New paint that cuts surface temperatures by 25 C in summer begins mass production in China

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China has begun mass production of a super-coating that can cut wall temperatures by 25 degrees Celsius in summer, according to the state-run *Science and Technology Daily*. The material has undergone six months of real-world testing at a petrochemical plant in the southern island province of Hainan. It uses the principles of radiative cooling. It requires neither electricity nor cooling agents and its overall performance is reportedly the highest among known global competitors, according to the report published on September 7.

The coating may also have potential for broader use in public infrastructure and homes. The need to reduce the effects of heat on buildings was apparent in Europe this summer when record heatwaves left many residents sweltering in homes without air conditioning.

Chemical storage tank (left) in Hainan coated in breakthrough paint (photo by Science and Technology Daily)

The coating has already transitioned from a laboratory innovation into mass production. Following dozens of trial batches, the research team has established manufacturing standards – spanning raw material grinding and formulation, right through to final product testing. The annual production capacity is 600,000 tonnes, the report notes.

At a petrochemical refinery in Hainan, the scorching sun routinely bakes a row of 3,000 cubic metres (106,000 cubic feet) spherical liquefied gas tanks. Without immediate cooling, internal pressures would surge, posing severe safety risks. Previously, the facility relied on highly water-intensive sprinkler systems to cool the tanks. Now, clad in this super-coating, the tanks achieve a remarkable self-cooling effect with zero energy consumption. [See photo above.]

Composed of tailored inorganic fillers and polymer resins, the coating boasts the dual properties of high solar reflectance and strong thermal emittance. It reflects most solar radiation while emitting the tank's accumulated heat outwards as infrared energy – without the need for power or refrigerants.

The pioneering material was jointly developed by the state-owned China Construction Eco-Development Company, headquartered in Suzhou, and the Harbin Institute of Technology (HIT) in Heilongjiang province. According to an R&D director from the Suzhou-based venture, on a clear 30-degree (86 Fahrenheit) day, a treated tank's surface temperature can drop by roughly 25 degrees, reducing internal temperatures by about 7 degrees.

Achieving an equivalent cooling effect via traditional sprinklers would consume an estimated 35 tonnes of water daily per tank, by some estimates. "Even during extreme heatwaves, the cooling coating can maintain the tank's interior at a safe temperature," the report quoted Li Xiang, head of the R&D centre at China Construction Eco-Development, as saying.

This is made possible by a specific infrared emission window. Scientists have long known that within the atmospheric infrared band of 8 to 13 micrometres, heat can penetrate the Earth's atmosphere and dissipate directly into the freezing vacuum of space. However, thick applications are required for traditional radiative cooling materials to be both highly reflective and highly emissive. This bulkiness leads to a host of drawbacks, including higher costs and impaired heat dissipation efficiency.

The research team overcame this hurdle by taking biomimetic inspiration from the microscopic structure of human skin wrinkles. By assigning various functional fillers to work collaboratively, they achieved both high reflection and emission within a much thinner layer. This design reportedly reduces the coating's thickness from 500 micrometres to 100 micrometres – thinner than a standard sheet of A4 paper – while driving both solar reflectance and infrared emissivity up to 97 per cent.

The coating is also exceptionally durable. During its 180-day on-site trial in Hainan, it endured 40,000 scrub tests without the paint film blistering or peeling. Based on this ageing rate, developers estimate its effective lifespan at up to 15 years.

The project is an example of scientific research bridging the gap to industrial application. Wang Fuqiang of HIT developed the foundational coating during his academic research. However, after publishing his findings, the project was largely shelved – until Wang crossed paths with the state construction corporation, which had been hunting for exactly this type of advanced cooling solution. The two parties then joined forces to drive the technology towards commercialisation.

Starting with laboratory samples, they spent several years on testing, optimisation and validation. Ultimately, they forged a manufacturing process capable of stable, large-scale production without compromising the material’s optical performance.