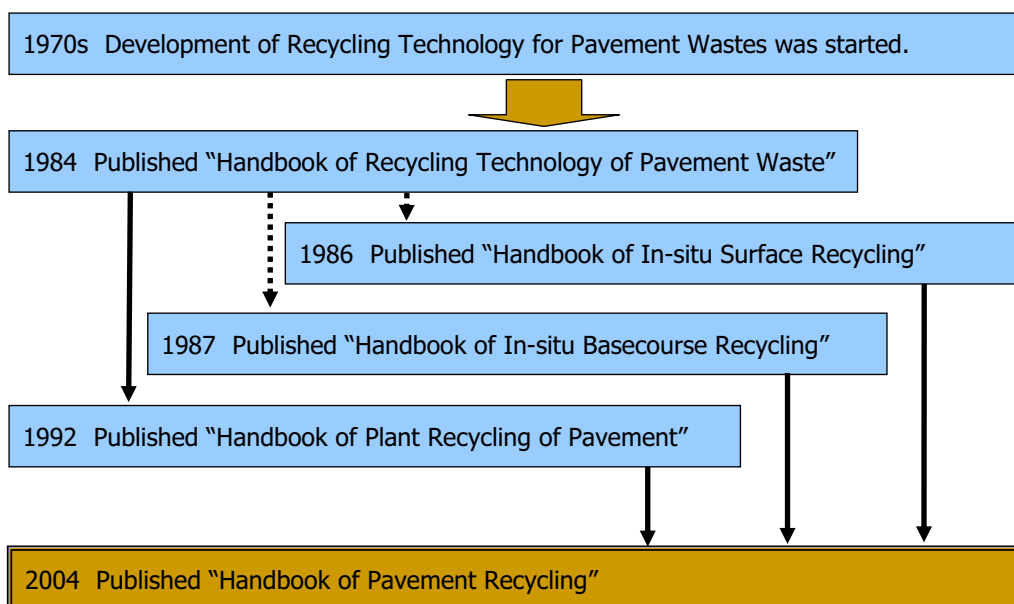


Recycling in Japan

Kazuyuki Kubo
Leader, Pavement Team
Public Works Research Institute
Japan

Recycling in Japan

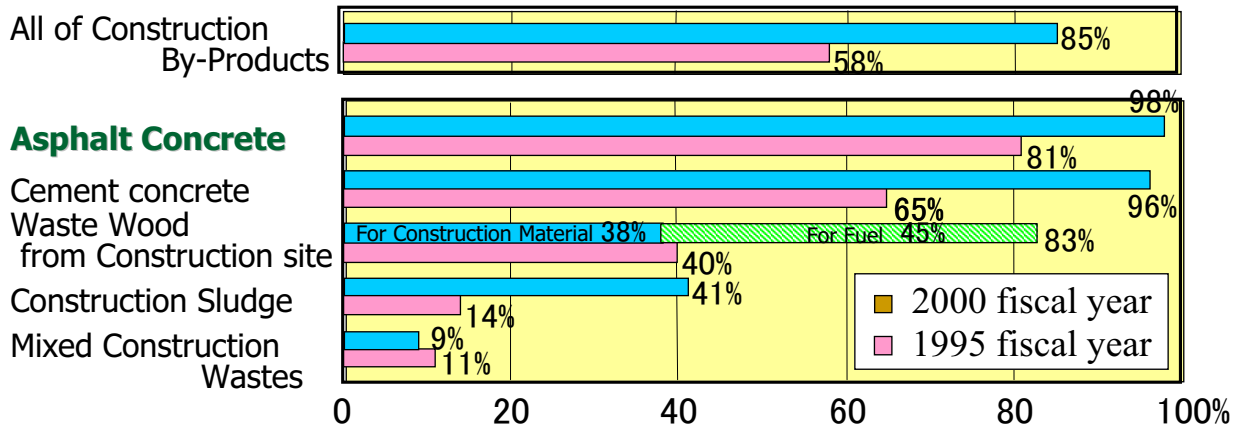
History of Pavement Recycling



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