Environmentally-Friendly Pavement Technology

- Noise reduction, Urban Heat Island mitigation & CO_2 reduction -

Masahiko Iwama
Dr. Eng, M.Phil, M.Eng, Senior Research Engineer
NIPPO Corporation

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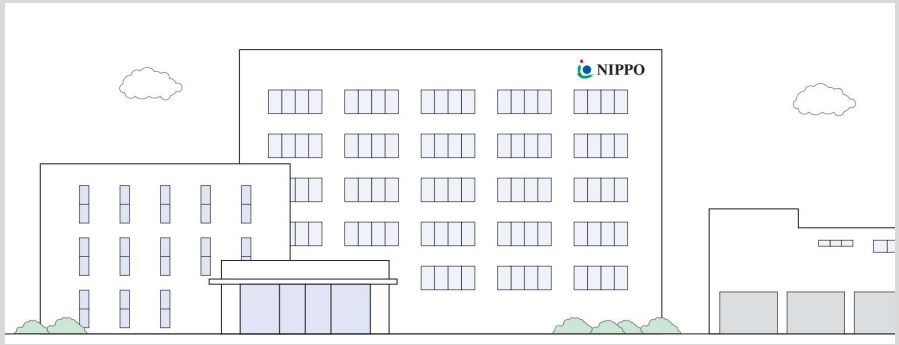


Company Profile

Company Name	NIPPO CORPORATION
Head Office	1-19-11, Kyobashi, Chuo-ku, Tokyo 104-8380 JAPAN
Representative	Chihiro Wada, President and Representative Director
Establishment	February 2, 1934
History	1907：Chugai Asphalt Co., Ltd. 1934：Nippon Hodo Co., Ltd. was established through the merger of the road departments of Nippon Oil Co., Ltd., and Asano Bussan Co., Ltd. 2003：We absorbed a division of Nippon Oil Engineering Co., Ltd. and the trade name was changed to NIPPO CORPORATION. 2009：We absorbed a division of Nippon Oil Engineering Co., Ltd. and the trade name was changed to NIPPO.

