PowerSafe SBS

EnerSys Power/Full Solutions

EnerSys Power/Full Solutions™

&

EnerSys Powertech

Battery Solutions

Presented by Wouter Vink

Business Development Manager

Enersys Powertech

Reserve Power / DC Power Solutions

Role /Activity



EnerSys® Group:Primary Markets

RESERVE POWER : used to supply standby power for :

- telecommunications applications such as wireless and wireline systems, including the internet
- uninterruptible power system applications for electronic, security, computer systems and switchgear in utilities
- renewable energy markets of solar wind and water power generation
- defense and aerospace : high technology power for defense aircraft, vehicle and submarine (multiple product technologies)

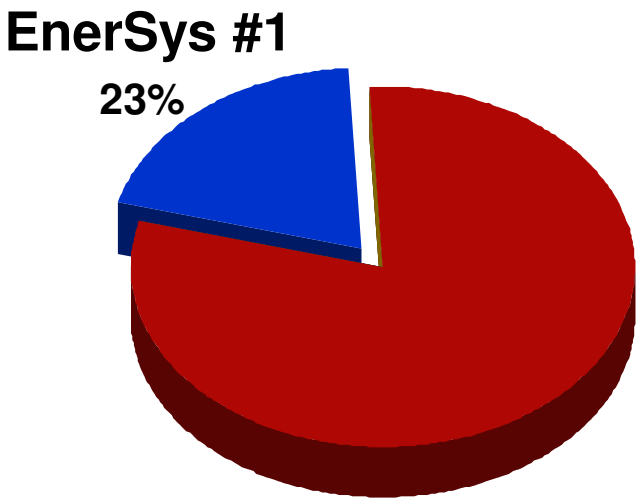
MOTIVE POWER : used as primary power source for :

- electric industrial forklift trucks for factory, warehouse, retail and logistic use
- electrically powered specialty equipment for airports, railroads, people movers, golf carts, cleaning equipment, mines, etc.

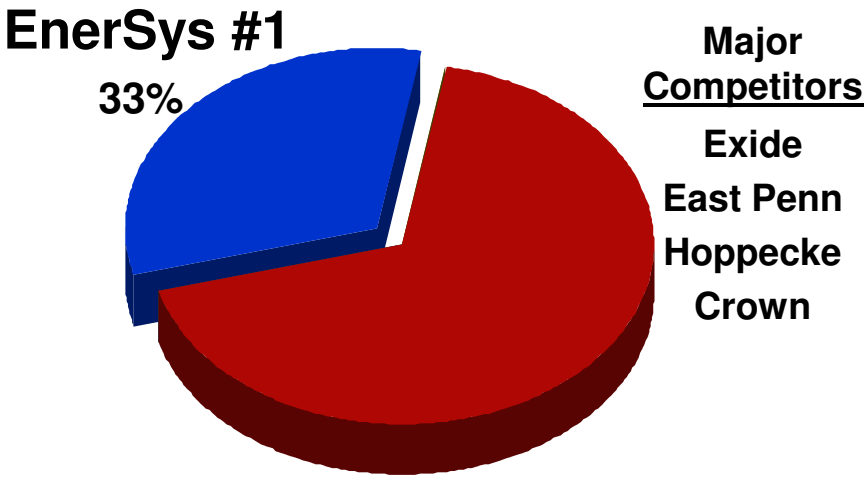
Leading Market Positions

#1 Worldwide Market Share - 27%

Reserve - $3.5 Billion



Motive - $2.5 Billion

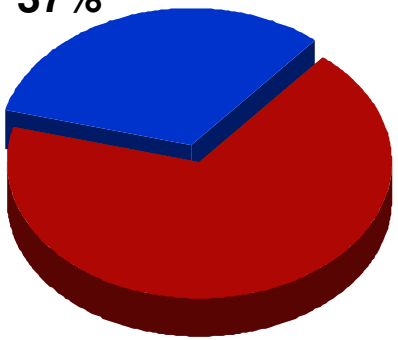


Source: BCI, Eurobat industry reports and management estimates. Market size and share are for batteries and chargers only. It excludes the aerospace and defense market (estimated at $1 to $2 billion) and service revenue.

Regional Market Share
(27% Global Share)

