EUROPE

ATMO sphere

"GREY MATTER FOR A BLUER SKY AND A GREENER PLANET"

LU-VE GROUP®

leadership with passion

Nidea®

NEW INTELLIGENT DEFROSTING APPARATUS

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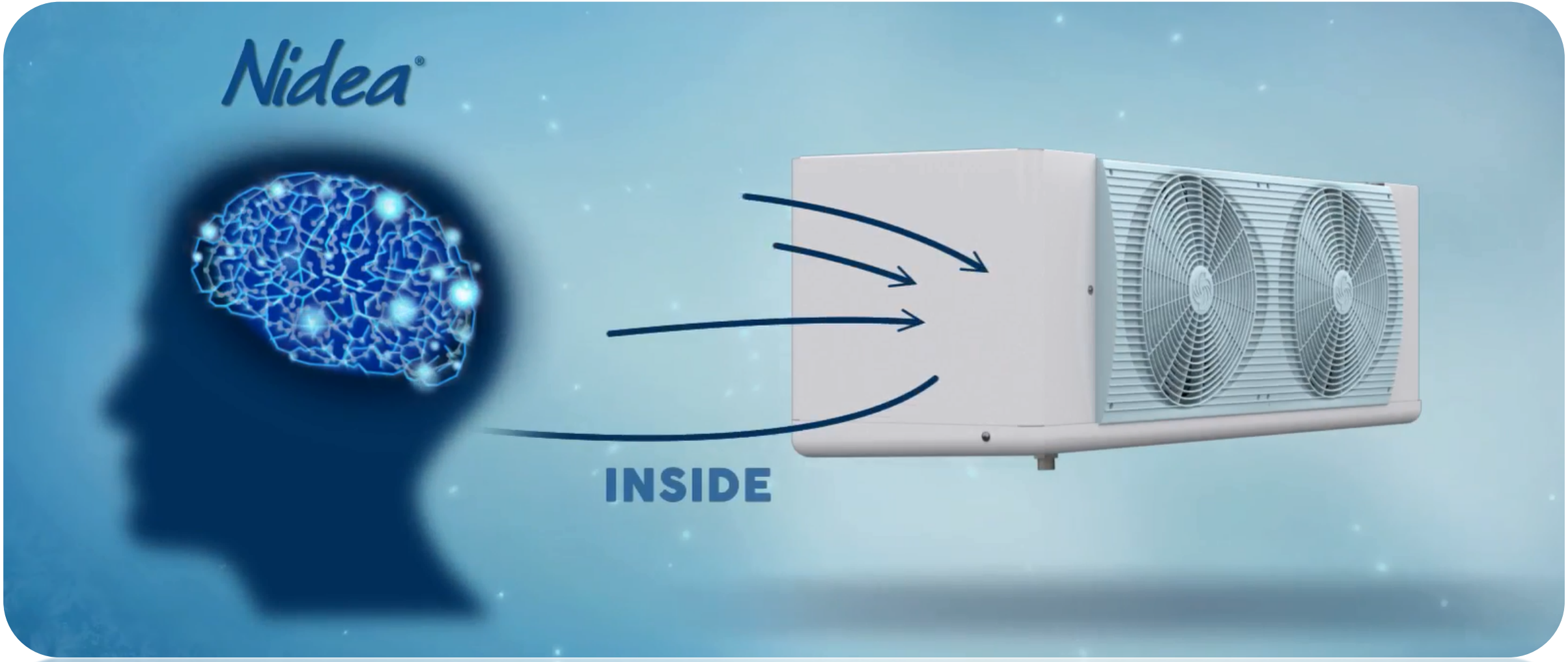
R&D Activity

- 1500 m^2 of surface
- Thermo-fluid dynamics, electric and acoustic tests
- R&D activities use systems with acquisition and elaboration data systems in real time
- Calibration operations comply with internal procedures

Test plants:

1. Coil tunnel
2. Fan-motor tunnels
3. Internal heat exchange plant
4. Reverberation acoustic room
5. Dry-cooler plant
6. Climatic chamber CO_2
7. Calorimeter rooms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INSIDE

