

ALUMINUM



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Important Facts

- **Use:** Racking for the solar panels, storage tanks, HVAC system
- **Key structural benefits:** Lightweight, strong, corrosion-resistant, resilient, non-combustible, versatile

Solar Decathlon 2013

The team is using an aluminum racking system to orient the photovoltaic panels at an optimal angle on the roof. The racking system is provided by Sunplanter, a European company that recently moved to the Silicon Valley. Sunplanter is committed to sustainability. Their website insists, "We can get rid of oil." They have been especially successful in France, where there is more investment in solar technology. Their focus is on making photovoltaic systems attractive and practical for the average home.

Ethical Issues Raised

Aluminum is a popular lightweight, corrosion-resistant material for buildings and automobiles. It is the most abundant metal on Earth, but it is rarely found in its pure form. Instead, it must be extracted from compounds it has formed with other materials. The initial ore comes from bauxite, primarily mined in the countries of Australia, China, and Brazil. The ore is pressure-heated until it can be dissolved into a residue that goes through a purification process. After adding aluminum hydroxide, the mixture is heated to a molten state, turning it into aluminum oxide. With further heating and the addition of an electric current, metallic aluminum forms. This is called the Hall-Heroult process, and it is the leading contributor to aluminum's high energy cost: almost seven times that of an equivalent amount of steel. There are currently no economically feasible alternatives to produce the same level of purity.

However, after production, aluminum is a sustainable material. Like steel, it is highly recyclable. More than two-thirds of all the aluminum ever produced remains in use. Aluminum can recycling, for example, has been highly successful, and revenue from repurposed aluminum helps keep recycling businesses profitable.

Strides have also been made to reduce energy output during the production process. In the past century, the energy required to produce a metric ton of aluminum has decreased from 28,000 kWh to 13,000 kWh. That remains a substantial amount, since 13,000 kWh is equivalent to driving a standard vehicle nearly 7000 miles, but it does reflect an effort to reduce the environmental impact of aluminum production. There are also technologies in development that could cut energy costs further, including reducing the smelting temperature and utilizing carbon capture devices during bauxite processing.

Plastic is the most common alternative to aluminum, but it is not as strong and fails to significantly reduce petroleum consumption. Carbon fiber composites are gaining popularity, and for a price, provide comparable strength and durability. For this project's purposes, aluminum remains the most practical option.