COOL-FX

LEARN HOW TO SAVE ENERGY WITH A ROOF COOLING COATING



COOL-FX
THE TEMPORARY ROOF COOLING COATING SOLUTION

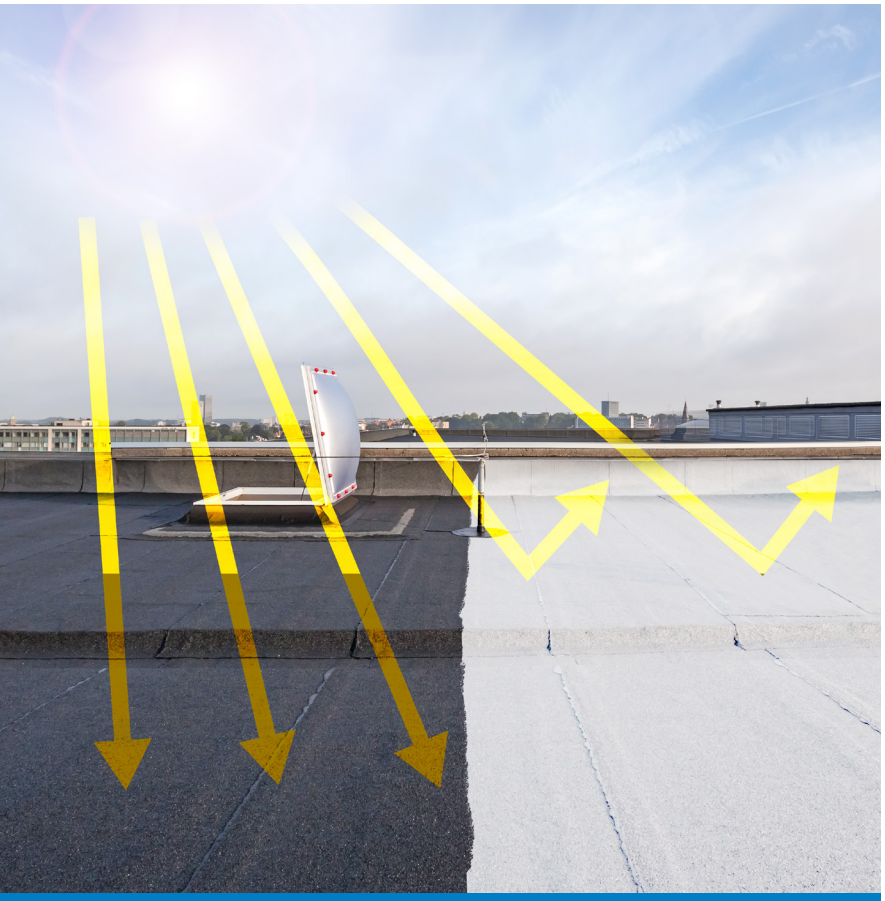
WHEN QUALITY MATTERS

BIOBASED & BIODEGRADABLE

1

INTEREST IN ROOF COOLING SOLUTIONS

During the last decade, everyone has been able to observe the steady increase of temperature in the world. This change in the global climate has local consequences: excessive accumulation of heat in buildings leading to difficult working/living conditions for humans and animals. Many solutions have been imagined to solve this issue. Some are active solutions like air conditioning while others are passive like white coatings, insulation, etc.



Impact of roof cooling coating on light reflection. With no coating the light (and the heat generated by it) is absorbed by the roof. With the white coating, Light is reflected by to the sky which avoid the heat absorption of the roof.

Passive roof cooling coatings are a growing solution in many countries to reduce the impact of heat during warm seasons. Indeed, by reducing the heat accumulated by the building they improve the climate inside for the beings while reducing the needs of active (expensive) solutions like air conditioning.

With such solution, the light is reflected before entering the building, so the heat is not accumulated by the roof and buildings can stay cooler inside. Usually, such technology, depending on the reflectivity index, can lower the temperature inside buildings between 2 to 7°C (3.6 to 12.6°F).

This not only enhances comfort for workers in industrial settings and animals in livestock facilities but also improves energy efficiency. By reducing reliance on air conditioning, it leads to significant energy savings and lower utility costs. At the same time, on the exterior, it helps regulate roof temperatures, protecting materials from heat damage, extending their lifespan, and minimizing long-term maintenance expenses.

TEMPORARY VS PERMANENT SOLUTIONS

2

Some permanent white insulating coatings already exist as roof cooling solutions. Even if some similarities exist with the Cool-FX, those products are technically quite different. The main difference is based on the lifetime of those solutions.

