



ELBC 24 - MILANO 16-19 .September 24

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Overview

- GEL- fumed or colloidal ?
- Various processes to manufacture GEL cells/blocks
- Principle GEL circulation process
- Advanced (continues) Circulation process
- Summary

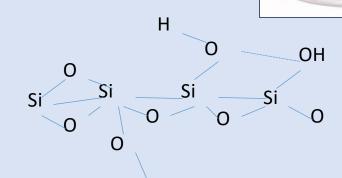




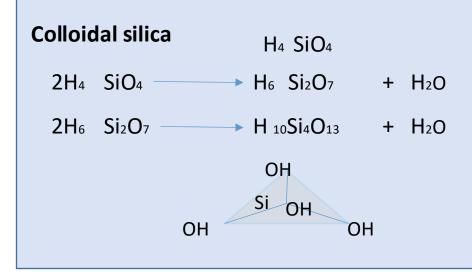
SiCl₄ + 2H₂ + O₂ \longrightarrow SiO₂ + 4HCl

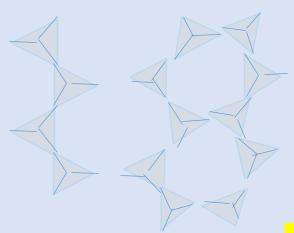
Amorphous particals 2 – 15 nm

Thixotropy is the property of GEL to switch from the solid to liquid phase by any fource like shaking or steering