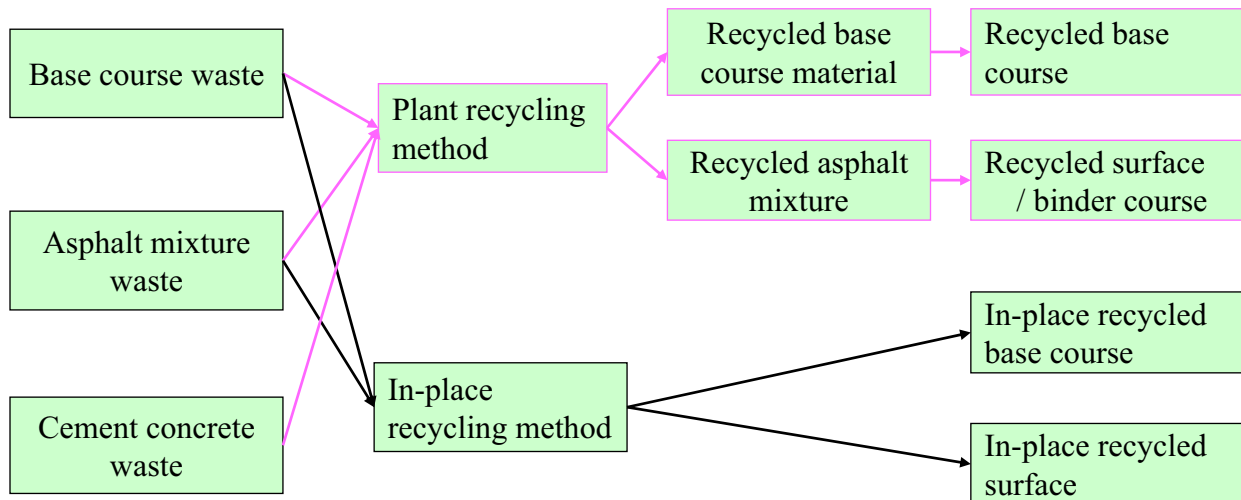
Recycling Ratio of Construction By-Products

■ Recycling Ratio of Asphalt Concrete is Over 98%



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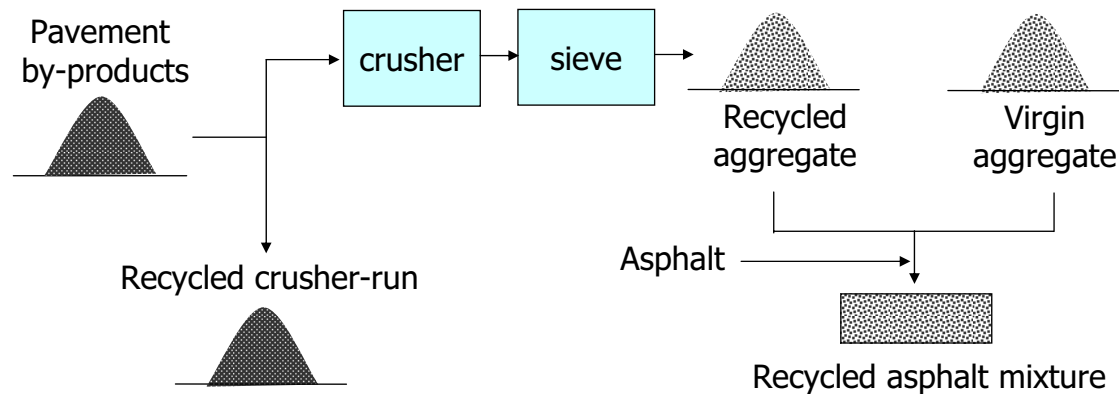
Recycling Method for Pavement



