

COOL DOWN YOUR WORK CLIMATE THE SMART WAY



**COOL-FX THE
TEMPORARY
COOL ROOFING
COATING
SOLUTION**

WHEN QUALITY MATTERS

COOL-FX

COAT ^{FX}

INTEREST IN COOL ROOFING 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 cool roofing 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 cool roofing 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.

This means, inside the building, better working conditions for workers, reduction of air conditioning (which comes with energy bill savings). But also outside, a reduction of roof temperature by almost 50°C for black roofs, which helps to improve the lifetime of roof materials.

TEMPORARY VS PERMANENT SOLUTIONS



Some permanent white insulating coatings already exist as cool roofing 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 (€/m ²)	Application	Yearly benefit	Environmental profile
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*	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**

* 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.

For France, 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 cool roofing coating on yearly energy bill.

This map shows that in the yellow-green areas (>90% of France country) using a permanent cool roofing solutions 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 cool roofing 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.

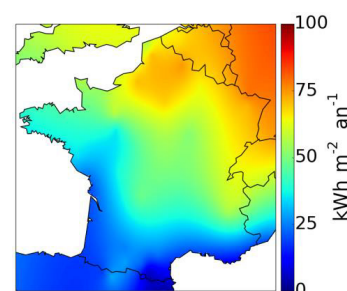


Illustration of the application of permanent cool roofing coatings on building energy bill.

EXPERIMENTAL RESULTS OF TEMPERATURE REDUCTION



OBJECTIVES

Spraying of Cool-FX on the industrial roof of a company near Echirolles (France). The goal of this application is to reduce the temperature inside the factory during the hot season (June to September). This factory doesn't have any air conditioning system installed, so the gain is not financial but Human, with an improvement of worker conditions during hot months.

2 Main issues were identified:

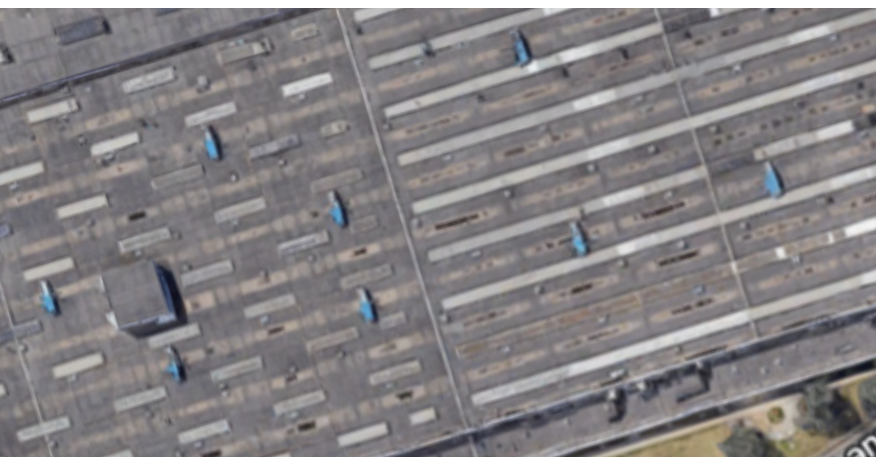
- Blindness caused by direct light through skylights.
- Excessive heat under skylights and in the building in general.

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

- Skylight made of plastic. Several kinds of skylights are installed, of different composition and ages.
- Black roof with rubber like composition.

For this test, 2 technologies of coatings have been applied to observe their impact on the temperature inside the building:

- **White heat-reflective coating (Cool-FX)** = White coating that limit the quantity of light entering the building.
- **Transparent heat-reflective coating** = Transparent coating that reflects IR wavelengths (so part of heat) with a limited loss of visible light.