On the one hand, Cool-FX is a temporary solution that will protect your building against excessive heat for **3-5 months** (May-September). Due to weather conditions (rains, wind, UV) the coating will progressively wear off and disappear from your roof surface, allowing you to recover your normal roof aspect/color in winter seasons.

On the other hand, permanent white insulating coatings are long-lasting solutions that are usually sold for 10-20 years (depending on the coating quality and resistance). With this solution, you can keep your roof white during several years, but it comes with other complications.

It is important to understand the differences between those opposite technical approaches to make the right choice for your building, in your geographical area. In the table below, you can find a more detailed comparison of these 2 solutions.

Characteristics	Longevity	Price applied (€/m²)	Application	Yearly benefit	Environmental profile
Temporary Solution*	3-5 months	Low (Consumable)	Easy (Fast, No surface preparation, 1 layer)	No energy loss in winter, only summer gains	Development of biobased/biodegradable formulas (patented solution) with local raw materials**
Permanent Solutions	10-20 years	High (Investment)	Difficult (Several layers, surface cleaning and preparation, long drying time)	Gains in summer balanced by energy loss in winter	Petrochemicals with huge environmental impact

* Temporary solution: Cool-FX coating

** >98% of raw materials are European, >96% are grown, extracted, and transformed in France



As described in the table, with a permanent coating the roof is white the whole year, so the light is also reflected in winter when it is normally absorbed, when no coating is present. Usually, this light absorption in winter, even if limited, warms up the building leading to a reduced need in terms of heating, thanks to this natural/free heating of the sun.

From an economic perspective, with a permanent white coating, to have a positive balance (increased heating in winter VS decreased cooling in Summer) the possible geographical locations where it can be installed are limited.

WHERE & WHEN TO USE COOL-FX

Using France as an example, it must be in the extreme South region which implies that none of the Northern countries will have a positive balance with a permanent coating, (source: Remon Lapisa. Étude du rafraîchissement passif de bâtiments commerciaux ou industriels. Université de La Rochelle, 2015. Français).

Only cities like Marseille, Perpignan or Montpellier have an interest in having a permanent solution, because Mediterranean climate being hotter, the needs of heating in winter are limited. But, even if the South of France present a positive balance with permanent solutions, it is important to keep in mind that the global gains would be even higher with a temporary coating like Cool-FX. And indeed, with the figure below, you can see the negative impact of the permanent roof cooling coating on yearly energy bill.

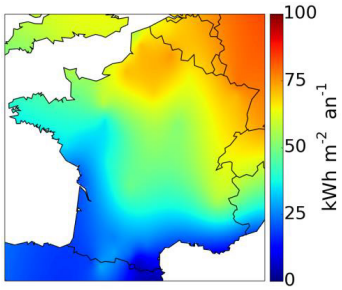


Illustration of the application of permanent roof cooling coatings on building energy bill.

This map shows that in the yellow-green areas (>90% of France country) using a permanent roof cooling solution will lead to an increase of the energy bill between 3-5 kWh.m-2.year-1. Currently (in May 2022), this means an increase of the energy bill of around € 0.50/square meter. This is one of the reasons why the permanent roof cooling solutions, even if innovative, are not applied everywhere, yet. Because the gains they create in Summer are too much off-set by the loss they induce in Winter, for most of the locations.

EXPERIMENTAL RESULTS OF TEMPERATURE REDUCTION

3

INDUSTRIAL SECTOR

OBJECTIVE

Cool-FX was applied to the industrial roof of a company near Échirolles, France, with the goal of reducing indoor temperatures during the hot season (June to September). Since the factory does not have an air conditioning system, the benefit is not financial but instead focused on improving working conditions for employees during the summer months.

2 Main issues were identified:

- Blindness caused by direct light through skylights.
- Excessive heat under skylights and in the building in general.

Thus, coating's applications are realized on 2 kinds of substrates:

- Skylight made of plastic.
- Black roof with rubber like composition.