Business line

この道の先に NIPPO

Construction

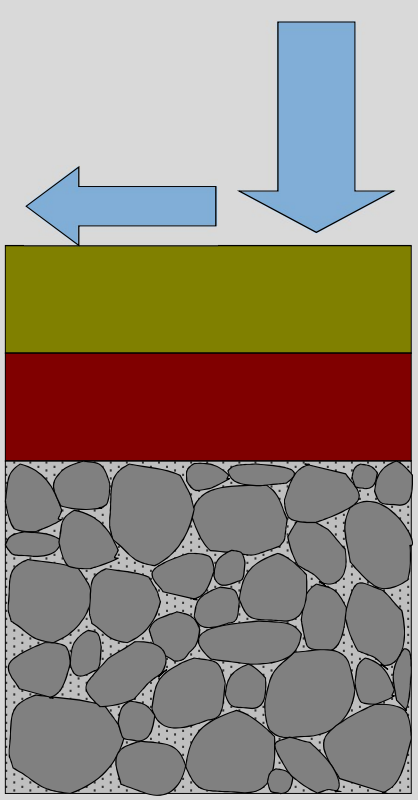
Manufacturing & Sales

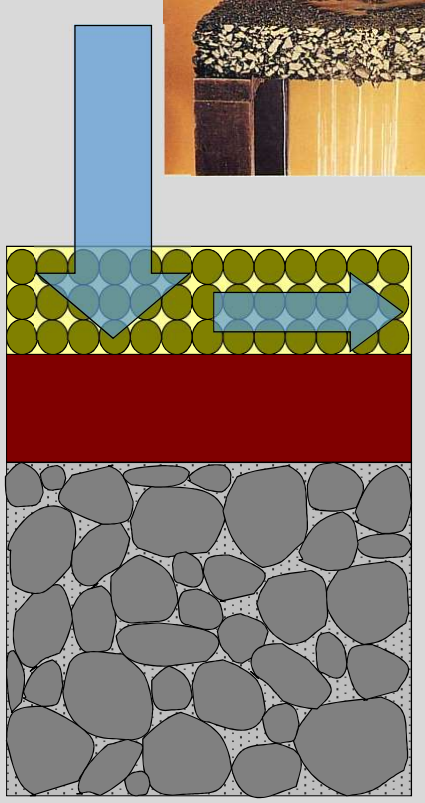
Overseas business

Real estate business

1. Noise Reduction
- Low Noise Pavement -

この道の先に NIPPO





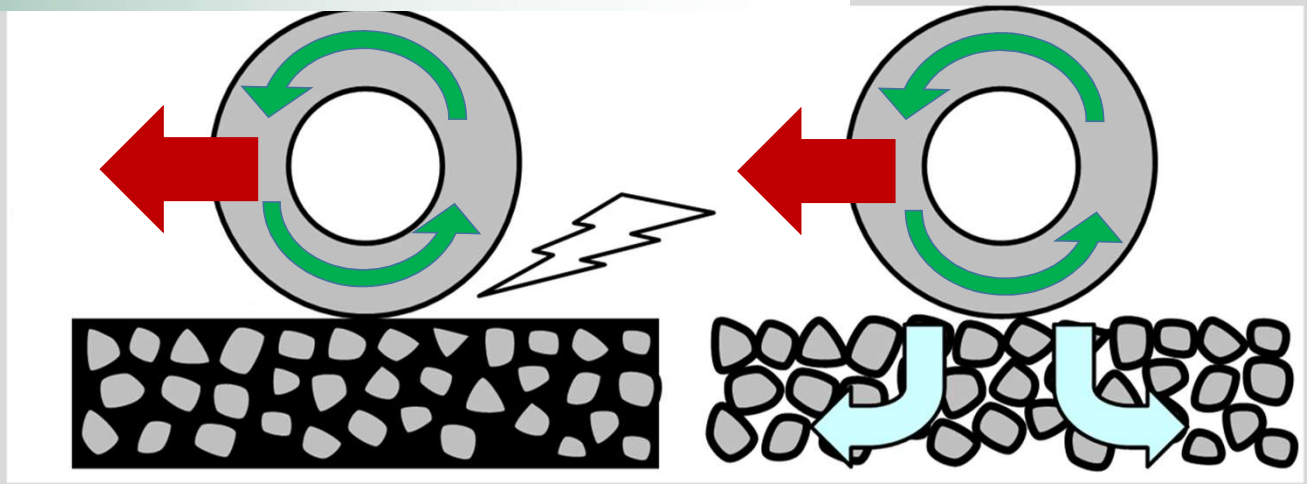
Low Noise Pavement (i.e. Porous Asphalt Mixture) reduces:

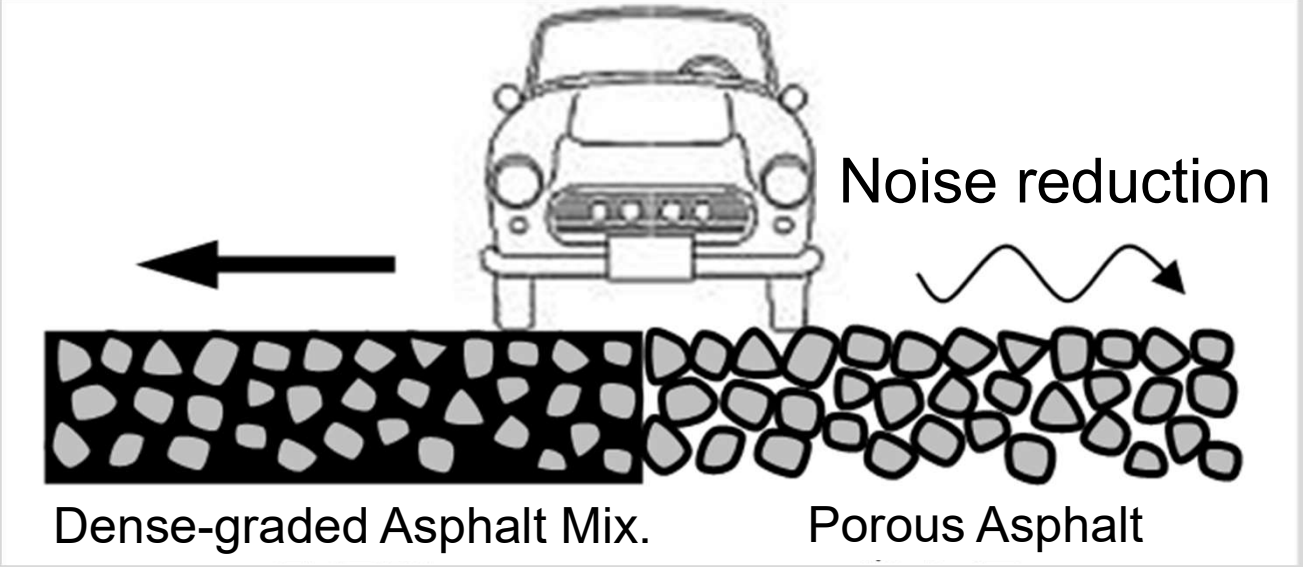
- a chance of hydroplaning and ensures good visibility in rainy days
- the fatal traffic accident rate in rainy days dramatically

