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THE UNCONVENTIONAL MANNER FOR LINE FIXATING OF A CONVEYOR TRANSPORT LINE

NEKONVENCIONALNI NAČIN FIKSIRANJA TRASE TRANSPORTNE LINIJE TRANSPORTERA

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Abstract: *The paper deals with manners and evaluations of line fixating for pipe conveyors.*

Key words: *belt conveyor, pipe conveyor, rope, anchorage*

Apstrakt: *Ovaj rad se bavi načinima i procenama fiksiranja trase kod transportera cevima.*

Ključne reči: *transporter sa trakom, transporter sa cevima, uže, sidrenje (utvrđivanje)*

1 INTRODUCTION

Conveyors belong to the not fungible elements of operational and interoperable transport in various industries. They serve for transportation of various bulk materials and can be also used for piece material transportation.

2 MANNERS FOR FIXATING AND ANCHORING OF BELT CONVEYORS

According to the conveyor type and transported material the conveyors were located mostly over or under ground. They were installed in free space or in closed structures (Figure 1, Figure 2, Figure 3).

1 UVOD

Transporteri pripadaju grupi elemenata koji nisu zamenljivi kod pogonskog i među-funkcionalnog (međukomunikacionog) transporta u različitim industrijskim oblastima. Oni služe za prevoz različitog rasutog materijala i takođe se može koristiti za prevoz materijala u komadima.

2 NAČINI ZA FIKSIRANJE I SIDRENJE TRANSPORTERA SA TRAKOM

Prema vrsti transportera i materijala koji se transportuje, transporteri se postavljaju uglavnom iznad ili ispod zemlje. Postavljaju se na otvorenom prostoru ili u zatvorenim konstrukcijama (slika 1, slika 2, slika 3).

Figure 1
slika 1

Figure 2
slika 2

Figure 3
slika 3

Table 1 Review of materials for bearing structures and materials for support stands
Tabela 1 Pregled materijala za noseće konstrukcije i materijala za potporna postolja

	Conveyor type	Bearing structure material	Support stand material
Figure 1	belt	steel	steel
Figure 2	belt	steel	concrete
Figure 3	belt	concrete	concrete

3 MANNERS FOR FIXATING AND ANCHORING OF PIPE CONVEYORS

In 1978 for the first time the Japanese company JPC put into operation the conveyor that had a rolled belt during the whole trajectory of motion. The belt was rolled into the shape of circled tube apart from feeding and dumping place where it has the valley shape like the classic belt conveyor.

3 NAČINI FIKSIRANJA I SIDRENJA TRANSPORTERA SA CEVIMA

Godine 1978. japanska kompanija JPC je po prvi put pustila u rad transporter koji ima savijenu traku duž cele trase kojom se transporter kreće. Traka je savijena u obliku kružne cevi, za razliku od trake na utovarnom i istovarnom mestu gde je ulegnuta kao kod klasičnog transportera sa trakom.

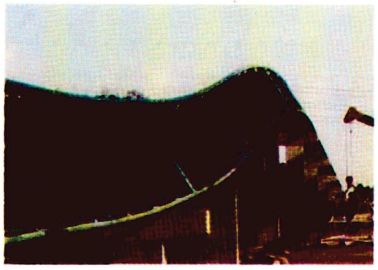
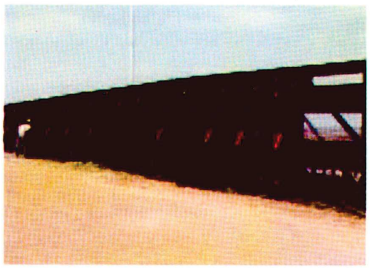


Figure 4
slika 4



Figire 5
slika 5

Figure 6
slika 6

Table 2 Review of materials for bearing structures and materials for support stands
Tabela 2 Pregled materijala za noseće konstrukcije i materijala za potporna postolja

	Conveyor type	Bearing structure material	Support stand material
Figure 4	pipe	steel	concrete
Figure 5	pipe	steel	———
Figure 6	pipe	steel	steel
	pipe	steel	———

4 PROJECT DESIGN

The basic project idea is usage advantages of hanging - fixation of a pipe conveyor for the whole or for a part of its line by ropes.

