

# ALUMINUM

## Success Story



## ALUMINUM ROOFING SYSTEM

### New Reflective Aluminum Chips Save Energy and Extend Roof Life

#### Benefits

- ◆ Has saved over 650 billion Btu through 2000
- ◆ Has saved over \$5.9 million dollars cumulatively through 2000
- ◆ Has reduced CO<sub>2</sub> emissions by over 41,000 tons cumulatively through 2000
- ◆ Increases the roof's service life, reducing maintenance and re-roofing costs
- ◆ Carries a 20-year guarantee, approximately double that of other nonaluminum systems
- ◆ Reduces installation costs and effort because it is lighter weight than stone aggregate coatings

#### Applications

Designed to be used on asphalt roofing and is applicable to buildings of all sizes.

"The Inventions and Innovation grant assisted Transmet Corporation to utilize the rapid solidification process to develop aluminum flake particulates into a form that could be applied to commercial roofing systems exhibiting superior solar reflectance compared with competing roofing systems."

– P. Doug Shull  
President  
Transmet Corporation

The energy demands and resulting pollution created from using air conditioning in warm climates are increasing concerns. In the United States alone, air conditioning consumes more than 0.85 quadrillion Btu per year, leading to frequent power outages and shortages. Applying reflective aluminum chips to dark asphalt roof coverings is an inexpensive, lightweight, effective way to reduce the contribution that these types of roofs make to the air conditioning power load.

Until the mid-1980s when these reflective aluminum chips were developed, the building industry only had the options of mixing gravel into the asphalt, spraying a reflective pigment, or covering the asphalt with a pigmented rubber sheet. Reflective aluminum chips are much lighter than gravel and are so cost-effective that they are ideal not only for hot climates but also for large roofs or with low-cost housing, among many other uses.



Reflective Aluminum Chips Installed on an Asphalt Roof



## Technology Description

The 1-mm-square aluminum chips are produced through a proprietary process where small streams of liquid metal are rapidly solidified. The aluminum chips are applied to a roof by the following two steps. First, a coat of asphalt is applied to the section of the roof being treated with the aluminum chips. Second, while the fresh asphalt is still tacky, the aluminum chips are air-sprayed on the asphalt using a pneumatic blower machine at a rate of 3 to 4 pounds of aluminum chips per 100 square feet of roofing. The chips can also be applied to rolled roofing materials at the factory, using easily modified available equipment. Transmet Corporation developed this technology with the help of a grant funded by the Inventions and Innovation Program through the U.S. Department of Energy's Office of Industrial Technologies.

## System Economics and Market Potential

Since its introduction in 1984, this invention has been used on more than 33 million square feet of roofing. Although most of the applications have been roofs in the United States, the technology has also been used on roofs in Singapore, Bahrain, and the United Kingdom. Through 2000, the aluminum chips have cumulatively saved over 650 Btu or over \$5.9 million and have reduced CO<sub>2</sub> emissions by over 41,000 tons.

Installing new or replacing weather-tight roofs in the United States is a \$17 billion industry and translates into approximately 5 billion square meters of roof area. The major constituent of almost all roofing material is asphalt that comes from petroleum. Thus, roofing products consume about 38 million barrels of crude oil per year.

Most basic roofs are black asphalt, which absorbs radiant heat from the sun. By using aluminum particulates or aluminum shielding rather than pebbles or stony granules, about 70% of the radiation can be reflected. The cost payback for such coverings from savings in the cooling load is about 3 years on average in the United States. A total annual electrical energy savings of about 50 billion kWh could be achieved if even half of the roofs had such reflective coatings. Furthermore, the reflection of ultraviolet radiation by the coatings could almost double the life of the asphalt roofing material. Thus, in addition to the electrical savings, the extensive use of such reflective coatings could reduce oil use by about 19 million barrels per year.

### INDUSTRY OF THE FUTURE — ALUMINUM

*Through the Office of Industrial Technologies' (OIT's) Industries of the Future initiative, the Aluminum Association, Inc., on behalf of the aluminum industry, has partnered with the U.S. Department of Energy (DOE) to spur technological innovations that will reduce energy consumption, pollution, and production costs. In March 1996, the industry outlined its vision for maintaining and building its competitive position in the world market in the document, **Aluminum Industry: Industry/Government Partnerships for the Future.***

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The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and to conduct early development. Ideas that have significant energy-savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

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