Tixotrophic system

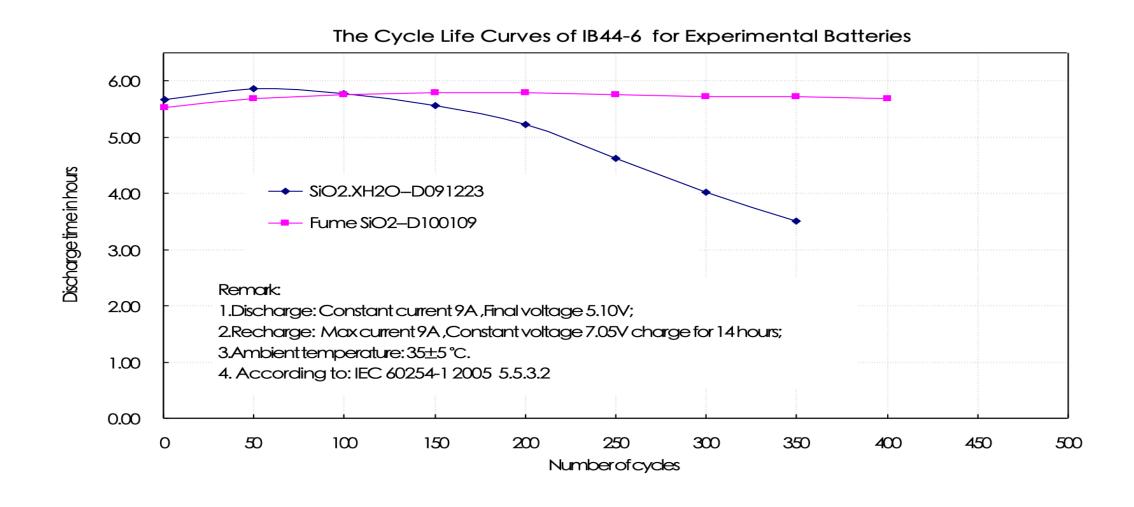






NO tixotrophic system - inelastic

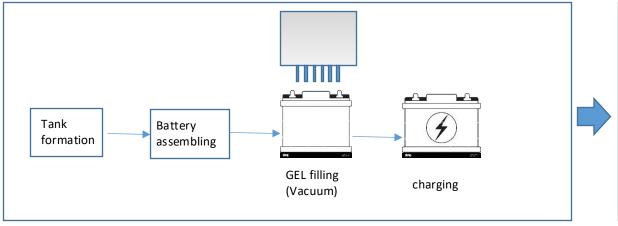




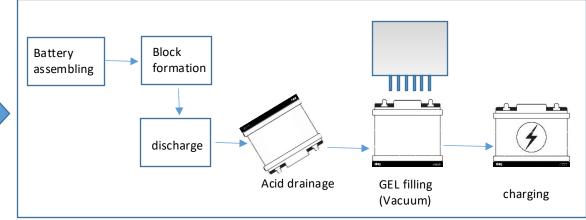


Main GEL filling processes

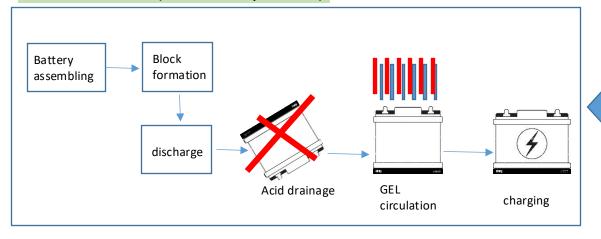
Formed batteries filling



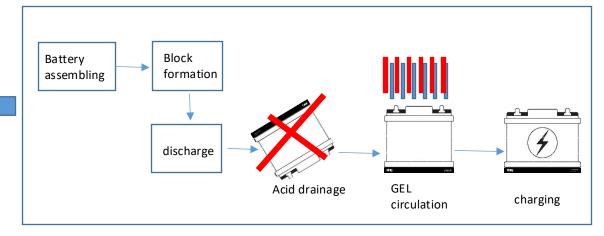
Two shot process



GEL circulation (continues process)

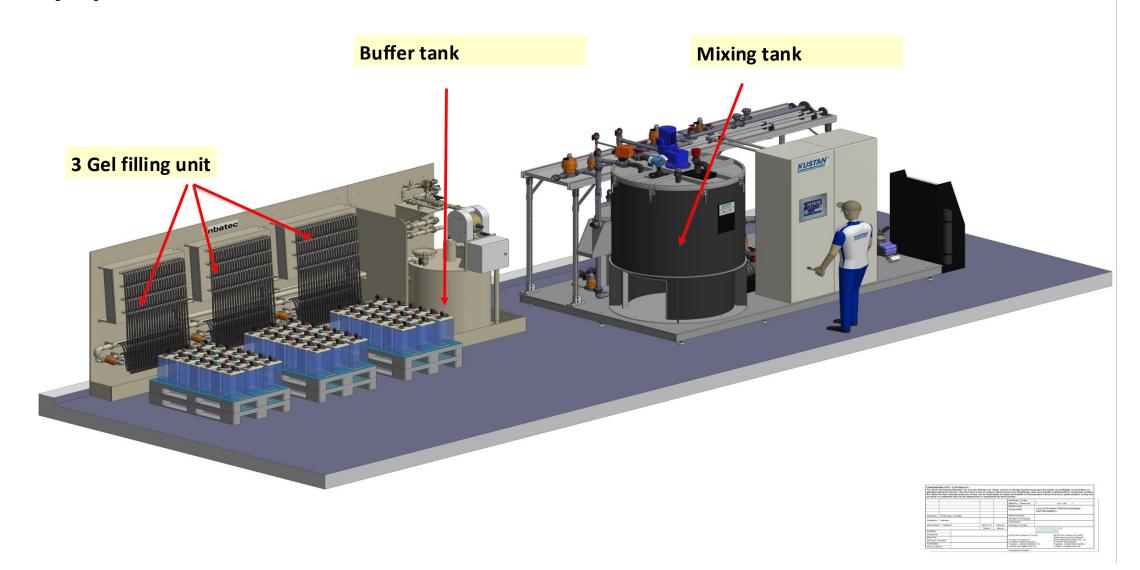


GEL circulation (batch process)