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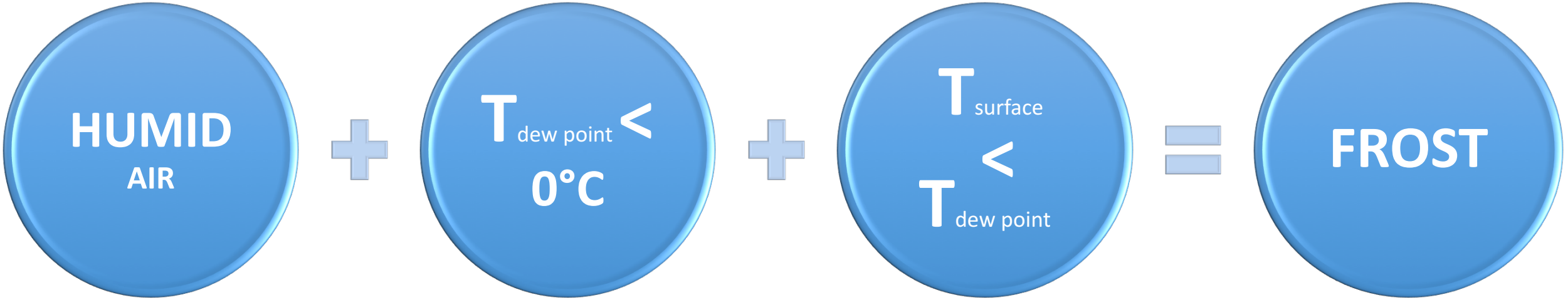
Control for electronic valve and intelligent defrost in a single device, mounted inside the unit cooler

MAIN ADVANTAGES

1) Innovative intelligent defrost
2) High energy efficiency thanks to electronic expansion valve technology
3) Plug-and-play solution, very easy commissioning

NIDEA patent pending

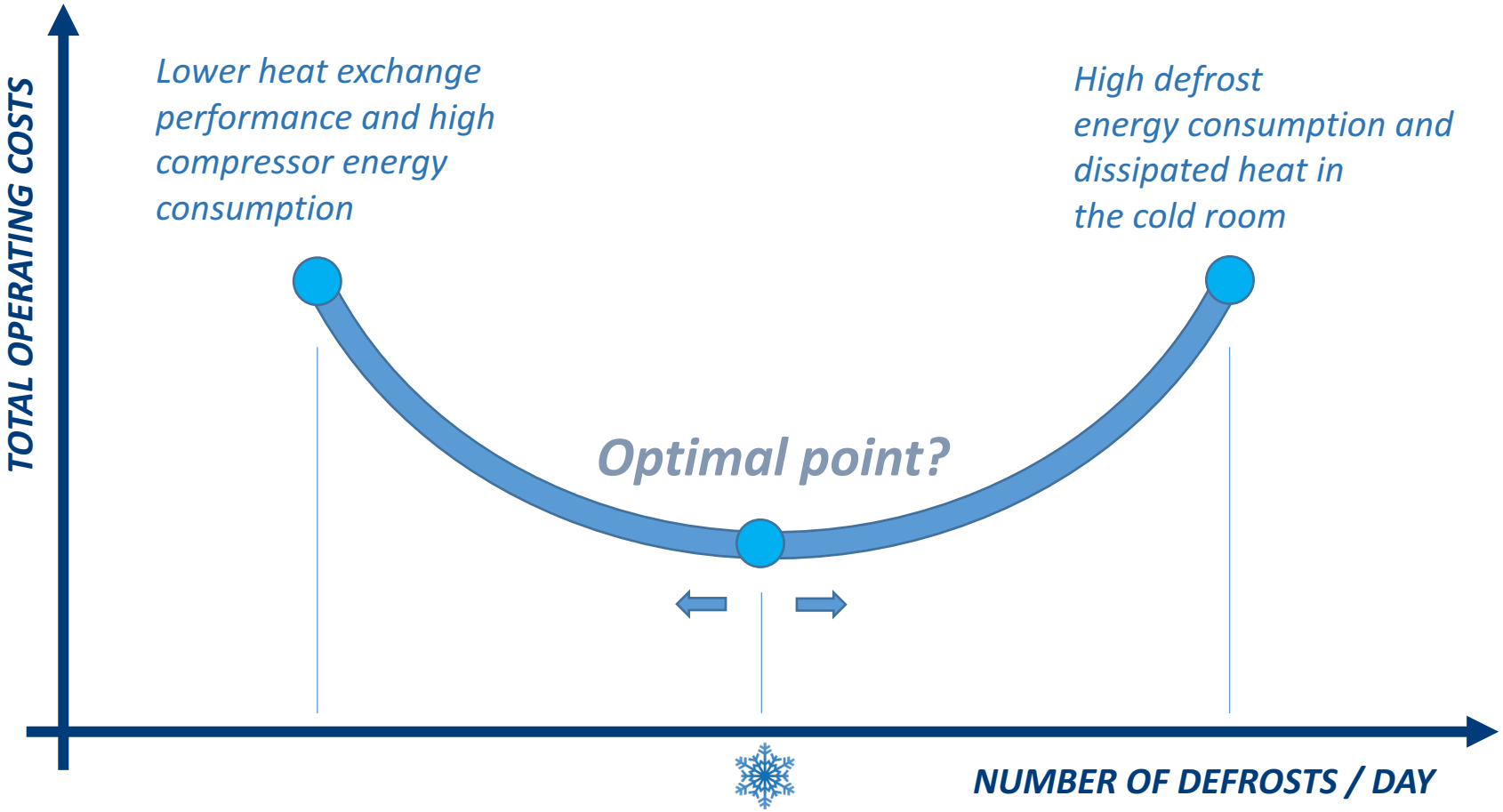
FROST PHENOMENA



- Additional **heat** resistance → heat transfer coefficient reduction
- Additional **aerodynamic** resistance → air flow reduction

