

**Third Annual International Science and
Technology Conference
"Battery Innovation-2021"**

Togliatty, March 18, 2021.

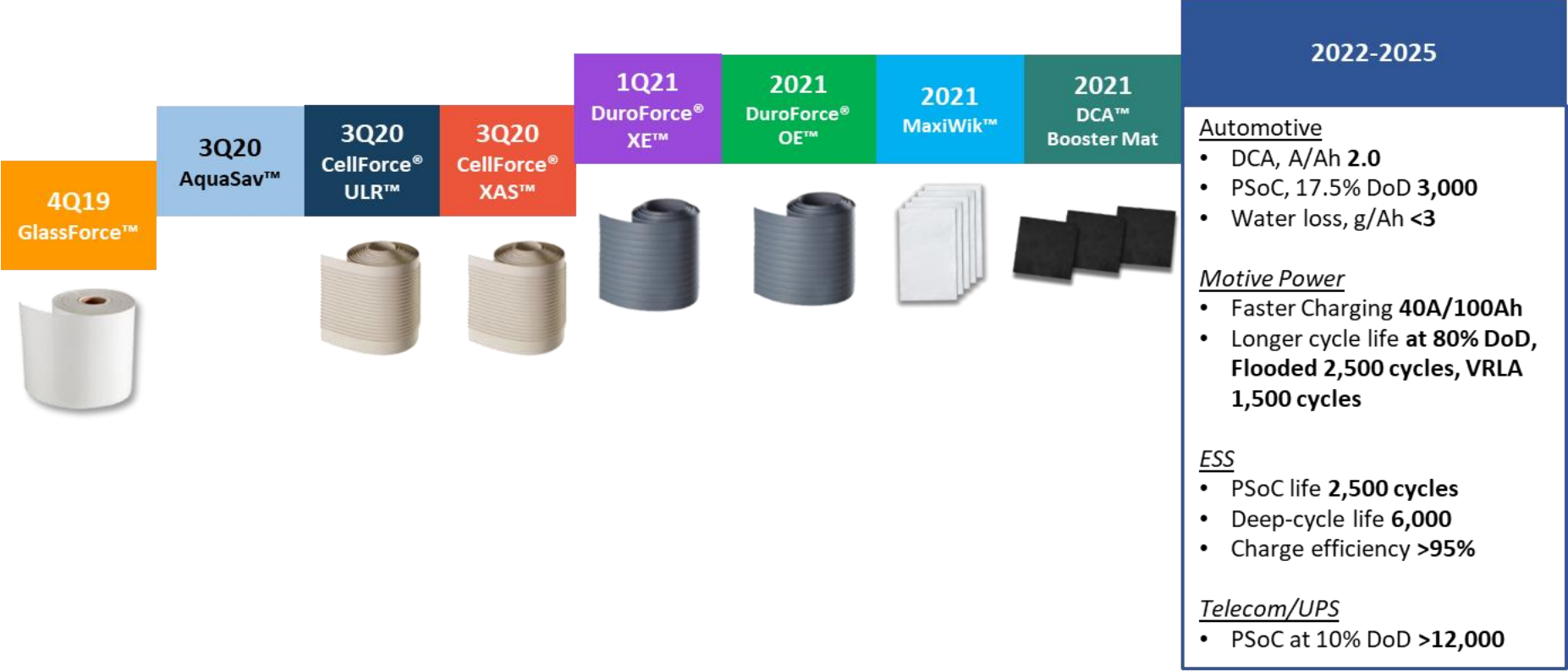
**MICROPOROUS TECHNICAL SOLUTIONS
DIVYA TIWARI**

**TECHNICAL MANAGER
MICROPOROUS LLC**

OUTLINE

- MICROPOROUS R&D ROADMAP
- VRLA
 - GLASSFORCE[®] AGM
- FLOODED & EFB
 - CELLFORCE[®] ULR
 - MAXIWIK[™]

MICROPOROUS R&D ROADMAP



Source Consortium for Battery Innovation (2020)

GLASSFORCE® AGM

IG

- PowerSports, Motorcycles, E-mobility
- BET Surface Area: 0.9 – 1.3 m²/g; 160 – 420 g/m²

GE

- Automotive, Start-Stop, Heavy-duty Trucks
- BET Surface Area: 1.3 – 1.6 m²/g; 160 – 420 g/m²

