TAILOR-MADE ROOFS

Fruit packing houses are facilities where fruit is received and processed prior to distribution to market. The fruit is transported via conveyor belts to the grading tables, where it is visually sorted into three grades: top quality, average, and orchard run, and is then carried via belts to the packing tables. During the late 19th century top-grade fruit would be wrapped in printed tissue paper, a technique developed in the town of Orange, California in the 1880s, and placed in the boxes so that the printed names showed between the slats.

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PHOTO: LUIS MURILLO

> In the 1920s, tissue wrappers were replaced with printed logos, and ultimately paper stickers. Packed fruit is designated by size, based on the average number of pieces it takes to fill a box. In the days of wooden crates, sizes were generally within a broad range from the 100s to the 390s. The sizes for the smaller cardboard boxes introduced in the 1950s, and still in use today, range from the 40s to the 210s, depending upon the variety of fruit being shipped.

Today, packing is often still performed by hand, even though Sunkist developed robotic packing machines in the 1980s. Packed boxes are stored in a "pre-cooler" to prepare them for the trip to market by truck or rail. Fruit was shipped across the

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country in ventilated railroad cars or insulated boxcars before the advent of the refrigerator car.

Spanish Company Frutiner has a long tradition of growing and trading fruits (mostly citrus) since the 1950s. Besides branches in Madrid, Barcelona, Mercabarna, Vila Real and Almazora, the company is constructing a roofing system for its new fruit packaging house in Onda Castellón. Frutiner was looking for a heavy-duty high-quality roofing system to cover a total area of 11,000 m^2.

The roofing system should be strong enough to allow the installation of a photovoltaic system for self-consumption. Designers Grupotec needed a reliable end-to-end system and a dependable roofing partner able to provide a durable solution. Sika convinced the customer to choose a high-performance thermoplastic roofing solution to fulfil the customer requirements from a technical, economic and environmental point of view.

The specified Sika roofing system with a beige-colored waterproofing membrane was approved by the customer thanks not only to its high technical performance, but also because it more than fulfilled their price expectations. In warm climates like Spain, white, highly reflective roofing membranes are known to be able to reduce a building's heat absorption as well as its cooling energy consumption and keep energy costs lower.

Sika thus proposed an alternative solution that is cost-effective not only in terms of the initial construction outlay, but also as regards the potential energy and carbon footprint savings that the installation of a high-reflective roofing membrane provides.

In a departure from the black-colored bituminous solutions which are typically applied in Spain, and also to convince the customer of the additional benefits of highly reflective thermoplastic cool roofs, Sika´s Global Product Sustainability Group performed a life cycle assessment (LCA) of three roofing solutions with similar performances. First, a specified Sika system build-up with a beige membrane was tested, then the same system build-up with a black membrane and, third, the very same system build-up but with a highly reflective membrane.

By reducing heating/cooling loads, light-colored reflective membranes can help cut energy consumption. The estimated potential energy and CO_2 savings from the building's lower cooling/heating loads thanks to the installation of the white and beige membranes, as compared against the black roof, are calcu-

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> lated to determine the energy and carbon break-even point of the roofing system.

For the total project surface area of 11,000 m², the results for a roofing system treated with beige Sarnafil TS 77-18 and one with white Sarnafil TS 77-18 SR demonstrate that both thermoplastic membranes bring significant savings owing to the reduced cooling load compared to a system with a black roofing membrane. The estimated potential savings surpass the energy and carbon impacts from cradle to gate of the roofing system in less than 5 years. It is as estimated that with the white membrane almost 8000 GJ of cooling/heating energy could be additionally saved compared with the beige membrane over a period of 20 years.

The life cycle assessment is a standardized method to assess and compare the inputs, outputs and potential environmental impacts of products and services over their life cycle. LCAs are increasingly recognized as the best way to evaluate the sustainability performance of products and systems. This method allows an evaluation of the systems' potential environmental impacts over the entire life cycle and thus selects a cost-effective solution in terms of both the initial construction costs and the potential energy and carbon footprint savings that come with installing a white membrane.

The LCA can greatly assist our customers in evaluating Sika's products and systems by providing quantitative data on their environmental profile. Products which may otherwise display a similar performance can be distinguished in terms of any greater differences they show with regard to environmental impact – where obviously the lower, the better.
Based on the reduction in overall environmental performance and, therefore, in costs (economic and environmental) in the long run, the results of the evaluation were conclusive enough for the customer to opt to install the high solar reflective white membrane as opposed to the beige one. The project allowed Sika to demonstrate its competence and expertise in sustainability, including all relevant quantitative contributions to a sustainable high performance tailor-made roofing solution to fulfill the customer requirements from a technical, economic and environmental point of view.

Climate-sensitive buildings such as food store centers, where fruits are stored for distribution, require special climatic conditions, including a specific temperature plus certain humidity. The fruits must be prevented from going bad; they are not to become ripe too early as they have to be perfect when they arrive in the supermarkets. So it is crucial to ensure the right building climate. It is helpful if the roof produces moderate building temperatures, as you do not require as much air conditioning or artificial heating. <

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