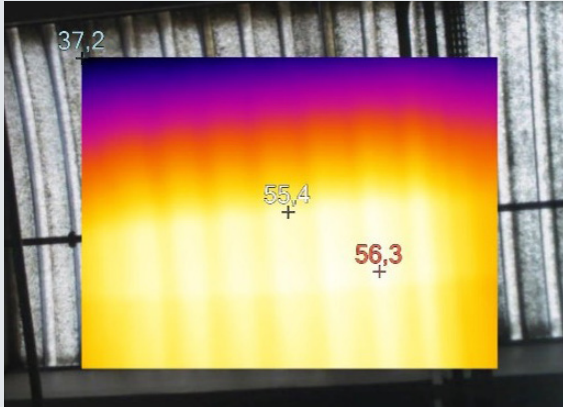


Satellite picture of the Industrial building. Numerous skylights are visible of different size and nature. The black coloration of the roof is also visible.

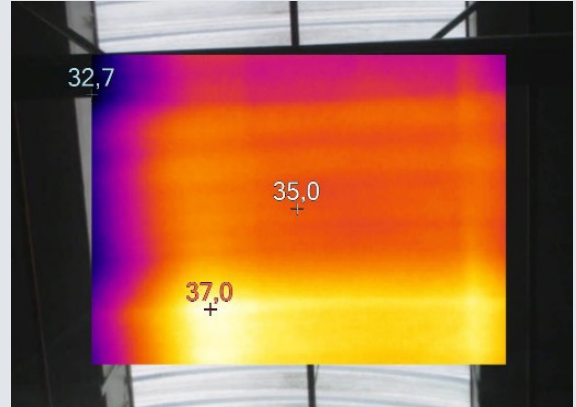
THERMAL MEASUREMENTS ON SKYLIGHTS

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

Skylight without Cool-FX

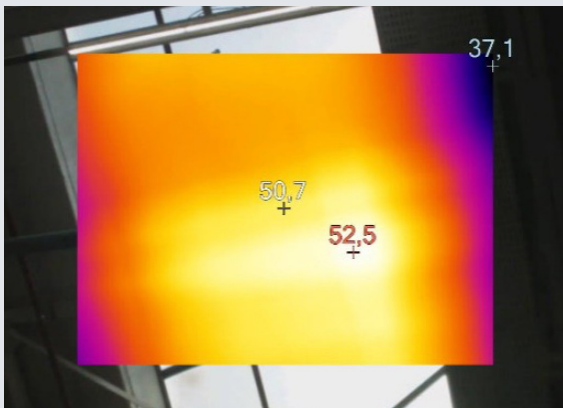


Skylight with Cool-FX

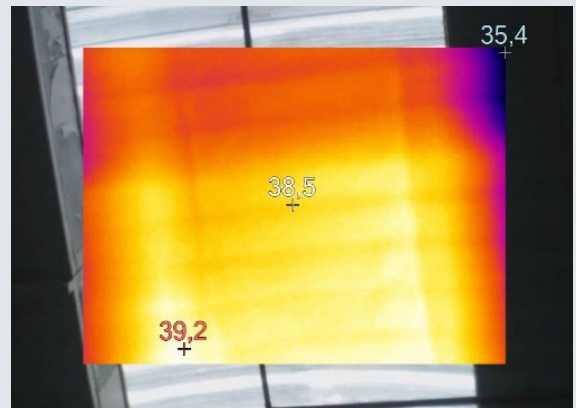


The use of Cool-FX allows a surface temperature reduction between 10 and 20°C, depending on the composition, the use of the skylights and the dilution used for Cool-FX, with an exterior temperature close to 35°C. The coatings also allow to reduce the light quantity entering the building, and thus to reduce the phenomenon of glare that bother workers below the skylights.

Skylight without transparent heat-reflective coating



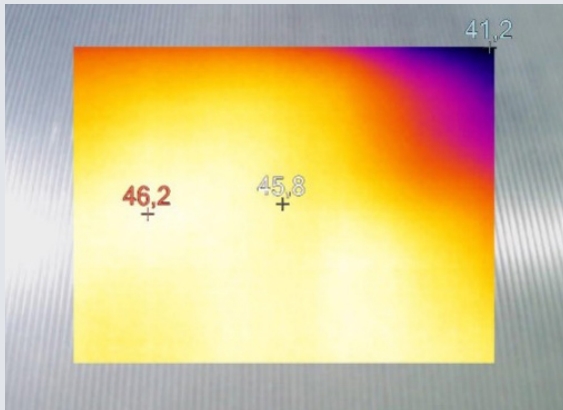
Skylight with transparent heat-reflective coating