EB

- Energy Storage, Telecom, Premium Products, Aviation
- BET Surface Area: 1.6 – 2.2 m²/g; 160 – 420 g/m²

AUTOMOTIVE AND STATIONARY APPLICATIONS



Cars



Other Automotive



UPS



Telecom



ESS



AUTOMOTIVE
GlassForce™ IG



AUTOMOTIVE
GlassForce™ GE



STATIONARY & SPECIALTY
GlassForce™ EB

QUALITY CONTROL THROUGH VERTICAL INTEGRATION

SAND

- Low Impurity Raw Materials
- C - Glass Chemistry

FIBERS

- Rotary Fibers (2.6 – 4.5 μm)
- Flame Attenuated Fibers (0.1 – 1.5 μm)

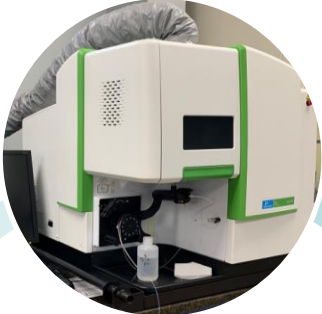
AGM

- Flotation Drying
- Inline or Offline Slitting
- Winding Thickness Control



BCI COMPLIANCE & QUALITY ASSURANCE

PERKIN ELMER
ICP/OES



MICROMERITICS
GEMINI BET



INSTRON
3343



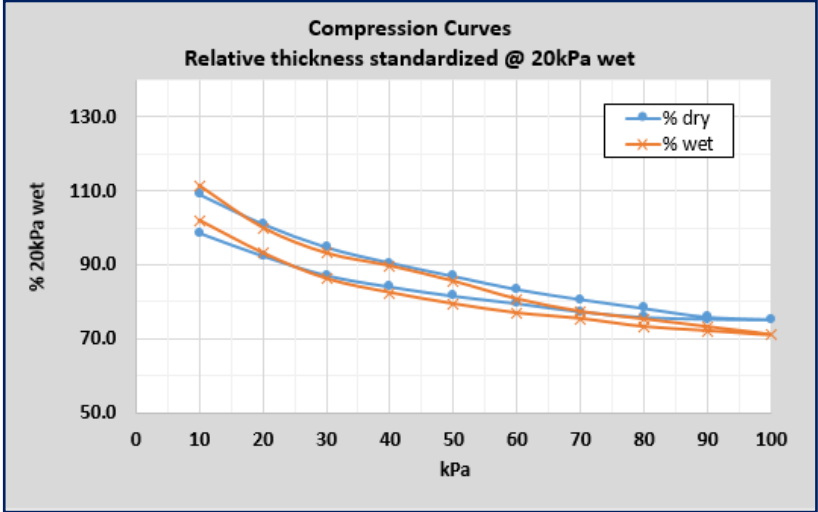
ADVANCED
ANALYTICAL
LAB



PROGAGE200

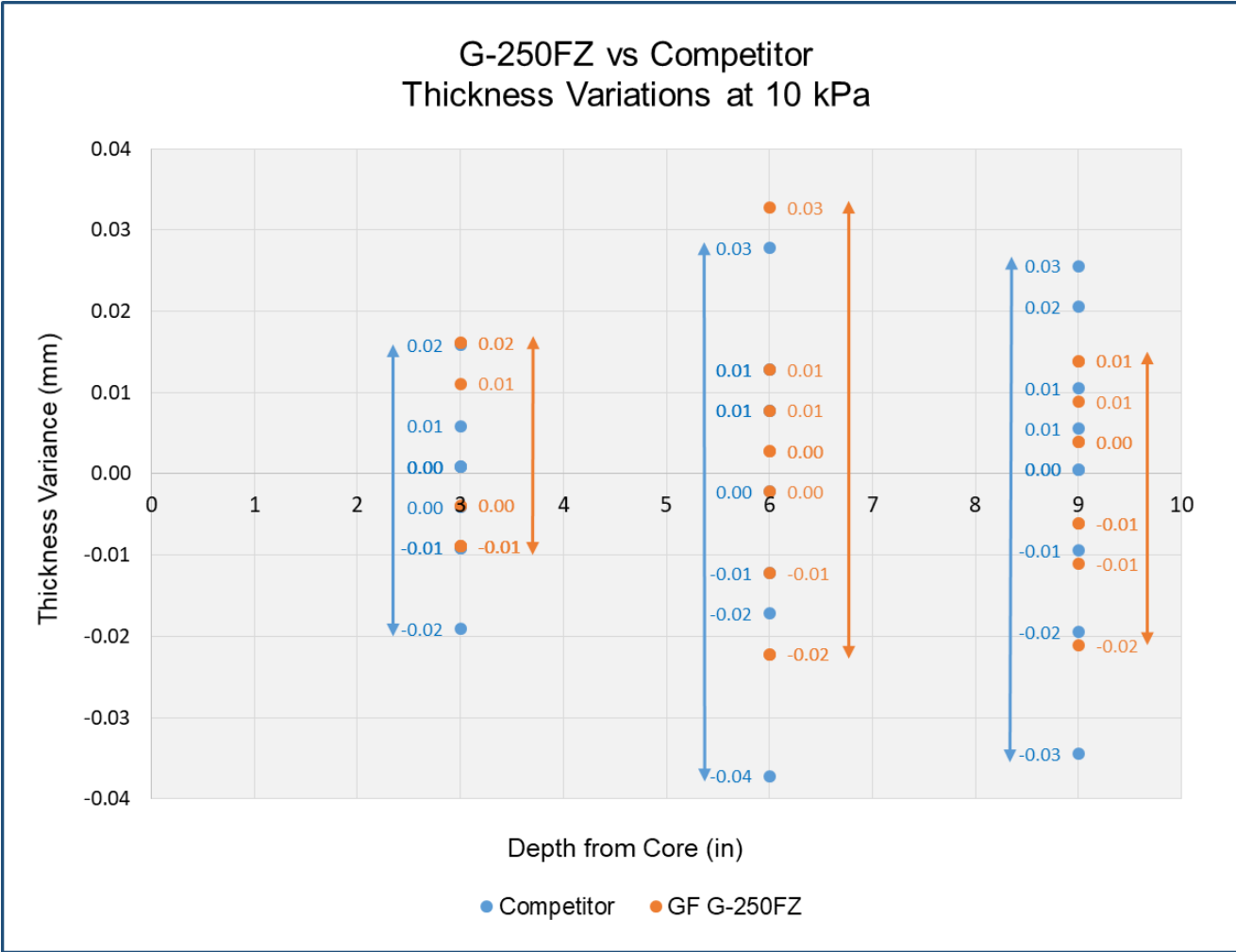
GlassForce® G-250FZ