4 PLAN PROJEKTA

Osnovna ideja projekta je korišćenje prednosti fiksiranja putem kačenja transportera sa cevima, u celosti ili samo jednog dela njegove trase pomoću užadi.

The fact that the manner is feasible is allowed by pre-stress in a rope which can be achieved by the appropriate structure. The second fact is that such manners of fixation exist in structures of hanged bridges (Figure 7), which excel in their elegance as well as in economy given by the rate of length L and width B of the structure. If the rate L/B is lower than 10: 1 it is normally not economic. But every proposal should be regarded individually [5].

Činjenicu da je ovaj način izvodljiv omogućava prethodno zatezanje užeta što se može postići odgovarajućom konstrukcijom. Druga činjenica jeste da ovakvi načini fiksiranja postoje u konstrukcijama visećih mostova (slika 7), koji se ističu svojom elegancijom kao i ekonomičnošću, s obzirom na odnos dužine L i širine B konstrukcije. Ako je odnos L/B manji od 10:1 tada naravno nije ekonomičan. Ali svaki predlog treba da se posmatra pojedinačno [5].

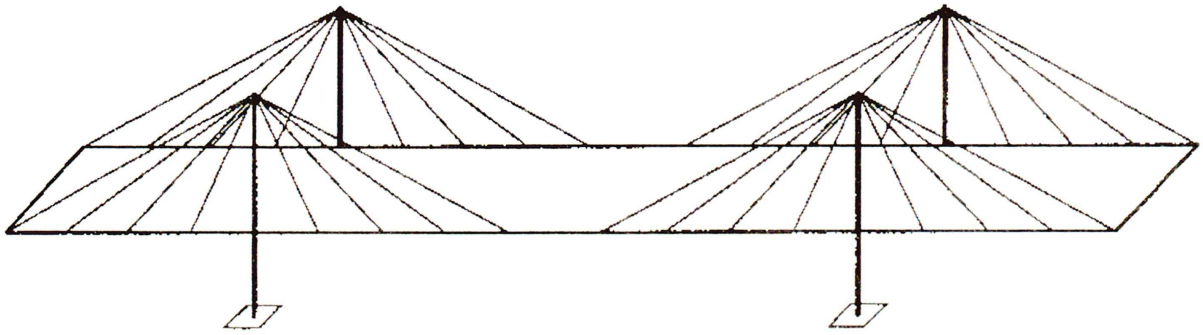


Figure 7
slika 7

5 POSSIBLE VARIANTS

For realization of fixating by using ropes we selected the length of bearing structure L=100m, width B=1,2m. There exists more combinations that are more or less technically or economic feasible. In all the variants we chose selected the rope fixation by the manner for ensuring the wind bracing of the bearing structure of the pipe conveyor it means the building width approximately 15 m.

5 MOGUĆE VARIJANTE

U cilju fiksiranja pomoću užadi, odabrali smo dužinu noseće konstrukcije L=100m, širinu B=1,2m. Postoji više kombinacija koje su manje ili više izvodljive, u tehničkom ili ekonomskom smislu. U svim varajantama izabrali smo fiksiranje putem užeta na način koji obezbeđuje otpornost na vetar kod noseće konstrukcije transportera sa cevima, što znači da je širina zgrade približno 15 m.

5.1 The harp organization

The organization is useless either from static or from economic point of view because of increasing rope consumption due to the high hanger inclination and so growth of structure compliance. The tractive stress of building or pylon grows significantly. The rope efficiency is low (small vertical component force, but high horizontal component which essentially reduces the internal pre-stress). The undoubted esthetical merits can be found along with the disadvantages (Figure 8) [5].

