



Planet Supra

Thermal Barrier for Logistics & Supply Chain

a
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by
Trading Green Ltd., eco-friendly solutions

The logistics and Supply Chain industries in warm countries face unique challenges due to the weather. These challenges increase year after year because of Global Warming. Warehouses present large roof surfaces impacted by solar radiations. Trucks spend long hours driving and parked fully exposed to the sun.

This White Paper will present how Planet Supra helps keeping buildings and vehicles cool, increasing product safety, saving costs on electricity and fuel, improving personnel working conditions, reducing carbon footprint.



Planet Supra: Thermal Barrier for Logistics & Supply Chain

Planet Supra: a nanotechnology, eco-friendly heat reflective barrier for the 21st century.



Heat reflective materials such as ceramic-based additives and coatings have been in the market for over 30 years. Their benefits as well as their limitations are well known.

When Planet Supra was developed, it pushed heat reflectance to a whole new level. Rather than ceramic, it

relies on **silica beads to reflect solar radiations.**

Silica beads reflect heat better and with a longer lifespan than ceramic. Less fragile, they do not break when stirred or when the coating is applied: performance is constant and predictable. Planet Supra can therefore be applied like regular paint, with a brush, roller or spray gun and does not require any special equipment.

Challenge: improve employee working conditions in warehouses.

Offering good working conditions to employees is not only beneficial from a social point of view, it also makes very good business sense. In logistics and supply chain in warm weather countries, employees working in warehouses have to spend long hours by ambient temperatures higher than 40°C. The ambient temperature inside non-air-conditioned warehouses is always superior to the outdoors ambient temperature, day and night. This causes dehydration, exhaustion, and leads to lower productivity and absenteeism.

When it comes to cooling down a building, every single degree Celsius counts. Human perception of heat and cold is based on body and ambient temperatures. Therefore if a warehouse is warmer indoors than outdoors, it is perceived as "hot".

Roofing insulation such as PE sheets or PU foam help lower temperatures by absorbing heat that has been accumulated by the roof. If the warehouse is not cold storage, it doesn't require air-conditioning and fans or

Business case: indoors ambient temperature reduced by 5°C in dry goods warehouse, Japan.



Toshin Soko operates a chain of warehouses in Japan. The company's owner was looking for a sustainable, immediate and cost-effective way to reduce the ambient temperature inside the buildings. As part of his CSR strategy, he wished to improve employee working conditions as well as goods storage conditions.

The company's logistics park in Omiya City, Saitama prefecture, was chosen to conduct technical trials as several identical warehouses are located side by side.

One of the warehouses' metal sheet rooftop was coated with Planet Supra in white color and temperatures were compared simultaneously with the adjacent twin building's.

Titanium dioxide (TiO₂) adds self-cleaning and easy-to-clean properties to the formula. When exposed to solar radiations, the TiO₂ in Planet Supra breaks down concentrations of airborne pollutants such as volatile organic compounds (VOC) and nitrogen oxides. Rain and high-pressure water sprays then remove dirt easier, keeping the painted surface cleaner, longer.

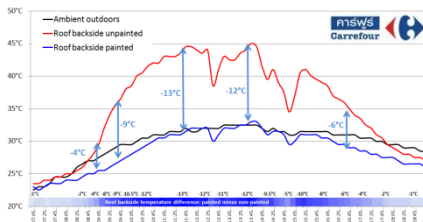
Planet Supra is water-based and totally VOC-free. It is non-inflammable and has no flashpoint.

It's extreme flexibility allows to coat fabric and PVC sheets. It will not crack during its 10 years lifespan, even masking micro-cracks that could appear in concrete. It also allows wood and concrete to breathe.

"When Planet Supra was developed, it pushed solar reflectance to a whole new level."

mechanical heat extractors are sometimes used to ventilate it. But the impact of creating an air flow on ambient temperature is very low.

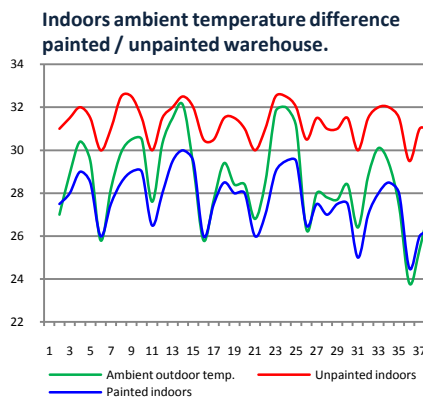
Planet Supra takes a different approach. As it is applied on the roof's outer surface, it prevents heat from entering the building at all. The impact on a building's heat load is therefore quite dramatic: drops of above 30% are recorded regularly.



Above: comparison between painted and unpainted metal sheet roof already insulated with PE foam. Site: Carrefour warehouse, Thailand, January 2010. This graph was published in newspaper The Bangkok Post in April 2010 in article "Beat the Heat".

