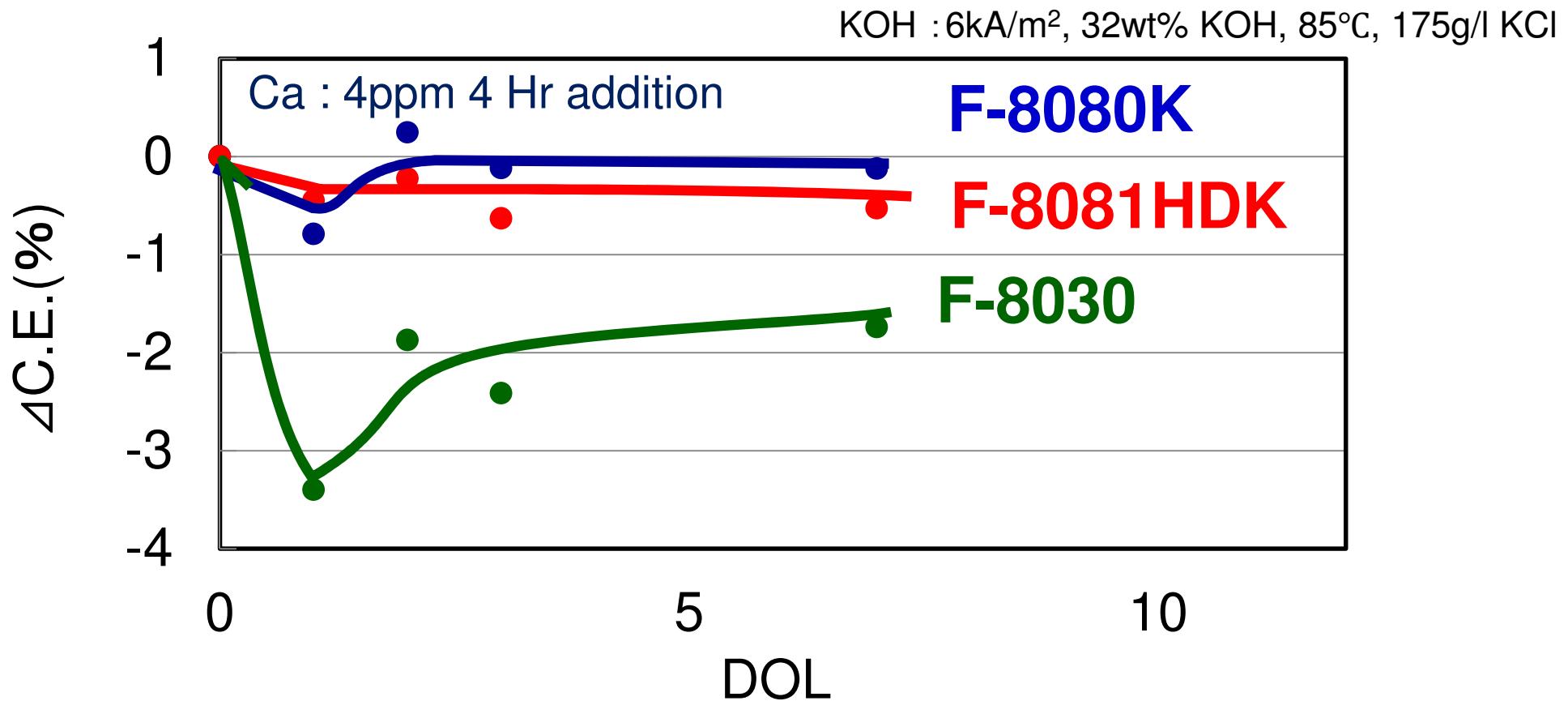
F-8080 series shows low KCl in KOH

Commercial plant data (AGC Chiba factory)



Low & Stable KCl in KOH for 17 month

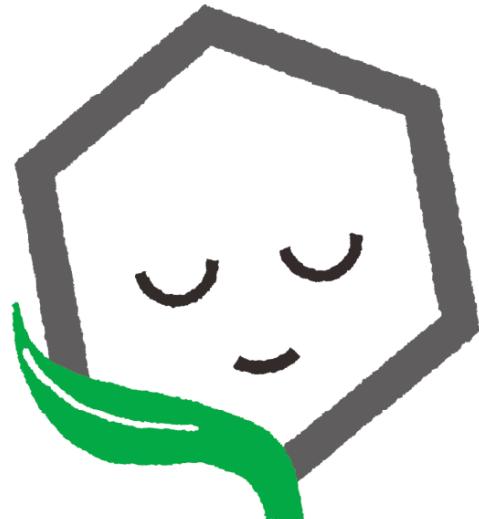
Ca upset at KOH operation



F-8080K and F-8081HDK has higher stability against Ca upset.

- 1. Many customer's data shows that F-8080 is 50~80mV lower cell voltage than competitor's membrane.**
- 2. F-8080HD shows lower NaCl in NaOH**
- 3. F-8080K shows 50~100mV lower cell voltage than competitor's membrane.**
- 4. F-8081HDK shows low KCl in KOH, applicable for production of high quality KOH.**
- 5. F-8080K and F-8081HDK are tolerant to impurities in brine.**

Thank you for your attention



**Chemistry
for a Blue Planet**
AGC Chemicals

私たちは化学の力を通じて、安全、安心、快適で、環境に優しい世の中を創造します。

Create a safe, secure, comfortable and environmentally friendly world with chemical technology.

通过我们的化学技术, 来创造一个安全、安心、舒适且环保的世界!