1. Noise Reduction
- Low Noise Pavement -

Low Noise Pavement:

- reduced the tire/road noise
- improves the road side environment





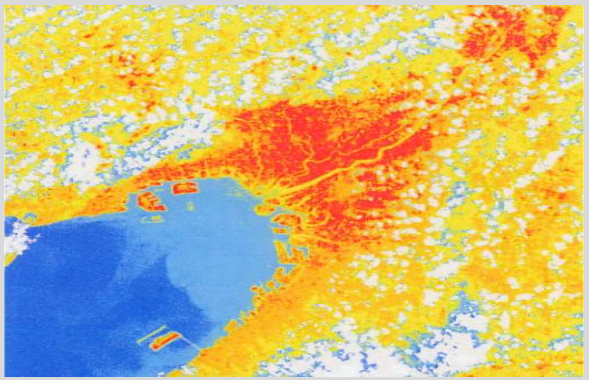
2. Urban Heat Island
- Solar Heat-blocking Pavement -

Urban Heat Island and pavements in Japan

- Air temperature during summer season has been increasing due to the global warming
- Surface temperatures of asphalt pavement **reach 60° C or higher** in summer
- Asphalt surfaces cover approx. **20%** of urban areas
- Pavement is a source of heat, similar to concrete structures

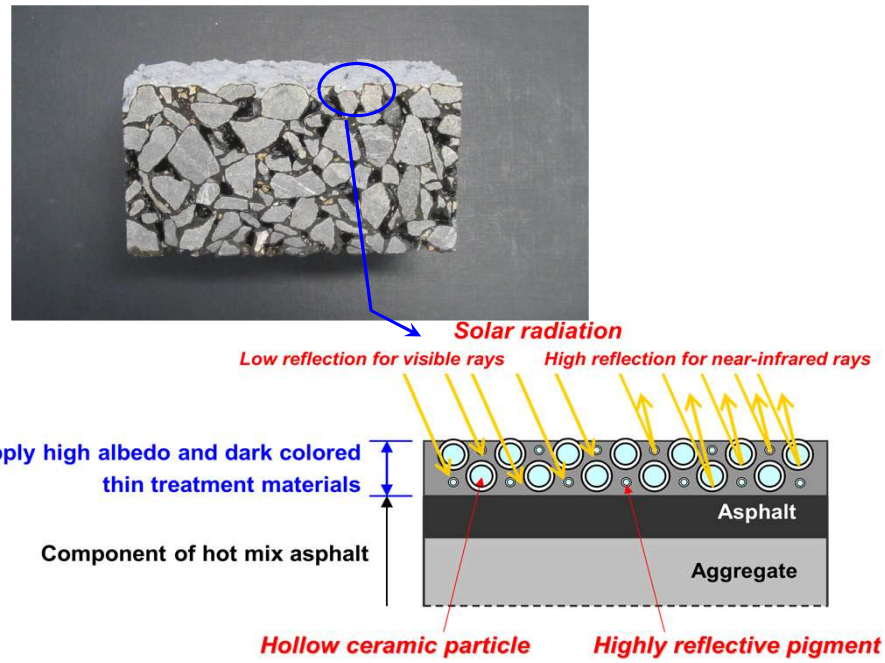
https://news.yahoo.co.jp/

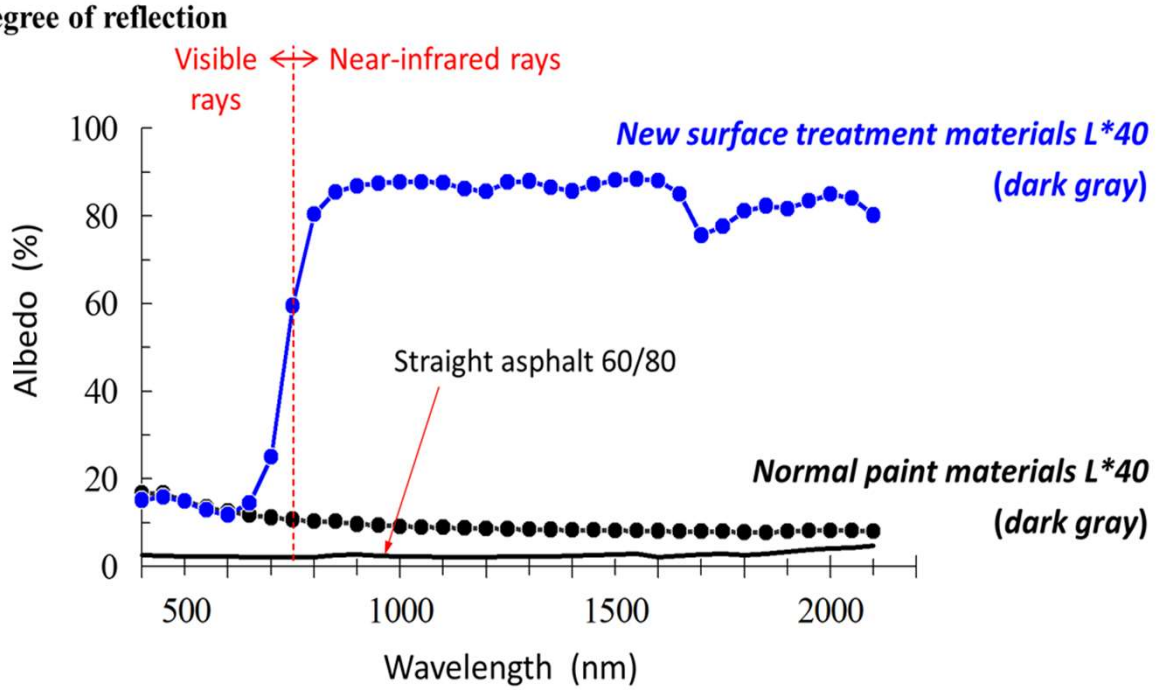
https://www.nikkei.com/article/



2. Urban Heat Island
- Solar Heat-blocking Pavement -

◆Albedo Characteristics of Solar Heat-blocking Pavement





- ◆Straight asphalt has a **very low albedo**
- ◆Dark-gray treatment materials have a **low albedo for visible rays,** but **a very high albedo (about 90%) for near-infrared rays**

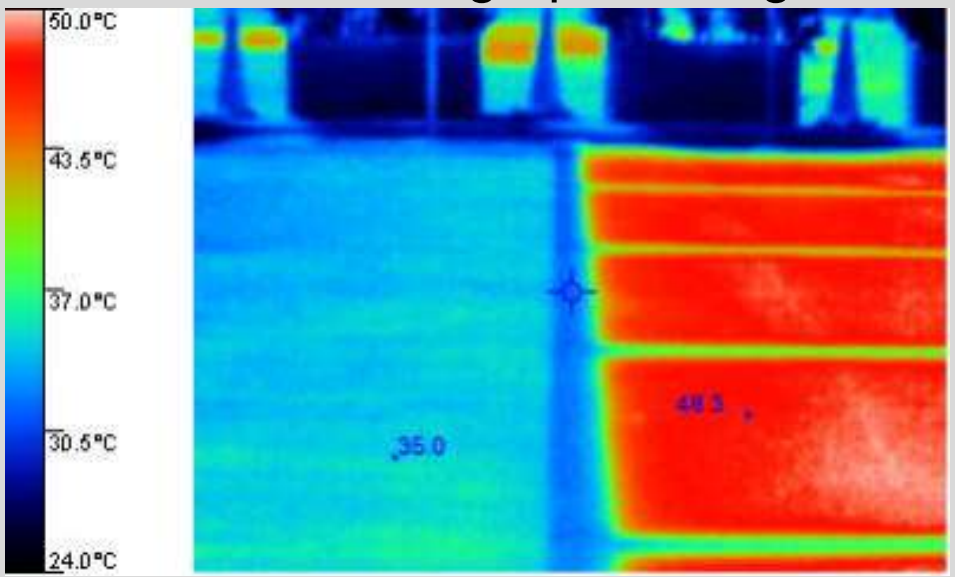
2. Urban Heat Island
- Solar Heat-blocking Pavement -

