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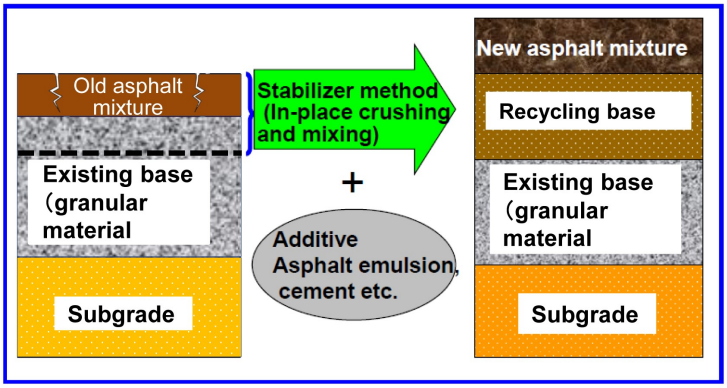
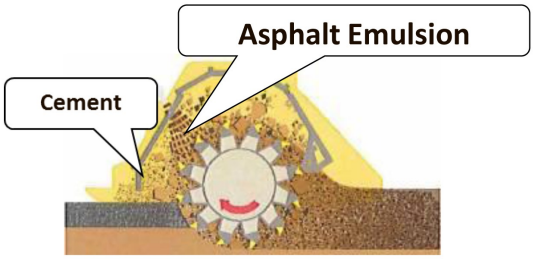
# IDI QUARTERLY

Infrastructure Development Institute—JAPAN

# Stabilizer Construction Method




## Our Target is Constructing Long-life (Perpetual) Pavements

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## Stabilizer Construction Method

### 1. Background of Technology Development

Around 1960, Stabilizing method using asphalt emulsion for gravel road and soil stabilization using cement were widely applied in Japan. Furthermore around 1980's in –place base course recycling method using stabilizer had started and the stabilizing equipment (stabilizer:Photo1) had improved to use both of asphalt and cement or lime.

At this moment, the stabilizer construction method can be used to (1) stabilize and improve weak sub-grade surface, (2) stabilize granular material, (3) construct new base courses using existing granular material,(4) reconstruct roads by reclaiming the existing asphalt mixture and base course material.

Photo1 Road stabilizer PM-550

### 2. Detailed Description of the Technology

There are several types of stabilizations as following:

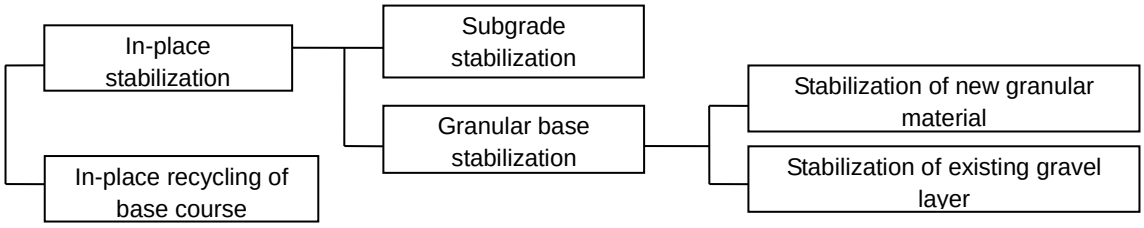


Figure1 Types of stabilizations

The features of this method are as following:

1) In-place upgrading: improve soil roads, gravel roads to enhance their durability right on-site.

2) Resource saving: by re-using existing base-course material, asphalt mixture.

3) Fast construction in one running of the plant by crushing base course materials and asphalt layer, mixing them with added binding agents at the same time, and place them back to the road immediately

4) Cost saving by recycling material and shortening construction time.

Mainly 3 type of stabilizer method is used( Figure2-4)