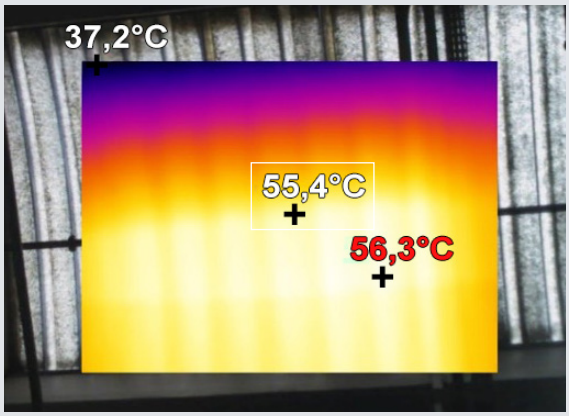
Satellite picture of the Industrial building. Numerous skylights are visible of different size and nature. The black coloration of the roof is also visible.



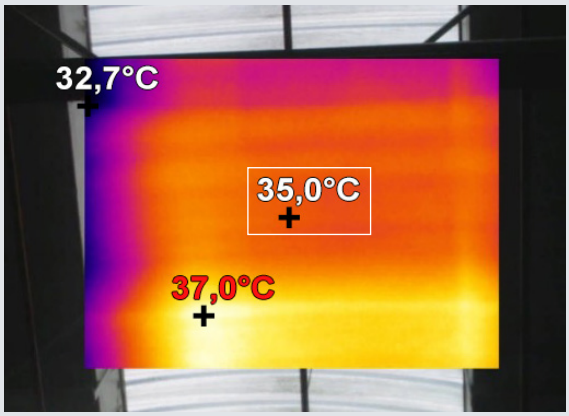
THERMAL MEASUREMENTS ON SKYLIGHTS

Influence of Cool-FX on skylight temperatures measured from the inside, with an IR-camera

Skylight without Cool-FX



Skylight with Cool-FX

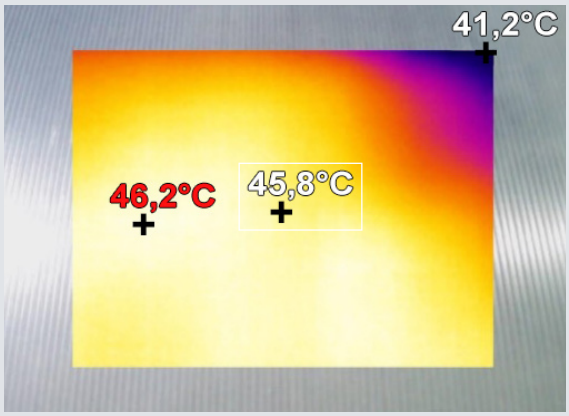


The use of Cool-FX allows a surface temperature reduction between 10 and 20°C (18 to 36°F), depending on the composition, the use of the skylights and the dilution used for Cool-FX, with an exterior temperature close to 35°C (95°F).

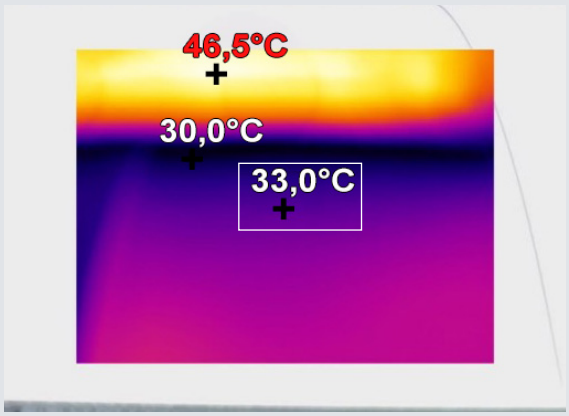
The coatings also allow to reduce the light quantity entering the building, and thus to reduce the phenomenon of glare that bother workers below the skylights.

Influence of Cool-FX on skylight temperatures measured from the outside, with an IR-camera.