AGM Separator Certificate of Analysis

Specification	Unit	Target Value	Tested Value	Test Method
Specific surface Area	m ² /g	1.45 ± 0.15	1.42	BCI 3A
Overall Thickness	mm (@ 20 kPa)	1.45 ± .07	1.40	BCI 3A
Grammage	g/m ²	254 ± 12	254	BCI 3A
Roll Width	mm	160 ± 1	160.0	--
Bulk Density	g/mm	170 ± 17	181	T-500
Tensile strength, MD	N/mm ²	> 0.40	0.55	BCI 3A
Elongation, MD	%	3	5	BCI 3A
Tensile Strength, CD	N/mm ²	> 0.15	0.31	BCI 3A
Elongation, CD	%	5	7	BCI 3A
Maximum pore size	µm	< 20	19.7	BCI 3A
Capillary Rise	mm/min	> 40	56	BCI 3A
Acid Absorption under 20 kPa	g/g	> 6	6.35	BCI 3A
LOI	%	< 1	0.35	BCI 3A
Moisture	%	< 0.5	0.1	BCI 3A
Al (Aluminum)	ppm	< 500	130	BCI 3A
Fe (Iron)	ppm	< 100	32	BCI 3A
Cl (Chloride)	ppm	< 50	6	BCI 3B
Cr (Chromium)	ppm	< 5	1	BCI 3A
Ni (Nickel)	ppm	< 2	< 1	BCI 3A
Cu (Copper)	ppm	< 10	< 1	BCI 3A
Mn (Manganese)	ppm	< 5	< 1	BCI 3A
Zn (Zinc)	ppm	< 100	3	BCI 3A