5.1 Uređenje (struktura) u obliku harfe

Ovakvo uređenje je beskorisno kako sa statičkog tako i sa ekonomskog gledišta zbog veće potrošnje užeta, koja nastaje usled velikog naginjanja vešalice (kuke), što dovodi i do veće neotpornosti strukture. Vučno zatezanje kod građevine ili nosećeg stuba u značajnom je porastu. Korisno dejstvo užeta je malo (mala sila kod vertikalne komponente, ali velika kod horizontalne komponente, što bitno smanjuje unutrašnje predzatezanje). Mogu se uočiti kako nesporne estetske vrednosti tako i mane (slika 8) [5].

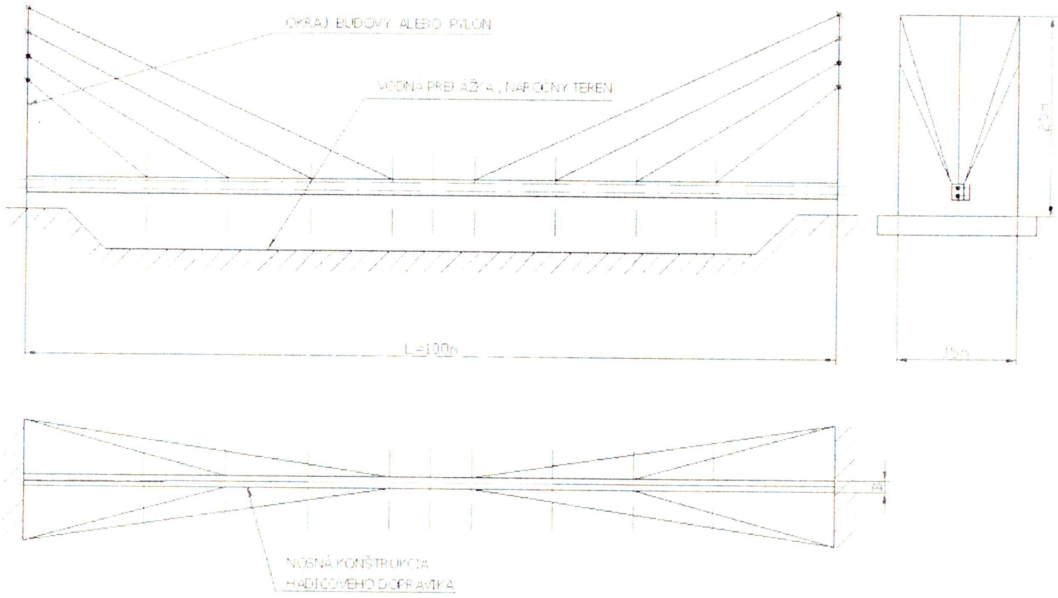


Figure 8 The harp organization
slika 8 Uređenje u obliku harfe

5.2 The fan-shaped organization

The manner belongs to the most economic. The main advantages are as follows:

- Horizontal forces in the bearing structures caused by the hangers are smaller.
- The building longitudinal bending is small.
- The high number, various length and concurrent ropes decrease structure sensibility for vibrations by the impact loading very favourably (Figure 9) [5].

5.2 Uređenje u obliku elise (ventilatora)

Ovaj način spada među najekonomičnije. Glavne prednosti su sledeće:

- Horizontalne sile u nosećim konstrukcijama, koje prouzrokuju vešalice, su manje
- Dužno savijanje građevine je malo
- Veliki broj, razne dužine i paralelna užad smanjuju osetljivost konstrukcije na vibracije što povoljno utiče na utovar. (slika 9) [5].

