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JAPANESE METHOD FOR FORMATION OF MULTI-GROUP TRAINS

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Annotation: The problem of tracks for formation of pick-up trains, with the analysis and proposal of possible solutions, is considered in the paper. The results obtained show that the current practice in solving this issue has not been appropriate, that it does not provide good results and, hence, that it has to be changed.

Key words: technical cargo stations, Pick-up train formation methods, number and length of tracks

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Аннотация: В статье рассматривается задача о путях формирования сборных поездов с анализом и предложением возможных решений. Полученные результаты показывают, что существующая практика решения этого вопроса оказалась неадекватной, что она не дает хороших результатов и, следовательно, должна быть изменена.

Ключевые слова: технические грузовые станции, методы формирования приемных поездов, количество и протяженность путей.

The Japanese method has been popular in technical freight yards due to a specific track solution. This method requires three shunting tracks, where the final feeder train forming takes place. The tracks must be interlinked with appropriate crossovers (most often with simple crossovers (Figure 1a) or double crossovers (Figure 1b)). Furthermore, all these tracks must have a downward grade of 2.5‰ and must be equipped with track brakes, radars, and axle counters. The central delivery track is usually by 50 to 80 mm higher then the end tracks, so that wagons can easier move to end tracks, depending on their use. In marshalling or classification yards, such track solutions can be:

- with only one track structure on which the final sorting is operated for all trains,

- with several track structures, where the number of such structures corresponds to the number of feeder trains to be formed at a particular yard, with several truck structures that are defined depending on the needs and expected effects.

This solution enables wagon sorting and grouping according to appropriate intermediate stations in a single classification effort, so that this phase is followed solely by grouping according to the order of intermediate stations. In the end, we could state that this solution is generally characterized by an increase in investment due to use of additional crossovers and track brakes, while on the other hand significant savings are made by shorter downtime of wagons.

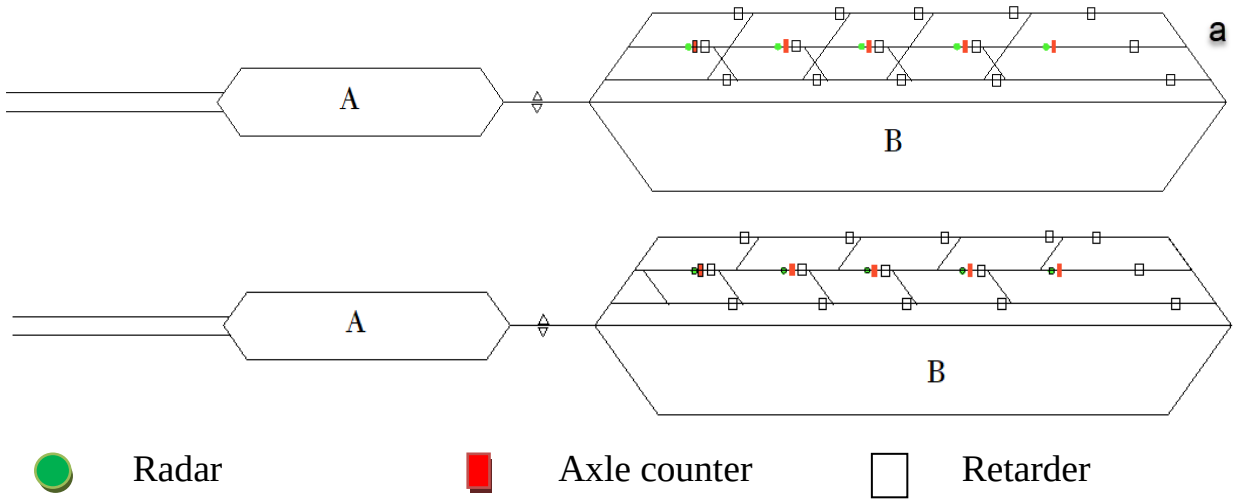

Figure 1.Technical solutions for forming feeder trains by Japanese method: a) with

simple crossovers; b) with double crossovers

The technology for final feeder train sorting by means of the Japanese Method does not depend on the number of track structures contained in the system of these yards, but rather on the technical track solution, i.e. on the use of crossovers (simple crossovers (Figure 1a) or double crossovers (Figure 1b)). Here it is important that in each track group the central track assumes the role of delivery track, while two end tracks are used for wagon collection by intermediate stations. This is why both end tracks must have the number of parts that corresponds to the maximum number of intermediate stations at a distribution section for which feeder trains are formed (e.g. in Figure 2, there are 10 parts at end tracks (5 on each track) on which feeder train forming is possible for ten intermediate stations). The method of wagon forming or wagon collection at sections, and by intermediate stations, depends on crossovers used:

- if simple crossovers are used, then the use of parts at end tracks must correspond to the order of intermediate stations (on one side 1, 2, ..., 5, and on the other 6, 7, ..., 10, or on the one side 1, 3, ..., 9, and on the other 2, 4, ..., 10);

- if double crossovers are used, then the use of parts at end tracks can be arbitrary.