Conclusion: painted warehouse's ambient temperature is now lower by 5°C, the rooftop is cooler by 12.5°C, the roof underside cooler by 19°C.

Temperatures in graph below were recorded on site, note how Planet Supra made the indoors ambient temperature cooler than outdoors.



Technical data sheet as per JIS R 3106:1998

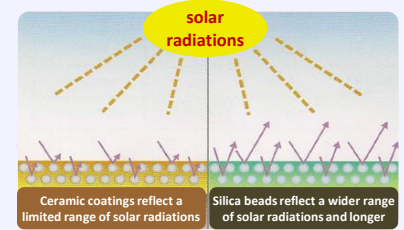
Identification: ultra-thin heat reflective and insulating nanotechnology radiant barrier.

Country of manufacture: Japan.

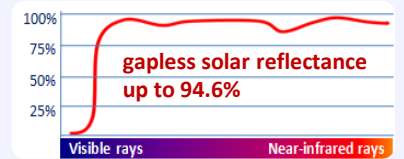
Purpose: to reflect solar radiations and improve building, vehicle, equipment insulation. To fight Global Warming by reducing carbon footprint.

Composition: water-based. Contains:

- hollow silica beads
- titanium dioxide (TiO₂)
- acryl silicon emulsion



Performance:



Maximum performance is achieved with only 200 microns or 0.2mm, with required two coats.

Examples of heat load reduction recorded:

- metal sheet rooftop underside: -33°C
- ceramic roof tile underside: -23°C
- truck metal roof underside: -18.5°C
- insulated truck ambient indoors: -7°C
- warehouse ambient temperature: -5°C
- hot pipe surface: -40°C

Performance lifespan: up to 10 years.

100% eco-friendly:

- no Volatile Organic Components (VOC)
- non toxic, no smell when applied
- certified to offset Carbon Credits

Safety:

- non-inflammable
- no flashpoint
- safe to transport by air and sea
- anti-mold

Versions available:

Planet Supra: matte finish.

Has heat reflective and insulating effect. Applicable on most surfaces without primer. Recommended for building rooftops and walls, insulating ovens, hot pipes, ...

Planet Supra Neo: glossy finish.

Has heat reflective effect, no insulating effect. Recommended for rooftops, walls, vehicles, outdoors equipment.

Planet Supra: Thermal Barrier for Logistics & Supply Chain

Challenge: save electricity costs on warehouse air-conditioning.

Air-conditioned warehouses are big spenders: they require constant air-conditioning to maintain a stable temperature indoors. Everyday, goods are moved in and out. This means access points are open regularly, letting the outside air in, which the air-conditioning has to compensate for by increasing workload, therefore its energy consumption.

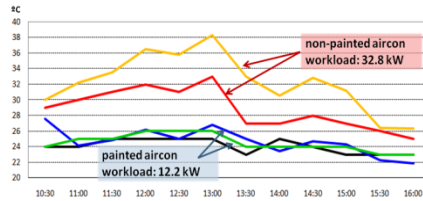
Air-conditioning systems rely on sensors to measure temperature and automatically switch the compressor on and off. But they have a tendency to "overshoot" the target temperature, because there is usually a single sensor: it doesn't always detect temperature changes immediately. This increases electricity consumption even further.

Warehouses commonly use metal sheet for rooftops and sometimes even walls. Metal sheet absorbs heat and stores it: in Thailand, for example, metal sheet roof surface temperatures of up to 76°C are recorded as soon as the ambient temperature goes beyond 30°C, which it does very often. This heat accumulates and is then diffused during day and night to the whole building's infrastructure: it's like having a heater sitting

on top of the building.

Once the warehouse's rooftop and walls, if relevant, are coated with Planet Supra, there is no more heat build-up. The roof underside's temperature will almost match the ambient temperature outdoors.

That's why the air-conditioning system's workload is automatically reduced, by a worldwide average of 25% (based on customer feedback). With Planet Supra, the air-conditioning doesn't have to fight the heat build-up due to solar radiations pounding on the rooftop anymore.



Above: in Japan, a warehouse's air-conditioning system was set to maintain a 25°C temperature indoors. As soon as the rooftop was coated with Planet Supra, the air-conditioning's workload dropped by 20.6kW, a direct 63% saving on electricity cost.

Challenge: reduce building maintenance costs, help prevent roofs from leaking.

Metal sheet and cement tile are the most commonly used materials for warehouse rooftops. When submitted to solar radiations, these materials expand with the heat. At night, they cool down and contract. A metal sheet rooftop's temperature in warm weather can go from 19°C at night up to 76°C at the hottest moment of the day. That's an amplitude of more than 50°C or 400%!