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Plant Recycling

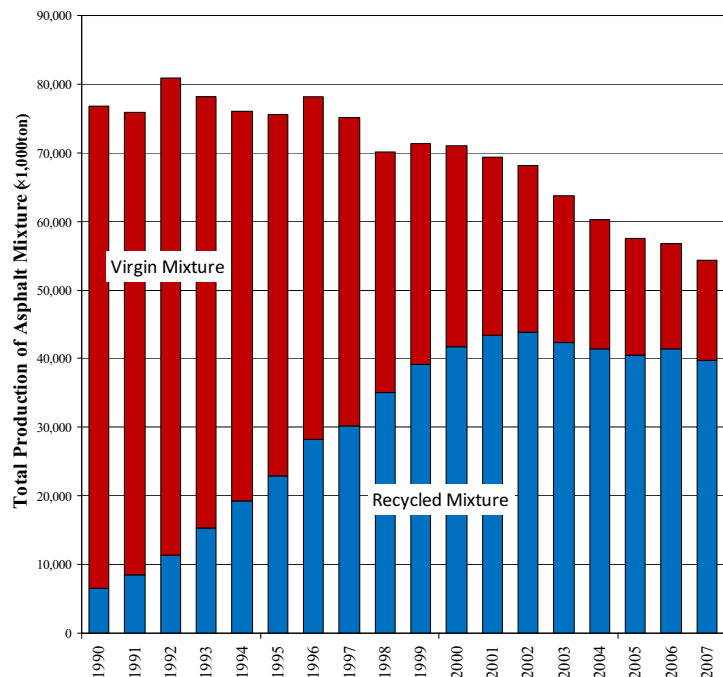
- Recycle pavement by-products at a stationary mixing plant (recycling mixing plant)
- Reuse them as pavement materials



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Plant Recycling

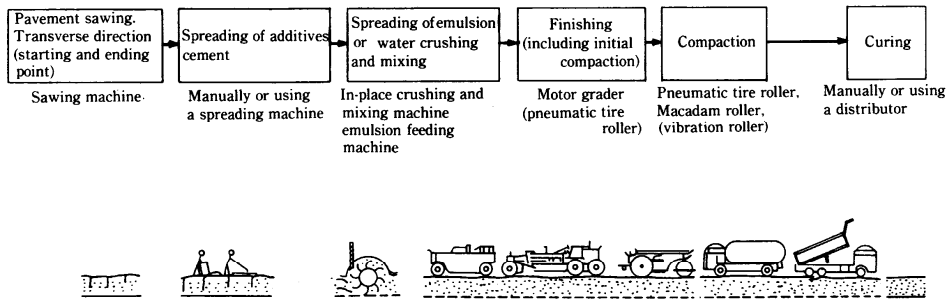
- Most popular in Japan
- Recently, the ratio of recycled asphalt mixture is close to 70%.
- Recycled asphalt mixture has already been promoted to use according to the following law
 - Law Concerning the Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (*Law on Promoting Green Purchasing*), enacted in FY2000



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In-place Base Course Recycling

- Crush existing asphalt mixtures
- Mix the milled asphalt mixture with existing granular base material and stabilizing agents such as cement and/or emulsified asphalt
- Compact this mixture to form a new base course
- Finally, construct new asphalt layers as surface and binder courses

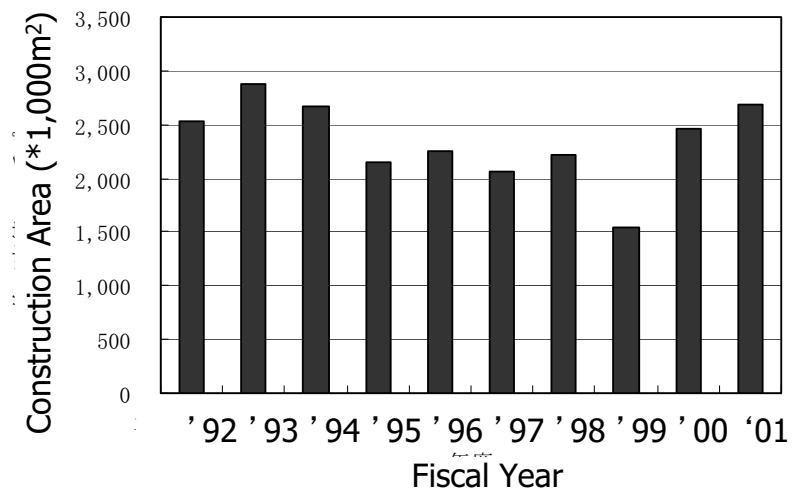


In-place Base Course Recycling Method

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In-place Base Course Recycling

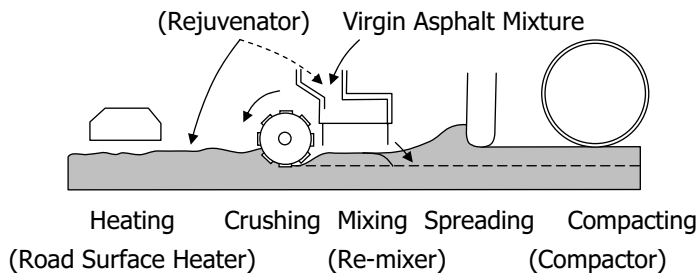
- Limitation on the thickness of existing asphalt layers (to 10cm)
- Rather popular at local roads
- Technology transfer has been tried to Vietnam or other Asian countries



