



OPTICOOL

New generation Milk Cooler with low energy consumption and carbon footprint

PERSON Patrick – Milk Cooler Marketing Manager, Groupe SERAP



AGRITECH DAY
By AXEMA

Who are we (Who am I) ?



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Summary

1. The Tank2020 Project
2. Concept
3. Results
4. Commercial product : Opticool

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The « Tank2020 » Project



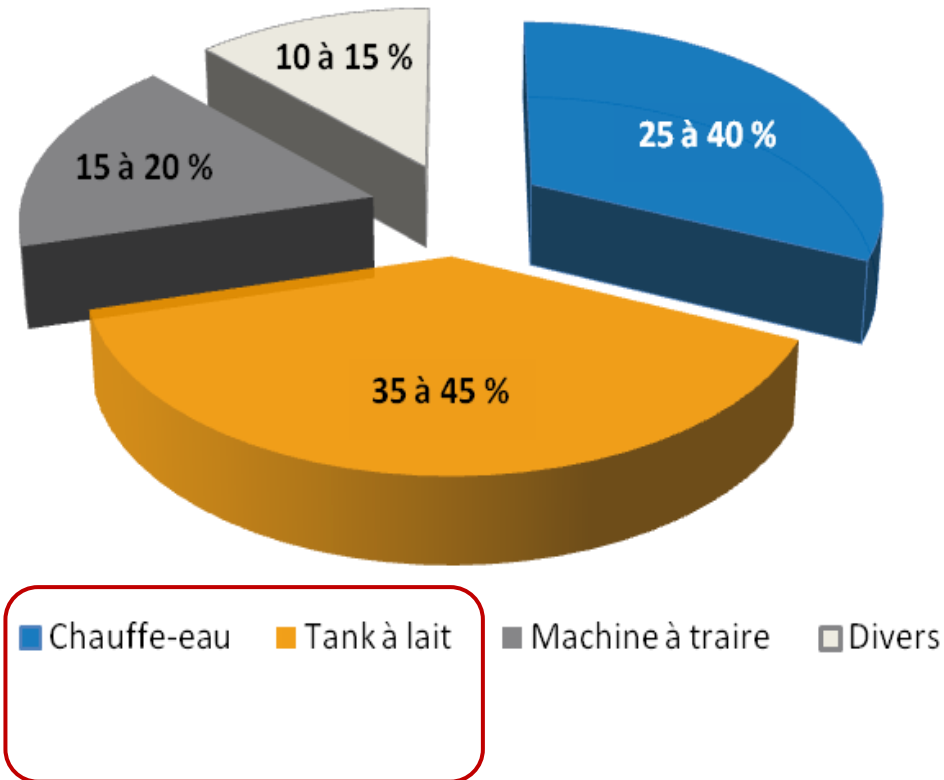
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The Tank 2020 project : a collaborative approach

- ❖ Project launched in 2017, for 5 years
- ❖ Within a consortium of 6 partners with complementary skills
 - **SERAP Industries** (leader) : conception, prototype making, industrialization and sales;
 - **Pôle Cristal** : R&D center in cooling technologies ;
 - **GIE Elevages de Bretagne** : project coordination;
 - **Institut de l'Élevage** : « Breeding Institute » : farm expertise and follow-up of field tests;
 - **TERRENA** (dairy cooperative) and **LACTALIS** (private dairy) : expertise in milk collection and transformation.
- ❖ A project granted by the Environment & Energy Agency (ADEME) and 2 French Regions

❖ **Objective: Design and validate experimentally a milk cooler with the lowest possible energy consumption and carbon footprint**

