

Train Shunting Operation Plan for Detachment and Coupling

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Abstract: This paper focus on two study cases for shunting train stocks which are required to be broken by two sections. First the position of the pulling out of the train stock shall be confirmed before detaching, followed by breaking up carriages or train stock according to the destinations. Then locomotive back to the line where the train stock waiting and pull out the other carriages and break them up again. Finally, all the carriages are made up in order and ready for departure.

Shunting list is used in the shunting operation to help railway working staff and locomotives to apply and check the lines. Shunting trip such as wagon coupling trips and wagon uncoupling trips are calculated in the shunting plan in both two study cases. In the end, the railway station is supposed to take the least shunting lines, least wagon coupling trip, least wagon uncoupling trip and least shunting working time to deal with the most shunting work.

Keywords: Shunting Plan; Wagon Coupling Trips; Wagon Uncoupling Trips

1 Introduction

Shunting work is an important and complex task in the train station work organization, especially in the marshalling yards. Shunting work also is the main production activity and situated in the central position. Whether the train can arrive and departure on time, goods can be loaded and unloaded on time, carriages or train stocks can be selected and delivered reasonably, equipment capabilities can be effectively utilized to achieve production plan targets largely depend on the decision-making level and quality of shunting operations.^[1] As far as shunting work, there are Break-up shunting, Make-up shunting, Detaching and attached of wagons shunting, Taking-out and placing-in of wagons shunting and other shunting work. In this paper, we will focus on two cases which are both belongs to Detaching and attached of wagons shunting.

2 Case Study 1

Train stock 43732371653312435472635224 stops in shunting yard line 10, waiting for breaking train stock up by sections according to the order of arrival of stations (the final order of train stock is 1234567). The shunting locomotive works on the right of the train stock. There are five shunting lines (line 10, 11, 12, 13 and 14) allowed to use, and the train stock will prepare in line 1 waiting for departing.

Position to Pull Out

Train stock 43732371653312435472635224, the first bigger figure mains the destination, and the second smaller figure mains the number of carriages. For example, 43, there are three carriages will arrive at 4 Station, and 73, there are three carriages will arrive at 7 Station.

The train stock is required to be broken by sections, therefore train locomotive shall pull out twice. There are 13 groups in the strain stock (43, 73, 23, 71, 65, 33, 12, 43, 54, 72, 63, 52, 24), where the farthest station groups are 73, 71, and 72, and the nearest group is 12. We take the 72 (far right of the three farthest station groups) as the finally farthest station group, which is also on the right hand of the nearest group (43, 73, 23, 71, 65, 33, 12, 43, 54, 72, 63, 52, 24).

The finally farthest station group is on the right, and the nearest group is on the left, so the first train stick pull out is 12, 43, 54, 72, 63, 52, 24, and the second train stock 43, 73, 23, 71, 65, 33.

Drop Down

The two sections of train stocks shall drop down in one time. The result of dropping down Train stock 43732371653312435472635224 is shown in Form 1 Shunting List – Drop Down.

Form 1 - Shunting List – Drop Down

Train Stock									43	73	23	71	65	33
Row	Line													
12		43	54	72	63	52	24							
A	10	12						24			23			33
B	11		43						43					
C	12			54			52						65	
D	13					63				73		71		
E	14				72									

Shunting Plan

Train locomotive pulls 12, 43, 54, 72, 63, 52, 24 out at the first time from Line 10 before breaking them up. Then train locomotive needs back to Line 10 to pull out 43, 73, 23, 71, 65, 33. Finally, the made-up train will departure from Line 1. The shunting plan is shown in Form 2. (“+” wagon coupling trip, “-” wagon uncoupling trip) (Line +/- carriages)

Form 2 - Shunting plan for Case Study 1

the first section	the second section	make-up	departure
10+18	10+18	14+2	DF1-38
11-3	11-3	13+7	
12-4	13-3	12+11	
14-2	10-3	11+6	
13-3	13-1	10+12	
12-2	12-5		
10-4	10-3		

Overall

In this case study, use 7 wagon coupling trips, 12 wagon uncoupling trips (not include the shunting trip for transferring to the arrival and departure line) and five shunting lines.