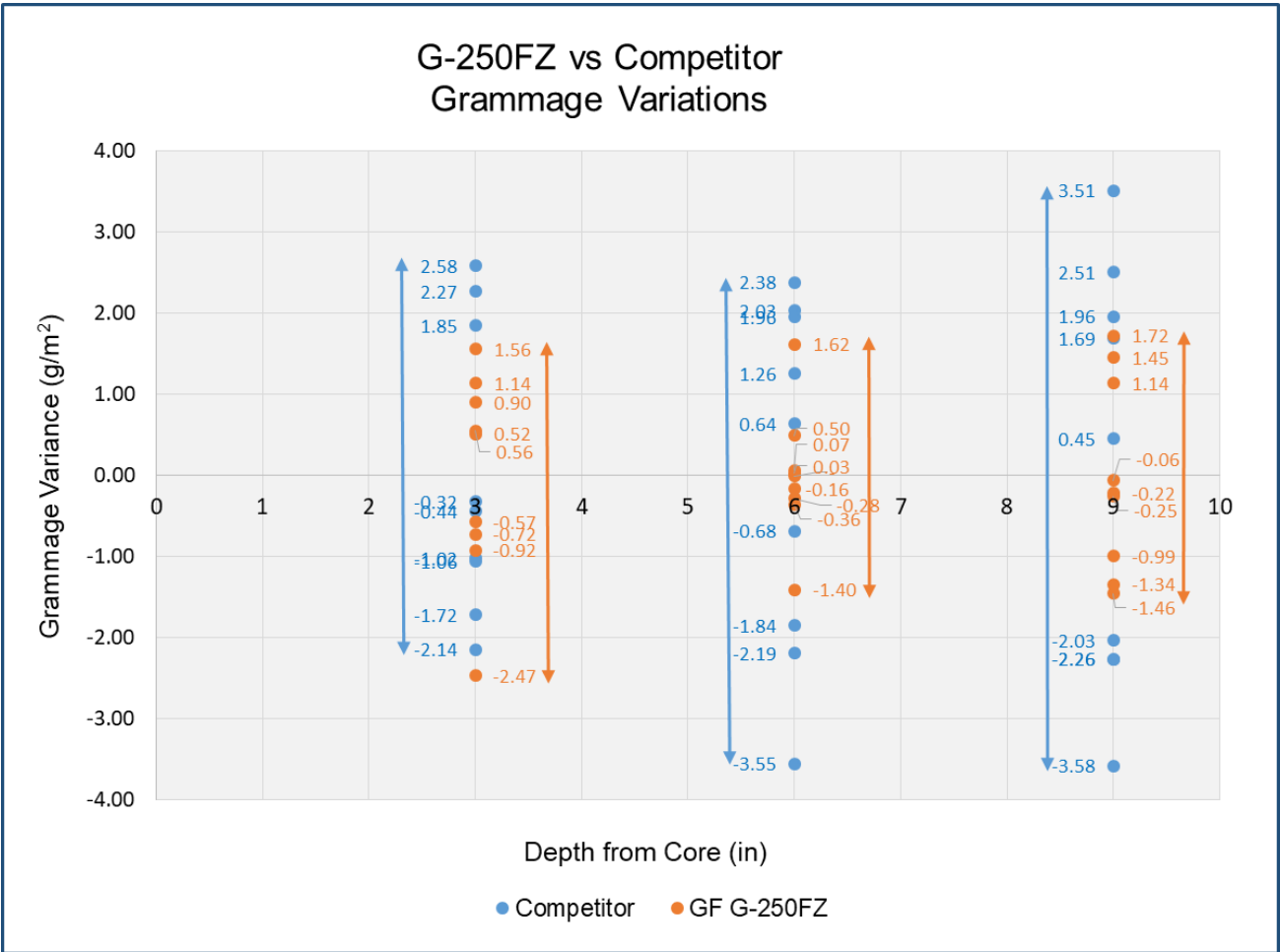
GLASSFORCE® THICKNESS VARIANCE

Minimal thickness variations throughout the 750 mm wide roll



GLASSFORCE® GRAMMAGE VARIANCE

Low Grammage variations throughout the 750 mm wide roll

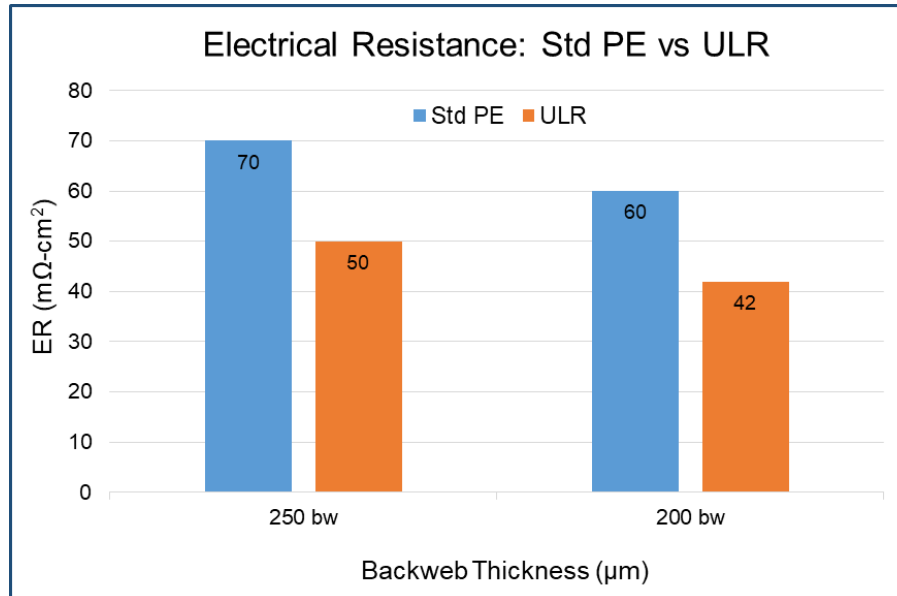


CELLFORCE[®] ULR

Ultra Low Resistance Separator for Fast Charging in EFB, Golf Carts and Forklifts

30% Reduction in ER compared to Std PE separator

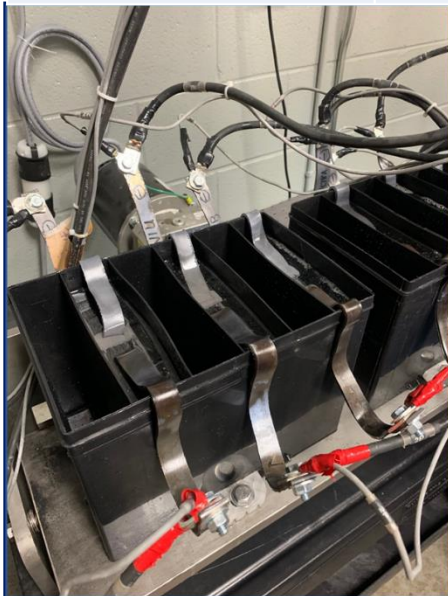
High Perox Stability through novel formula