Skylight without Cool-FX



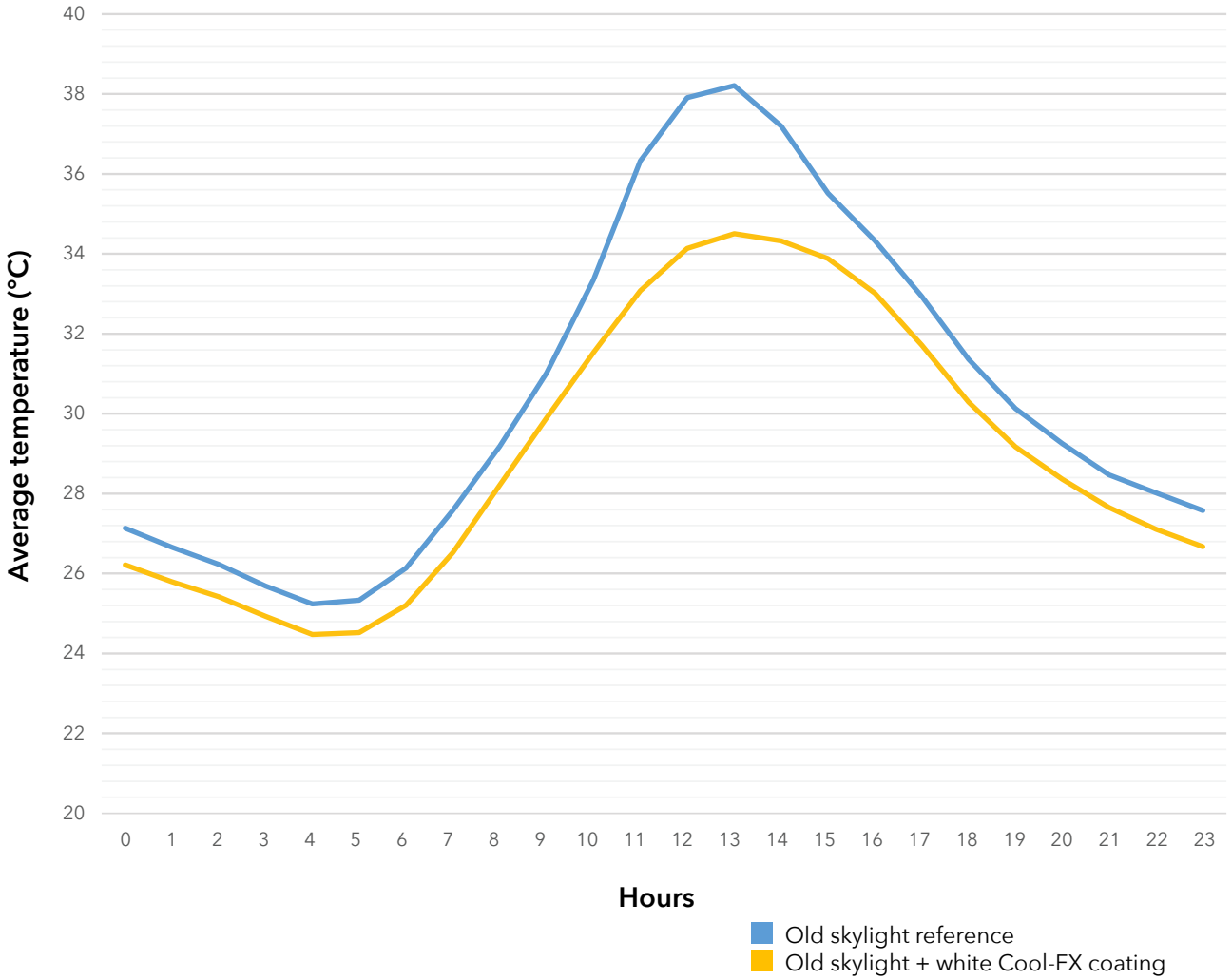
Skylight with Cool-FX



The Cool-FX leads to an average surface temperature decrease of skylights of 10-15°C (18-27°F).

MEASUREMENTS WITH SENSORS

Temperature sensors were placed inside the building, beneath a skylight, for nearly two months (July 8th to August 28th) to assess Cool-FX's impact on the interior temperature.



Cool-FX helps reduce the interior temperature of the building by several degrees Celsius. During the hottest part of the day, between 10:00 and 16:00, this reduction in temperature can be as much as 3.5°C (6.3°F), providing a noticeable cooling effect.

RESULTS

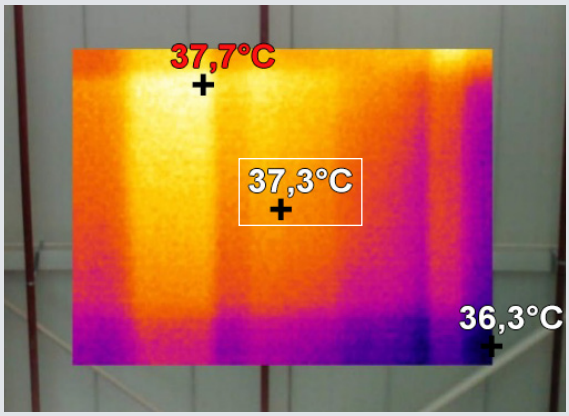
Measurements	Temperature Reduction
Inside building	3.5°C (6.3°F)
Inside surface	10-20°C (18-36°F)
Outside surface	10-15°C (18-27°F)



