

Development of Automatic Strapping Machine Using the PET Band

Ki Sung You*, Hee Don Jeong.**

*Research Institute of Science and Technology, Pohang, P.O.Box 135
Korea (Tel:82-054-279-6653; e-mail: yks@rist.re.kr).

** Research Institute of Science and Technology, Pohang, P.O.Box 135
(e-mail: hdjeong@rist.re.kr)}

Abstract: We present an equipment development for PET Banding Header that complements the Steel Banding machine currently being utilized in Pohang steel works, South Korea. The PET Banding Header was developed due to the damages done on the surface of the cold rolling products whilst being transported. Because the PET Banding Header was designed as a friction-binding technology against the existing heat-binding technology, the intensity concentrated on the binding area was significantly improved and its efficiency was also increased because it was designed to be a wider range of the banding. In addition, for the cost-cutting of the new equipment in development, the PET Banding header allows for both the Steel Banding Machine and PET Banding Machine to be utilized together. As a result, being applied to the facilities in the field, we were able to reduce the facility investment, demonstrate the efficient facility maintenance, and more importantly, solve the complaints from the customers.

1. INTRODUCTION

General binding methods such as wrapping devices using a stretching wrap and banding devices partially using a plastic band or a steel band have been dominated in the binding industries. Strapping machine (i.e., banding device) is a device that ties up the products. Depending on how to tie up the products (i.e., uses of the type of band), it is categorized into steel band strapping device and a plastic band strapping device.

Steel band strapping devices have been used in steel works to tie up coils made out of the steel plate (e.g., plate and sheet included). However, in case of binding the coils with the steel band, due to the weight of the coils themselves, the band marks appear on the surface of the cold rolling plate which is the serious damage on the products. In order to overcome deterioration of quality of the products due to the band mark emerged on the surface of the cold rolling products, steel band strapping device is used for the plate. On the other hand, the plastic band, specifically polyester band, strapping device is used for the sheet. Due to the different steel plates, two different machines have been installed on the product binding separately. However, because the plastic band strapping devices should be installed with an additional cost, it is not cost effective and not enough space for this device to be installed on the existing machine as well. In addition, previously imported heat-binding method, PET Banding Header, does not provide the sufficient binding force due to the characteristics of its junction method, thus brought up non-uniform tensile strength problem on the binding area.

This paper introduces the improved strapping machine by utilizing two band headers together. In particular, we introduce development of the plastic banding header,

sufficiently improved both a width of the plastic band and tensile strength against the joint.

2. COMBINATION BANDING MACHINE

This section proposes the solution of the problem raised up in the previous section. The purpose of this research is to develop the strapping machine compatible to both the steel band and plastic band by modifying the existing steel band strapping machine without rebuilding the plastic band strapping machine alone. As a result of development of combination banding machine, we are able to attain the desirable results such that it increases work efficiency by reducing the size of the workspace, it is cost-effective because the currently used machine need not modified without any extra investment in the context of developing new equipment, and it is compatible banding machine for both the steel band and the plastic band being capable of switching their uses whenever needed. Figure 1 and Figure 2 show pictures of combination banding machine used as described above.

3. PET BANDING HEADER

This section explains development of the banding header as a friction-binding technology. In general, band used for the plastic banding makes out of the polyester with other additives, thus becomes an intensified basic material and bound with heat. Weight of the plastic band is only 1.37 times greater than that of water (i.e., 1.37g/cm³). Shock Reserve and Elongation are superior, thus does not leave the band mark on the surface of the cold rolling due to the weight while being transported. However, since the tensile strength over the binding area is low, the binding area is broken while being transported. Therefore, we increase its intensity concentrated on the binding area.

Table 1 shows characteristics of the steel band, general plastic band, and PET band. Considered that intensity of the steel band on the welding area is below 450N/mm², if its intensity of PET band on the binding area is over 80%, it is noted that mechanical properties are good enough to replace the steel band for the coil wrapping. In addition, because the elastic elongation is 8 times superior to the steel band, it reduces the number of the band mark damages occurred while being transported. Figure 3 is picture of PET Banding Header being assembled as a final device.

Table 1. Comparison of characteristics of the band type

	Steel Strap	PP Strap	PET Strap
Tensile Strength	900 N/mm ²	300 N/mm ²	550 N/mm ²
Elongation At break	~ 8 %	~ 20 %	~ 11 %
Elastic Elongation	< 1 %	~ 4 %	~ 8 %
Creep	0 %	~ 18 %	~ 2 %

4. CONCLUSIOS

This paper presents an automatic strapping machine compatible with steel band and PET band header. This developed machine operates to bind the cold rolling products with one of the two banding headers appropriated to its condition. In addition, since the currently used machines are modified to fit into the combination banding machine, it decreases the size of the workspace, increases the work efficiency, and is cost-effective development. Consequently, we are able to remove the band mark from the surface of the products.

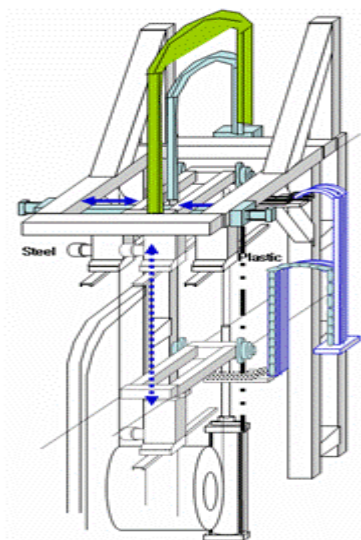


Fig. 1. Draft concept of combination banding machine

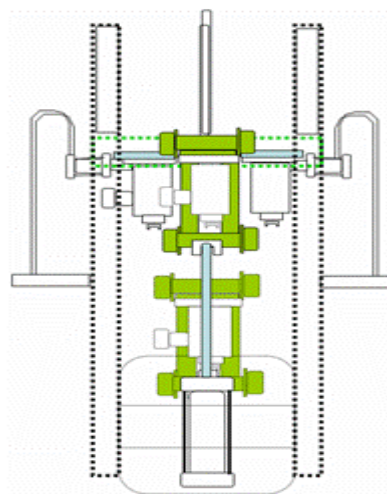


Fig. 2. Tool exchange and banding mechanism

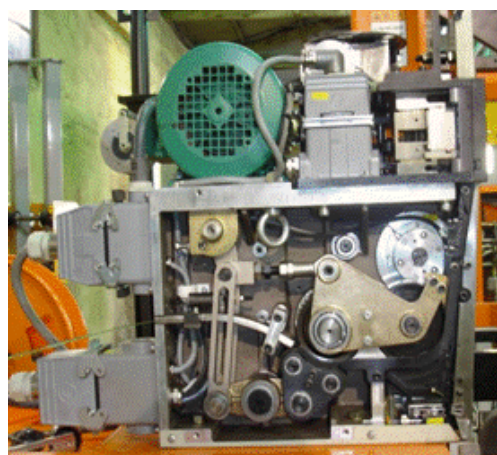


Fig. 3. Picture of the assembled PET Banding Header