Context of the project



High consumption of electricity

~450 kWh / Cow / year

Milk cooler + Water heater ≈ 70 % of total need

Strong demand in mornings and evenings,
during the consumption peaks

Urgency to reduce the carbon footprint

European F-GAS regulation

Carbon neutrality by 2050

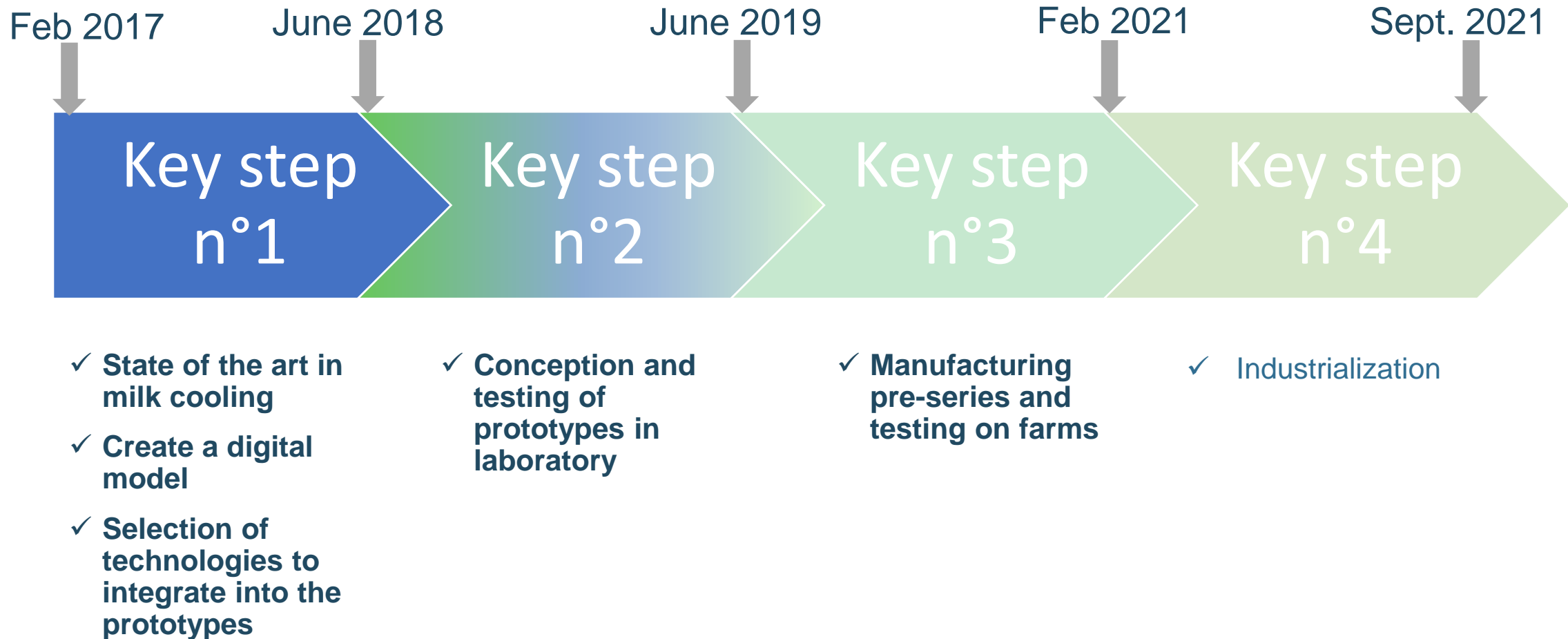
Low renewal of milk coolers

Renewal rate < 1,5% / year

Many old tanks and non-optimized situations

In France : $\frac{3}{4}$ owned by dairies

Project phasing



Prototype design

The Tank 2020 Project was an opportunity to explore and evaluate :

- Technologies:
 - ✓ Direct expansion vs ice bank tank
 - ✓ Coupling with solar panels...
- Refrigerants:
 - ✓ Propane
 - ✓ CO2
 - ✓ HFOs
 - ✓ HFCs...
- Components:
 - ✓ Variable power compressors
 - ✓ Variable speed fans
 - ✓ PLC control
 - ✓ Electronic expansion valves...

