



Behind the green curtain

For most of human history, construction methods developed in response to the local climatic conditions. But in recent decades, the seemingly infinite availability of energy, labor and building materials led architects, developers and clients to overlook these time-tested techniques. A new plant in Vietnam revisits the region's traditional building methods and combines them with modern materials to create a spectacular and sustainable green wall made of molybdenum-containing stainless steel ropes and nets.



Green façades absorb CO₂, bind dust and air pollutants, dampen noise and reduce energy requirements through shading and water evaporation. With the increasing awareness of sustainable construction methods, exciting examples of such façades are taking root, especially in large cities and other residential areas. But what about industrial areas, where large, fully air-conditioned factory production halls not only consume a lot of energy, but also pave over vast amounts of land, preventing rainwater drainage?

The region north of Ho Chi Minh City (formerly Saigon), Vietnam's financial center and largest metropolis, is one such industrial area. Since Vietnam's economic reform in 1986, the country has experienced rapid growth, especially in manufacturing. Central planning was abandoned, and foreign companies were allowed to invest and open branches. With enormous speed and little regulation, industrial parks sprang up on the outskirts of cities and continue to sprawl outward, leading to significant environmental problems.

Historically, structures in hot and tropical climates relied on open façades or wall apertures to regulate their internal temperatures. But the new factories are entirely enclosed and air conditioned at massive cost and energy expenditure. These buildings and associated roads and parking spaces also effectively seal the soil and prevent rainwater drainage, so flooding has worsened significantly in the region. In 2008, the Swiss rope manufacturer, Jakob Rope Systems, began producing its flexible wire rope nets in one such factory. With the construction of its second production facility, the company decided to change course and respond to the environmental fallout from industrial development with a breathtaking design unlike anything else in the area.

Learning from the past

What does sustainable architecture mean? There are many definitions to sustainability and theories about how to incorporate sustainable practices into the built environment. One widely accepted theory imagines sustainability as having three parts or "pillars": ecological, economic and social. The new rope net factory embraces sustainability along all three pillars, reducing both its impact on the environment and operating costs, while also improving working conditions for its employees.

The 30,000 m² site sits in the center of an industrial park 50 kilometers north of Ho Chi Minh City. The pioneering factory, created by rollimarchini architects and G8A, is like a lonely plant sprouting from a crack in the kilometers of near-continuous concrete. The primary challenge was to create a design that responds to a climate with both an average temperature of about 27°C and high humidity. Southern Vietnam is also exposed to seasonal typhoons and strong winds and rainfall. The architects met these



➤ Aerial view of the Jakob factory in a sea of sealed buildings.

challenges with a combination of both modern industrial and local traditional building techniques. Traditional Vietnamese dwellings utilized wide cantilever roofs with permeable wall constructions and planted vegetation for shade, protection from the weather and sufficient ventilation.

Following these traditional methods, the factory's overhanging roof and floor slabs shield the interior, allowing portions of the building to be open to fresh air. However, due to the height of the façade, this overhang was not sufficient to ensure complete sun and rain protection. This task is supplemented by a "hanging garden" of planters suspended from stainless steel cables. The garden-like green wall not only shades the interiors and filters pollutants out of the air, but also contributes to lowering the temperature through evaporation.

➤ Sliding polycarbonate dividers, fixed in front of the factory's concrete support columns, can be closed in extreme weather.



Opening the façade for ventilation significantly reduces energy costs and emissions. Where the building is not open to the outside, mobile sliding walls made of translucent polycarbonate allow sunlight to permeate. Using natural light for interior spaces further reduces the factory's electricity needs.

In addition to conserving electricity, the factory's design also conserves space. Instead of the usual horizontally distributed, single-story factory floor plan, the architects set the required workspaces on top of each other. The site includes a three-story production building, an administration building and a covered storage and parking area, all arranged around a generous courtyard at the center of the site. Grass covered and tree-studded "planting islands" accent this courtyard. The walkways between the islands are gravel covered, allowing any excess water to seep away. This novel arrangement offers employees a park-like lounge area complete with shady trees, sports equipment, volleyball and table tennis courts.

Stainless steel nets and ropes

The vegetation of the green façades grows in planters that stretch the length of the buildings. Over six kilometers of diagonally installed stainless steel ropes carry up to nine levels of planters. The inner and outer layers of the 16 millimeter thick rope supports introduce the loads at the top into the steel roof racks and at the bottom into the base plate. The planters themselves are constructed of a base frame made of rectangular profiles and a watertight layer that is held up by rope nets stretched across the frames. All structural components are made of Type 316L stainless steel. The engineers designed the system to be strong enough to resist high wind loads and also took into consideration the increasing weight of the plants over time as they grow. In addition to the structural elements, the façade system contains a fully automatic irrigation and fertilization system. The 2% molybdenum in Type 316 stainless steel is crucial to resist both corrosion from the

- The Jakob factory's stainless steel façade consists of two layers of symmetrically inclined cables which support nine levels of planter frames with cable clamp connections.



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➤ Frames of reinforced concrete break through the green façade and mark the entries into the building – here from the courtyard into the canteen.

fertilizers and other compounds in the soil, as well as chlorides present in the environment. This is especially true for the ropes, as the tight crevices between individual wires are particularly susceptible to crevice corrosion.

The factory's green façade not only defines its character but also becomes a showcase for the rope net manufacturer. It signals to other companies to "open up" and use natural ventilation and drainage for better working conditions with a

lower ecological impact. The natural lighting and temperature control achieved with the help of this stainless steel rope system is exemplary of the three pillars of sustainability working together. This project's worker-centered design will hopefully influence additional development both in Vietnam and worldwide. In the tropical, humid and coastal regions that could benefit from such designs, molybdenum-alloyed stainless steel with its improved corrosion resistance will be critical. (Martina Helzel)