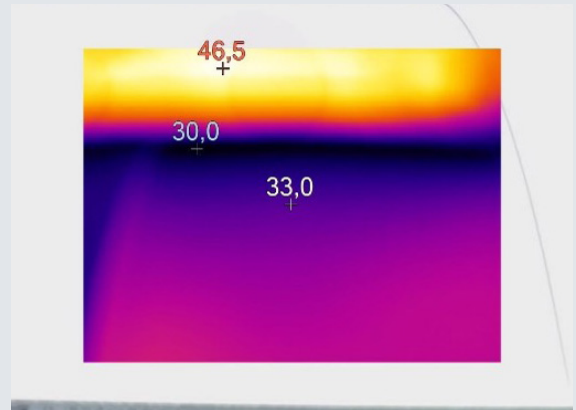
The application of transparent heat-reflective coating on skylights lead to a surface temperature reduction of 12°C (value taken from inside).

Influence of the different coatings on the surface temperature of skylights and roof

Skylight without Cool-FX



Skylight with Cool-FX

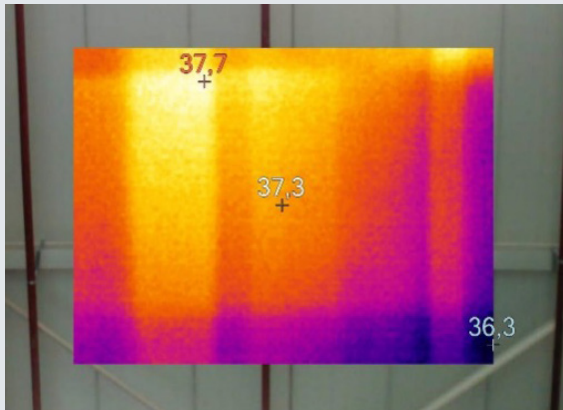


The Cool-FX leads to an average surface temperature decrease of skylights of 10-15°C.