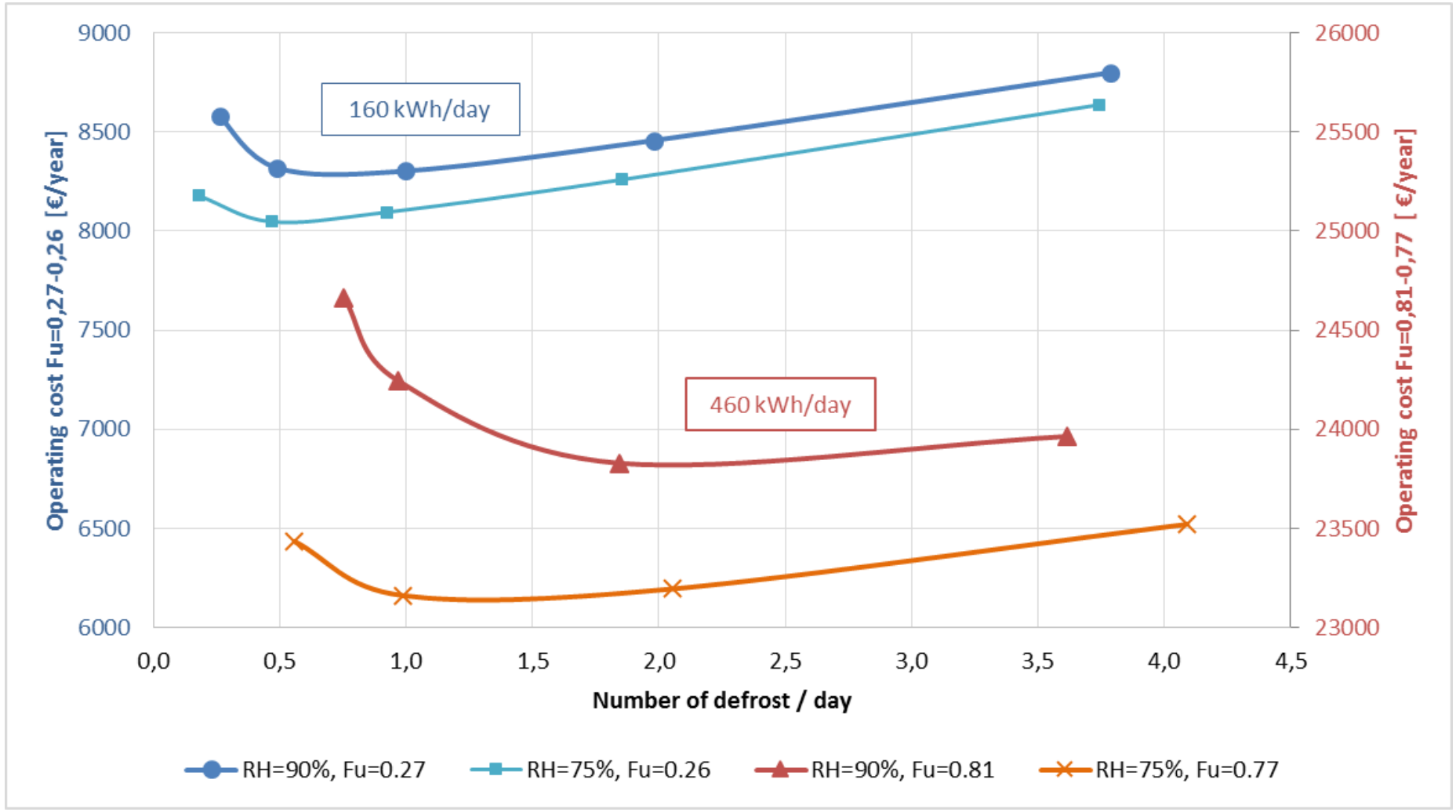
Lower capacity and greater consumption

OPTIMUM DEFROST/DAY NUMBER



- NIDEA self-adjusts the parameters and finds the best compromise

OPERATING COSTS AT DIFFERENT HUMIDITY AND UTILIZATION FACTOR



- Every working condition has a number of defrost/day that minimize running costs
- The minimum cost point occurs, in all simulations, when the heat exchanger has the same amount of frost

TRADITIONAL DEFROST

Start defrost by time, fixed time period between defrost
(e.g. every 6 hours = 4 defrost/day)

