ZESZYTY NAUKOWE POLITECHNIKI ŚLĄSKIEJ 2004
Seria: GÓRNICTWO z. 260 Nr kol. 1649

Jiří FRIES, Josef JURMAN, František HELEBRANT
Vysoká Škola Báňská - Technická Univerzita, Ostrava

TRANSPORT OF CONVEYOR BELTS UNDER HOISTING CAGE

Summary. The article describes possibilities of partial decrease costs during conveyor belts replacement of mucking on mine Lazy, with using hot vulcanisation of jointed conveyor belt parts. Professional firms at the scope concern by making and completing or vulcanisation of jointed relatively long belt parts, give on the joints guarantee up to four years. Despite of make the joints underground in mine conditions, moreover at areas with fire explosion dangerous. In this case, conveyors have to be keeping in adequate operational conditions.

TRANSPORT TAŚMY PRZENOŚNIKOWEJ POD KLATKĄ WYCIĄGU SZYBOWEGO

Streszczenie. W artykule przedstawiono możliwości obniżenia kosztów związanych z eksploatacją i wymianą zużytej taśmy przenośnikowej w kopalni Lazy (Czechy) poprzez zastosowanie wulkanizacji termicznej. Połączenia tego typu pozwalają na wydłużanie odcinków łączonych taśm, a firmy produkujące taśmy oraz wykonujące wymiany i łączenia taśm dają na nie nawet ponad 4-letnią gwarancję. Należy zachować jednak właściwe użytkowanie przenośnika.

1. Introduction

During first half of 2002 on main mucking of the mine Lazy was needful to replace old belt on conveyor no. 9 kind 39990 Sch 800 type, by belt Fenaplast FRSR 9000 from Fenner firm. At the same time, the firm proposed hot vulcanisation of jointed belt parts in underground mine conditions, at areas with fire explosion danger. First time, we needed 13 joints. We had to do economic balance of the project and compare with possibilities to used steel connecting devices.

2. Economic balance

Upon using mechanical joints on new completed conveyor belt, which will have 13 joints with 35,6% joints replacement per month it is 56 joints per year, have to replace them. Price of the one mechanical joint MATO U 38 type is 6.554 CZK, plus steel wire 250 CZK, in sum 6.804 CZK. Start costs of 13 mechanical joints are 88.452 CZK. Firm Fenner give three years guarantee on vulcanising joints. Replacement costs of mechanical joints during three years would be 3 x 56 x 6.804 CZK, what is in sum 1,143.072 CZK. Including start costs – buying mechanical devices, whole costs of the joints would be 1,231.524 CZK. Whole price of the vulcanised joints, arranged with Fenner firm was 1,561.548 CZK. But at margin of both prices (330.024 CZK) against vulcanisation, don't include other costs, such us bigger rolls usage, bigger demands of maintenance and dust treatment, bigger downtimes etc. It is evident, even joint vulcanisation is more expensive, for long time usage (3 to 5 yers) is cheaper than mechanical joints of belt conveyors. That is why, we must to study the shaft technical design and to do analyse of possibilities of belts transport to underground of the mine, and decrease number of joints between conveyor belt parts (increase conveyor belt parts length).

3. Variant solving

When I wrote mentioned, we had to do analyse of transport possibilities to decrease costs and increase length of the belt pieces. From analyse follows final transport method, which is transport of the two-roll belt piece under hoisting cage in pit no. 5. The pit has guides along cage sides, across if we compare it with new – modern cages. Just this fact allows transport two-rolls belt, which is relatively too width (1200 mm), hung up under hoisting cage on/in special device. Was designed and solved three variants:

3.1. Carriage with fixed truss

The device composes from support frame; bench and triangular truss. Advantage of the device is possibility to transport two-rolls or simple roll of belt from surface loading station to underground place of destination without additional material handling. Maximal rolls diameter can be 1500 mm and minimal cca 900 mm (roll with less diameter we must not to transport under cage). Device is showed on Figure 1.

