The introductory plans of labor-saving track on soil roadbed at the lines in operation.

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abstract: In railroad management, it is important to cut down maintenance cost. Besides Japan is changing social situation , so it is a big subject to realize labor-saving track on soil roadbed at the lines in operation. This report says the development of it.

1.INTRODUCTION

In railroad management, it is said that "the maintenance is a cost to be most important in management" . In case of East Japan railway company, the expense of maintenance becomes about 45 hundred millions dollar by repair costs and personnel expenses, and becomes about 1/3 of all the business expense ,at the analyzes expense construction.

On the other hand, Japan tends to aging and child-less and begins to decrease the working population(15～64 years old) in 1995, so population decrease fairly in 2006.

The railway business is gathered labor power ,and competes with aircraft and speedway. So it is a big subject that the low cost in every field by means of "labor saving", "mechanization", "systematization", that high quality service by the price with competitive power.

2.AN OUTLINE OF TRACK MAINTENANCE

2.1 Social conditions

The present state of maintenance in Japan is

① maintenance costs are very high

② decrease the working population (difficult that keeping workers in severe working conditions)

③ difficult that repairing track in the night by noise and vibration

In environment condition to surround a railroad as the above, track maintenance section cut down maintenance cost and advance the development such as

"maintenance free facilities"

"mechanization of human work and inspection work"

for the 21st century.

2.2 Ballast-track

As you know, conventional track structure is mainly ballast-track. The structure supports rails with sleepers on ballast laid on soil roadbed (Figure 1).

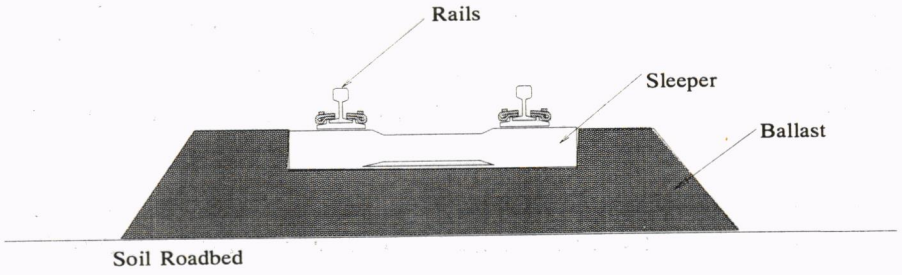

Figure 1 Track structure ballast-track

The advantages of this track is

① low construction cost

② fast construction

③ track repair is easy

As for the disadvantage, it is necessary to periodically.

So we look for introduction of "labor-saving track" which can reduce maintenance further.

This report says the development of "labor-saving track" on soil roadbed closing the greater part of revenue line.

3.DEVELOPMENT OF LABOR-SAVING TRACK

The development of "labor-saving track" on soil roadbed was started in 1970's, and there were the laying results with revenue line as B-type paved track (Figure 2), but it did not spread because laying cost was high,4900000 dollar/km in the existing price.

Necessity of "labor-saving track" on soil roadbed rose once again in social background of insufficient workers as the said article. So E-type paved track (Figure 3) was developed, has the following characteristic.

① It is possible to lay at normal temperature by using "composition injection materials of cement asphalt" (PQCAM).

② It is easy to keep paved bed by use non-woven fabric.

③ The laying costs were 3100000 dollar/km in 1991.

