



MUPIC 2020

Axel Soyez – CEO

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Why Desimone ?

- We believe the future of industry goes through process automation and perfect quality
- We help to implement what we call :

ZERO DEFECT AUTOMATION

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How ? Our resources

- 45 Employees :
 - Mechanics, pneumatics, hydraulics, electricity, automation, robotics specialists
 - Very high employee loyalty, thanks to :
 - Profit sharing with our staff
 - Continuous training programs
- 5300 sqm offices and production halls
- 8+ M € turnover (65%+ Export)
- Own R&D company (Industrie & Développement S.A.)
- Strong financial situation



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What we do

AUTOMATION

We support companies to

- Automate their production line
- Increase manufacturing efficiency
- Reduce operational costs,

ZERO DEFECT

while helping them to

- Produce defect free products
- Increase customer satisfaction

Renewable
energies

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They trust us

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Accutherm

by **Desimone**

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Background



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Background

- 2008 : R&D of single axis Sun Trackers for solar energy optimisation
- 2009-2013 : over 800 Trackers sold
- 2013 : next step thoughts : what to do with solar electricity ?
- 2014 : founding R&D project of the Greenwin walloon cluster will be : Accutherm
- 2018 : R&D phase 1 finished
- 2019 : from a prototype to an industrial product



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The idea

- Thermal energy storage (T.E.S.) for positive cold applications
- Plug & Play installation
- Bio and low cost materials (vs. Li-Ion)
- Competitiveness towards electricity storage technologies

WE STOCK THE DIRECTLY USABLE ENERGY, NOT THE PRIMARY ENERGY



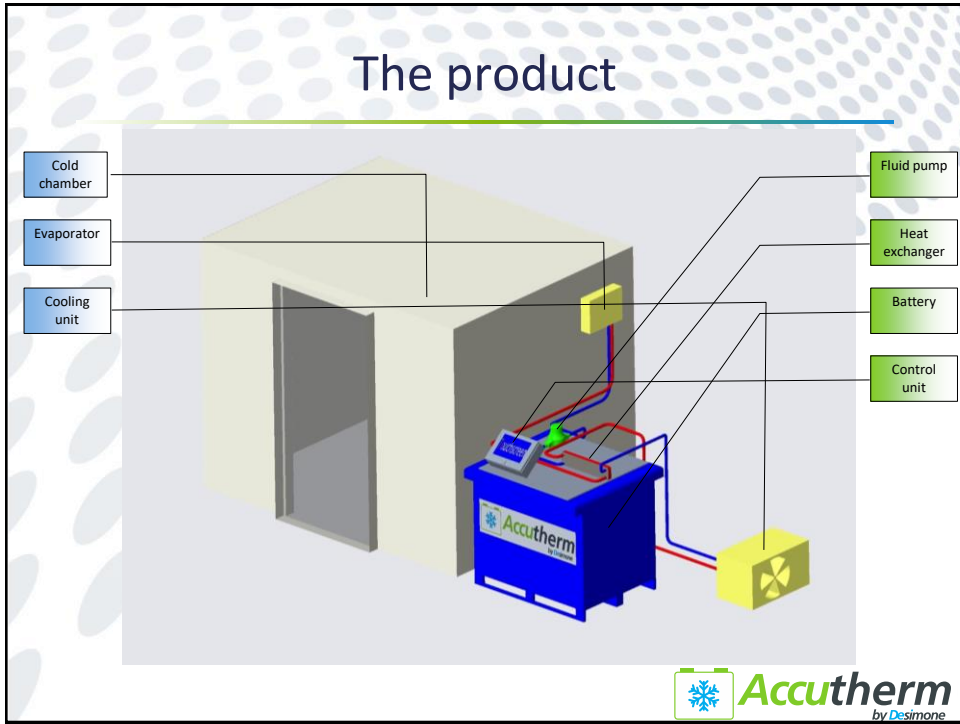
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The benefits