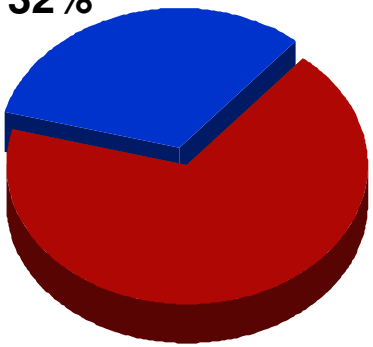
Americas
$1.8 Billion

EnerSys #1
37%



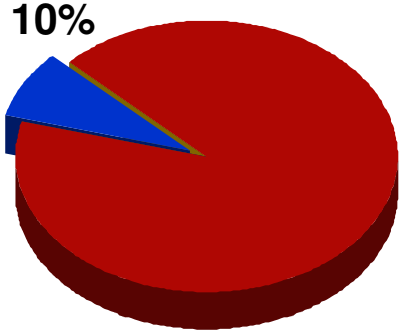
EMEA
$2.5 Billion

EnerSys #1
32%

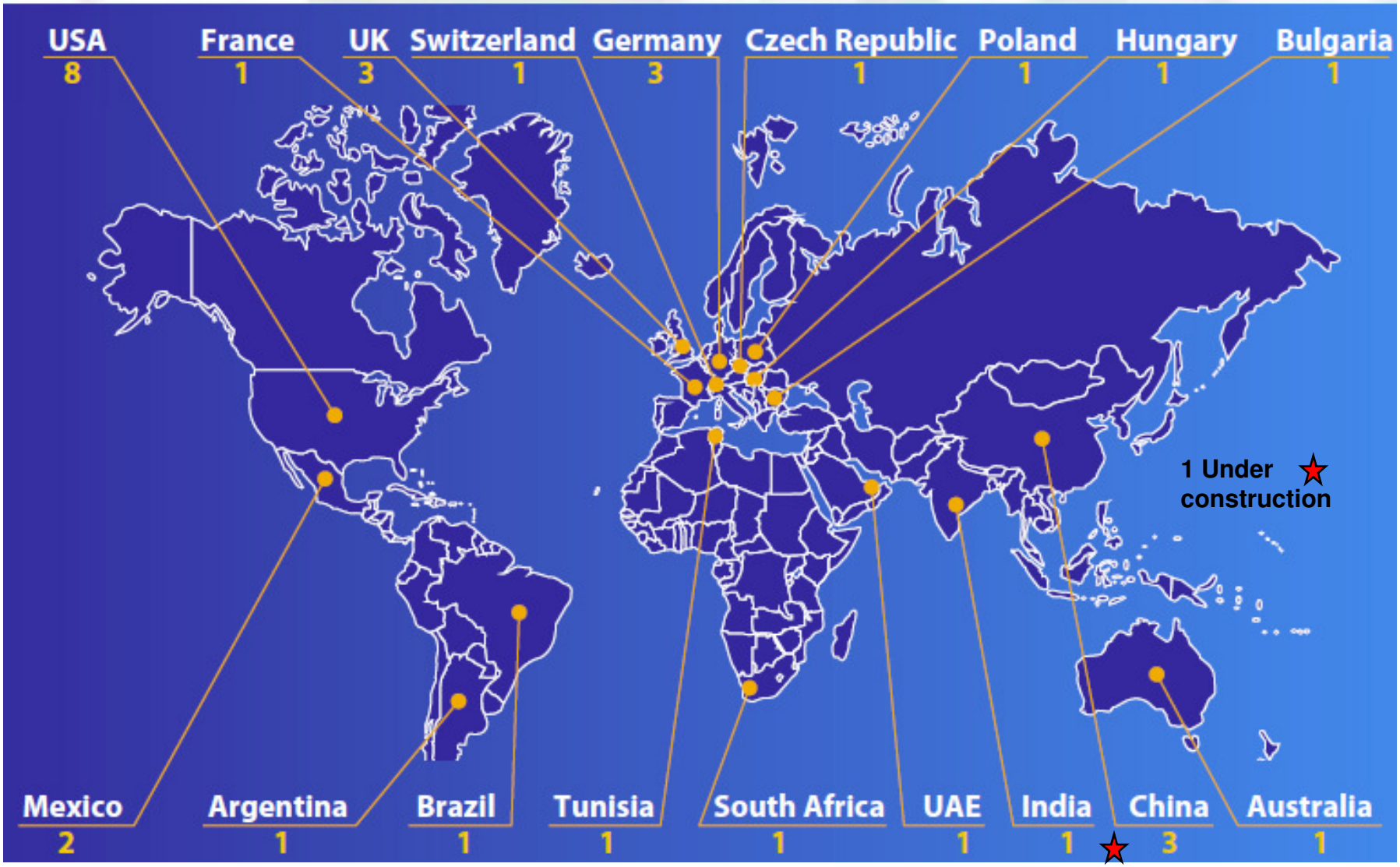


Asia
$1.7 Billion

EnerSys #5
10%



32 x Global Manufacturing Locations &
9,000 Thousands Employee's



Role /Activity



Africa Footprint

- **South Africa - HQ**
  - System Designs
  - Sales
  - Warehousing
- **Enersys**
  - Morocco (Warehouse & Sales Office)
  - Algeria (Rep Office)
  - Tunisia (Factory & Sales Office)
  - Ghana (Rep Office)
  - Kenya (Rep office)-pending
- **Distribution network in various African countries**
- **Powertech**
  - Tanzania, Nigeria, Namibia, Mozambique

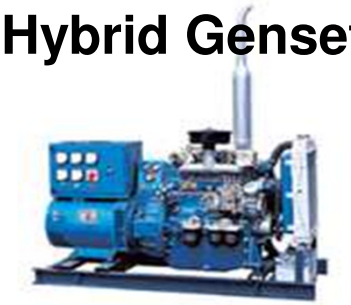


Solution Integrator





Hybrid Genset







Rectifier And Batteries

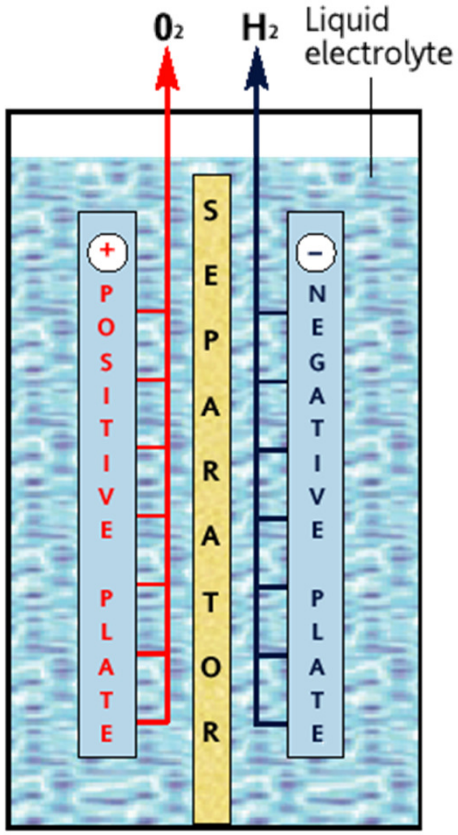




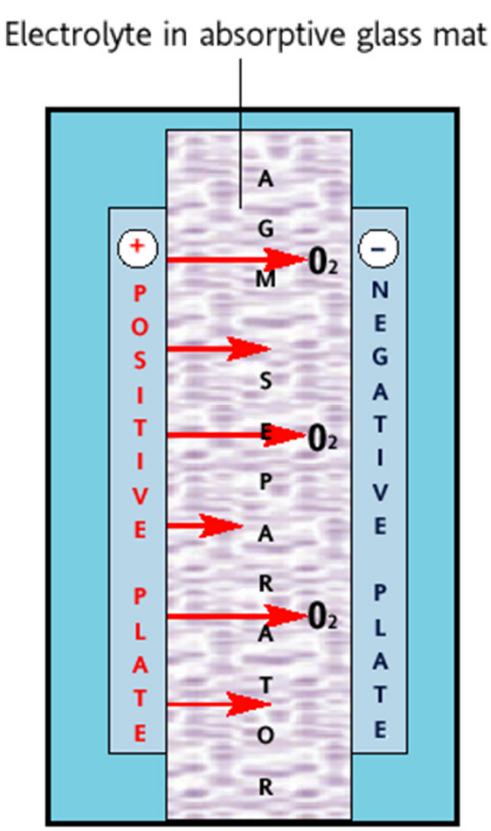
DC Aircon



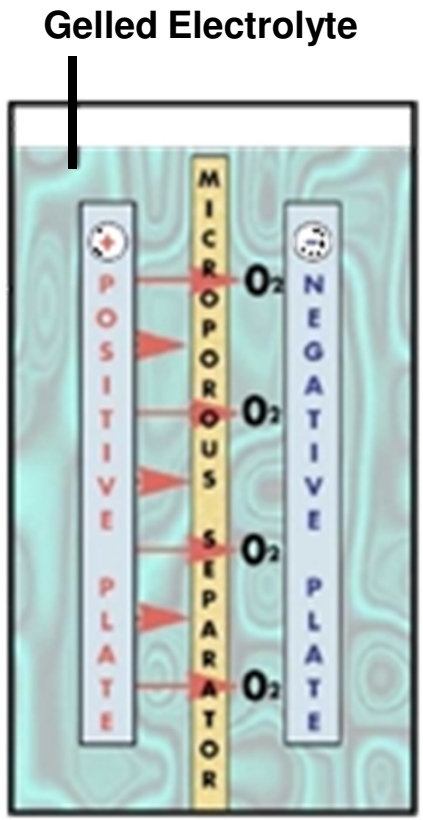
Battery Technologies



Flooded



VRLA AGM



VRLA Gel

THIN PLATE THE ADVANTAGE

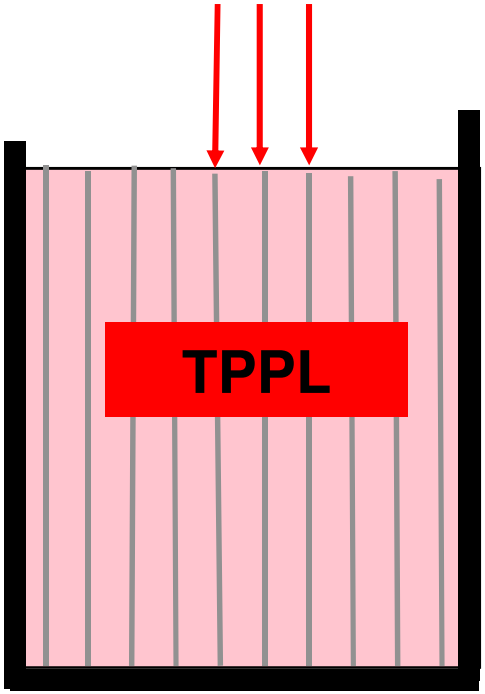
ENERSYS MANUFACTURING
PROCESS ALLOWS PROCESSING OF PURE
LEAD GRID RESULT : 1mm THIN

