

PUBLISHABLE SUMMARY



Grant Agreement number: 260132

Project acronym: COOL-Coverings

Project title: "Development of a novel and cost-effective range of nanotech improved coatings to substantially improve NIR (Near Infrared Reflective) properties of the building envelope"

Funding Scheme: FP7-CP

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Project context and objectives

Cool Coverings: development of near infrared coatings and tiles to reduce heating of dark colored surfaces on roofs and façades. Sun-reflective building materials help to achieve reduction of cooling loads and improve thermal comfort. Cool materials are often seen in roofing but there are also tentative applications for façades. Cool materials are in competition with insulation materials and cannot be applied in cold countries, a part from roof where photovoltaic can have a benefit in efficiency improvement due to reduced environmental temperature. In hot countries, instead, the cool coverings are absolutely cost effective against insulation retrofitting since they reduce heat gain with minor investment costs. Cool materials on the market are always **white** since a large part of heat is contained in the visible spectrum. Architects, however, are eager to find solutions for **dark colored** reflective materials also.

The core idea of the Cool Coverings project (an FP7 project funded under the PPP-NMP-EEB umbrella and completed in June 2013) is to use nanotechnology and pigment technology to improve reflectance in the “non visible” spectrum of the light. In particular, the Near Infrared region (NIR) can be targeted since it contains 30-45% of the heat. New paints, tiles and waterproofing roof membranes can be modified by nanotechnology to achieve high NIR reflectance, with very small aesthetic differences with respect to standard materials.

After 2 years of research the Cool Coverings project developed (1) a new range of colored paints for façade, (2) a new range of black tiles for façade, (3) a new colored bitumen based waterproofing membrane for flat roof. These materials can be now scaled up to market and the recent efforts of the industrial companies belonging to our consortium are all in this direction.

The materials have been validated following a strict scientific approach, firstly in the laboratories, than in simulations and finally in a middle scale comparative demonstration park. The following performances have been certified:

Case 1: re-roofing a flat warehouse in Madrid with the same grey membrane, but this time NIR reflective. Overall savings on the energy bill, in one year (considering conventional gas heating and electric HVAC) = 4,6%