◆Performance

Original Image

Solar Heat-blocking Pavement　Conventional

Thermographic Image



Solar Heat-blocking Pavement　Conventional

35.0 ˚C　**48.3 ˚C**

2. Urban Heat Island
- Solar Heat-blocking Pavement -

◆ Achievements

The technology has been used by other contractors as well;
the total area constructed by all contractors has reached to **3,000,000m^2.**

AOBADAI, YOKOHAMA

Kokyogaien National Gardens

OKINAWA

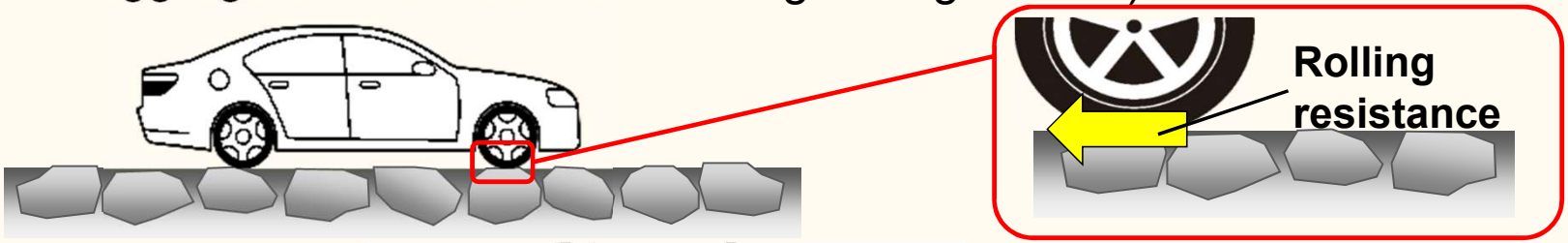
MINATOMIRAI, YOKOHAMA

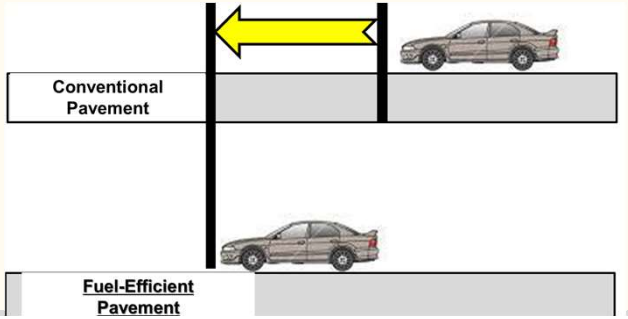
3. Reduction in Carbon Dioxide Emission - Fuel-Efficient Pavement -

What is fuel-efficient pavement?

- Asphalt pavement that reduces the rolling resistance of tires on paved surfaces
- Lower rolling resistance of tires reduces fuel consumption and CO_2 emissions when driving an automobile

Negative texture ⇒ **Reduced rolling resistance**
(Road surface texture with a dense and smooth arrangement of aggregate on the surface and slight irregularities)