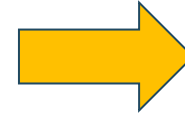
After complete evaluation, the validated prototype was based on:

- ✓ **Direct expansion for efficiency**
- ✓ **Variable power condensing units for consumption performance**
- ✓ **Low GWP HFC refrigerant for safety and performance**

Prototype design

Cooling technologies retained:

- Variable power compressors
- Variable speed fans
- Electronic expansion valves
- Low GWP refrigerant working at low pressure
- Self-adaptive regulation algorithm



Consumption

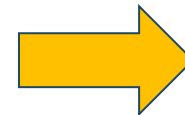
Up to -40% vs standard units
Up to -70% with pre-cooling

Carbon footprint

-50% to -80%

Integrated heat recovery

- Heats water with the calories taken from milk
- Driven by the PLC for optimization



Production of hot water

42°C to 50°C for free
-50% on water heater cons°

=> Restitutes partly or totally
the energy consumed to cool
milk in the form of hot water

Farm tests



Farm 1
FSE 7000L - Propane



Farm 2
FSE 7000L



Farm 3
FSE 12000L



Farm 4
FSE 12000L



Farm 5
FSE 15000L



Farm 6
FSE 5200L



Farm 7
FSE 7000L



Farm 8
FSE 5200L



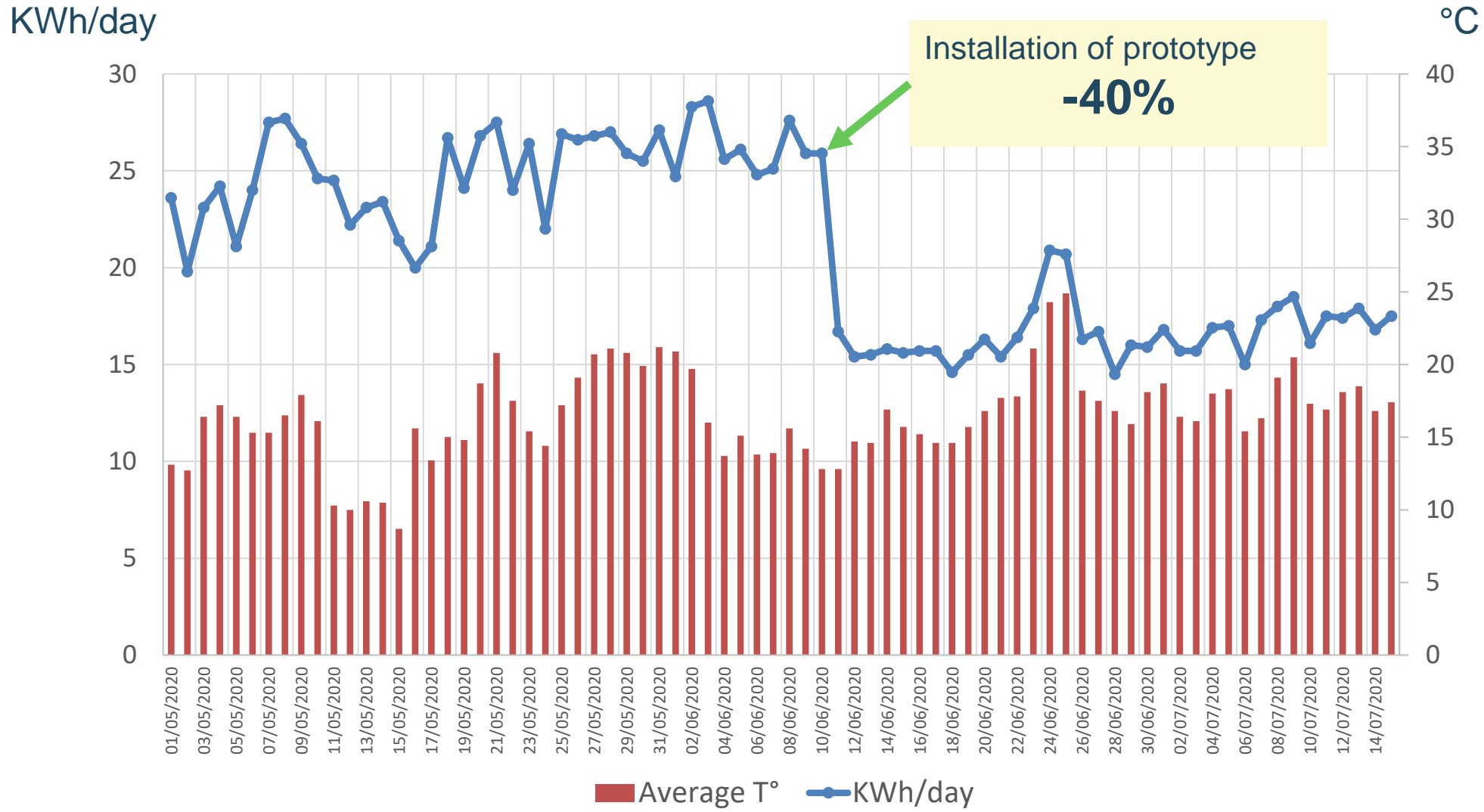
Farm 9
FSE 18000L



Farm 10
FSE 8000L

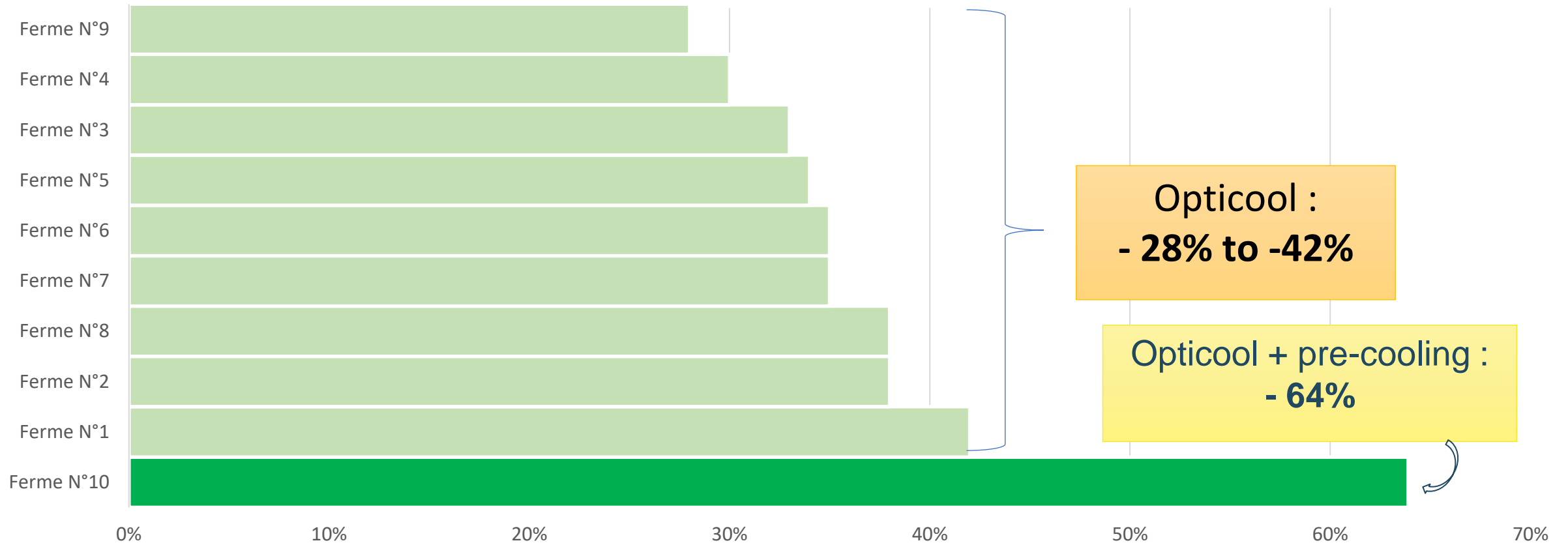


Farm tests : example Farm n°1 – KWh and T°

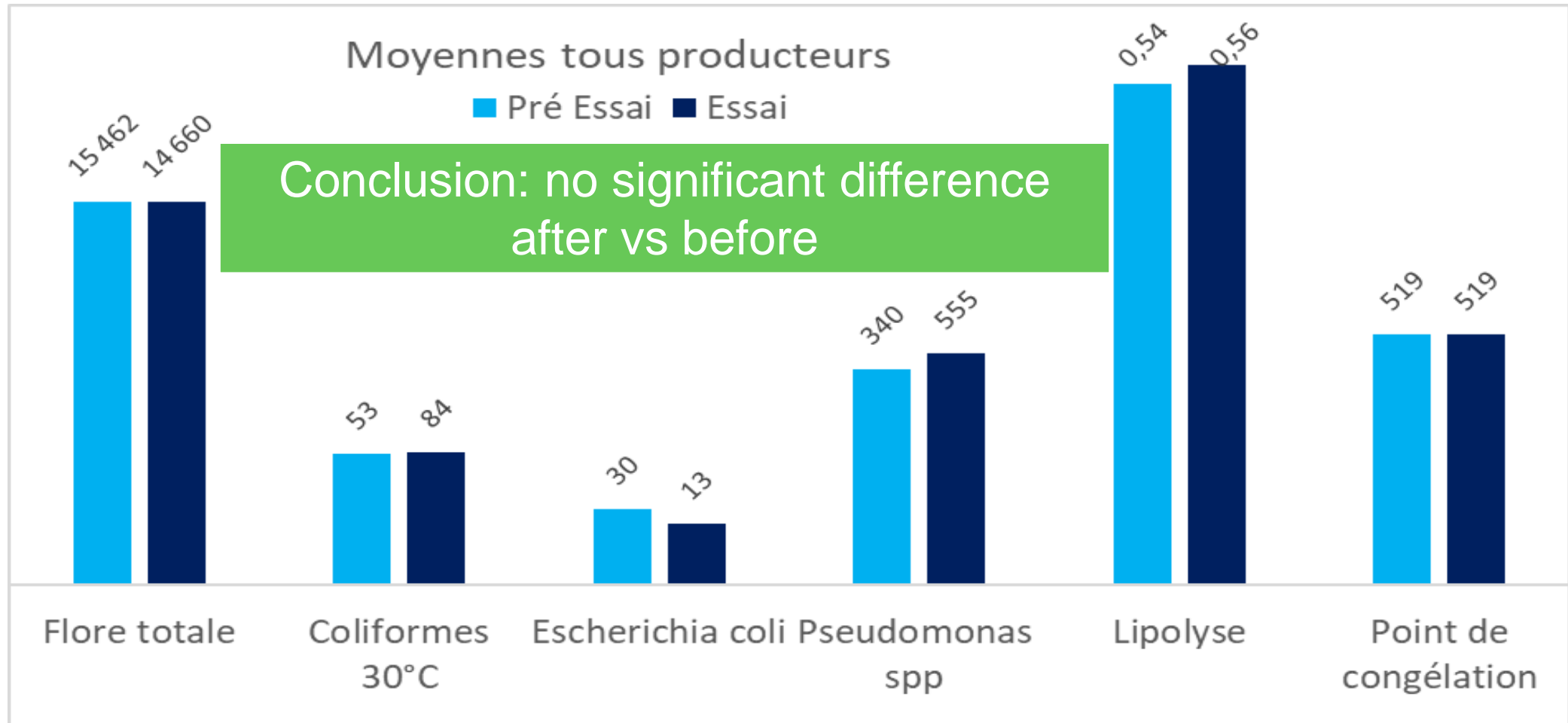


Farm tests : electricity consumption

Reduction of consumption prototypes vs historical tanks
(in %)

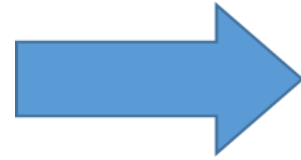


Farm tests : Milk quality



From project to product...