CONVENTIONAL BATTERY BOOKMOLD
CASTING REQUIRES ARTIFICIAL HARDENERS
TO PROCESS GRID

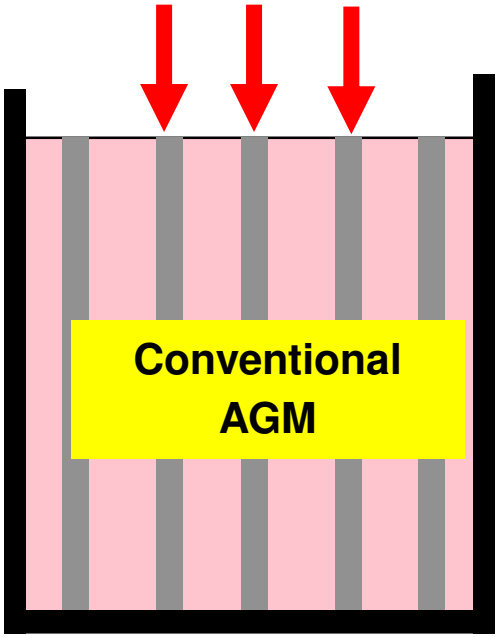
RESULT : 2 - 4 mm THICK

SBS Eon THIN PLATE TECHNOLOGY = MORE PLATES IN EACH 2 VOLT CELL

RESULT = MORE CRANKING AMPS & SUPERIOR POWER & ENERGY DENSITY



100ahr 32.6KG



100ahr 30.8KG
(V series)



PowerSafe™ SBS

Vs.



Traditional Lead-Calcium AGM Monobloc Product

What Makes PowerSafe SBS Different?

EnerSys® Power/Full Solutions

- Extremely Thin Grids → High Power Density
- Highly-Automated Process → Product Consistency
- 99.99% Pure-Lead
  - Grid Corrosion & Growth no Longer Limiter for Battery Life

→
  - Longer Float Life
  - Higher Cycling Capabilities
  - Better Recovery From Abuse
  - Long Shelf Life
- Medical-Grade Acid

	PowerSafe™ SBS	Traditional AGM
Cost / Ah	Approx. 1.25X	X
Energy Density (Ah / ft^3 @ 12V)	244.5	218.7
Ah/lb	1.44	1.15
Approximate Design Life @ 25ºC	15 years	5 to 10 years
Shelf Life @ 20ºC	24 months	6 months
Pos Grid Thickness	0.040”	0.111”
Grid Composition	99.9% Pure Lead	Lead-Calcium-Tin Alloy
Float Current (**mAmp**s / 100Ah)	20	30 to 100

	PowerSafe™ SBS	Traditional AGM
Cost		
Energy Density		
Ah/lb		
Approximate Design Life		
Shelf Life @ 20ºC		
Grid Composition		
Float Current		

PowerSafe™ SBS *Tubular Gel*

Cost / Ah	X	2 to 3x
Energy Density (Ah / ft^3 @ 12V)	244.5	118.6
Ah/lb	1.44	0.84
Approximate Design Life @ 25ºC	15 years	20 years
Nonspillable?	Yes	Sometimes
Pos Grid (Rod) Thickness	0.040”	0.126”
Grid Composition	99.9% Pure Lead	Lead-Calcium-Tin Alloy
Float Current (mAmps / 100Ah)	20	7 to 26

	PowerSafe™ SBS	Tubular Gel
Cost	✓	
Energy Density	✓	
Ah/lb	✓	
Approximate Design Life@ 25ºC		✓
Shelf Life @ 20ºC	✓	
Grid Composition	✓	
Float Current	✓	

Summary of Telecom applications

EnerSys®
Power/Full Solutions



PowerSafe®



genesis® TD

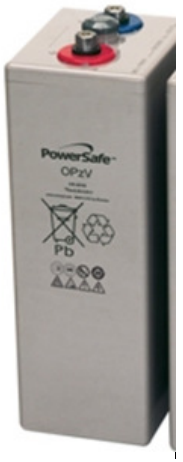
1) Float charge mode: Stable grid, stable ambient temperature, temp compensated float charge current, no cyclic use (<10 cycles p.a.)	2) Grid assist application: Quite stable grid, ambient temp. more/less stable, medium cyclic use (50-100 cycles p.a.), low risk for PSOC
3) PSOC: Unstable grid, warm ambient, uncontrolled cyclic use (incl. microcycles), high risk for PSOC	4) Off Grid Mode: Diesel-hybrid, warm ambient regular cyclic use ➔ usually 1 cycle per day



PowerSafe™ SBS

PSOC: Partial State Of Charge

PowerSafe®



EnerSys Technology matrix

Characteristic	PowerSafe V FT	OPzV	SBS Eon
Nominal voltage	12V	2V	2 - 12V
Nominal capacity	30 - 190Ah	215 to 3170Ah	62 to 900Ah
Shelf life	6 months	6 months	2 years
Design life	12 years	20 years	15 years
Hybrid cycles (60% dod) **35ºC** 100% SOC / **PSOC** (85%) per cycle	no	1203 / **902**	1170 / **878**
Hybrid cycles (60% dod) @ **50ºC** 100% SOC / **PSOC** (85%) per cycle	n/a	n/a	1170 / **878**
Cycles derating for temperature	yes	yes	no

Applications selection matrix:

Application	SBS EON	PowerSafe V FT	OPzV
Stable grid (float)	✓	✓	✓
Grid assist – daily cycle	✓	✗	✓
Unreliable grid – uncontrolled PSOC	✓	✗	✗/✓
Hybrid – Full SOC	✓	✗	✓
Hybrid – Controlled PSOC	✓	✗	✗/✓

PowerSafe SBS

EnerSys
Power//Full Solutions

AVAILABLE TO ORDER FROM 02 SEPTEMBER 2013 !

NEW PRODUCT !

PowerSafe SB 900

EON Technolo xtension



Overview of SBS 320–900

- Major extension to the highly successful PowerSafe SBS product range
  - Part of the existing, outstanding EON Technology series
- 7 brand new 2 volt single cells offering a large capacity range
  - From 320 up to 900Ah (C_{10}/1.80Vpc/20°C rate)
- Ideally suited for hybrid telecom applications (not exclusively)
- New products combine the use of EnerSys' proven, advanced Thin Plate Pure Lead (TPPL) and EON technologies with OPzV's DIN container sizes and state-of-the-art manufacturing process
- Up to 51% increase in capacity (C_{10}/1.80Vpc/20°C) compared with equivalent OPzV sizes while still offering the outstanding features and benefits of PowerSafe SBS EON Technology
- Full production in September 2013
  - SBS 900 cells still available for trials
  - Other types available shortly (orders can be placed now)

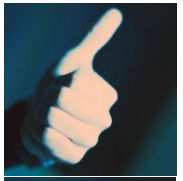
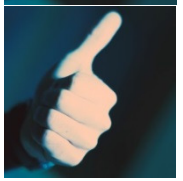
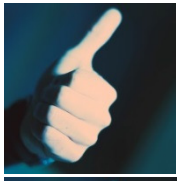
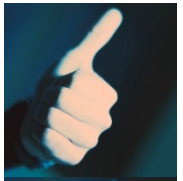
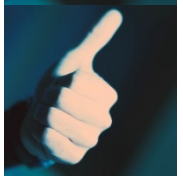


Designed for Various Applications

Telecom (hybrid and float)	
Utilities (power generation and distribution, oil and gas, etc.)	
Large UPS installations (datacentres, etc.)	
Off-grid energy storage (power generation and distribution, etc.)	