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In-place Surface Recycling

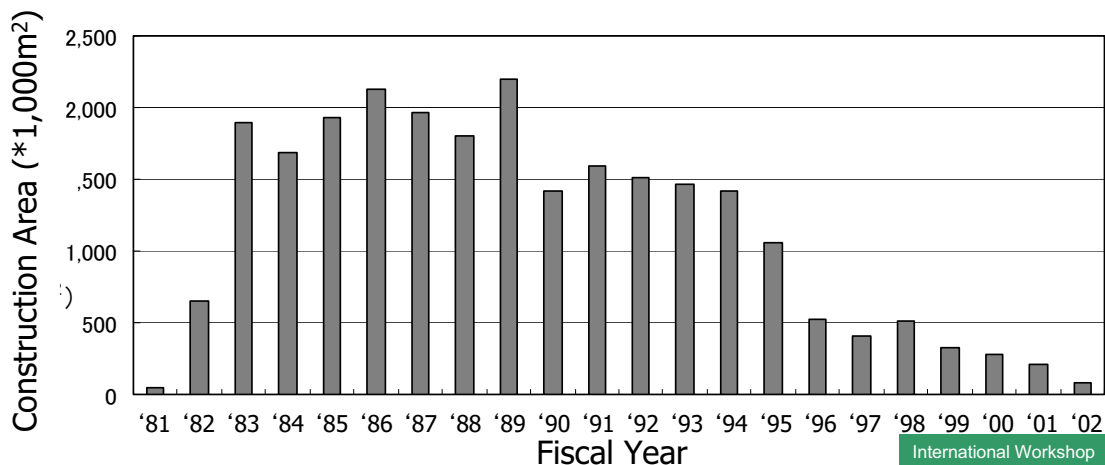
- Heat the existing asphalt mixture
- Scarify to loosen the material
- Add new asphalt mixture and/or rejuvenators if necessary
- Spread and compact it to construct a new surface course or binder course.



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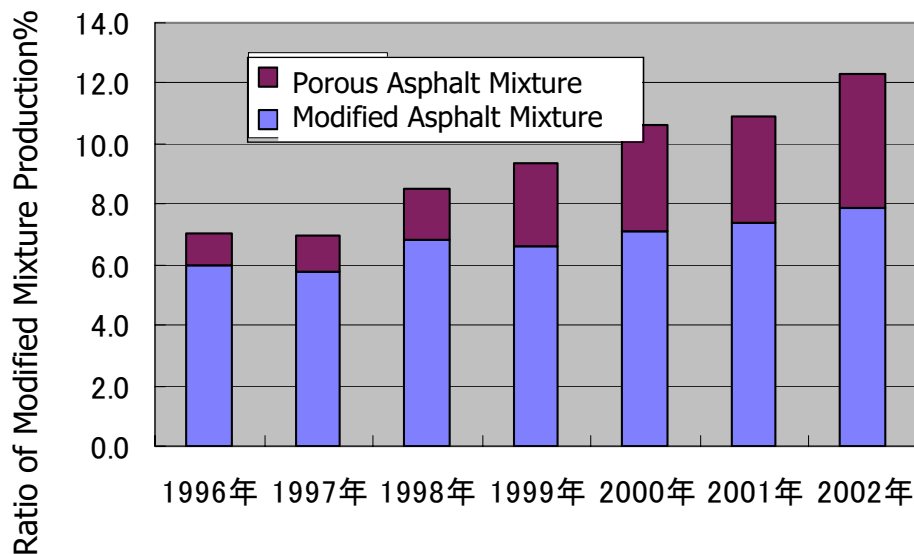
In-place Surface Recycling

- Once it was popular in expressways
 - Drainage asphalt pavement (DAP) has become popular
 - In-place surface recycling is not adequate for DAP
- There is an environmental problem such as an influence of heated air to plants along the roads



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Production of Modified Asphalt Mixture



Problem:
Recycling Method of Modified Asphalt

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Outstanding problems about AC (Asphalt Concrete) recycle

