Improving the technological process of dismantling rail and sleeper grids through the use of a removable catcher

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Abstract. The maintenance and development of railway infrastructure requires a significant amount of repair and construction work. The most labour-intensive and time-consuming type of repair is a major track repair. The development strategy of the track complex sets tasks for planning and organizing track repair work, taking into account the fulfilment of the requirements for highly efficient use of track machines, ensuring their production at the level of passport characteristics. The article discusses the problem of dismantling a rail and sleeper grid using a laying crane, namely the process of lowering the first link of the package onto the crane platform. In a curved section of track, the problem arises that the inverted rail does not reach the platform rollers. Equipping the platforms with additional removable catchers will eliminate the process of rocking the inverted link by track fitters.

1 Introduction

The maintenance and development of railway infrastructure requires a significant amount of repair and construction work. Every year, up to 600 thousand “windows” are provided on the railway network, 12% of which last 4 hours or more [1]. The most labor-intensive and time-consuming type of repair is a major track repair using new materials [2]. With this type of work, the following is carried out:

- replacing the old rail and sleeper grid with a new one;
- deep cleaning of contaminated ballast with addition of new crushed stone;
- laying strands of seamless track, welding them to the length of a stretch or block section;
- straightening the track according to the level in plan and profile using straightening complexes;
- repair of drainage and artificial structures; crossing repairs.

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2 Materials and methods

To increase labor productivity and reduce the duration of “windows”, the development strategy of the track complex of Russian railways sets the industry the task of planning and organizing track repair work, taking into account the requirements for highly efficient use of track machines, ensuring their production at the level passport characteristics [3,4].

When replacing a rail and sleeper grid with reinforced concrete sleepers, the main work, which directly affects the duration of the window, and therefore the scope of work, is the dismantling of the rail and sleeper grid.

The start time for dismantling the rail and sleeper grid with the strands of the continuous track laid, perhaps after the welders have previously cut the strands onto rails 25.5 m long at a distance from the beginning of the work front, which ensures the placement of the head part of the dismantling train with a lifting link and compliance with the safety distance between working welders and the head part of the dismantling train [5].

After the link is lifted off the ground by the boom of the dismantling train, loading of the link onto the platform begins (Fig. 1).

![Fig. 1. The work of a laying crane to dismantle the rail and sleeper grid.](image1)

When a crane forms a package of 5 links, the lower link, which was removed first, is placed on the crane platform with a preliminary inversion, so that the package can later be pulled along rollers to another platform. In straight sections of the track, problems do not arise in this process, but in curves of small radius, the inverted link has a straight direction, and the platforms on which it is laid are bent due to the curvature of the track, as a result of which the rail, when lowering the link, may not fall on the roller and the entire package will jam (Fig. 2).

![Fig. 2. Scheme of the process of laying the removed rail and sleeper grid link on the platform (top view).](image2)
In such cases, to load the first link, it is necessary to use from three to five track fitters to swing it, which is necessary for the rail to hit the roller conveyor (Fig. 3).

![Fig. 3. The process of swinging a link in a curved section of track.](image)

Since swinging a link is not a typical operation when loading a link, its implementation requires the involvement of track fitters involved in other work. This reduces labour productivity and leads to lost working time.

### 3 Results and discussion

On the Trans-Baikal Railway, given its complex layout and profile, major track repairs are often carried out in sections with a large number of curves, including small radii. The number of inverted links in one “window” can be 10 or more pieces (depending on the length of the work area), which results in significant losses of “window” time and physical strength.

It is proposed to additionally equip the platform with a removable inverted link catcher, operating on the principle of a funnel (Fig. 4).

![Fig. 4. Inverted link catcher.](image)
When loading, even in a curved section of the track, the inverted link falls onto the catcher with the rails and is lowered along it onto the rollers, thereby speeding up the process of dismantling the rail and sleeper grid during the “window” and facilitating the work of the track fitters.

The removable catcher is made from discarded P50 pads and is secured to the platform and roller conveyor with terminal bolts. The height of the catcher is 10 mm less than the height of the inverted rail lying on the roller conveyor. To prevent lateral movement of the catcher, holders are welded to the roller conveyor on both sides.

4 Conclusion

Currently, a prototype of a removable catcher has been manufactured and successfully tested on the Trans-Baikal Railway by Track Machine Station No. 328 in Mogocha city.

The device has repeatedly proven its effectiveness and showed good results when dismantling rail and sleeper grids in small radius curves. Further research includes typification of the invention, development of design documentation and replication.

References

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