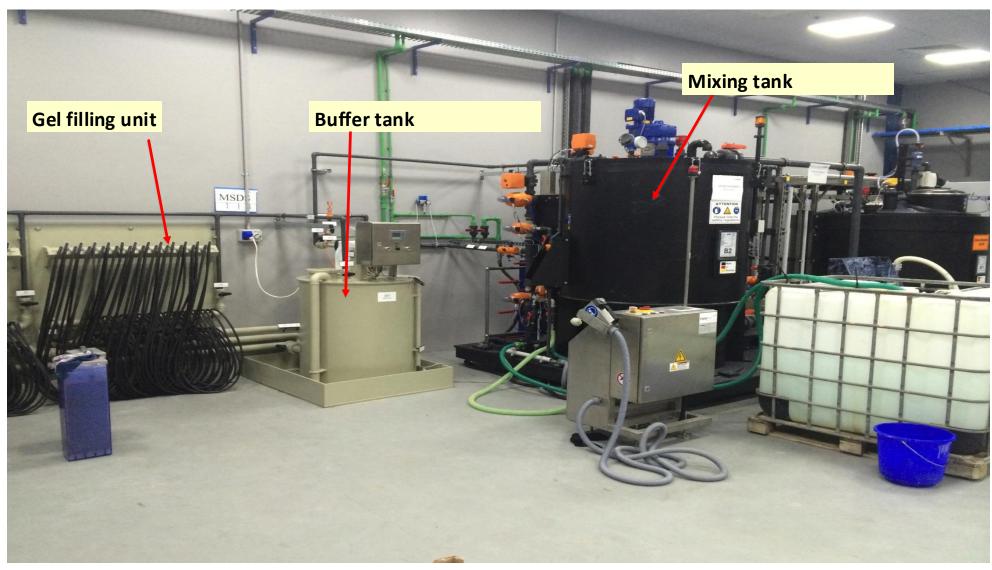
Equipment





Equipment

VIEW OF THE MIXING & CIRCULATION MACHINES





GEL circulation (batch process)

Block formation

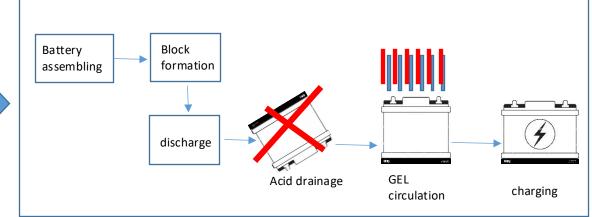
discharge

Acid drainage

GEL circulation

charging

GEL circulation (continues process)



Advantages:

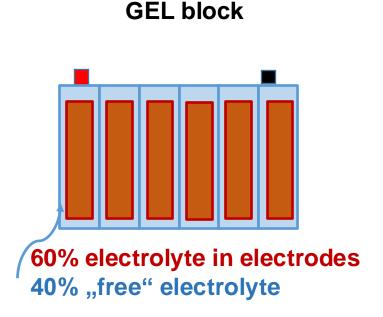
- higher flexibility
- higher number of cells
- particular for high Ah cells

Requirements:

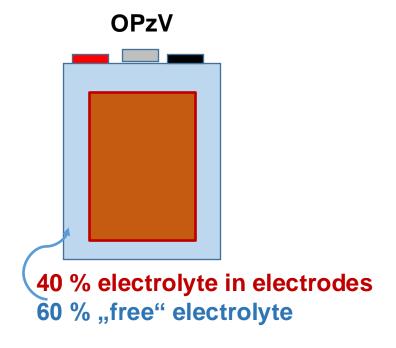
- tolerances of SiO2 of +/- 0,3 %
- SiO2 calculation based on "free" electrolyte



! Calculation of SiO₂ based on "free" electrolyte 10.5 – 11,5 %



SiO2 calculation based on total electrolyte of 6 % = 15% SiO2 in "free, electrolyte

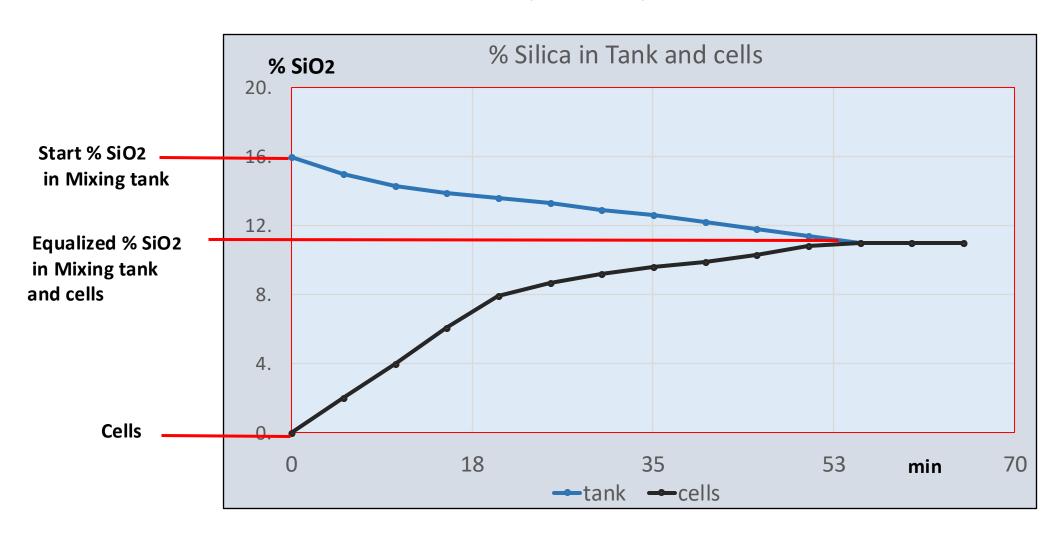


SiO2 calculation based on total electrolyte: 6 % = 10% SiO2 in "free, electrolyte

