

Title USING HIGH SOLAR REFLECTIVE COATING TO
IMPROVE ENERGY SAVING IN BUILDING

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ABSTRACT

The purpose of this study aims to explore on technology enhancing the solar reflectivity in decorative coating that will help reducing cooling energy consumption in household and commercial building. By combining knowledge in paint chemical and painting application system that can increase solar reflectivity in all wavelength, many special paint formula will be tested on sample panels and, be identified the optimal formulation in the same color shade with normal house paint. The optimal paint formula with suitable amount of IR pigment Microsphere Ceramic, and Black pigment generate highest solar reflectivity, conductivity, and emissivity will be carefully selected to proceed to use in small building experiment. The optimized formulation or High Solar Reflective Paint with 18% lower in conductivity will be tested against conventional paint system and uncoated system on three small buildings. The experimental result shows the different of temperature, and energy consumption of three buildings, which are uncoated, coated with conventional paints, and coated with High Solar Reflective Paint (Beger Cool UV Shield). In the experimental set up, two types of paint were applied on the envelop surface of building and using two shades of color namely white and white grey color. It was found that the small building that coated with Beger cool UV shield shows lower wall and roof temperature by 3-4°C and the least electric energy consumption due to the better reflectivity of sun light. The OTTV, RTTV, and total heat gain through the building which was painted

with Beger Cool UV Shield is lower than Conventional coated by 17% and lower than no coating by 22%. Building painted with BegerCool UV Shield consumed significantly less electricity than the conventional coated by 858 kWh/year or 19% and uncoated building by 1,409 kWh/year or 27%. Therefore the paint with higher solar reflectivity and lower thermal conductivity causes lower heat transfer into the building and result in greater reduction in cooling energy. In addition, the experimental results are validated with the math model derived from finite differential principal using Transient heat conduction in one-dimension plane wall. This math model represents the decent correlation between solar reflectance, thermal conductivity and, heat gain reduction from outside to inside surface. By adjusting reflectivity, and thermal conductivity value, it is found that Beger Cool UV shield paint created lower outside temperature comparing with every conditions of the conventional coating. And these results correspond to the experiment.