

December 3, 2021
Marubeni Corporation
SPACECOOL Inc.
Osaka Gas Co., Ltd.

Joint Study for Sales of SPACECOOL[®], a New Material Using Radiant Cooling Technology

Marubeni Corporation (hereinafter, "Marubeni") and SPACECOOL Inc. (hereinafter, "SPACECOOL"), in which Osaka Gas Co., Ltd. (hereinafter, "Osaka Gas") has considerable stake, have agreed to jointly study the sales of SPACECOOL[®] (hereinafter, the "Material"), a radiant cooling material, both domestically and internationally. The Material was independently developed by Osaka Gas using its own technology and can be applied to liquefied petroleum gas (hereinafter, "LPG") vessels, LPG tanks for land storage, LPG transport vehicles and rail cars, vessels for grain and storage silos for grain.

The Material is a new material that can realize a decrease in temperature without using energy through radiant cooling technology that release heat into space (*1). The heat generated by sunlight on the earth's surface is constantly dissipated into space, but partially absorbed by carbon dioxide and water vapor, and remains in the atmosphere, leading to global warming. Since the Material emits infrared wavelengths that are not easily absorbed by carbon dioxide and water vapor, the heat can be released into space without remaining in the atmosphere.

In a demonstrative experiment conducted by Osaka Gas, it was confirmed that the surface temperature of the Material was about 6°C (*2) lower than the outside temperature in direct sunlight. It has the world's highest level of cooling performance (*3) and is expected to be increasingly used as measures against global warming, energy conservation and the need for natural cooling comfort rise.

Currently, in the transportation and storage of products like propane, butane, propylene, butadiene, etc., by fully pressurized LPG vessels and storage tanks, the maximum loading and storage volume may be limited, and quality may change in hot climate regions and high temperature seasons. In addition, grain is sometimes damaged during vessel transportation and in the grain storage silos because of high temperatures and have to be disposed of in some cases.

By utilizing the Material, it is expected to improve transportation efficiency by increasing the maximum loading and storage volume of products by reducing the amount of fuel used, reducing costs for quality maintenance, reducing waste, and reducing carbon dioxide emissions. In the future, Marubeni and SPACECOOL will also consider measures to quantify the effects of global warming suppression and create credits by taking advantage of the characteristics of the Material, and will actively promote joint research for other applications, utilizing the Marubeni Group's network.

Marubeni, SPACECOOL, and Osaka Gas will widely promote the use of this material both domestically and internationally with the aim of contributing to solving such societal issues as heat (rising temperatures), global warming, and energy depletion problems.

*1: Using Osaka Gas's independently developed optical control technology, it was realized that enlarging the material design suppresses the heat input of sunlight and increases heat dissipation through heat radiation (the phenomenon that the heat from heated objects can be carried as electromagnetic waves (light))(Fig. 1)

Two types of products have been developed: film and canvas (Figs. 2-1, 2-2).