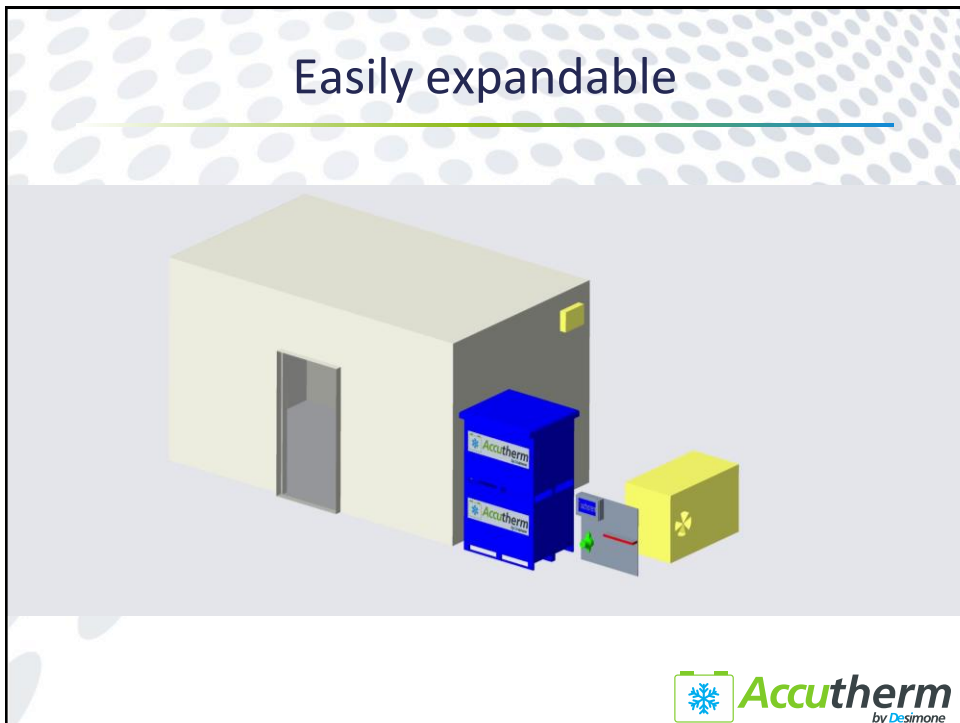
- Defer production and use of energy
- Minimise consumption peaks and/or choose their moment
- Cold chamber regulation smoothing
- Drastic reduction or even full withdrawal of electricity re-injection in the grid
- No wear of the battery itself
- *Reminder : +-25% of all electricity produced is used for cooling applications*



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Prototype



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Technical aspects

- Heat exchanger design :
 - Various studies with CSL (Centre Spatial Liège)
 - Plastic base is the best solution :
 - No corrosion with PCM
 - Conductivity issue is neglectable
 - Cost



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Technical aspects

- Heat exchanger design :
 - Need of a fluid distributor in order to reach homogenous temperatures within the tank (same length for each circuit)
- Tank design :
 - Rounded is ideal
 - ...but expensive !



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Technical aspects

- PCM Fluid :
 - The best amongst all : water ! (highest latent heat)
 - But freezing point must be below zero (delta t°)
- Requirements :
 - For « meat conservation » need of +2, +3° in cold chamber >>> freezing point at least - 3°
 - « Bio » product is key
 - Salted solution = demixing issues
 - Latent heat as close as possible to water
 - Price
- Solution : found after 2 years (!)

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Technical aspects

- Pending issue : Accuracy of battery status measurement
 - We need to measure the frozen part of the battery
 - T° measure is not efficient
 - Volume difference measurement depends on heat exchanger design (ice blocks retention)

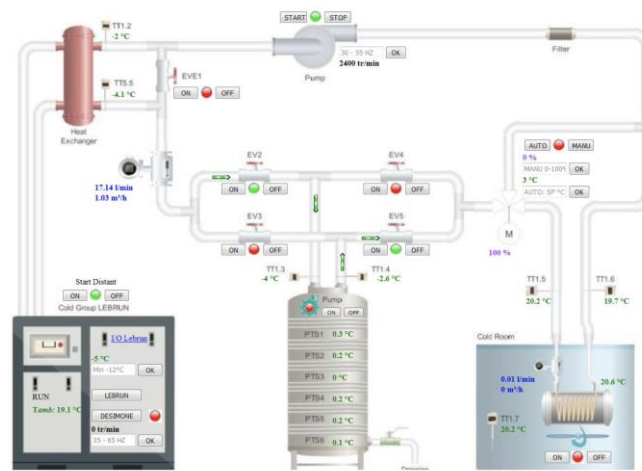


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Technical aspects

- System architecture :