End defrost

- **By time:** when the defrost phase exceeds the maximum time settled *(e.g. 30 min)*
- **By temperature:** when the defrost probe exceeds the end defrost temperature value

Precautionary logic
The technician will set up a high number of defrost with long phase to avoid thick frost formation during the toughest working conditions

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- **Select** the optimum instant to start the defrost
- Choose **when** to stop the defrost
- It is **self-adjusting** and it changes the parameters depending on operating conditions
- Detect alarm event and, if necessary, move to **safety-mode**

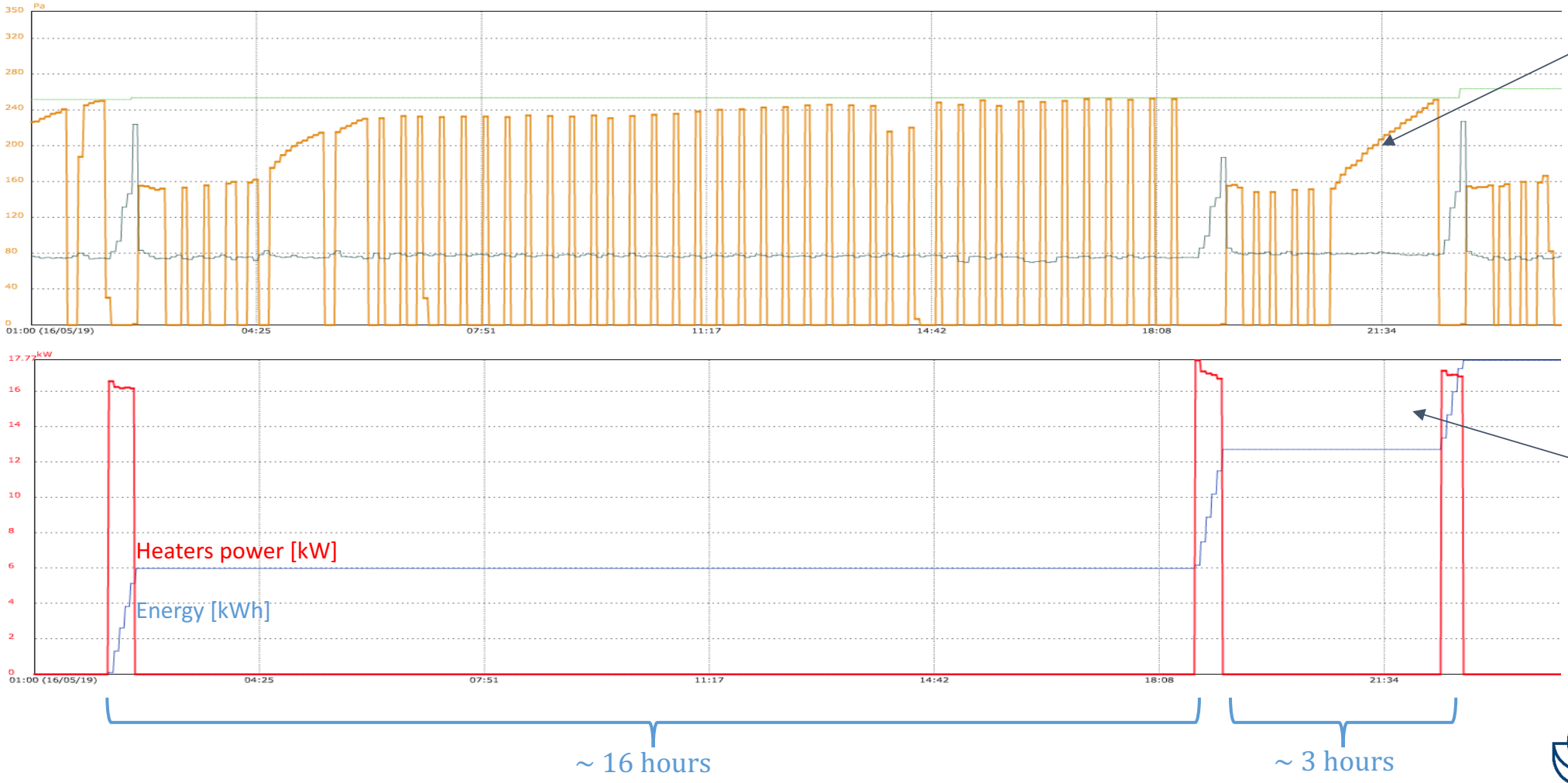
Efficiency logic
The software calculates every cycle the best defrost start time and defrost duration, so the heat exchangers always work in optimum conditions

Nidea® application in a real plant

Mogliano Veneto (Italy) field test

- LT cold room, frozen product storage
- Unit coolers LU-VE CS71H 4404 E10 with electronic valve E^{3}V and NIDEA
- Plant is continuously controlled by the monitoring system
  - Pressure and temperatures probe, energy-meter on heaters, compressor and fans