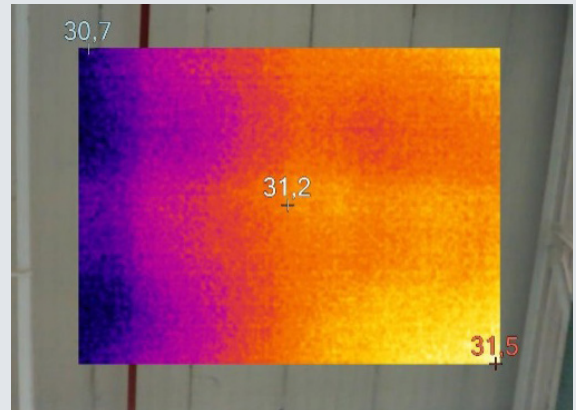
THERMAL MEASUREMENTS ON ROOFS

From inside

Building's roof without Cool-FX



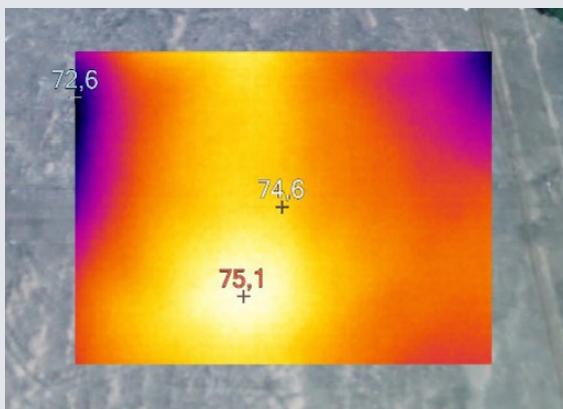
Building's roof with Cool-FX



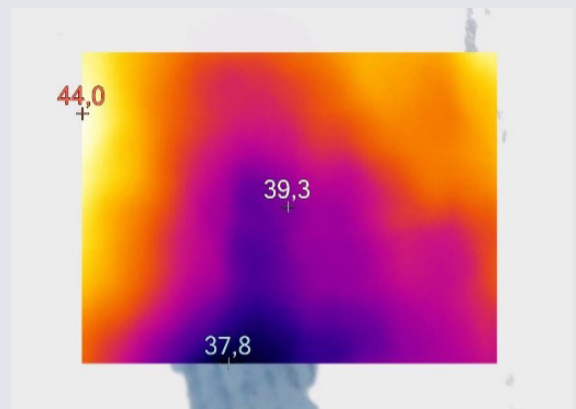
Application of Cool-FX on the building's roof leads to a surface temperature decrease (on the inside) of 6°C.