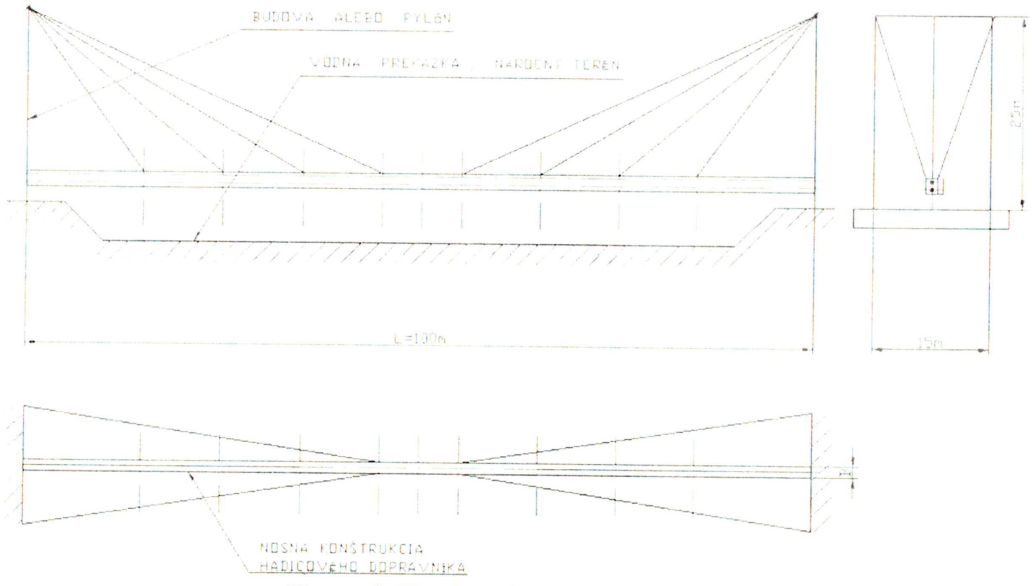


Figure 9 The fan-shaped organization
slika 9 Uređenje (struktura) u obliku elise (lepeze)

5.3 The semi-harp organization

The organization allows, similar to the harp organization, simple details of ropes fixing into the building and simple rope exchange. It is a compromise between configuration into the fan shape and harp and so balance advantages or disadvantages of the both extreme solutions. It belongs to the most used organizations (Fig. 10) [5].

5.3 Uređenje u obliku polovine lepeze

Ovakva struktura omogućava, slično kao kod uređenja u obliku lepeze, jednostavne pojedinosst fiksiranja užadi na građevinu i jednostavnu zamenu užadi. Ona predstavlja kompromis između konfiguracije u obliku elise i u obliku harfe, a time ujednačava prednosti i mane ova dva ekstremna rešenja. Spada u najrasprostranjenije strukture. (slika 10) [5].

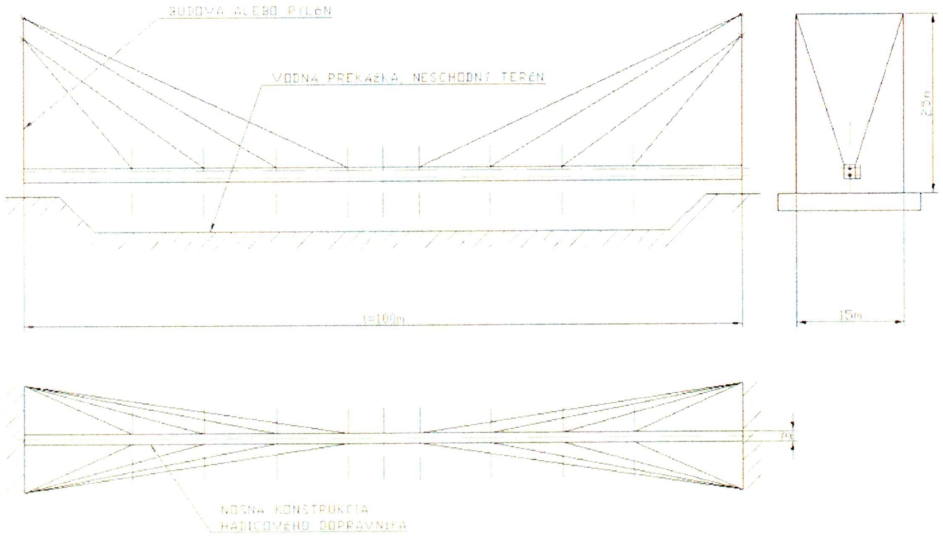


Figure 10
slika 10

5.4 The asymmetrical organization

The manner is characteristic for country conditions, terrain composition or other requirements. The building has to have robust footing, walls stability eventually the upper node has to be fixed by the tail-rope in the terrain (Figure 11) [5].