DAILY ANALYSIS, NIDEA AND HEATERS ENERGY-METER CHART



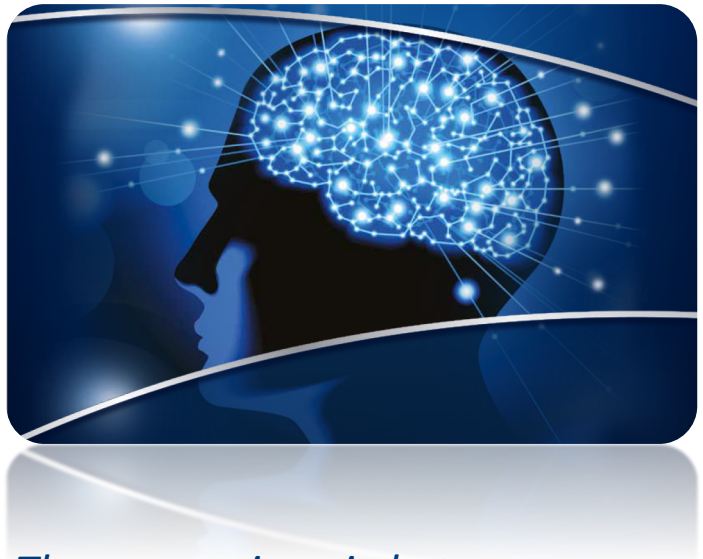
Continuous operation of the compressor and rapid frost-blocking of the coil

One defrost operation is carried out shortly after the previous one

- Defrost take place «when needed»

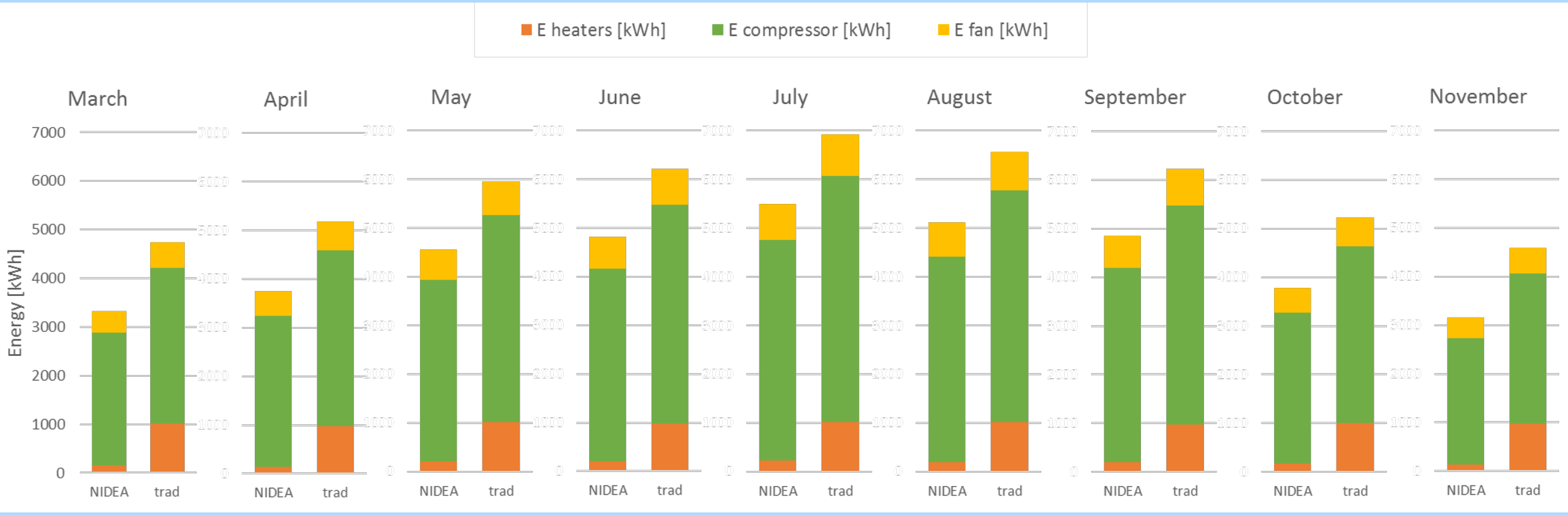
- Field test cold room base condition with traditional system:
  4 defrost/day, defrost fixed duration=30 min

- NIDEA optimum point:
  1 defrost/day, defrost average duration=25 min



The data analysis was made on a six-month period, from March to August 2016. The comparison is between energy consumption of NIDEA, measured by the energy-meter, and energy consumption that the plant would have with the old defrost default setting.

