EVALUATION ON WEAR OF LONG-PITCH ROLLER CHAIN WITH COMPOSITES PIN

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ABSTRACT

Bucket elevator long-pitch roller chain is used to carry cargo and it requires high tension, applied to the outer and inner plate. Long pitch roller chain while driving it generates a high impact met vibration noise while in contact with the sprocket.

The impact is acting on the whole beam delivered by the roller, bushing and pin, among them, pin will receive most impact. The impact shock occurs due to damage to the reduced life chain.

Thus, by using the hybrid pin by increasing the shock attenuation effect on the chain and the life is extended of chain [1]. The natural fiber reinforced composite pins were fabricated by utilizing jute/carbon and epoxy for inside (interior) of conventional steel frame (exterior). Safety evaluation is required for the composite pin for particle applications and it is necessary to support abrasion resistance while applying high load. Wear life evaluation is required through wear test of roller chain. Hence, in this study, evaluate the wear life of long pitch roller chains with composite pins. The wear life evaluation method was implemented similar to the actual chain behavior. The maximum tensile force was applied at the end of the chain and wear behavior was evaluated by repeating the up and down movement at the center roller of the chain. The upper and lower repetition motion, calculates the angle of the sprocket and moved by a vertical height. The angle was set differently according to the dimensions of the sprocket.

The weight reduction of the roller chain is important for the Bucket elevator. The composite materials using in the place of metal, to reduce weight and impact damping effect as well, and has connected to the plate for support the load. The outer steel material and interior to use composite material was trying to see the wear resistance. Table 1 shows the specifications of the roller chain. Table 2 shows the weight per roller chain part. The weight of the pin was the largest.

Table 1 Long pitch roller chain specification

Pitch	Tension	Breaking strength	Weight
300 mm	16.1 Ton	220 Ton	1ling = 29 kgf

Table 2 Long pitch roller chain weight

Part	Weight (kg)	Wt. %
Plate	8.1	28
Pin	8.5	29
Bush	5.4	18
Roller	7	24
Total	29	100

Figure 1 shows the results of the finite element analysis according to the inner diameter of the fin. When the stress distribution and the weight reduction were compared, it was confirmed that the optimum value was obtained at a weight reduction of 20% and a stress of 100% of the pin at 34.05 mm.

The manufacturing method of the composite material pin is made of a metal material on the outside and a composite material on the inside. The finite element analysis was used to confirm the safety of the designed composite fins and the final design was derived. Based on the final design, composite fins were manufactured and applied to the roller chain. The wear resistance test for the roller chain was carried out through the abrasion resistance testing apparatus.

The roller chain wear test was carried out using a self-developed machine. Figure 2 shows the roller chain wear test machine. Apply maximum tension to the roller chain and drive the link linkage. The profile of the cam was made along the shape of the sprocket. The wear test was carried out to confirm the wear status of each part and to evaluate the life. Figure 3 shows the displacement and load while driving the abrasion tester. A constant load is applied, and the displacement tends to increase and decrease by wear.

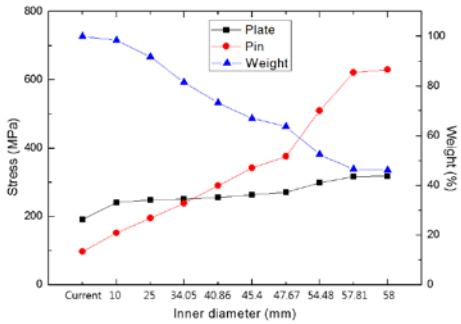

Fig. 1 Finite element analysis results of roller chain

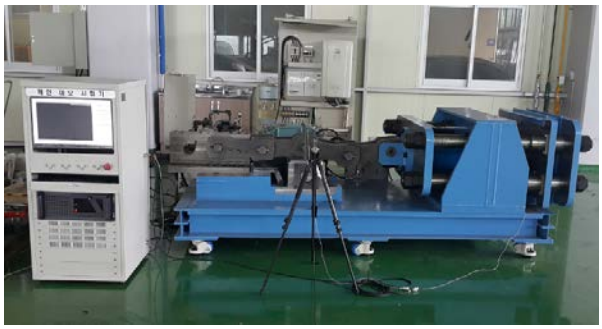

Fig. 2 Long pitch roller chain wear test machine

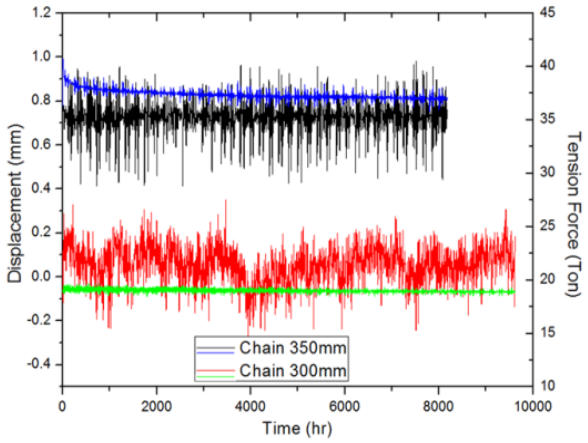

Fig. 3 Wear test result of the load and displacement

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