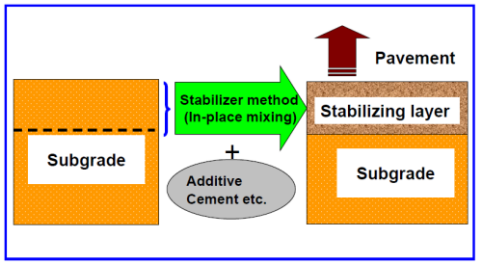


Figure2 Improvement of subgrade

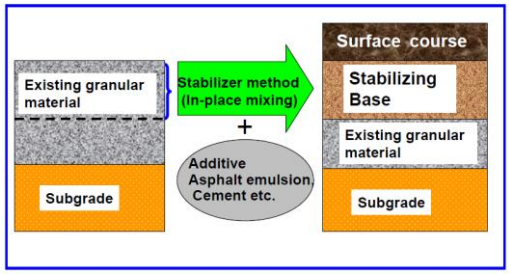


Figure3 Improvement of base course

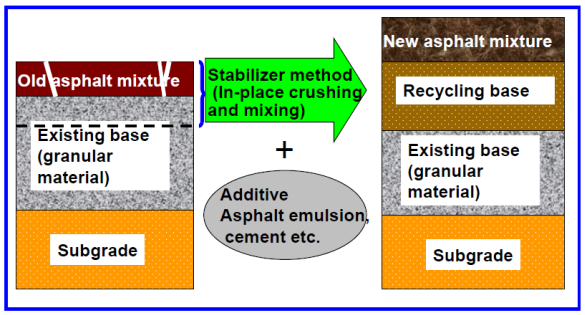


Figure4 In-place base course recycling

Specification of Road stabilizer PM550 is shown in Table1.

Table1 Specification of PM550

| TYPE | | Road Stabilizer | |
|---|---|---|---|
| MODEL | | PM550 | PM550-s |
| CHASSIS MODEL | | 1PM5 | 1PM6 |
| WEIGHTS | | | |
| Operating weight | kg(lb) | 22,500 (49,600) | 22,480 (49,560) |
| Load on front axle (Operating weight) | kg(lb) | 7,550 (16,645) | 7,560 (16,670) |
| Load on rear axle (Operating weight) | kg(lb) | 14,950 (32,955) | 14,950 (32,890) |
| PERFORMANCE | | | |
| Speed range(travel) | km/h(mph) | 0 -14(0 - 8.7) | |
| Speed range(operating) | m/min(ft/min) | 0 - 48.0(0 - 157) | |
| Gradability | %(°) | 51(27) | |
| Min. turn radius(outer) | m(in) | 11.3(445) | |
| DIMENSIONS | | | |
| Overall length | mm(in) | 9,280(365) | |
| Overall width | mm(in) | 2,650(104) | |
| Overall height | mm(in) | 2,915(115) | |
| Wheelbase | mm(in) | 5,700(224) | |
| Tire size×Number of tires | | 20.5-25 20PR×4 | |
| Infration(front/rear) | kPa(psi) | 400/450(58.0/65.3) | |

| TYPE | | Road Stabilizer | |
|---|---|---|---|
| MODEL | | PM550 | PM550-s |
| CHASSIS MODEL | | 1PM5 | 1PM6 |
| CRUSHING AND MIXING ROTOR | | | |
| Rotor width | mm(in) | 2,000(79) | |
| Rotor depth | mm(in) | 430(17) | |
| Rotor diameter | mm(in) | 1.150(45) | |
| Rotor speed (L/H) | rpm | 100/130 | |
| Number of bit (conical/roof) | pcs. | 98/8 | |
| Shift stroke | mm(in) | 500(20) | |
| Side clearance | mm(in) | 235(9.3) | |
| ENGINE | | | |
| Make | | KOMATSU | |
| Model | | SAA6D140E-5 | |
| | | (EPA-Tier3) | - |
| Type | | Diesel, water cooled 4cycle,6cylinder, with turbo charger | |
| Displacement | L(cu.in) | 15,239(929.9) | |
| Rated output | kw(HP)/min$^{-1}$ | 370kw(496PS)/1,800rpm | |
| FLUID CAPACITY | | | |
| Fuel tank | L(gal) | 700(185) | |
| Hydraulic tan | L(gal) | 235(62) | |

The detail of mixing rotor are shown in photo2,3.

Photo2 Rotor system(shift mechanism)

Photo3 Conical bits(inside rotor system)