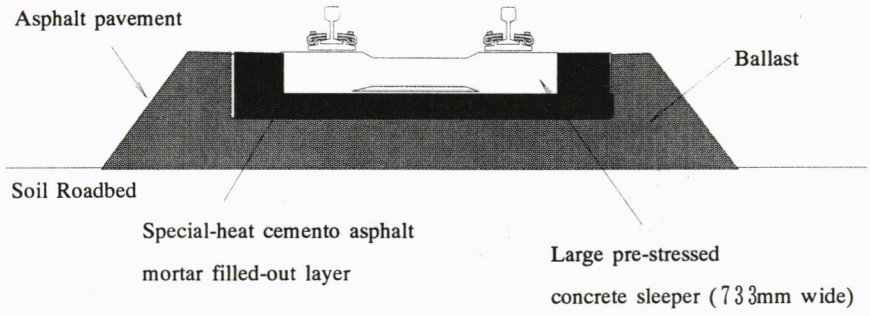

Figure 2 Track structure of B-type paved track

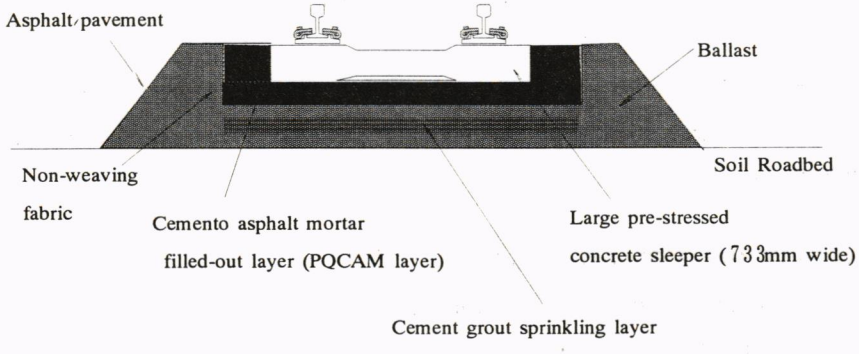

Figure 3 Track structure of B-type paved track

The aim of maintenance of labor-saving track is "the track which can secure balance of train by around 1 time repair between 10".The aim of laying costs of it is "the costs that 1400000 dollar/km". This laying costs calculated it from reduction of track maintenance and increase equipment investment.

By the present, E-type paved track about 2.5 ㎞ laid in Yamanote Line of Tokyo that there was a lot of transport volume. As a result, it continues in the best 6 years the state that we don't maintain track at all. But the laying costs is 2500000 dollar/km, so it becomes a big subject to do cost reduction furthermore.

4. DEVELOPMENT OF LOW COST LABOR-SAVING TRACK

We did cost analysis of E-type paved track, and attempted cut of laying costs in the following matter.

① Reduction of materials cost by meddle size sleeper (733mm wide → 400mm wide)

② Reduction of constructional cost by the mechanization execution of removing and laying sleeper construction.

③ Reduction of materials cost by reviewing injection materials from cement asphalt series composition materials to cement series composition materials.

By new paved track (Figure 4), the laying costs is reduction of 21% (1800000 dollar/km) and track keeps the stable state .

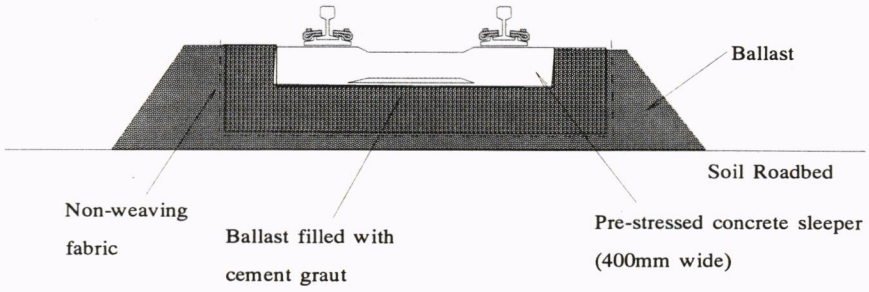

Figure 4 Track structure of low cost paved track

We measured roadbed pressure and vibration acceleration, and having calculated a quantity of track destruction. As a result, it is confirmed that roadbed pressure is about 1/2 of ballast track, that track destruction is about 1/5 of it .

5. THE DEVEIOPMENT AFTER NOW

We make studies going on cost reduction about the next item.

① Low cost of the conclusion device.

② Improvement of plant for injection.

③ Concentrate execution by a large-sized machine group in the daytime.

④ The method of construction which digging isn't done of roadbed, and is injected.

By this thing, realization of aim cost becomes possible.

We plan laying expansion of new labor-saving track about 70km in addition to Yamanote Line in the future.