PROJET



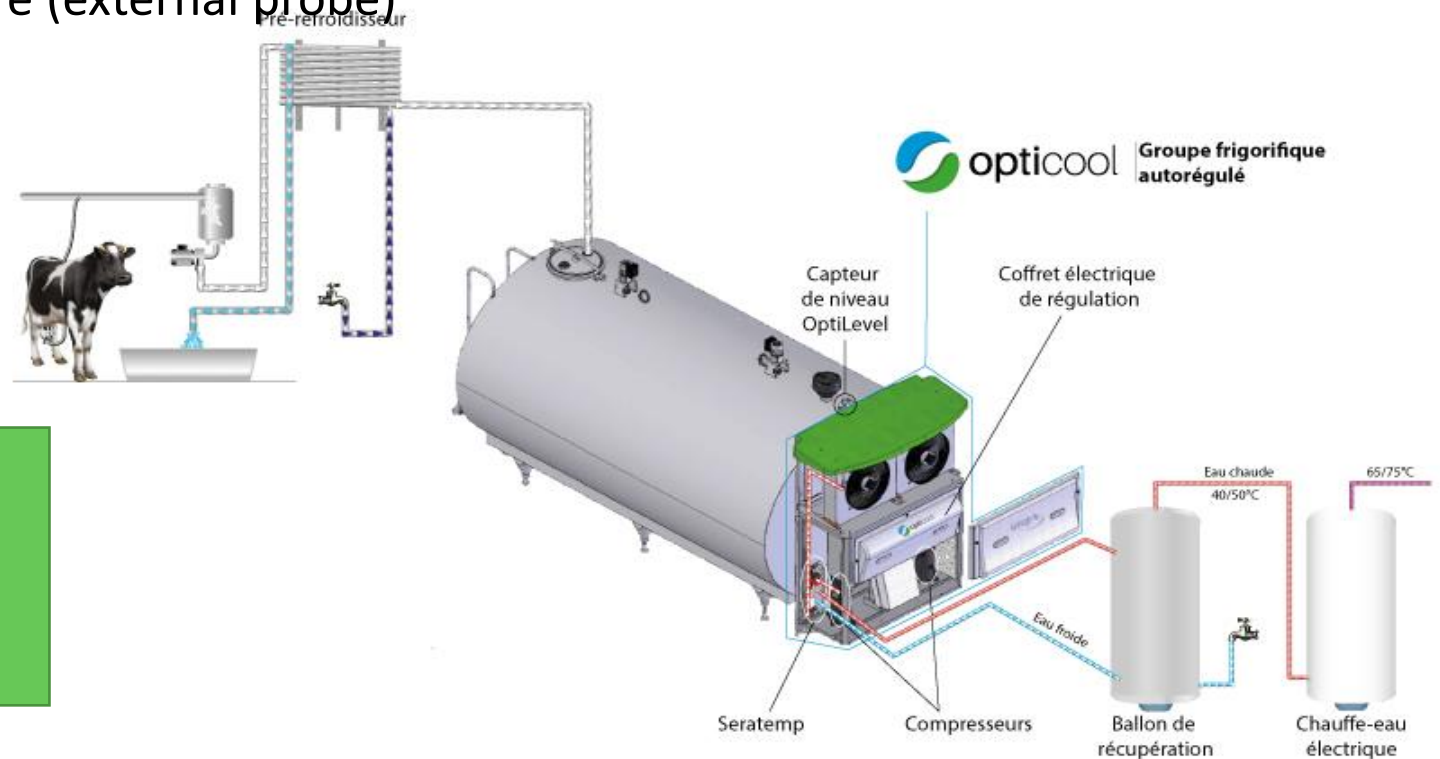
Commercial launch at



Specific regulation :

- The PLC adjusts the frigorific power to the needed level to cool milk down to 4°C depending on :
 - The quantity of milk inside the tank (level sensor)
 - The ambient temperature (external probe)
 - Auto-adaptive

Auto-adaptive



Adapted to robotic milking as well as conventional milking
Starts and adapts the cooling power according to the milk inlet flow

Last generation refrigerant : R513A

- Low GWP :**630**
 - Vs R404A (the most used) : **3900**;
 - Vs R449A (new tanks) : **1400**
- Non-flamable, non-explosive (**A1 class**)
- Requires the same skills and equipments than current refrigerants
- Quantity reduced per circuit
- No glide