The outstanding features and benefits of PowerSafe SBS EON Technology make the SBS 320-900 series an attractive solution for various applications

Ideal For Various Telecom Operation Modes

Hybrid	Controlled full state of charge	
	Controlled partial state of charge	
Float	Stable grids (reliable mains)	
	Semi-stable grids (grid assist)	
	Unreliable grids (uncontrolled partial state of charge)	

The SBS EON Technology is proven and trusted in all types of telecom operation modes, in particular hybrid ones (typically a battery and a diesel generator)

Battery Foot Print

- Up to 51% more Energy
  - In the same foot print!

- Or Less cabinet space !
  - For the same OPZV power





Outstanding Energy Density

PowerSafe SBS EON Cell Type	Nominal C10 Capacity (Ah) C10/1.80Vpc/20℃		PowerSafe OPzV Cell Type	Capacity Increase (%)
	SBS	OPzV		
SBS 320	320	215	4 OPzV 200	49
SBS 400	400	265	5 OPzV 250	51
SBS 480	480	320	6 OPzV 300	50
SBS 580	580	385	5 OPzV 350	51
SBS 680	680	465	6 OPzV 420	46
SBS 780	780	540	7 OPzV 490	44
SBS 900	900	705	6 OPzV 600	28

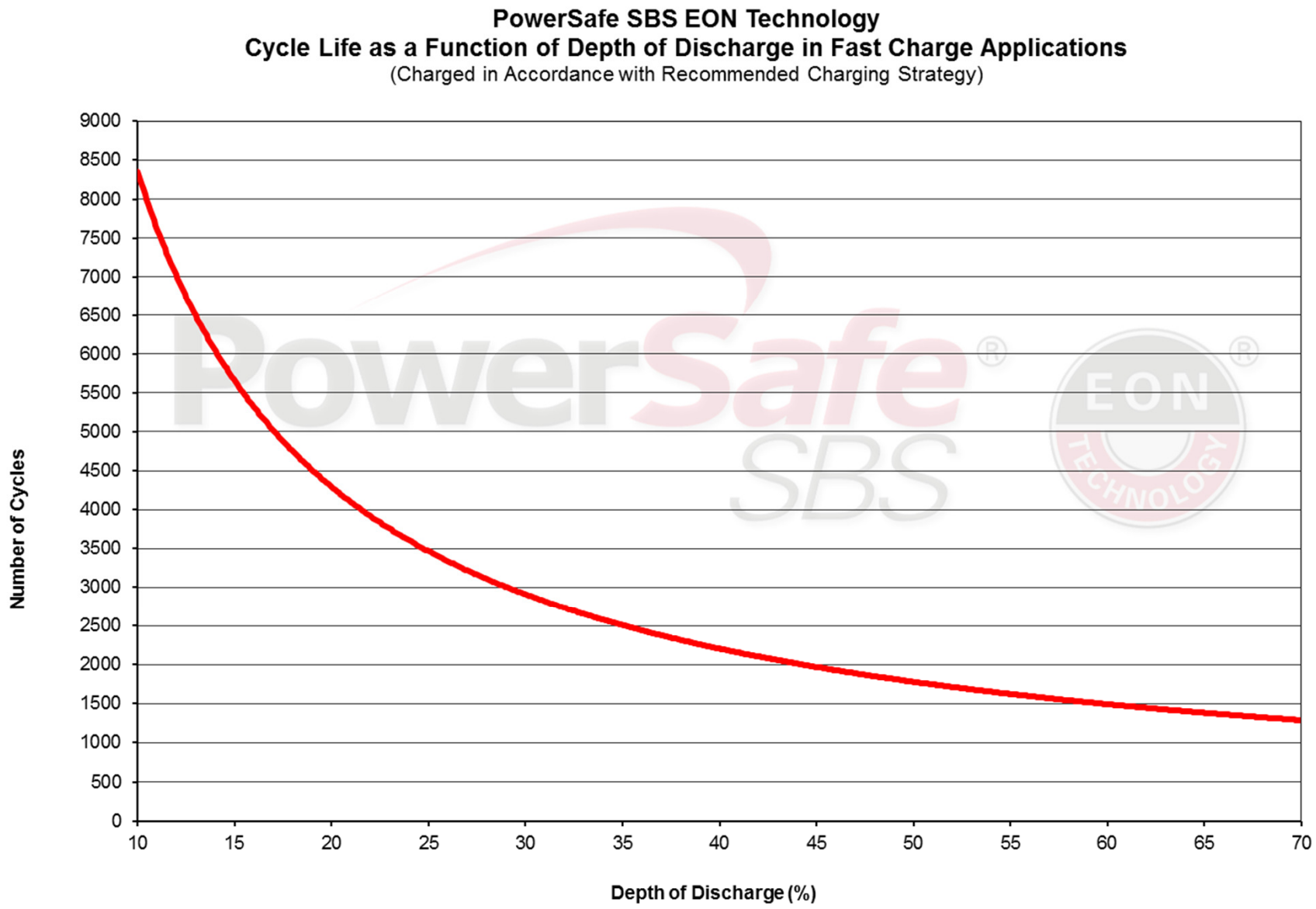
PowerSafe SBS EON Technology provides up to 51% increase in nominal C_{10}/1.80Vpc/20℃ capacity compared with 'size-equivalent' OPzV cells

Outstanding Discharge Performance

Discharge Current (Amps) @ 20°C	Type	15 min	30 min	1 hr	2hr	3hr	4hr
1.60 Vpc	SBS 900	720.0	720.0	609.5	360.7	257.2	201.2
	6 OPzV 600	*718.0*	*595.0*	*424.0*	*255.0*	*187.0*	*150.0*
1.65 Vpc	SBS 900	720.0	719.7	586.8	360.7	257.2	201.2
	6 OPzV 600	*649.0*	*548.0*	*405.0*	*255.0*	*187.0*	*150.0*
1.70 Vpc	SBS 900	720.0	719.7	556.8	358.0	257.2	201.2
	6 OPzV 600	*576.0*	*494.0*	*379.0*	*251.4*	*187.3*	*150.2*
1.75 Vpc	SBS 900	720.0	683.2	518.1	342.9	255.2	201.2
	6 OPzV 600	*500.0*	*436.0*	*344.9*	*238.3*	*182.5*	*149.3*
1.80 Vpc	SBS 900	704.4	605.8	469.9	320.1	242.6	195.5
	6 OPzV 600	*422.0*	*375.0*	*302.2*	*218.1*	*171.0*	*140.9*
1.85 Vpc	SBS 900	593.1	519.3	412.5	289.4	222.4	181.4
	6 OPzV 600	*376.0*	*336.0*	*273.7*	*202.9*	*161.2*	*133.6*