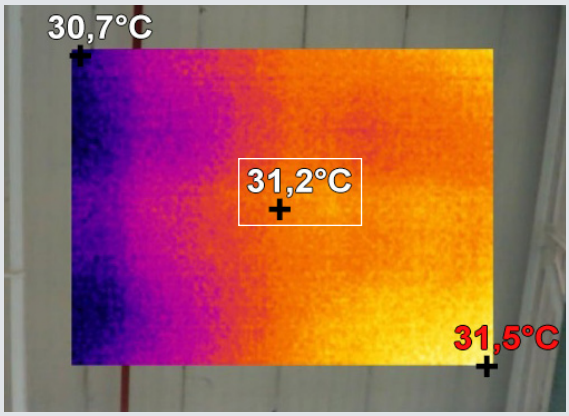
THERMAL MEASUREMENTS ON ROOFS

Influence of Cool-FX on roof temperatures measured from the inside, with an IR-camera.

Building's roof without Cool-FX



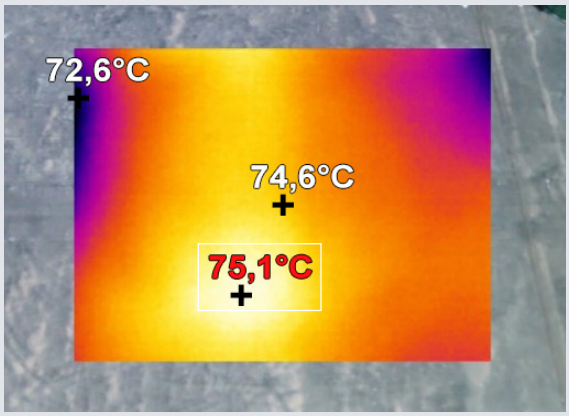
Building's roof with Cool-FX



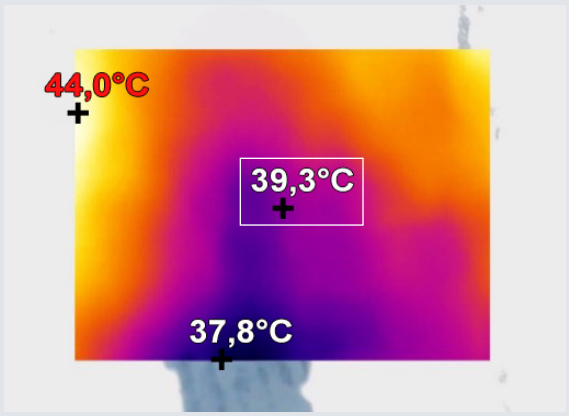
Application of Cool-FX on the building's roof leads to a surface temperature decrease (on the inside) of 6°C (10.8°F).

Influence of Cool-FX on roof temperatures measured from the outside, with an IR-camera.

Black roof without Cool-FX



Black roof with Cool-FX



The application of Cool-FX on the roof leads to a surface temperature reduction of 35°C (63°F).

RESULTS

Measurements	Temperature Reduction
Inside surface	6°C (10.8°F)
Outside surface	35°C (63°F)

COOL-FX

EXPERIMENTAL RESULTS OF TEMPERATURE REDUCTION

4

LIVESTOCK SECTOR

OBJECTIVE

Cool-FX was tested on poultry barns in Ankara, Turkey, to see how it could help with the heat during the summer. The trial ran from August to September and aimed to lower temperatures inside the barn and create a more stable environment for the chickens. This helps keep the chickens healthier and improves their productivity. Another goal was to save energy by using less cooling equipment, making it more cost-effective for the farmers.

3 Main Issues were identified:

- Excessive heat in the barns during summer creates an unhealthy and uncomfortable environment for chickens.
- Cooling systems consume large amounts of electricity, leading to higher energy costs.
- High temperatures reduce chicken growth, lower meat production, and result in greater losses of livestock.

Thus, the coating application was carried out on a single substrate:

- Roof made out of aluminium.



Two barns of identical size (16m x 120m, with a height of 4.7m) were selected for the trial. Each barn was equipped with: 13 fans, each capable of moving 38,000 m³ of air. 70 air vents, each allowing 1,700 m³ of air to pass through.

