A Sensitivity Study on Number of Rail Clamp

Soung Kyu Lee*, Woo Cheol Choi, Ho Jung Lee, Sung Hwan Kim, Min Gyu Kim
Mechanical System Engineering Dept, KEPCO E&C, 989-111, daedukdaero, Yuseong-gu, Daejeon, 34057, Korea
**Corresponding author: hikyu@kepco-enc.com*

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1. Introduction

The typical cranes installed in the reactor containment building and the auxiliary building consists of bridge, trolley, hoist as well as a pair of rails. The rails are installed for horizontal movement of the crane. And rail is commonly fixed with clamps installed in both sides for 1 set at regular intervals as shown Fig. 1. So that, the rail with clamp generally is under the static and live load from the wheel and the resulting stress affects the structural integrity of a rail.

Since the installation of clamps is related to the construction time, cost and integration of the rail, it is necessary to determine the appropriate number of clamps according to the magnitude of the load applied to the rail.

The objective of this paper is to calculate the appropriate clamp number based on the vertical load acting on a rail by using finite element method.

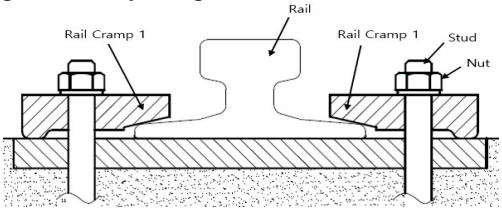

Fig. 1. Configuration of Installed Rail Assembly(Typical)

2. Methods and Results

2.1 Configuration of Geometric Model

A rail assembly is made-up of rail, clamps, studs and nuts. The clamps of a typical rail(A55)[1] at the edges on both side of a rail are fixed by using studs and nuts and installed at regular spacing on 10,000mm of the rail. In order to consider only four clamps adjacent to the point where the load is generated in this study, the total length of a rail is modeled as 3a by reflecting the regular interval(a) between clamps as shown in Fig. 2.

2.2 Boundary Condition

The boundary conditions for analysis are defined by assuming the crane operation condition as described in Fig. 2. The vertical load in case of seismic, which is considered as a large structural effect on a rail, is applied to the center region of the rail head. Four points in consideration of the spacing between the clamps are constrained. The cases of analysis are divided into 6 cases. The cases of clamp number cases are assumed as 17, 20, 25, 34, 50, 100, respectively and the analyses are performed by applying the interval(a) between clamps calculated, accordingly.

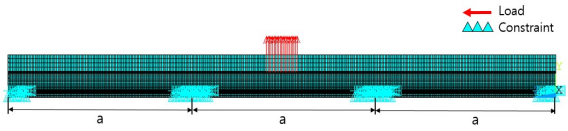

Fig. 2. FE-Model and Boundary Condition

2.3 Result

The stress results according to the number of clamps is shown Fig. 3. It is shown that stresses are decreased nonlinearly as the number of clamps increases. Up to 17 and 20 clamps, the stress decreased drastically and the stress more than 25 clamps decreased linearly. That is, it can be considered that installing more than 25 clamps are less economically efficient and 25 clamps are appropriate for the rail.

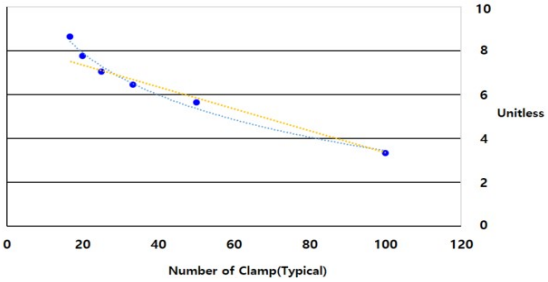

Fig. 3. Maximum Stress of Rail by Number of Clamps

3. Conclusions

In consideration of the vertical load acting on a rail of typical crane, the stress distribution of the rail has been analyzed. And the stress tendency of the rail according to the number of clamps has been computed.

Considering the economic efficiency for rail installation of typical crane, 25 clamps can be appropriate in case of seismic vertical load.

REFERENCES

[1] Standard Specification for Crane Rails; Hot Rolled Flat Bottom Crane Rails(Type A); Dimensions, Section Parameters and Steel Grades, DIN 536-1.