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Technical aspects

- Architecture :
 - Interface with existing cooling system
 - Need of a heat exchanger (! Losses) and secondary fluid
 - Need of a fluid pump (! Power consumption)
 - Various secondary fluids tested (compromise between viscosity and heat capacity)
 - Heat exchanger within cold chamber issue :
 - Not optimized yet (cost compromise between 2 heat exchangers and losses if we work with only one)

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Technical aspects

- Sizing of the refrigeration unit :
 - Big enough to support cooling of both cold chamber and battery
 - But bigger is more expensive (investment and running costs)

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Testing campaigns

- In order to avoid using a climatized lab, we worked with 2 installations in parallel :
 - 1 equipped with a classical refrigeration unit
 - 1 with Accutherm
- Limitation :
 - Performance comparison but few absolute values
- Ultimately, we monitored the global electrical consumption, not the EER (energy efficiency ratio)

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Current results

- **80%** of electricity consumption during 8 hours only (on a 24 hours total cycle)
- **60 hours** autonomy in full discharge mode
- **5%** volume ratio between battery size and cold chamber size (standard door-closed model)
- **80 kWh** thermal stock capacity per m³ of battery

Test conditions : 3° inside chamber, 20° outside, 60% HR, 1 loading goods (20% volume loaded)

 **Accutherm**
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Pricing target

	Tesla Powerwall	LG Chem	Accutherm
Ex-works price	685,95 €	1.042,00 €	1.000,00 €
Inverter	included	300,00 €	not needed
Capacity (KwH)	3,50	10,00	N.A.
Thermal capacity (COP 3,7)	129,95	37,00	30,00
Price/KwH (thermal)	13,83 €	157,89 €	100,00 €
	+14%	+58%	



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Pricing target

	Tesla Powerwall	LG Chem	Accutherm
Warranty	70% after 10 years	60% after 10 years	100% after 10 years
10 years KwH capacity (thermal)	57.000	8.500	82.500
Amortization/KwH (thermal) on 10 year base	0,0362 €	0,0538 €	0,0274 €
	+32%	+96%	

- Our technology allows a much better positioning than any Li-Ion solution available on the market
- On 20 years base, Tesla would be 64% more expensive than Accutherm



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Next steps & challenges

- Thermodynamic calculation model (sizing)
- Software
- Production
- Market analysis
- Business model
- Market launch plan

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Thermodynamic model

- Basic input data : like today (usage, desired t° , capacity, local climate, needed autonomy, evt. existing installation)
- Output data :
 - Accutherm battery size
 - Heat exchanger(s) sizing
 - Fluid pump size
- Existing info : testing reports (empirical), base to validate calculation model
- Remark : don't rely on professionals of cooling installations !

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Software

- Internal input data :
 - Cold chamber t° evolution
 - Battery status
- External input data :
 - Availability of low cost energy :
 - Smart meter input (protocol ?)
 - Availability & prediction of renewable energies (sun, wind) : open source data available ?
- Final output needed :
 - Piloting algorithm (when to run cooling unit, when to charge/discharge)

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Production

- Heat exchanger (and tank) redesign :
 - Keep the current efficiency and principle
 - Think about automated production :
 - Component sourcing
 - Assembly process and time
 - Think about serial installations (multiple units for bigger needs)
- Control plate :
 - Integrate heat exchanger cooling fluid, fluid pump, electrical cabinet, control unit, HMI

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Market analysis

- European-wide product = many specific rules
- Wide customer range (from butcher to industry, via Supermarkets)
- We need to analyze local pricing formulas (per customer group)
- We need to evaluate ROI (target cost of the installation)
- Output :
 - Identified potential markets today...
 - Prediction of evolution within 3 years

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Market analysis

- Competition :
 - Is there any competition in the market (today and tomorrow) ? Where ? Who ?
- Business model (sales channels) :
 - Players identification and typology (from end customer to producer) on key markets
 - SWOT selling through cooling units producers/cooling unit installers

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Market launch plan

- Timing per market
- Marketing strategy :
 - Integration with partner's marketing
 - Customer pull
 - Press communication
 - Media strategy

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