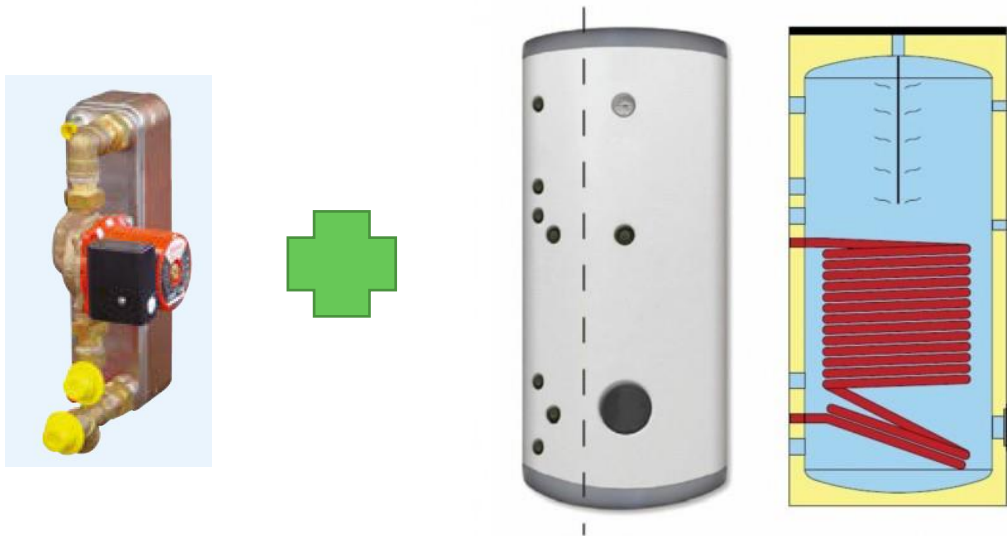
Inverter compressors

Variable speed fans

**Electronic expansion
valves**

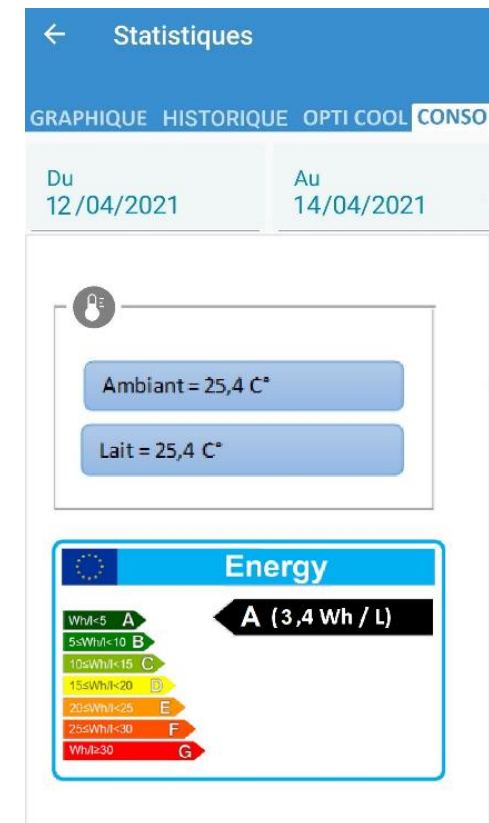
Integrated heat recovery

- Heats sanitary water with the calories extracted from milk
- Up to 45°C => over 50% savings on water heating



Data restitution

(in development)