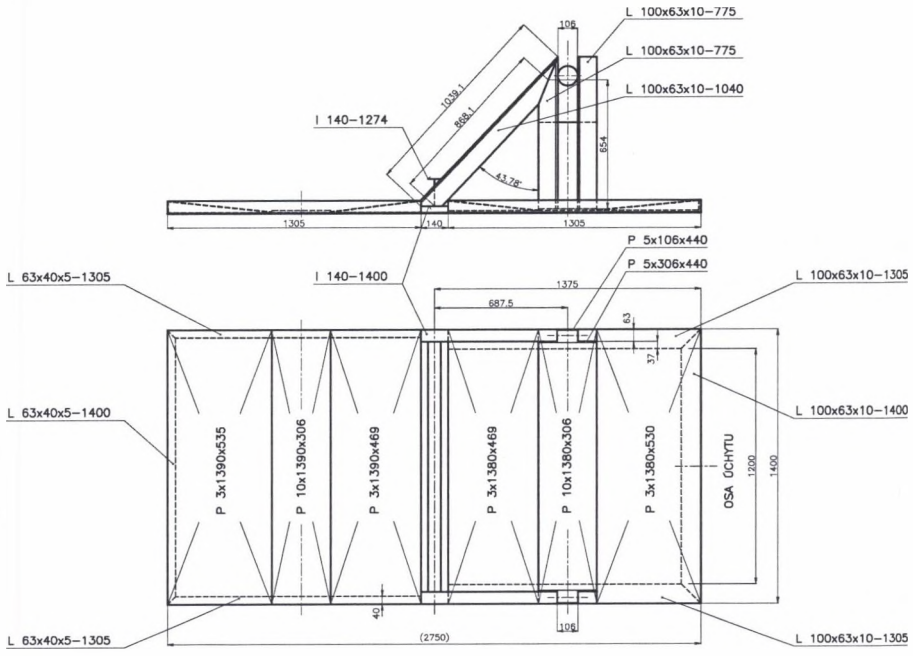

Fig. 1. Construction of carriage with fixed truss
Rys. 1. Konstrukcja wagonu z mocowaniem pasowym

3.2. Carriage with chain

This device is similar to the device from 3.1 chapter, it hasn't the steel triangular truss, but hoisting chain. This structural design is simple and cheaper that other one. Landing gear to the mentioned two devices we can use from dead carriage, which are on scrap heap. Advantage of the chain device compared to mentioned device is, that we can transport rolls or roll of belt from surface loading station to underground place of destination without additional material handling too. Disadvantage is lowered structural - transport height, in virtue of don't used height of the landing gear. This fact is done by necessity carriage to going through air breaks and caging devices on each filling station of the shaft.

3.3. Container

Another device for belt transport was container, which thanks to specific reasons was selects to realization. Container is intricate to solving them by human forces, but I did only simple calculations of the body and more precise solving of connecting through tenon, which joined two pieces of container and rope coupling, which is connecting device between container and steel shaft rope. Disadvantage of the container is its weight, which decreases weight of transporting material. Whole weight of hinged load is limited and closely watched.

Another disadvantage is its no very good manipulation, because he isn't on wheels, for it we must to displace him or draw on footwall. Advantage is full covered - protected of the belt rolls or other transported materials and relatively lower transport height - we can transport bigger material, belt rolls with relatively bigger diameter. Therefore we save bigger money, because belt pieces are longer what decrease number of joints and reduce costs.

4. Conclusion

From mentioned text is evident, that it is more important to establish new technology, which can increase work productivity and effectiveness. For example hot vulcanisation, which was too expensive is cheaper then mechanical connecting belt parts, if we do adequate analysis. Thank to detail solving and study shaft technical documentations, we reduced belt joints from 13 to 9 and decrease operational costs. Saved money we spent to hot vulcanising, which warrant operational long time without downtimes of whole conveyor belt or mucking respectively. *Realized with government financial funds and Czech republic grant agency as the part of grant project № 105/02/1091.*

LITERATURA

1. Peterka P., Krešák J., Kropuch S.: Equipment for internal and external diagnostics of pipelines and its development at SOL - SKTC 147 of faculty BERG. Technical university Kosice, Acta Electrotechnica et informatica, ročník 2., číslo 3/2002, str. 92-95, Fakulta elektrotechniky a informatiky TU v Košiciach, Košice 2002, ISSN1335-8243.

Recenzent: Prof. dr hab. inż. Włodzimierz Sikora

Omówienie

W kopalni Lazy (Czechy) konieczna była wymiana taśmy na jednym z przenośników odstawy głównej. Firma Fenner producent i dostawca taśmy Fenaplast FRSR 9000 zaproponowała równocześnie łączenie odcinków taśmy poprzez ich wulkanizację. Realizacja

tego pomysłu wymagała analizy ekonomicznej porównania kosztów połączeń mechanicznych i wulkanizowanych. Przedsięwzięcie stało się opłacalne pod warunkiem zmniejszenia liczby połączeń z 13. do 9., czyli wydłużenia odcinków taśm, które z kolei muszą być przetransportowane szybem pod ziemię. Zmusiło to kopalnię do opracowania nowych rozwiązań technicznych transportu taśmy. W artykule przedstawiono 3 warianty rozwiązania transportu taśmy pod klatką urządzenia wyciągowego. W dwóch rozwiązaniach taśma jest transportowana z wykorzystaniem wagoników, a w trzecim w specjalnej konstrukcji kontenerze. Mogą być transportowane równocześnie dwie rolki taśmy o średnicy do 1,5m.