3. Reduction in Carbon Dioxide Emission - Fuel-Efficient Pavement -

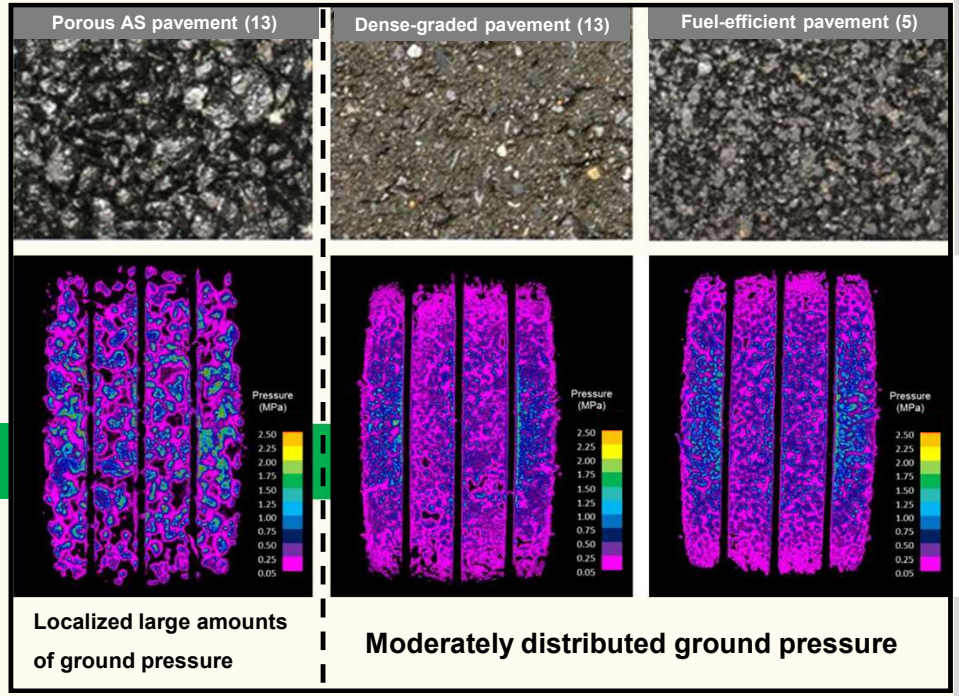
Fuel-Efficient Pavement Features

- Porous Asphalt Pavement with a maximum aggregate grain size of 5mm
- Compaction done using only a tandem roller (tire roller not used)
- Dense, smooth road surface reduces tire ground pressure
- Lower tire ground pressure also reduces rolling resistance, which improves vehicle fuel economy and reduces CO_2 emissions

Effects

- Reduced CO_2 emissions from driving automobiles
- Capable of providing necessary slip resistance
- Moderately porous, allowing adequate drainage and low noise

Tire ground pressure distribution by pavement type

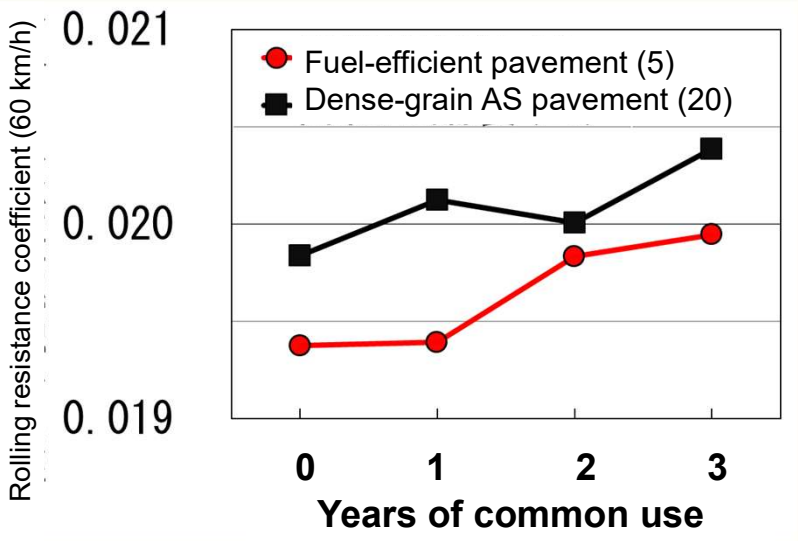


3. Reduction in Carbon Dioxide Emission - Fuel-Efficient Pavement -

Demonstration Experiment Example

Location	National Expressway in Niigata City, Niigata Prefecture, Japan
Construction extension	123m
Construction period	October 2018
Traffic amount	500 vehicles per day (large vehicle rate: 13.2%)
Rolling resistance coefficient after 3 years of common use	**Fuel-efficient** pavement: 0.0199 Dense-grain AS pavement: 0.0204

Change over time in rolling resistance coefficient



Thank you for your kind attention