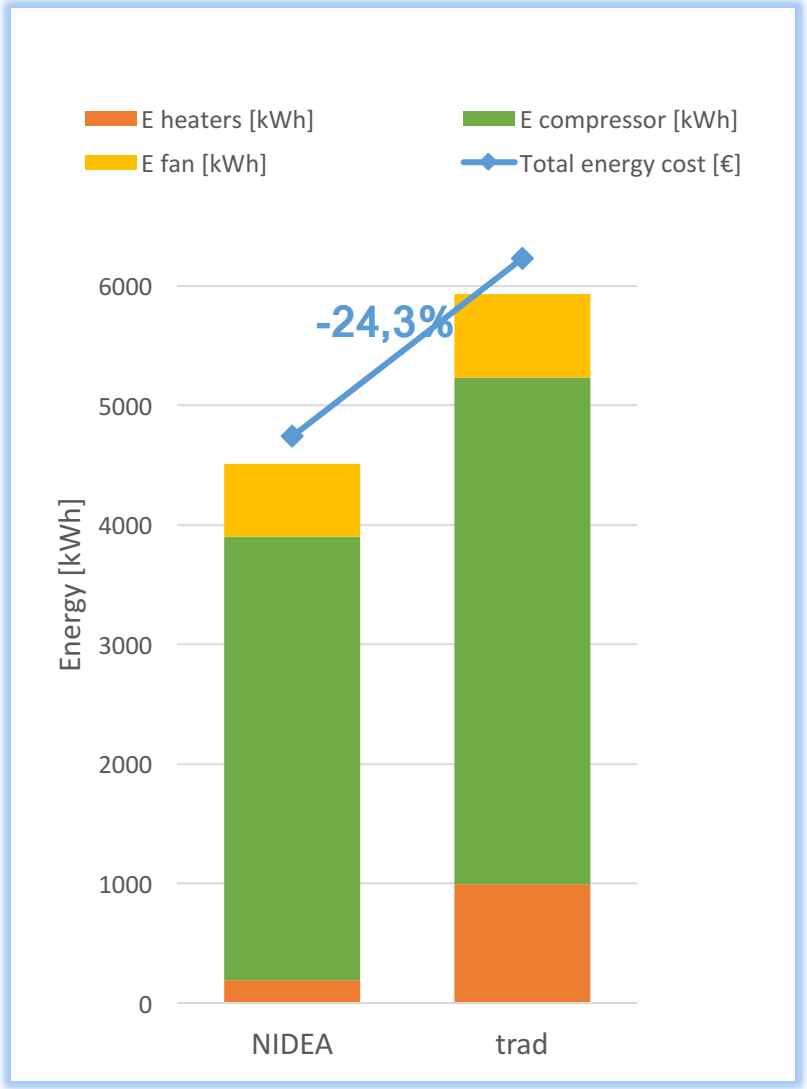
MONTHLY ANALYSIS



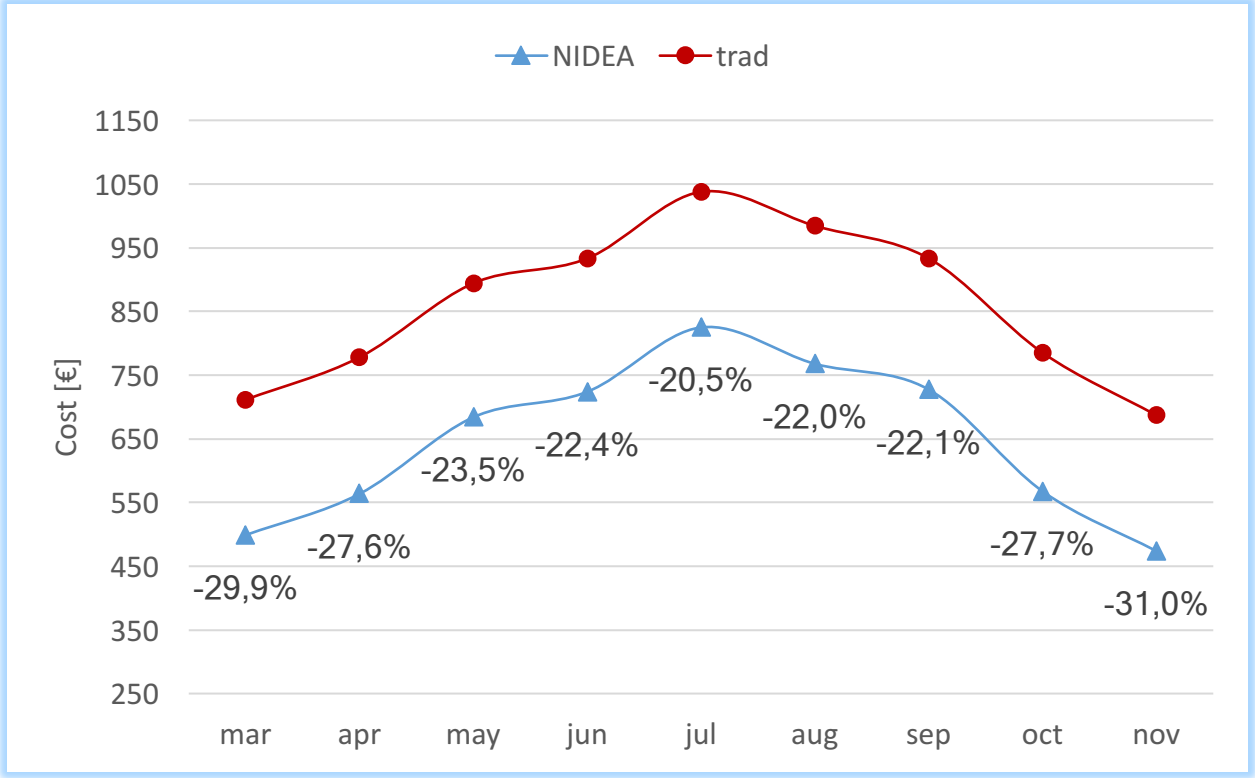
- In all months NIDEA has lower total energy consumption
- In warm months the energy consumption increases, since the COP is lower and the compressor requires additional power