The roof's expansion and contraction, with time, creates gaps around screws that act like miniature saws. Where covering material parts overlap, temperature amplitude stresses those areas and gaps can appear. After a few years, the risk of leakage increases substantially.

Planet Supra cools down the building's roof surface and reduces temperature amplitude between day and night by more than half. On a 7-Eleven store in Thailand, a 33°C reduction in amplitude was recorded in February 2010.

As the roof's material doesn't expand and contract as much, the risk of leakage is greatly reduced, the roof will last longer.



Above and left: screws, joints present a leak hazard because of temperature amplitude.

Challenge: directly contribute to fight the effects of Global Warming.

Temperatures are on the rise each year, there is no denying it. Shielding buildings from solar radiations becomes an increasingly urgent necessity. So is the need to help mitigate Global Warming, a fight to which logistics and supply chain companies can contribute decisively.



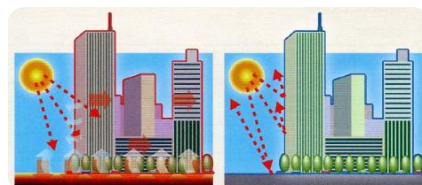
Planet Supra's performance in reducing energy costs and mitigating the heat island effect have been officially recognized by the Carbon Offset Japan (COJ).

COJ grants 1 Ton of Carbon Emission Reduction (CER) credits to Planet Supra's manufacturer for every 10 cans of

paint sold.

Companies coating their warehouses and trucks with Planet Supra can therefore proudly advertise that they directly participate in the mitigation of Global Warming. They reduce their carbon footprint by 1 Ton of CO₂ for every 400sqm painted. For example, a 10,000sqm warehouse would, once coated, reduce its owner's carbon footprint by 25 Ton of CO₂ per year for up to 10 years, 250 Ton in total.

The heat island effect is observed in metropolitan areas which are warmer than surrounding rural areas. Cities are concrete jungles which absorb heat during the day and radiate at night. By painting building roofs and walls with Planet Supra, the heat island effect is nullified: the more buildings are coated in a neighborhood, the cooler it becomes.



Business case: comparative test with Carrefour Thailand

Location: Lopburi, Thailand.

Date: January 2010.

Test scope: dry goods warehouse, half roof to be coated with Planet Supra for comparative testing.

Warehouse:

- non-air-conditioned
- metal sheet with 5mm PE sheet insulation

Result: painted roof section cooler by 33%

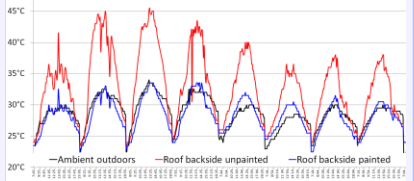
Below: painting was completed in one day.



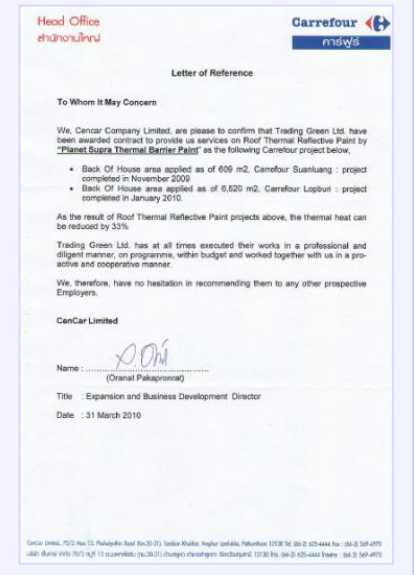
Below: Carrefour's project manager taking real time temperature readings.



Temperature differences on roof underside between painted (blue) and unpainted (red).



Reference letter following project's success, this was the second technical trial for Carrefour.



Planet Supra: Thermal Barrier for Logistics & Supply Chain

Challenge: reduce temperature inside personnel transport truck.

JVK International Movers Ltd. is keen on providing the best quality service to its customers.

It is important for the company that after long hauls, workers remain fit and ready to carry out the loading or offloading of customers' belongings.

People travel in trucks converted for carrying passengers, their metal roof and walls have no insulation, however: they don't offer any protection from Thailand's tropical sun.

Ms. Orawan Voranij, JVK's Chief Financial Officer, ordered a truck to be coated with Planet Supra for technical assessment.

The result exceeded expectations: the roof of the coated truck was recorded to be up to 18.5°C cooler.

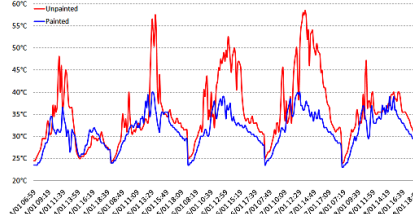
This project is part of JVK's ISO 14,000 certification strategy, highlighting the company's commitment to running environmentally responsible operations.