MAXIWIK™

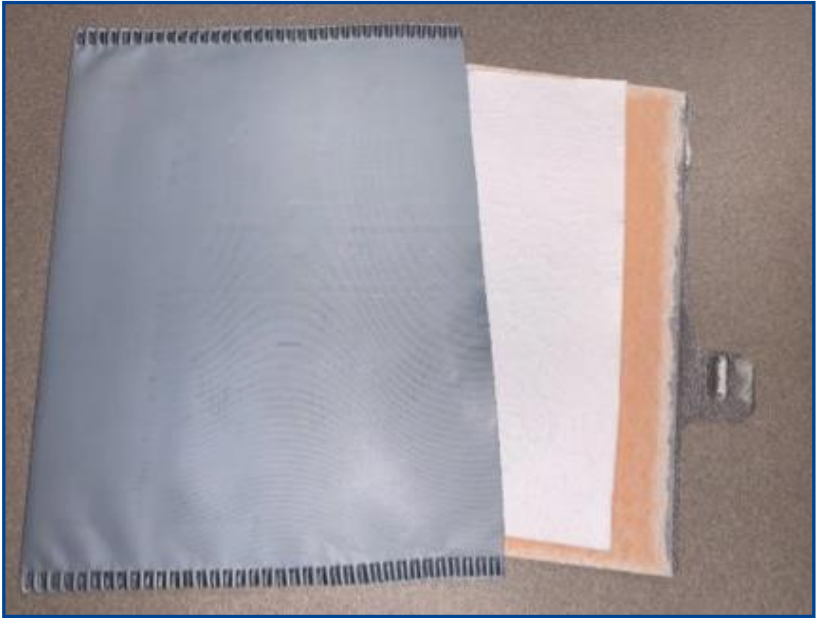
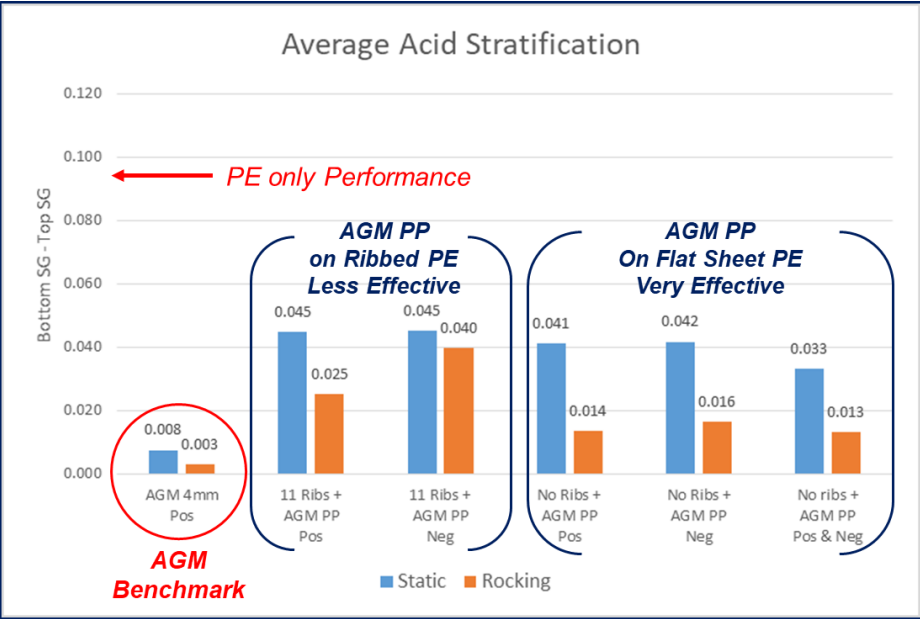
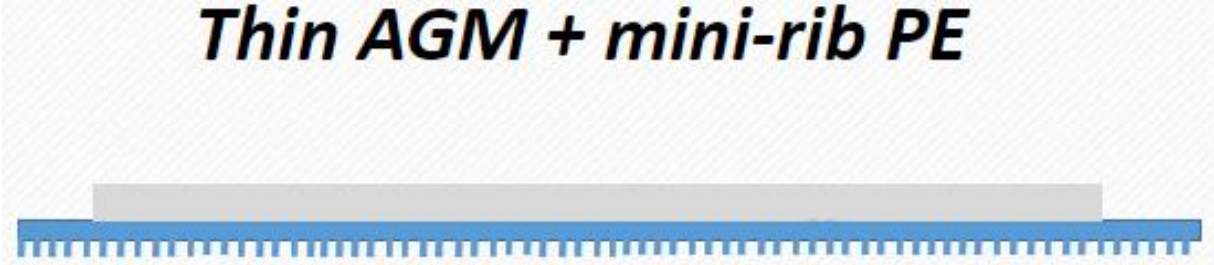
Reducing acid stratification in Start-Stop and PSoC applications
 Test Standard: EN 50342-6 17.5%DoD Continuous Cycle Test

Step	Time	Current	Percent
1 – Rest	30 min	0A	
2 – Discharge	2.5 hours	6A	- 37.5%
3 – Charge	40 min	10.5A (2.4vpc max)	+17.5%
4 – Discharge	30 min	10.5A (1.0 vpc min)	+13.1%
5 – Repeat 3-4			
6 – Stop after 20 cyclers	~26 hours		



MAXIWIK™

Thin AGM + mini-rib PE



**THANK YOU FOR YOUR
ATTENTION!**

DIVYA TIWARI

Company name: MICROPOROUS LLC

Address : 596 INDUSTRIAL PARK RD, PINEY FLATS, TENNESSEE, USA

Telephone : 423-793-4017

E-mail: divya.tiwari@microporous.net

Web-site: <https://microporous.net>