Figure 1: Conceptual diagram of the Material

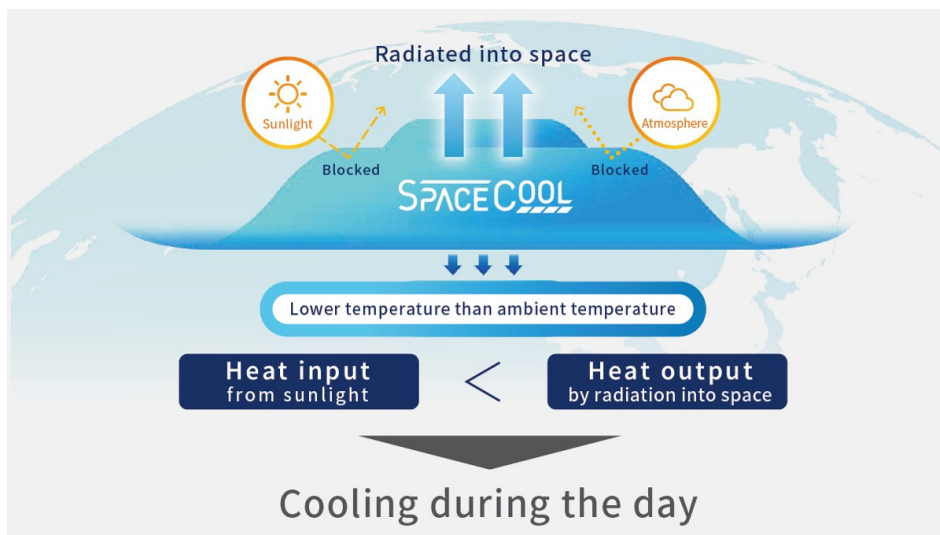


Figure 2-1: Product (Film)

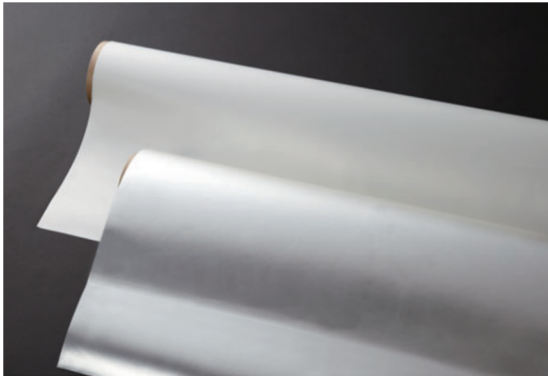
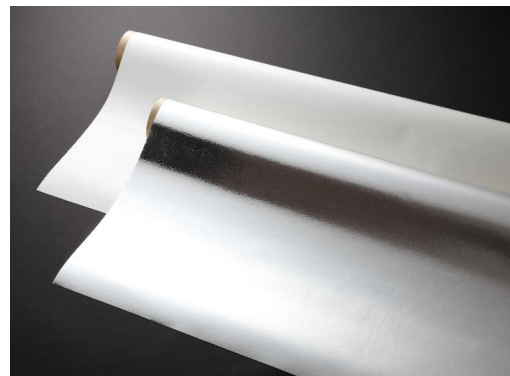


Figure 2-2: Product (Canvas)



*2: Measured at Osaka Gas Co., Ltd. Energy Technology Laboratories (Konohana-ku, Osaka-shi) (ambient temperature at the time of measurement is about 35°C)

*3: According to published papers researched by Osaka Gas and SPACECOOL

*4: Propane and butane are raw materials for fuel and chemical products, propylene is a raw material for various petrochemical products including synthetic resins, and butadiene is a raw material used in synthetic rubber and synthetic resins etc.

< Marubeni >

Company: Marubeni Corporation

Established: 1949

Head Office: Chiyoda-ku, Tokyo

Representative: Masumi Kakinoki

Main Business: Marubeni Corporation and its consolidated subsidiaries use their broad business networks, both within Japan and overseas, to conduct importing and exporting (including third country trading), as well as domestic business, encompassing a diverse range of business activities across wide-ranging fields including lifestyle, ICT & real estate business, forest products, food, agri business, chemicals, energy, metals & mineral resources, power business, infrastructure project, aerospace & ship, finance & leasing business, construction, industrial machinery & mobility, and next generation business development. Additionally, the Marubeni Group offers a variety of services, makes internal and external investments, and is involved in resource development throughout all of the above industries.

HP: <https://www.marubeni.com/en/>

< SPACECOOL >

Company: SPACECOOL Inc.
Established: 2021
Head Office: Minnato-ku, Tokyo
Representative: Takayuki Hoshuyama
Main Business: Manufacture and sale of SPACECOOL® radiant cooling material
Shareholders: WiL Fund II, L.P. 51%, Osaka Gas Co., Ltd. 49%
HP: <https://www.spacecool.jp/en/>

< Osaka Gas >

Company: Osaka Gas Co., Ltd.
Established: 1897
Head Office: Chuo-ku, Osaka
Representative: Masataka Fujiwara
Main Business: Manufacture, supply and sale of gas, power generation and sales, etc.
HP: <https://www.osakagas.co.jp/en/>