3 Case Study 2

Train stock 637223521145113223643213 stops in shunting yard line 7, waiting for breaking train stock up by sections according to the order of arrival of stations (the final order of train stock is 1234567). The shunting locomotive works on the right of the train stock. There are five shunting lines (line 7, 8, 9, 10 and 11) allowed to use, and the train stock will prepare in line 2 waiting for departing.

Position to Pull Out

Train stock 637223521145113223643213, the first bigger figure means the destination, and the second smaller figure means the number of carriages. For example, 63, there are three carriages will arrive at 6 Station, and 72, there are two carriages will arrive at 7 Station.

The train stock is required to be broken by sections, therefore train locomotive shall pull out twice. There are 12 groups in the train stock (63, 72, 23, 52, 11, 45, 11, 32, 23, 64, 32, 13), where the farthest station group is 72, and the nearest groups are 11, 11, and 13.

We take the 11 (far left of the three nearest station groups) as the finally nearest station group, which is also on the right hand of the farthest group (63, 72, 23, 52, 11, 45, 11, 32, 23, 64, 32, 13).

The finally farthest station group is on the left, and the nearest group is on the right, so the first train stock pull out is 11, 45, 11, 32, 23, 64, 32, 13, and the second train stock 63, 72, 23, 52.

Drop Down

The two sections of train stocks shall drop down in one time. The result of dropping down Train stock 637223521145113223643213 is shown in Form 3.

Form 3 - Shunting List – Drop Down

Train Stock									63	72	23	52
Row	Line											
11		45	11	32	23	64	32	13				
A	7	11		11					13			23
B	8					23		32				
C	9				32							
D	10		45									52
E	11						64			63	72	

Shunting Plan

Train locomotive pulls 11, 45, 11, 32, 23, 64, 32, 13 out at the first time from Line 7 before breaking them up. Then train locomotive needs back to Line 7 to pull out 63, 72, 23, 52. Finally, the made-up train will departure from Line 2.

The shunting plan is shown in Form 4. (“+” wagon coupling trip, “-” wagon uncoupling trip)

(Line +/- carriages)

Form 4 - Shunting plan for Case Study 2

the first section	the second section	make-up	departure
7+19	7+10	11+9	DF2-31
10-5	11-5	10+7	
7-1	7-3	9+3	
9-3	10-2	8+5	
8-3		7+8	
11-4			
8-2			
7-7			

Overall

In this case study, use 7 wagon coupling trips, 10 wagon uncoupling trips (not include the shunting trip for transferring to the arrival and departure line) and five shunting lines.

4 Conclusion

Breaking train stock up by sections is one of the shunting operation work. Due to the factors such as the layout of the railway station yards, the length of the traction lines, capabilities of the locomotives or the nature of the goods, train stocks can be pull out in one or two, even more than two times. Therefore, when the train stock is required to be pull out twice, the position is required. As for the shunting trip, wagon coupling trip and wagon uncoupling trip are both used in the shunting plan. Wagon coupling trip is use to hang on carriages or train stock, and the wagon uncoupling trip is used to break up carriages or train stock.

Overall, when the farthest group is on the left and the nearest group is on the right, the position of pulling out is between the two groups. Otherwise, when the farthest group is on the right and the nearest group is on the left hand, the position of pulling out is on both sides. Sometimes, there are more than one farthest groups and more than one nearest groups. Usually, we take the far left among the nearest groups as the finally nearest group, and take the far right among the farthest groups as the finally farthest group. No matter what kind of shunting operation work, the most important is keeping safe, efficient, and economic.

References

[1] Peng Qiyuan, Wang Ciguang, Organisation of Train Operation, Chapter 1, The Theory and Methods of Shunting Work, 2006, p:25.