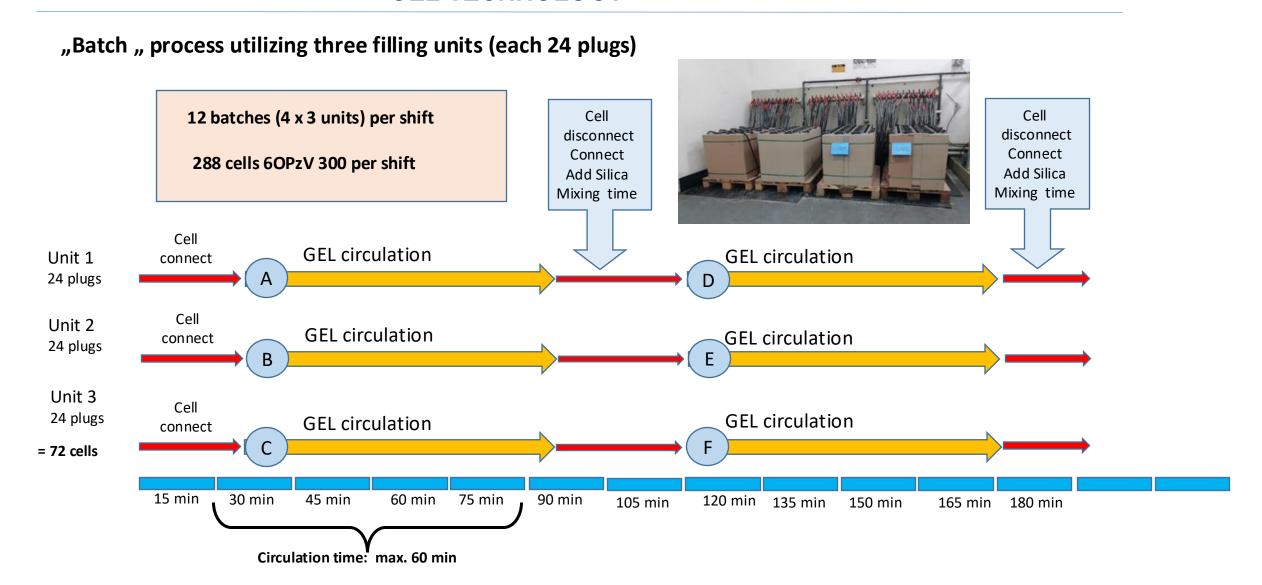
Better to calculate the % SiO2 based on "free, electrolyte = constant between 10,5 and 11,5%



MAX. MIXING TIME WITH HIGHEST LOAD (worst case)

