## Responding to the Need for Steel Plate in Larger Sizes Part I Product Length Expansion Up to 30 m

#### 1. Introduction

The construction of larger-scale container ships in recent years has heightened demand for steel plates with larger sizes, which can reduce the work load in welding and block assembly and shorten the construction interval in shipbuilding. At the plate mill at JFE Steel's West Japan Works (Kurashiki District), in order to expand the production of steel plates with a product length of 30 m, a new crane for long length plate products was constructed and various improvement were carried out, including expansion of the surface conditioning frame, revamping of conveyance control and improvement of the transportation route from the warehouse to the shipping quay.

# 2. Establishment of 30-m Plate Production System

#### 2.1 Problems for Establishment of 30-m Plate Production System and Measures

Figure 1 shows a schematic diagram of the plant layout and manufacturing process at the West Japan Works (Kurashiki District) plate mill from the shear line and finishing line to the product warehouse. Accepted products are transferred laterally from the shear line to the pass production line (accepted products line) by transfer <sup>①</sup>. In cases where conditioning of the top and/or bottom surfaces of the product is necessary, the plate is transferred to the surface conditioning line by transfer ②, and after online surface conditioning, it is returned to the finishing line by transfer ③ and then transferred laterally to the pass production line by transfer ④. When expanding product length, the length restrictions on these transfers became a problem in the existing ground-level equipment.

The method of expanding product length by enlarging the existing transfers would have large impact on plate mill operation, as online surface conditioning will be impossible during the revamping period. Therefore, a new overhead traveling crane for long length plate products (**Photo 1**) was constructed, and a method in which plates are discharged from the shear line and the finishing line to the pass production line by using the crane was adopted. To enable flaw conditioning of the top and bottom surfaces of these plates, the offline surface conditioning frame was expanded.

As illustrated in **Fig. 2**, if long plates are hoisted with the existing single-girder crane, there is a risk that the crane crab may overturn if a situation in which the load is supported on only one side occurs, resulting in an unbalanced load. Therefore, in the construction of the new overhead traveling crane, a double-girder crane was adopted to eliminate the risk of overturning. However, the weight of the overhead traveling crane increased due to this double-girder design, and the concentrated load on the building pillars exceeded the allowable load. To solve this problem, the crane wheelbase was increased so as to obtain a flat load on the



Fig. 1 Plant layout and manufacturing process

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Photo 1 Crane for long plate products



Fig. 2 Schematic diagram of crane girder

pillars, as shown in **Fig. 3**. By reducing the maximum bending moment on the girders by 24%, this measure made it possible to hoist long plates without structural reinforcement.

#### 2.2 Enlargement of Available Product Size Range

As a result of these equipment improvements, it was possible to expand the available product size range to a product length of 30 m in the range of plate thicknesses up to 40 mm. In the case of wide plates with thicknesses of 20 mm and less, the lifting magnet may attract the table rolls together with the steel plate when a plate is lifted off the shear line, and there was a risk that the plate might drop from the lifting magnet due to the reaction when the plate is separated from the table rolls. To avoid this danger, we proposed a method which reduces the reaction at the timing when the plate is hoisted, making it possible to produce plates with a



Fig. 3 Schematic diagram of crane wheelbase

product length of 30 m.

### 3. Conclusion

A new crane for long length plate products was constructed and table conveying control was revamped, making it possible to produce steel plates with a product length of 30 m. In 2019, long plates with a product length exceeding 27 m were delivered to a customer, contributing to a reduction of the processing work load. In the future, together with establishing the necessary shipping system, we hope to contribute to a reduction of the work load in welding and block assembly and shortening of the construction interval at customers by including these long length plates in ship design.

#### For Further Information, Please Contact(Oct.2021-):

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