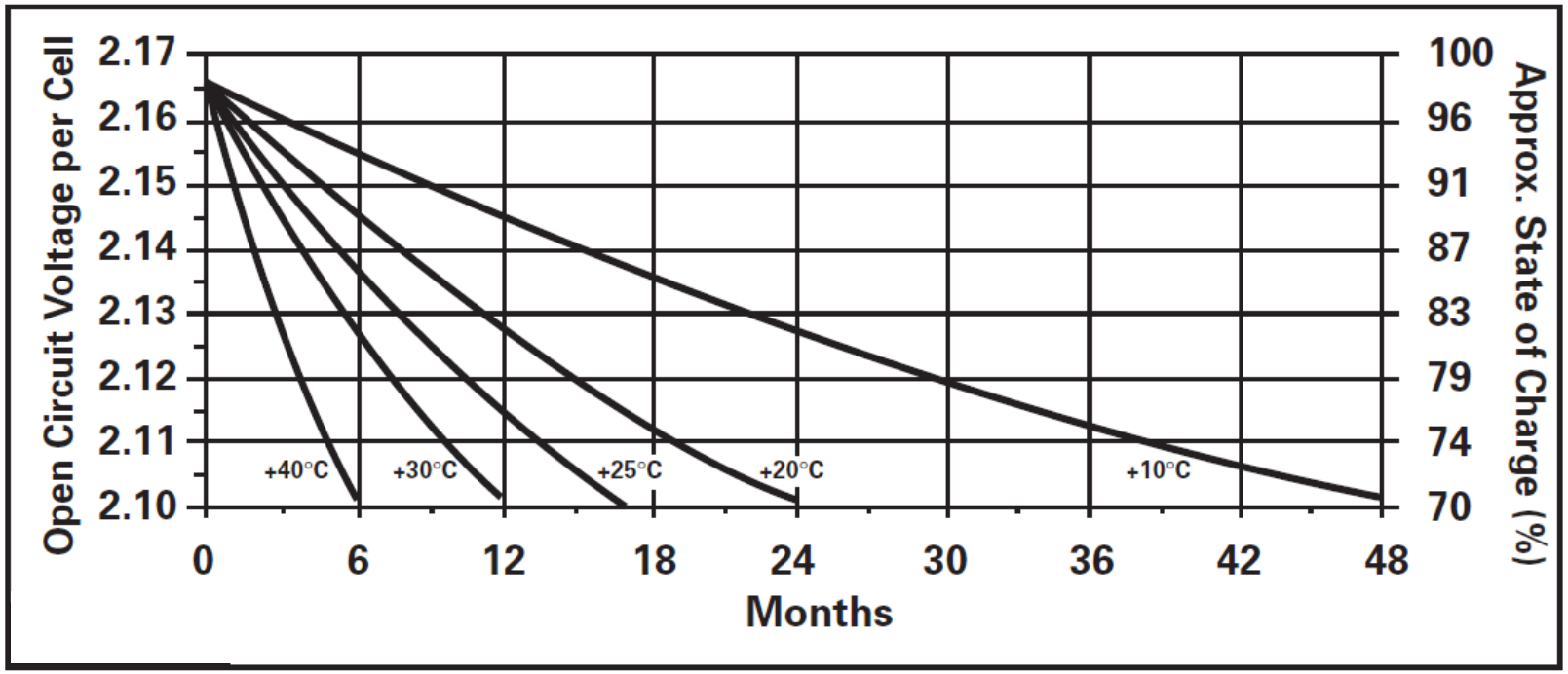
Note: The above-mentioned SBS 900 discharge data are subject to confirmation in October 2013. Performance data for all other types to be also available in October