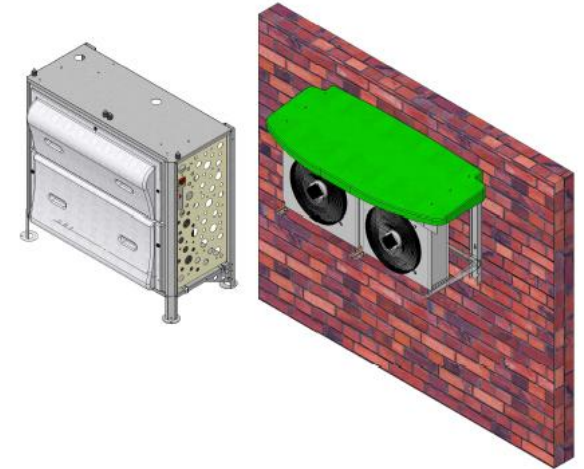


Double-Patented condensing unit

Modular and waterproof



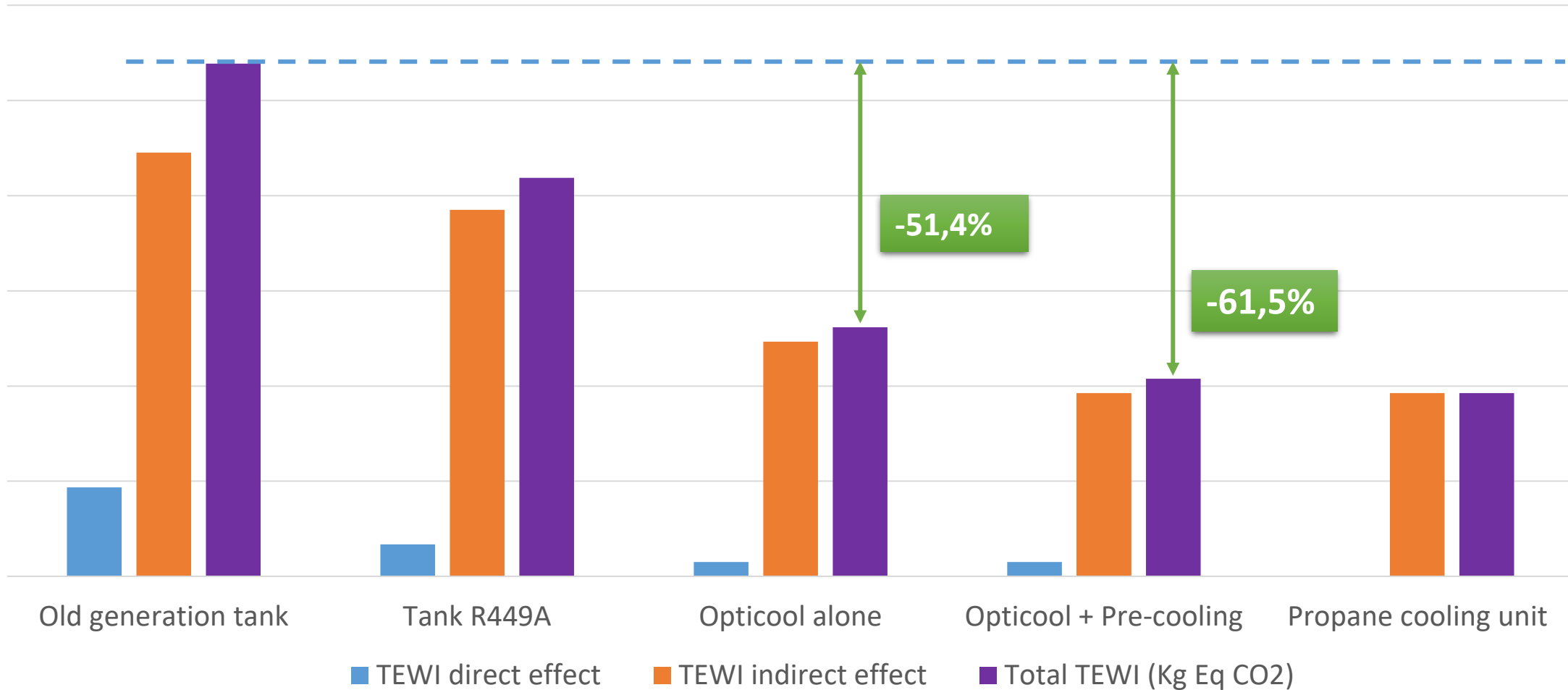
Compatible with all
existing tanks (any
brand, any model)



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Carbon footprint : TEWI (Total Equivalent Warming Impact)

Mostly driven by the drop of energy consumption (indirect effect)



A sustainable solution for the dairy sector in line with the energy transition issues

Diminution of the energy consumption for milk cooling

up to 40% compared to equivalent standard models

up to 70% with the addition of a pre-cooler

The integrated heat recovery allows an additional saving of

up to 50% on water heating

Carbon footprint reduction

50% to 65% compared to the cooling tanks most used

Potential drop in electricity consumption at France's level:

400 MWh/year at peak times (mornings & evenings)

An investment for the future

- ✓ SERAP : French manufacturer of milk coolers for over 60 years
- ✓ 6 industrial sites: 3 in France, India, Brazil, Mexico
- ✓ 530 employees in the world, of which 250 in Gorron (headquarters)
- ✓ Turnover 50 M€ 50% abroad (100 countries)
- ✓ Leader in France, in Europe and in the world
- ✓ The most extended range of solutions on the market
- ✓ Other activities: wine tanks, process equipments, cryogenic tunnels...



SERAP is positioned as an **innovation leader** in the field of milk cooling :

- ✓ **Tank 2020 / Opticool**
- ✓ Solar solutions
- ✓ Remote monitoring MyRainbow...



Thank you



For further information:
www.opticool.groupeserap.com

QUESTIONS & ANSWERS