- Improve the ratio of AC waste reclaimed to AC
 - According to the survey in 2002,
 - Total amount of AC waste in Japan is 30million tons
 - Amount of AC waste recycled to reclaimed AC is 15million tons (=50%)
 - The rest has been reused as recycled base course material
 - Recycle use of modified AC and Porous AC
 - How will modifier act in the recycled mixture?
 - How about the influence of the difference in gradation between dense-graded AC and Porous AC
- Evaluation method for recycled asphalt
 - Present : Penetration of old asphalt
 - Revised : Indirect tensile test for reclaimed AC mixture

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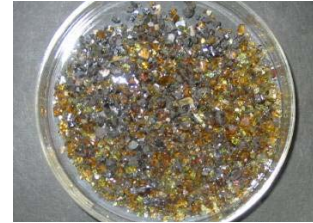
Typical wastes from other areas



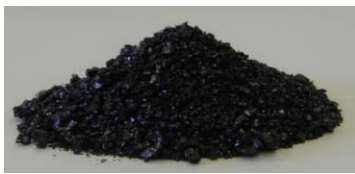
Wood



Molten slag made from municipal waste and sewer sludge



Glass



Steel slag



Used tire rubber



Fly ash from fire power plants

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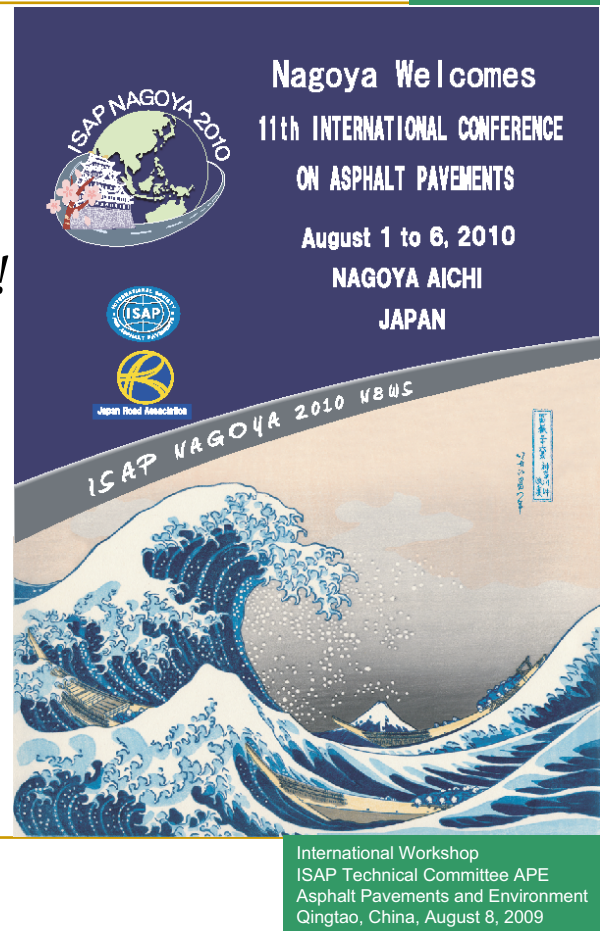
Attention to use waste from other areas

- Environmental Safety
 - No seeping out of any harmful materials such as lead, chrome, etc.
- Durability
 - Equal strength with natural aggregate in hardness, wear-resist, etc.
- Economical
 - Not so expensive rather than natural aggregate
- Stable supply
 - Can be supplied with constant quantity and uniform quality
- Sustainability
 - Can be recycled in several times

Thank you for your attention!

See you again at
ISAP NAGOYA 2010

<http://isap-nagoya2010.jp/>



The poster for the ISAP NAGOYA 2010 conference features a dark blue background with white text. At the top left is a circular logo with a globe and the text 'ISAP NAGOYA 2010'. Below it are the ISAP logo and the Japan Road Association logo. The main text reads: 'Nagoya Welcomes 11th INTERNATIONAL CONFERENCE ON ASPHALT PAVEMENTS August 1 to 6, 2010 NAGOYA AICHI JAPAN'. A diagonal banner across the middle says 'ISAP NAGOYA 2010 NEWS'. The bottom half of the poster is a reproduction of the Japanese woodblock print 'The Great Wave off Kanagawa', showing a massive blue wave crashing over a boat. In the bottom right corner, there is a small vertical text box with Japanese characters.

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