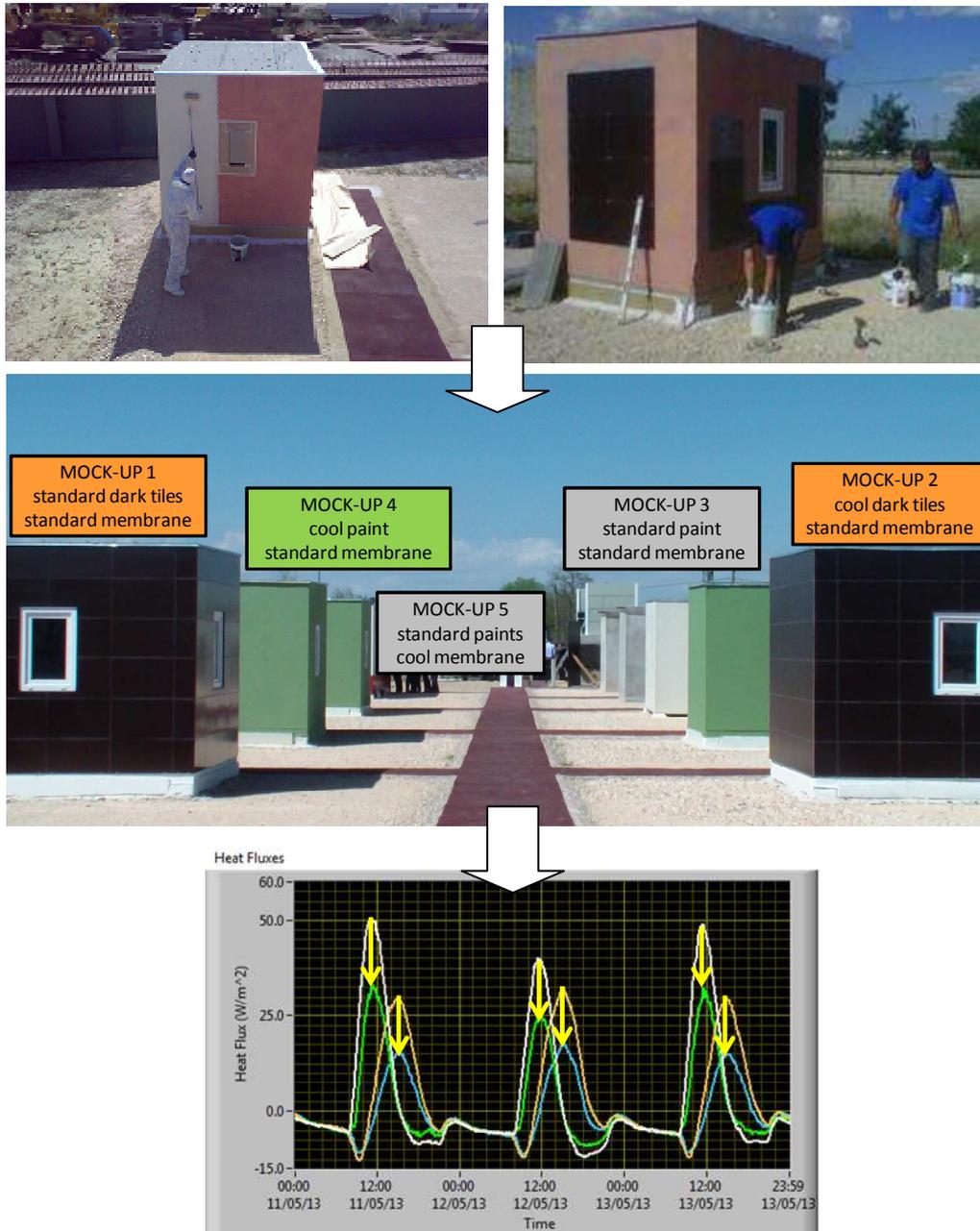
Case 2: re-painting a multistorey house in Madrid with the same “dark green” tint, but this time NIR reflective. Overall savings on the energy bill, in one year (considering conventional gas heating and electric HVAC)= 7,5%

Case 3: re-tiling a multistorey house in Madrid with the same black tint, but this time NIR reflective. Overall savings on the energy bill, in one year (considering conventional gas heating and electric HVAC) = 4%

The cool coverings products have been developed thanks to the deep collaboration and cross expertise of 3 traditional building material industries, 1 construction company and 8 research & engineering companies:

- Step 1: development of nanoxides additives and pigments by using several different nanopowders production approaches (non disclosable information);
- Step 2: integration to paint, tiles and membranes (non disclosable information);
- Step 3: test in lab conditions, re-creating artificially the effect of rising and falling sun on standard building substrates;
- Step 4: application of samples in a facility called “demo park” (Madrid) in order to assess their thermal behavior when integrated in a building mass. To do this, several middle scaled

building were constructed in the area to perform a comparative analysis under real conditions, under the Spanish sun.



The three products are rather close to industrial scale up: roof membranes and cool paints are about to appear in the commercial catalogues, while roof tiles need to fine tune the industrialization process, although the current production line need only a light setting up. All products are, at the moment, covered by trade secret apart from the membrane which was filed for PCT patent, in the white version.

A further result of Cool Covering is, finally, a close to market prototype of spectral imaging portable device, which can be used to determine behaviour of cool coverings in a portable way (unique in the world).

At the end of the project it was clear that:

1. the technical barriers would have never been overcome without cross collaboration of such diverse expertise and sensitiveness.
2. the implementation of the demo park allowed cross collaboration with 4 other projects in the area of NMP-PPP-EEB generated cost savings per project averaging k€50-70. This allowed each consortium to focus even more on further testing.