This solution enables wagon sorting and grouping according to appropriate intermediate stations in a single classification effort, so that this phase is followed solely by grouping according to the order of intermediate stations.

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Brief presentation of the Japanese Method

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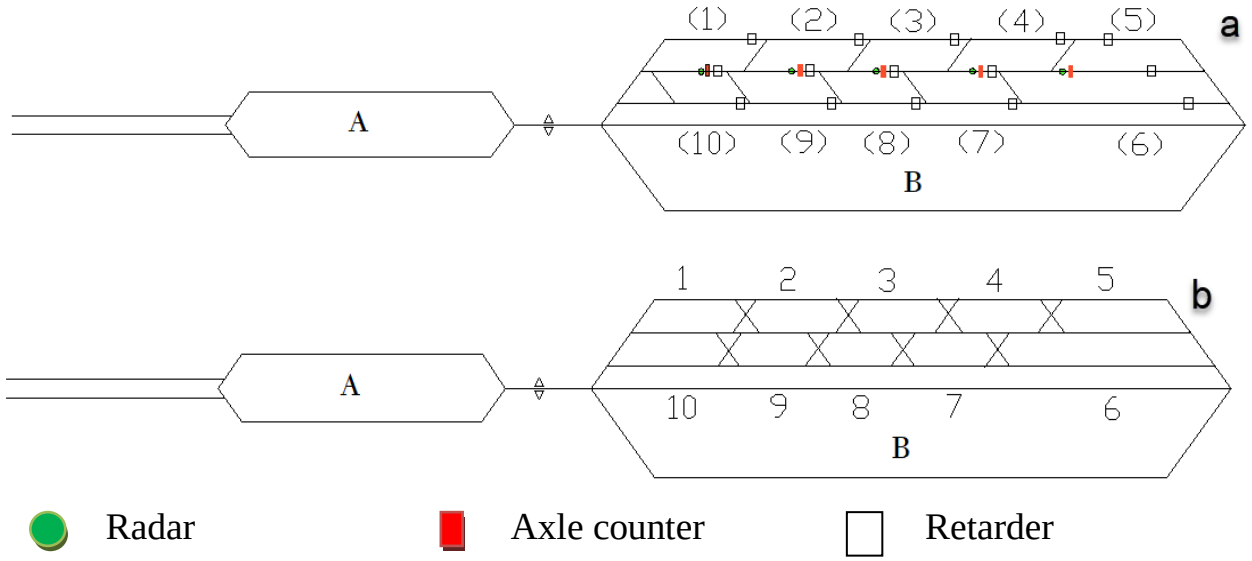

Figure 2. Track use during feeder train forming by Japanese method a) for solution with simple crossovers; b) for solution with double crossovers

Based on research conducted in this paper, and the corresponding analysis of results, the following conclusions can be made:

- Regardless of the method used, the process of feeder train forming can be relatively easily modelled and simulated by means of any programming language.

- Results of the model used show the real situation with regard to the use of analyzed methods, and point to a number of errors in the current design and operation of technical freight yards. That is why these results can be used as an additional argument for making significant technical and investment decisions during the design and operation of either new or renovated technical freight stations.

- Significant new indicators as to the use of these methods can be developed by broadening the base of input elements, and through additional analyses. A separate report (study) should be prepared in that respect.

- The establishment of this model has created favourable conditions, and has given an additional encouragement, for the participation of wider public and the authors themselves in the further development of the model through future study of this or other similar problems.

Method name	**Parameters for application**	**Basic characteristics**	**Advantages**	**Disadvantage**
Japanese methods	The technical solution for rail	Three shunting tracks mutually connected to a larger number of track connections	With briefly stopping wagons achieve significant savings	Increase in investments due to the use additional links of track and of track brakes

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