Typical machine fleet of in-place base course recycling is shown in Figure 5

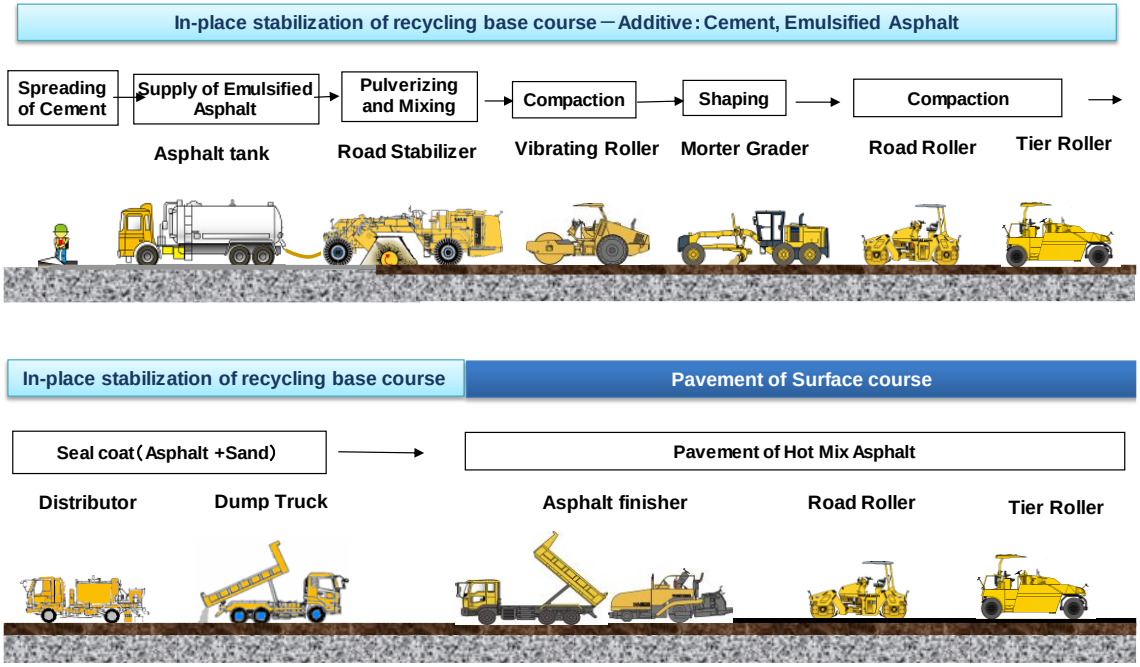


Figure5 Typical Machine Fleet of In-place Base course Recycling

## 3. Advantage of the Technology

In many countries the traffic (cargo transport) volume has been increasing more rapidly than the road extension. There is concern that the traffic volume will increase and damage will be increased accordingly. So the biggest problem is using budget effectively for maintenance and new construction.

The consideration of long-life pavement (it is called perpetual pavement in U.S.A) is necessary at the process of pavement design and construction for the effective infrastructure development. Long-life pavement means the under-layer of pavements (subgrade, subbase and base course) is maintenance-free structure and only surface course (or binder course) will be repaired. Road stabilization method is useful technology to make the pavement durable.

(1) Features of soil stabilization

1) Soil stabilization is the construction method to raise strength (bearing capacity) for weak materials of embankment or subgrade. → Saving time and materials

2) Increasing the bearing capacity of subgrade (CBR value of subgrade), decreasing the thickness of pavement structure. → Lower Cost

3) Make water-tight subgrade. → Durable

(2) Features of Base course stabilization

1) Recycle of existing base course materials/asphalt surface course →Environment Friendly

2) Up-grading of existing roads in the case of traffic increasing. →Durable structure

3) Shortening construction period → Quick rehabilitation

4) Low-cost construction in comparison with full replacement. →Lower cost

## 4. Applicability

This technology is available for the stabilization of soil, granular materials and base course and asphalt pavements. Additive for stabilization are

cement (or lime) and /or asphalt emulsion. The reason of using asphalt emulsion is as follows.

1) Safety reason

Asphalt emulsion is cold materials, not hot asphalt so if the worker contact the asphalt, there are no possibility of getting burned.

2) Less Troubles

In the case of using asphalt emulsion, simple nozzle is available. Simple nozzle is less stuffed and prevent trouble at the construction site and easy to solve the problems. Asphalt emulsion is low viscosity liquid, so the mixing of aggregate and asphalt is easy.

3) Emulsion can be stored considerably long term. If construction work stop, emulsion can be used on next day

## 5. Installation Record (Example of construction)

(1) Soil road stabilization (Vietnam : cement)

Photo4 Before stabilization

Photo5 After stabilization

(2) Gravel road stabilization (Nicaragua : cement)

Photo6 Before (gravel road)

Photo7 stabilization

Photo8 Completion (Block pavement)

(3) In-place base course recycling (Vietnam: cement and asphalt emulsion)

Photo9 Before (Damaged road)

Photo10 stabilization

Photo11 Completion (Asphalt pavement)

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