Superb Cycling Performance

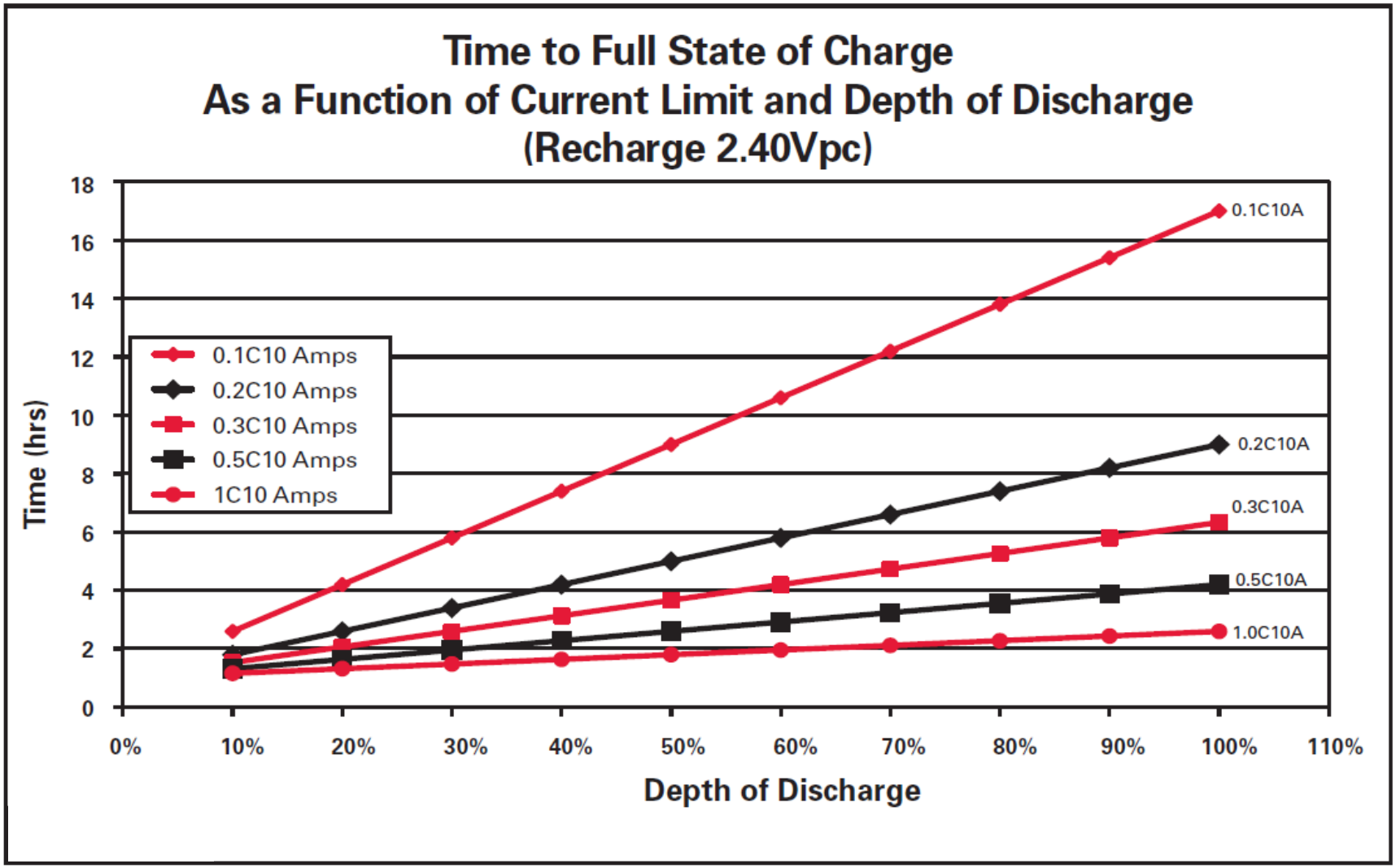


Class-Leading Shelf Life

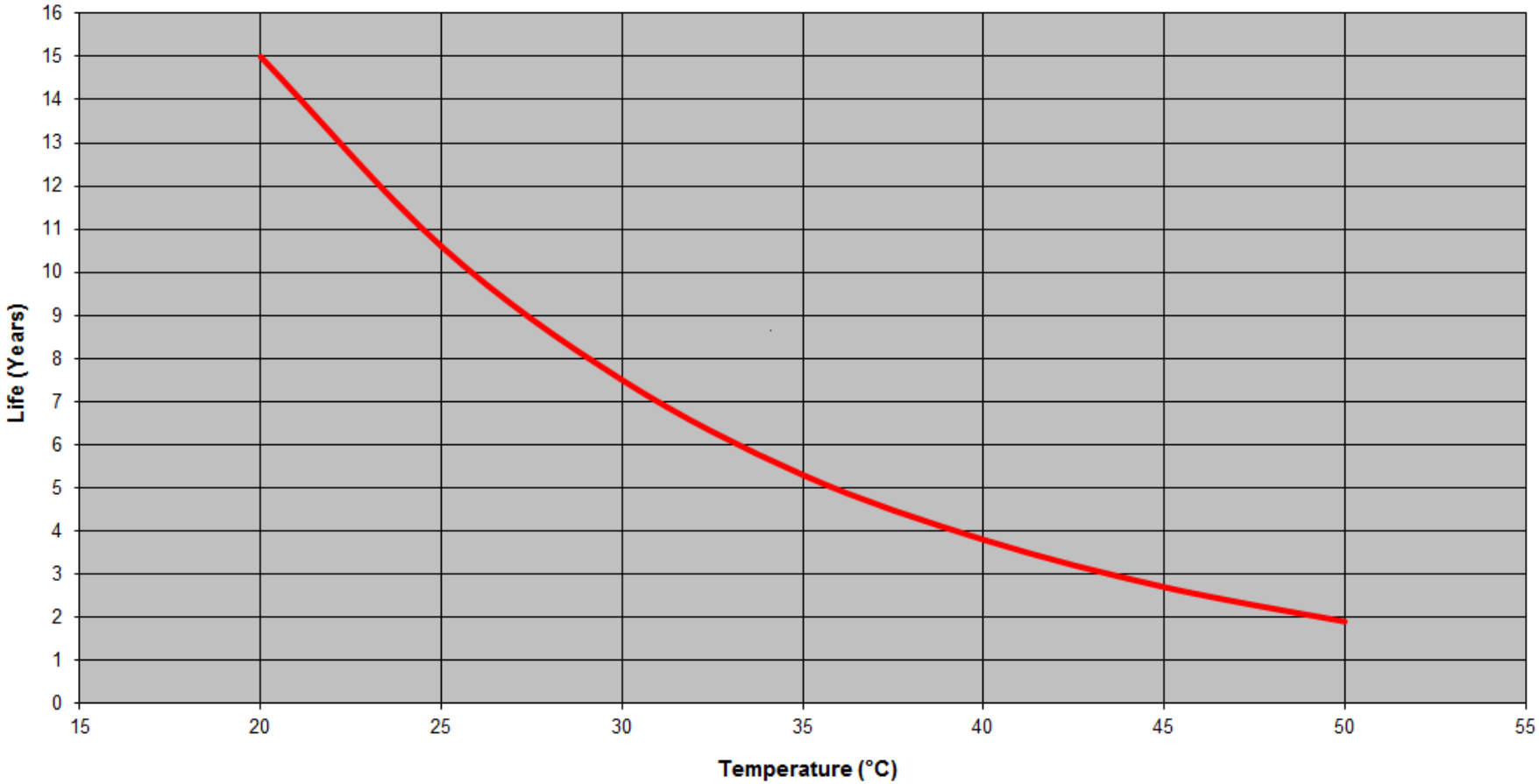
- PowerSafe SBS 320-900 cells have a shelf life of up to 2 years when stored at 20℃
- The graph below demonstrates the relationship between storage time, open circuit voltage (OCV) and state of charge as a function of temperature



Short Recharge Times



Excellent Design Life (Float, 20°C)



Typical Construction

- Tough, flame retardant UL94 V-0 rated PC/ABS container and lid
  - Polymer highly resistant to shock and vibration
  - A special two-component resin is applied evenly to guarantee a consistent box to lid bonding
- High performance Thin Plate Pure Lead positive plates
  - Grids designed to resist corrosion and prolong active life
- Negative plates - provide perfect balance with the positive plates to ensure optimum recombination efficiency
- Superior quality, low resistance microporous glass mat separators
  - High absorption and stability properties for acid-free operation
- Electrolyte: high grade dilute sulphuric acid absorbed into separator material for reduced maintenance (no water addition required)
- High integrity & quality, leak-resistant pillar seal
  - Proven in service on several other product ranges
- Self-sealing, low pressure, relief valve prevents ingress of atmospheric oxygen
- Flame arrestor fitted into each cell for increased operational safety
- Fully insulated flexible connectors supplied as standard

Focus on the Pillar Seal

- PowerSafe SBS 320-900 single cells use a high integrity, high quality pillar seal
- Design protects cells against any electrolyte leakage
- Uses a long, acid resistant, double compressed grommet
- The grommet is permanently fitted to the lid
- The high quality surface finish of the pillar ensures a perfect seal
- In the event of plate growth, terminals can slide without creating stress on the lid
- 100% seal checks on production lines



Product Marking (1/2)

Product-specific label
(stuck onto container)

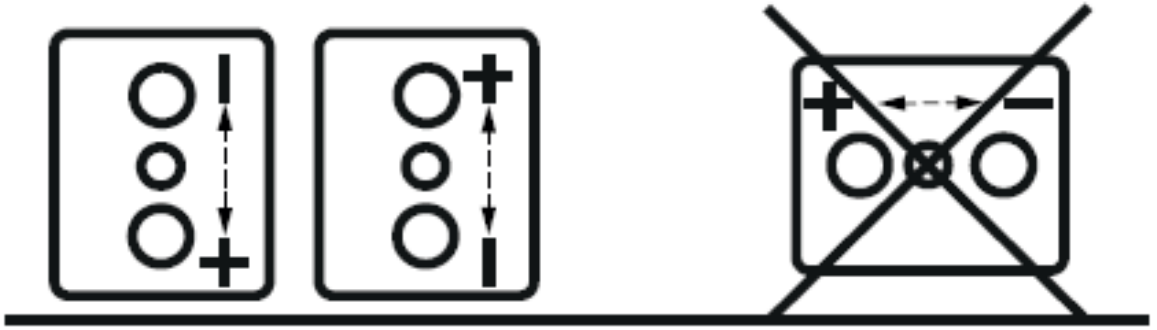


Ink-jet printed details
(on lid)



Installation

- All PowerSafe SBS 320–900 single cells shall be installed in horizontal orientation (as shown below) to optimise rack designs and maximise battery life





Optional Remote Gas Venting

- Ideal where limited room ventilation is available
- Gas can be vented outside the battery enclosure
- A single manifold enables gas to be remotely vented
- Vents are connected together with a flexible tube