5.4 Asimetrično uređenje

Ovaj način je karakterističan za uslove koji vladaju u zemlji, sastav terena ili druge uslove. Građevina treba da ima čvrsto postolje, stabilnost zidova – eventualno se može gornji čvor fiksirati zadnjim užetom za zemlju (slika 11) [5].

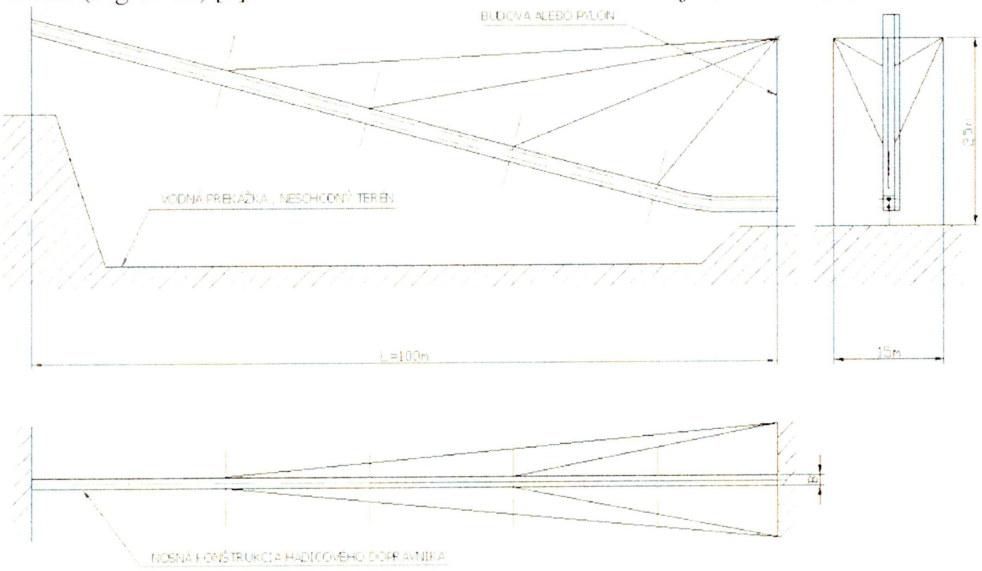


Fig. 11
slika 11

6 CONCLUSION

The manner for fixating of conveyor leading depends on several factors:

- the conveyor transportation length,
- the conveyor transport capacity,
- the terrain shape and segmentation,
- the potential depth of feeding and dumping place,
- the size , strength of buildings between them the transport should be realized,
- the soil type on which the buildings are built.

The manner for fixation of conveyor leading will be useful among rugged high-rise buildings in various industry branches as well as in various natural terrains e.g. water barriers, deep valleys where the pipe conveyor structure can not copy the complicated and inaccessible terrain.

The next reason is the fact that steels with high robustness, used for ropes production, have standard high and reliable mechanical properties and their multiple anticorrosive shelter dramatically decreases the risk of their exchange demand [5].

6 ZAKLJUČAK

Način fiksiranja konstrukcije transportera zavisi od nekoliko faktora:

- Transportne dužine transportera.
- Transportnog kapaciteta transportera.
- Oblika terena i segmentacije.
- Potencijalne dubine mesta za punjenje i odlaganje.
- Veličina, jačina građevina između kojih treba da se vrši transport.
- Vrsta zemljišta na kojima se grade građevine.

Način fiksiranja konstrukcije transportera biće koristan među rogobatnim, visokim zgradama u raznim granama industrije kao i na različitim prirodnim terenima, kao što su vodene prepreke, duboke doline, gde konstrukcija transportera sa trakom ne može da prati složeni i nepristupačni teren.

Drugi razlog je činjenica da čelične konstrukcije, sa svojom robustnošću, koje se koriste za proizvodnju užadi, imaju dobre i pouzdane mehaničke osobine, a njihov višenamenski antikorozivni štit u značajnoj meri smanjuje rizik od potrebe za njihovim menjanjem [5].

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