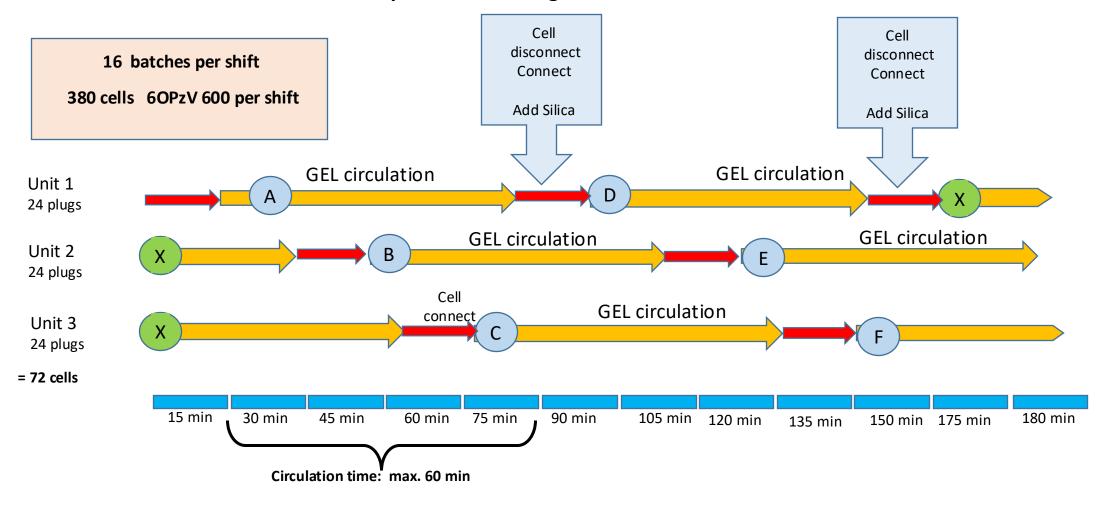








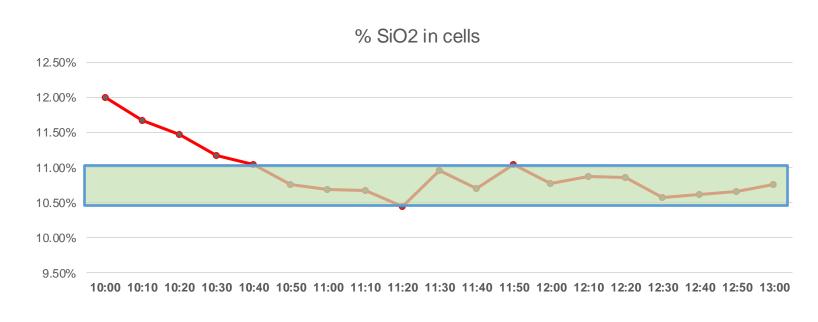
Continues circulations eliminates the problem with high % of SiO2





The SiO2 content in the mixing tank (= cells) stays in a range of +/- 0,25 %

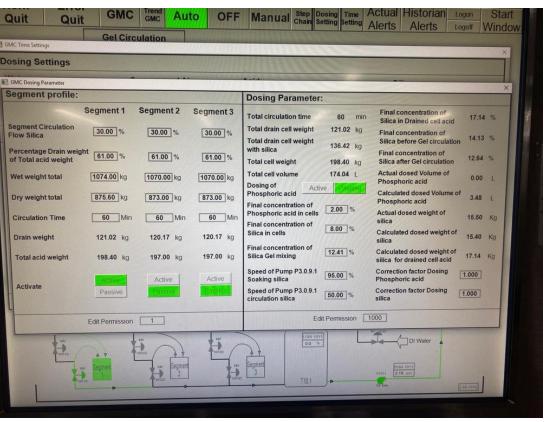
	:-	_				
	min	A	В	С	D	average
10:00	0	12,0%				12,00%
10:10	10	11,7%				11,67%
10:20	20	11,3%	11,6%			11,47%
10:30	30	11,0%	11,3%			11,17%
10:40	40	10,6%	11,1%	11,4%		11,05%
10:50	50	10,3%	10,8%	11,2%		10,75%
11:00	60	10,0%	10,5%	11,0%	11,3%	10,69%
11:10	70		10,3%	10,7%	11,0%	10,68%
11:20	80		10,0%	10,5%	10,8%	10,44%
11:30	90	12,0%		10,2%	10,6%	10,96%
11:40	100	11,7%		10,0%	10,4%	10,70%
11:50	110	11,3%	11,6%		10,2%	11,05%
12:00	120	11,0%	11,3%		10,0%	10,78%
12:10	130	10,7%	11,1%			10,87%
12:20	140	10,3%	10,8%	11,4%		10,86%
12:30	150	10,0%	10,5%	11,20%		10,58%
12:40	160		10,3%	10,96%		10,61%
12:50	170		10,0%	10,72%	11,3%	10,66%
13:00	180			10,48%	11,0%	10,76%





Very compact Production line – automatic calculation software





ECONOMIC MANUFACTURING PROCESS FOR VRLA BATTERIES IN GEL TECHNOLOGY



SUMMARY:

- less investment, no acid drainage, no vaccum filling
- one filling unit for all types of products (cells/blocks)
- faster process in production (time saving)
- no waste material (drained acid)
- no risk of filling problems
- good product quality
 - neg.plates not exposed to air
 - perfect distribution of GEL
 - high consistancy of cell performance



THANK YOU

QUESTIONS?

SEE US AT THE ABERTAX BOOTH 57/58