REQUIRED FOR CLOSED LOOP COOLING ONLY

Standards

- Designed to be compliant with the requirements of the international IEC 60896-21/22 standard

- Classified as “Long Life” (Eurobat guide)
  - 15 year design life (float, 20℃)

- Recognised by UL (approval pending)

- The management systems governing the manufacture of PowerSafe SBS 320-900 products are ISO 9001:2008 and ISO 14001:2004 certified

Manufacturing Locations





Warrensburg, Missouri, USA

Newport, South Wales, UK



ISO 9001 & ISO 14001 certified factories



Manufacturing Location – 2V TPPL SBS EON

- EnerSys S.A.R.L, Arras, Northern France
- Over 40 years experience in battery manufacturing (well over *100* years for EnerSys)
- Produces cells and monoblocs for Reserve Power and Motive Power applications
- EnerSys' central logistical hub for Europe/Middle-East/Africa
- Total site area 132,302m^2 (45,000m^2 indoor)
- Circa 750 employees
- Accredited to ISO 9001:2008 for quality management and ISO 14001:2004 for environmental management





SBS 320–900 General Specification

- 7 brand new single cell types offering a large capacity range
  - 320Ah / 400Ah / 480Ah / 580Ah / 680Ah / 780Ah and 900Ah respectively

- General characteristics

			Cell Dimensions (mm)				
New SBS EON Types	Voltage (V)	Nominal Capacity (Ah) C_{10}/1.80Vpc/20°C	Length	Width	Cell Height	Overall Height	Typical Weight (kg)
SBS 320	2	320	103	206	382	403	20.0
SBS 400	2	400	124	206	382	403	24.0
SBS 480	2	480	145	206	382	403	28.0
SBS 580	2	580	124	206	498	520	33.0
SBS 680	2	680	145	206	498	520	38.5
SBS 780	2	780	166	206	498	520	44.0
SBS 900	2	900	145	206	673	695	50.0

Notes:

- *PowerSafe SBS 320-900 cells shall be installed in horizontal orientation.*
- *In horizontal orientation, the afore-mentioned heights become the lengths, lengths become widths and widths become heights.*
- *"Overall height" means height over connectors.*





Reminder: Other SBS EON Technology Products

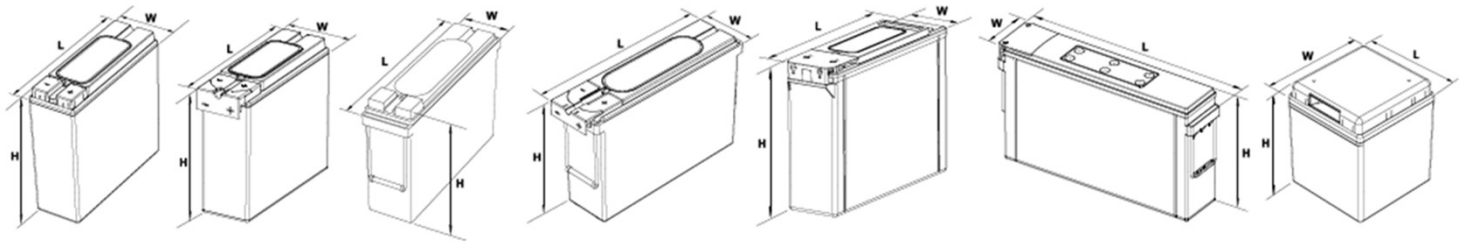
- The SBS B14… SBS 190F front terminal monoblocs and the 410 cell continue to be part of the PowerSafe SBS EON Technology range

		Nominal Capacity (Ah)		Nominal Dimensions (mm)						
Battery Type	Nominal Voltage (V)	10 hr rate to 1.80Vpc @ 20°C	8 hr rate to 1.75Vpc @ 77°F	Length	Width	Height	Typical Weight (kg)	Short Circuit Current (A)[1]	Internal Resistance (mΩ)[1]	Terminals
SBS B14	12	62	62	280	97	264	19.1	1800	7.0	2 x M8 F
SBS B14F	12	62	62	303	97	264	19.1	1800	7.0	2 x M6 M
SBS C11[2]	12	92	91	395	105	264	28.0	2300	5.5	2 x M8 F
SBS C11F[2]	12	92	91	417	105	256	28.0	2300	5.5	2 x M6 M
SBS 100[2]	12	100	100	395	108	287	32.6	2210	5.6	2 x M8 F
SBS 100F[2]	12	100	100	395	108	287	32.6	2210	5.6	2 x M6 M
SBS 170F[2]	12	170	170	561	125	283	52.5	2750	4.5	2 x M6 M
SBS 190F[2]	12	190	190	561	125	316	60.0	3990	3.2	2 x M6 M
SBS 410[2]	2	410	410	200	208	239	23.2	4725	1.3	2 x M8 M

Notes:

[1] Figures obtained via IEC method.

[2] With integral or rope handles.



Summary Benefits of SBS EON Technology

- Superb charge acceptance rates for fast recharge capability
  - Ideal for hybrid systems
  - The generator's run time to achieve the battery's full state of charge is significantly reduced
  - This leads to a very competitive total cost of ownership
    - **Lower generator maintenance / replacement costs,**
    - **savings in fuel consumption…**

- Significantly more energy and power than a conventional VRLA or OPzV battery of the same size

- Exceptional cycling performance in both float and fast charge applications
  - PowerSafe SBS EON has a proven track record in off-grid hybrid applications

- Market-leading shelf life due to low rate of self-discharge
  - Up to **24 month storage** (20°C) compared to conventional VRLA batteries

- Resilient to hot and harsh environments
  - Wide operating temperature range (-40°C to +50°C) for greater application flexibility



Mobile Operator SA – Case Study

Site Name: Saartjiesnek

Site Design factors

Pre-Site Visit:

- No AC on site;
- Diesel generator running 24/7;
- 10 day service interval;
- OPEX costs > USD3 000 per month;

Mobile Operator SA

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Upgrade included:

	Approx. Cost
20kVA Silent Generator	USD 16 500
6 strings of 12V 190Ah SBS EON batteries	USD 13 000
Rectifier upgrade	USD 0
Total:	**USD 29 500**