Each truck coated with Planet Supra contributes to fighting global warming by reducing JVK's carbon footprint yearly, for up to 10 years.



Photo: JVK was the first company in Thailand to shield a truck from solar radiations with Planet Supra (left: Ms. Orawan Voranij, JVK's CFO, with Mr. A. Denes, Trading Green's MD).

Graph: painted truck (blue) compared with an unpainted one.



Challenge: reduce fuel consumption and cooling down time for fresh and frozen food trucks.

A key element of any cold supply chain, fresh and frozen food trucks are also an important part of the working capital and cost. They need to be on the move as much as possible to optimize the investment they represent, their worst enemy is immobilization.

DHL and Linfox provide supply chain management solutions in Thailand to companies such as Foremost, BigC, Unilever, Makro. Both companies conducted technical trials with Planet Supra on fresh and frozen food trucks in April and May 2010.

The trial's primary goal was to reduce truck cooling down time, then save on fuel costs. The truck painted with Planet Supra reached its operating temperature



Photos: for benchmarking purposes, A/C fuel lines were disconnected from main fuel tanks and plugged into 5L bottles.

of 10°C twenty minutes faster and needed 20% less fuel than an identical unpainted truck.

"DHL Logistics sees climate change and the impact that we, as a logistics provider, have on the world's carbon footprint, as the most important long term challenge currently facing the organization. Carbon management targets are in place since 2007 to drive a 30% improvement in carbon efficiency across every business unit by 2020. In Thailand, we are painting Fresh Food trucks used for BigC with Planet Supra Thermal Barrier Paint to save on fuel consumption, speed up cooling time and contribute to DHL's global carbon efficiency objective." says Mr. Jan Willem Winkelhuijzen, Senior Director Transport, DHL Supply Chain Thailand Ltd.



Total savings expected from coating truck rooftops with Planet Supra are high: whether cooling down, loading and off-loading or driving, conditions are improved throughout the entire working cycle of the A/C.

Savings on maintenance costs are expected too, since the compressor's workload is reduced. The solution's return on investment is very good on new and second-hand trucks alike.

Fleet managers can also leverage Planet Supra's carbon offset certification to reduce the company's footprint.

Photo: Linfox had a pickup and a 40 foot trailer painted, they transport fresh and frozen food products for Foremost Thailand.

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Business case: every degree counts for saving time, fuel

Project owner: Exel Logistics (Far East) Ltd., DHL Supply Chain.

Location: Wangnoi, Thailand.

Scope: 7.5m truck rooftop coated with Planet Supra Neo, white color.

Objective: measure cooling down time from ambient temperature to truck's operating temperature of 10°C.

Setup: one truck with rooftop painted with Planet Supra, an identical unpainted truck parked alongside for reference.

Test agenda: April 28th, 2010.

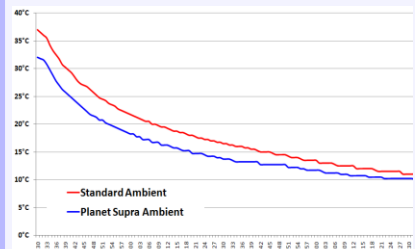
- **10:30am to 1:30pm:** record temperatures without air-conditioning

- **1:30pm to 4:30pm:** record air-conditioning system's fuel consumption while it brings temperature down to 10°C

Conclusion: every degree counts when it comes to saving time and fuel. Each degree cooler costs more in fuel and time than the one before. Since trucks coated with Planet Supra are protected from solar radiations, they use less fuel as the air-conditioning does not have to fight heat build-up and ambient temperature at the same time.

Below: truck cooling down times per 5°C increments and graph showing progress.

Degrees Celsius	Cooling down time in hours and minutes		Improvement	
	Planet Supra	Standard	Minutes	%
30.8 to 25.8	00:06	00:10	04:00	40%
25.8 to 20.8	00:11	00:16	05:00	31%
20.8 to 15.8	00:24	00:33	09:00	27%
15.8 to 10.8	00:57	01:10	13:00	19%



Rooftop	Planet Supra	Standard	Delta
Mini	40.5°C	44.5°C	-4.0°C
Maxi	56.0°C	67.0°C	-11.0°C

Left: temperatures recorded from 10:30am to 1:30pm on painted and unpainted trucks. Planet Supra keeps trucks cooler and shields them from heat build-up from solar radiations.

Under roof	Planet Supra	Standard	Delta
Mini	30.0°C	33.0°C	-3.0°C
Maxi	33.0°C	38.0°C	-5.0°C

Ambient	Planet Supra	Standard	Delta
Mini	29.8°C	33.3°C	-3.5°C
Maxi	32.0°C	37.0°C	-5.0°C

Below: Planet Supra Neo painted on a 40 foot trailer.