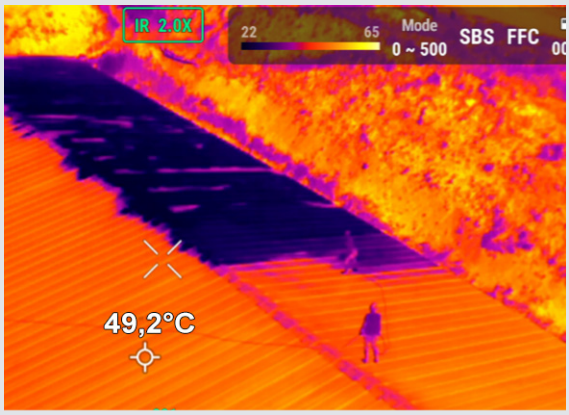
For the application, Cool-FX was mixed with water in a ratio of 1 part coating to 3 parts water. The mixture was applied manually using six buckets of the product (20kg per bucket). One barn was treated with the coating, while the other was deliberately left uncoated to serve as a control. This setup enabled effective A/B testing to compare the performance of the coated barn against the uncoated barn under identical conditions.



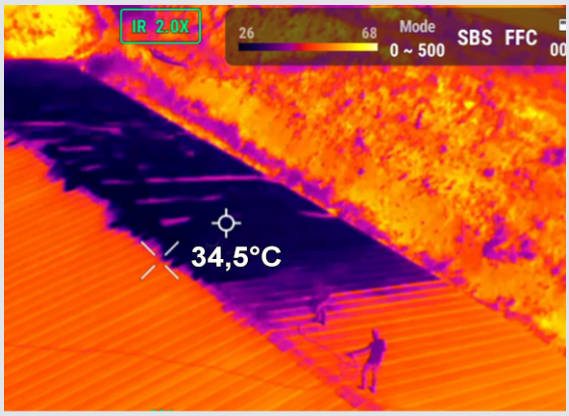
THERMAL MEASUREMENTS ON ROOFS

Influence of Cool-FX on aluminium roof temperatures measured from the outside, with an IR-camera.

Aluminium roof without Cool-FX



Aluminium roof with Cool-FX



The application of Cool-FX on the roof leads to a surface temperature reduction of 14.7°C (26.5°F).

Internal Temperature After Cool-FX Application

Time	Control barn*	Cool-FX coated barn*	Outside temperature
13:00	32.2°C (89.96°F)	26.1°C (78.98°F)	34.4°C (93.92°F)
15:00	34.9°C (94.82°F)	27.6°C (81.68°F)	39.4°C (102.92°F)
18:00	33.8°C (92.84°F)	27.2°C (80.96°F)	36.6°C (97.88°F)

* Internal temperature

These readings were taken before the chickens were placed in the barns, with no fans or cooling pads running. Once the chickens were inside, the temperature in both barns started at 33°C (91.4°F) and was gradually lowered to 20°C (68.0°F) over the 42-day cycle. The barn with the Cool-FX coating had a more stable and comfortable temperature.

Benchmark Over the 42-day trial

Electricity Consumption	Control barn	Cool-FX coated barn
One cycle (42 days)	4,684.813 kWh	4,129.696 kWh

Production and Health Benefits

Chicklet entry amount	Control barn	Cool-FX coated barn
One cycle (42 days) Date: 10/08/2024	33.255	33.255

Loss during one cycle	Control barn	Cool-FX coated barn
Day 1: 10/08/2024 Day 2: 21/09/2024	1397	1101

Data on the 35th day	Control barn	Cool-FX coated barn
Total meat production (incl. bones)	67.602 kg (149.0 lbs)	69.388 kg (153.0 lbs)
Total chicken feed consumption	96.400 kg (212.5 lbs)	94.900 kg (209.2 lbs)
FCR (Feed conversion ratio)	1,42	1,36

* FCR : The weight of feed intake divided by weight gained by the animal. Lower FCR values indicate higher efficiency.
* The same chicken feed has been used in both barns.
* Expected FCR value is max 1,47 in the 35th day of the cycle.

SUMMARY OF RESULTS

Measurements	Cool-FX coated barn
kWh	- 12%
Loss of animals	- 21%
Meat production	+ 3%
Feed consumption	- 2%
FCR	- 4%
Temperature difference*	7.3°C (13.1°F)

* Without cooling (15:00)

Note:
Next to Cool-FX, other factors could be influencing the results as well, like (1) the genetics of the animals (parent animals), (2) chicken congestion (crowding of the animals), (3) quick drops in temperature, ventilation and diseases might have an effect on these results as well.

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COAT FX

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