From outside

Black roof without Cool-FX



Black roof with Cool-FX

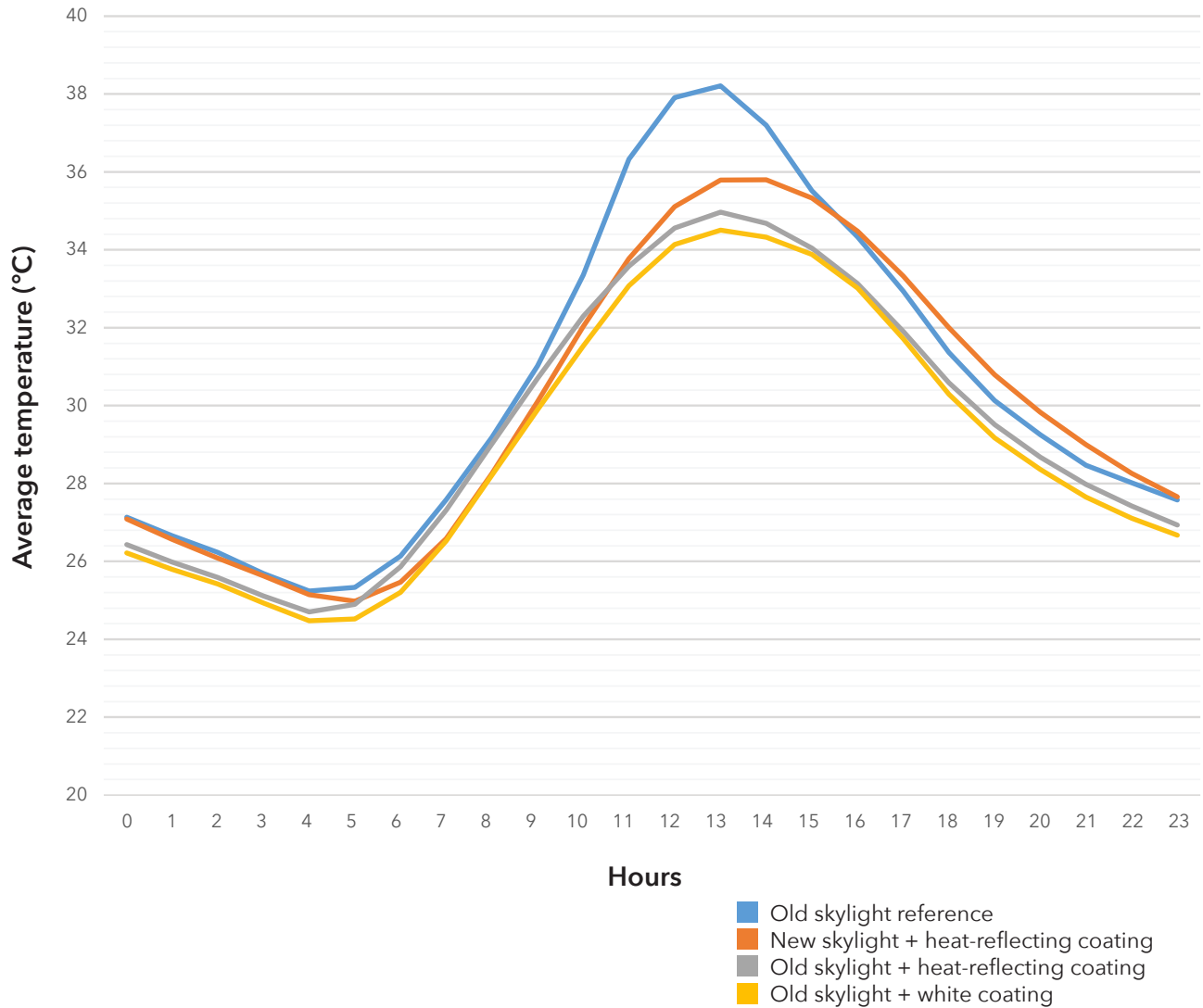


The application of Cool-FX on the roof leads to a surface temperature reduction of 35°C.

MEASUREMENTS WITH SENSORS

Temperature sensors were placed inside the building during almost 2 months (8 July - 28 August) under the different skylights to evaluate the coating's influence on the interior temperature.

Average temperature taken under different skylights between the 8th July and 28th August




Cool-FX and the transparent heat-reflective coating leads to a temperature decrease of several °C inside the building. During the hottest hours of the day (10-16h) this temperature reduction is as much as 3.5°C.

CONCLUSION

With the application of our coatings, the following effects have been observed on the industrial building of our partner:

- A decrease of skylights surface temperature up to 20°C.
- A decrease of roof (black) surface temperature up to 35°C.
- A decrease of the ceiling temperature (inside) of 6°C.

Use of our coatings allows, effectively, to reduce surface temperature of roof and skylights. The use of temperature sensors has demonstrated **a significant reduction of the temperature inside the building** (3°C in average) with Cool-FX and the transparent heat-reflective coating.



*“Cool down your interior
with Cool-FX, a professional
temporary roof cooling solution”*

EXECUTIVE SUMMARY

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Cool-FX Temporary coating solution is, as demonstrated, a different technology that creates various benefits for the Cool Roofing market:

→ **Application on hard-to-reach buildings**

As no preparation or special application equipment are needed, it is possible to apply the product even on tilted surfaces with low security installed using, for example, spraying drones.

→ **Easy and fast application**

No need for a special extensive training to apply Cool-FX. This product is easy to use and large areas can be applied in few hours, because only one layer needs to be applied. On the contrary, permanent solutions need several applications separated by several drying times (Cleaning and surface preparation, primer, coating, topcoat such as UV protection varnish = 4 steps at least). But also, they will need a yearly maintenance to keep the surface clean and white.

→ **A product present only when needed**

The main benefit of a temporary solution is its presence when it is necessary. Thus, you do not have to worry for the loss of energy accumulation in winter. Cool-FX will reflect the heat in summer and let your black roof absorb the light in winter.

→ **Improvement of environmental profile**

Coat-FX brand is developing innovative coatings with the lowest environmental profile possible. Next year, a more ecological version of the Cool-FX will be commercially available (possibility to obtain small volumes for testing in 2022).

This new version uses biobased raw materials (from vegetable origin like corn or pea) and the end formula is fully biodegradable in less than 28 days (tested with OCDE 301 official European norm). These 2 elements allow an important reduction of the product environmental impact, knowing that current Cool-FX formula is already label free (no chemical hazard) and with reduced environmental impact compared with other solutions on the market. Permanent coatings are using binders based on Epoxy or Polyurethane technology that, even if really performant in term of wear resistance and waterproofing, are made from toxic and energy-guzzling raw materials, very impacting for the planet.

→ **Different price positioning**

Because Cool-FX is only supposed to be on the roof for few months, the price positioning is also very different from the one of permanent coatings. While Cool-FX can be seen as a consumable, the permanent solution needs to be an investment considering the costs.

→ **Effective temperature reduction**

As demonstrated with the study in part 3, the use of Cool-FX allows a temperature reduction, inside the building, of almost 5°C on the hottest days. This means better working conditions for workers inside the building and reduction of active cooling solutions use like air conditioning, with related energy savings. Also, the roof surface temperature is lowered to the ambient air temperature (reduction of 20 to 35°C) which preserves the materials constituting the roof.



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