SIX-MONTHLY ANALYSIS – AVERAGE DATA

AVERAGE 6 MONTHS		NIDEA	Trad.	difference	ratio %
n° defrost	-	29	123	94	-76,7%
E average defrost	kWh/month	6,6	8,1	1,50	-18,5%
E heaters	kWh/month	189	994	805	-81,0%
E compressor	kWh/month	3711	4237	526	-12,7%
E fans	kWh/month	614	701	87	-12,7%
Eth.in room defrost	kWh/month	117	924	807	-87,4%
E compressor additional	kWh/month	0	526	526	-100,0%
E el. Total	kWh/month	4514	5932	1418	-24,3%
Total energy cost	€/month	677	890	213	**-24,3%**



MONTHLY COST ANALYSIS



- Energy cost reduction from 20% up to 30%
- In Mogliano field test savings of 2000 €/year

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Payback: about 6 months

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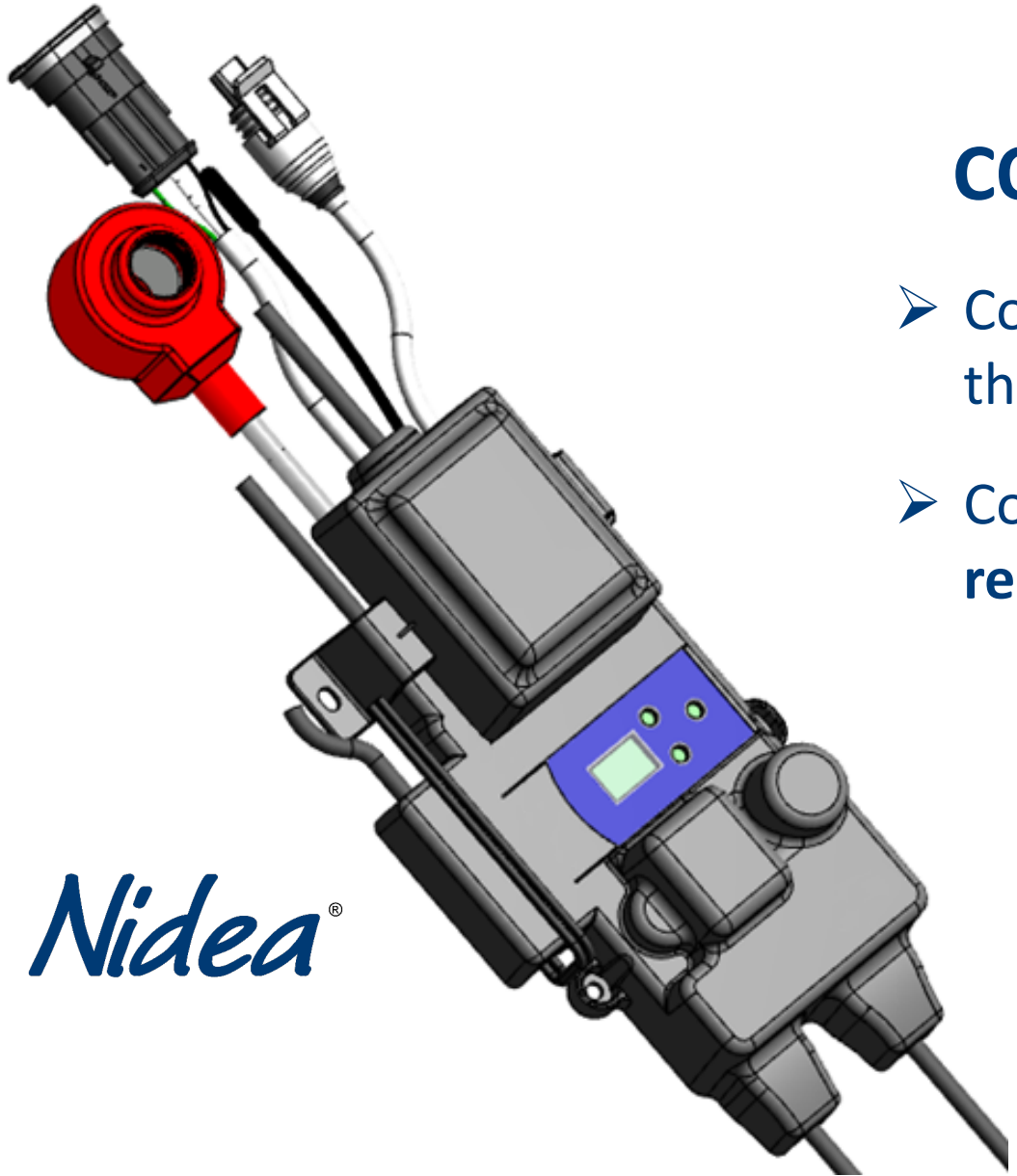
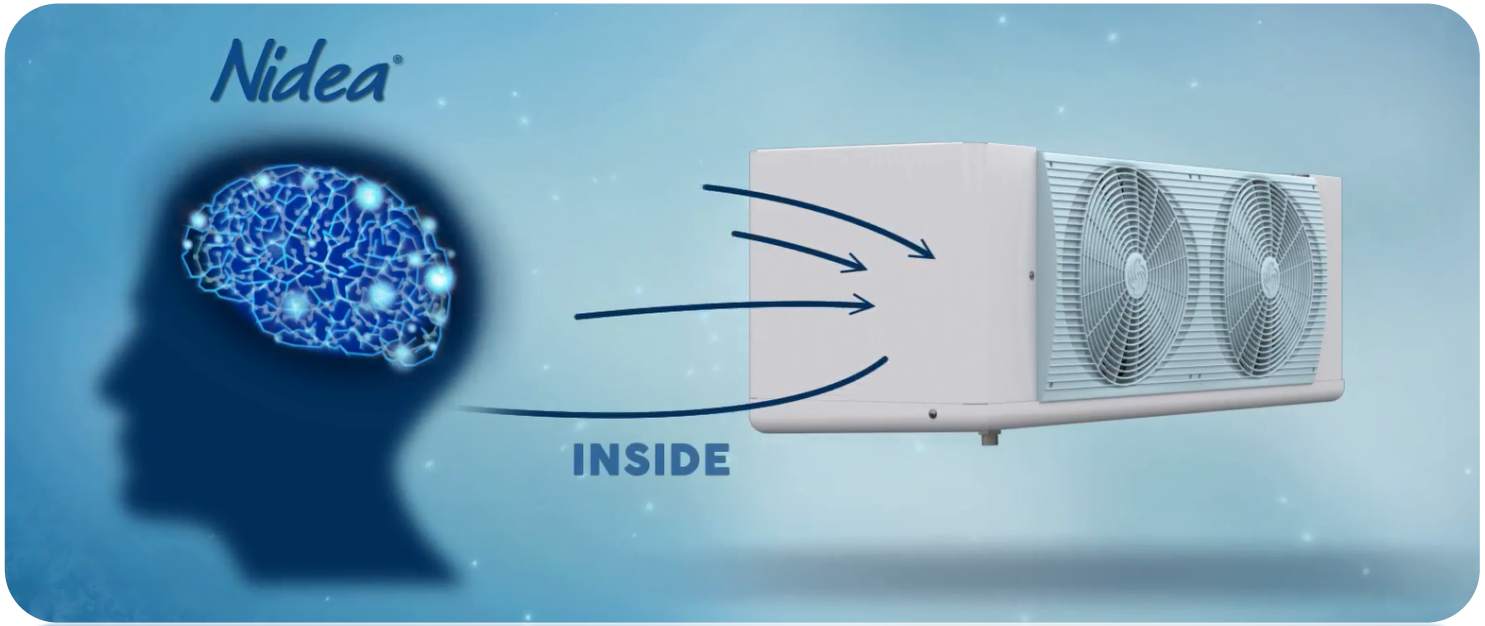


CONNECTIONS

- Connected with the **room main controller** to send the start and stop defrost signal
- Connected with the supervisory system and **remotely controlled** with RS485 Modbus

Conclusion

- Optimal defrosting enables lower energy consumption of a refrigeration plant
- Field tests on NIDEA confirm the energy saving potential
- NIDEA is available for standard products and further R&D activities are in progress to enlarge the application fields.



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Thank you very much!
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