Mobile Operator SA

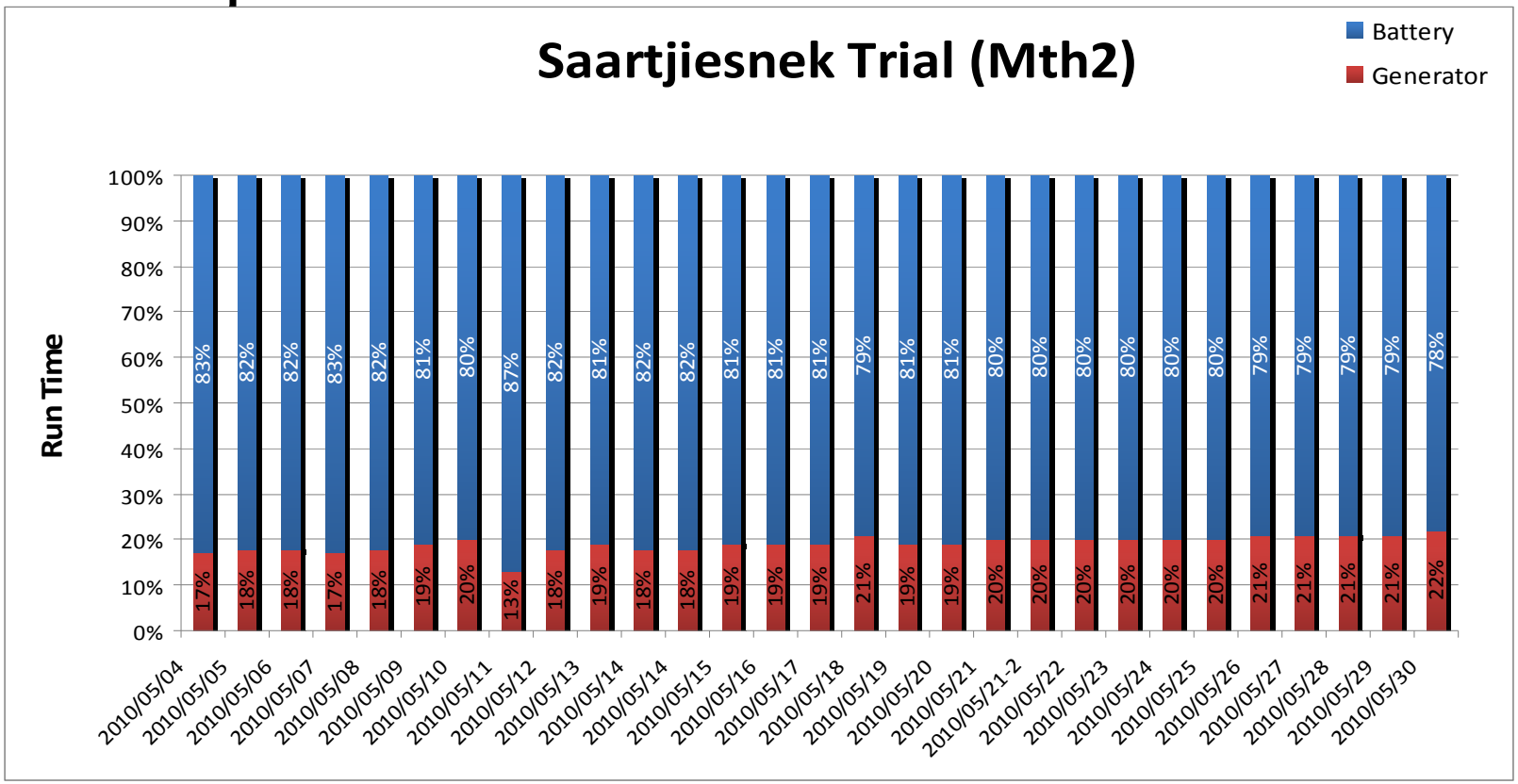
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Results:

Average Generator run time	25%
OPEX savings in 1st 4 months	USD 10 000 (min)
Payback period	± 1 year
Expected battery life	> 2 years

Mobile Operator SA

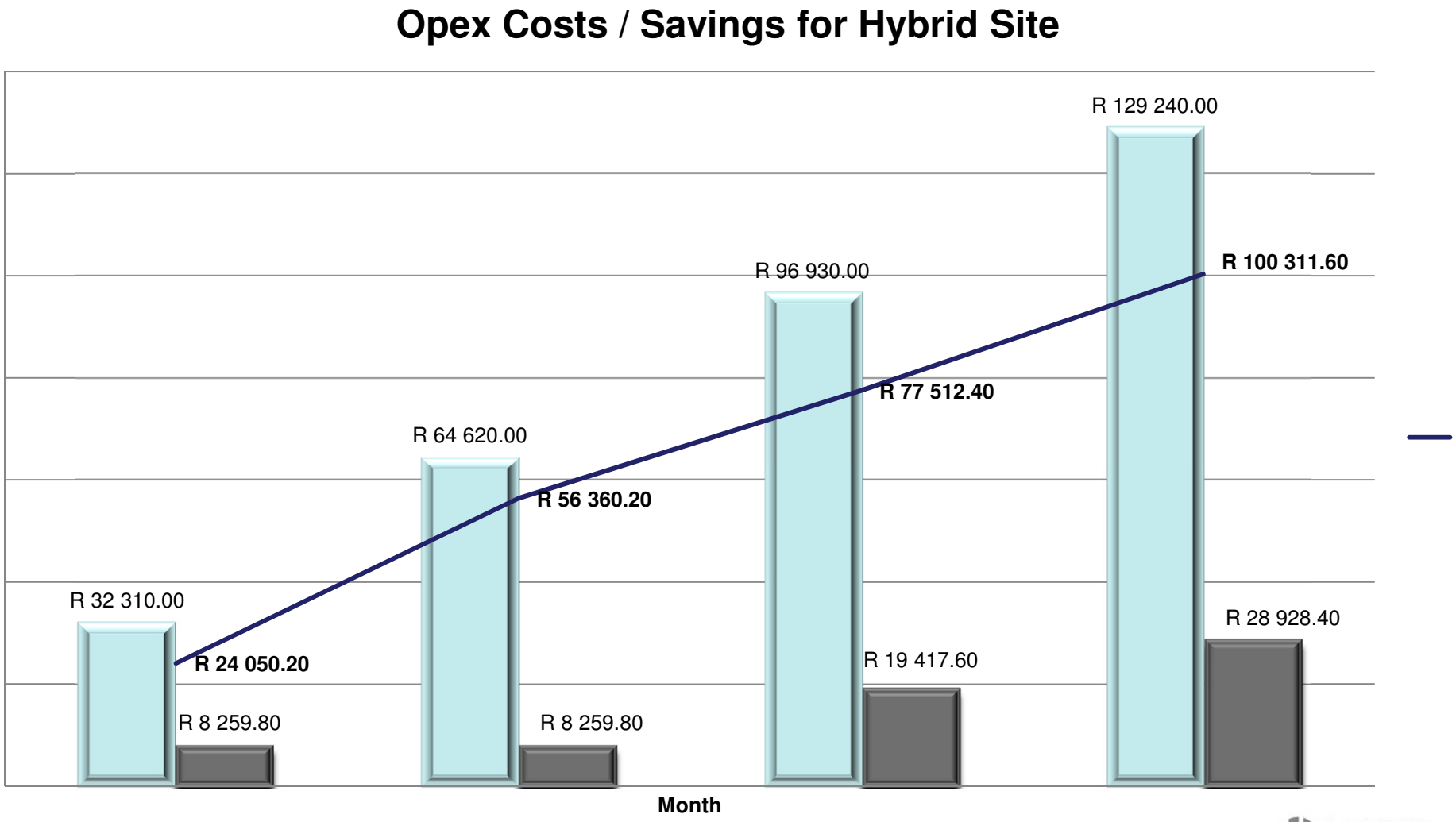
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- **80% on Battery**
- **20% on Generator**

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Capabilities as a DC Power Solutions Provider

- **Assist with DC Power solution Design by:**



- Understand the customers needs
- Design the solutions using:
  - The correct Battery Technology – Standby / Hybrid / Off grid / Solar
  - The preferred Rectifier Solution
  - Indoor / Outdoor cabinets with correct cooling requirement for the batteries
  - Solar solutions – 100% Solar / Solar assist
  - Hybrid Sites calculations depending on site configurations
  - AVR's (Automatic Voltage Regulators) for bad grid supply
  - DC Cooling for existing cubicles, where Telecoms equipment needs cooling









Thank you





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