International Journal of Multidisciplinary Research and Development

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Volume: 2, Issue: 9, 649-651
Sep 2015
www.allsubjectjournal.com
e-ISSN: 2349-4182
p-ISSN: 2349-5979
Impact Factor: 4.342

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Polymer Tunnel Way Transportation System; Hypothesis Analysis and Material Methodology

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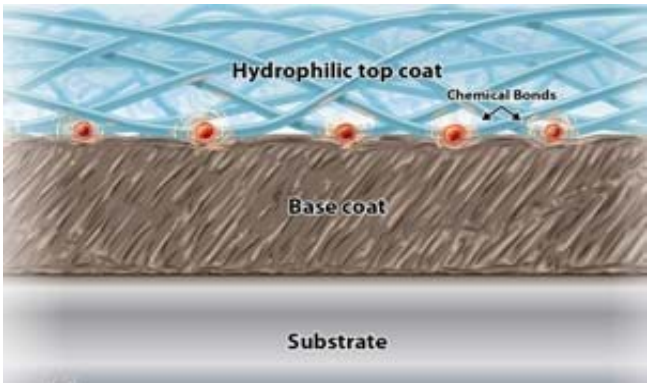
Abstract
The research involves a hypothetical analysis of a new type of transportation system that is driven by the concept of sliding of polymer ball on frictionless surface with appropriate coating. The transportation system consist of the two major components; first the hollow polymer ball to store and carry the cargo in it; and the second is the polymer tunnel tube with hydrophobic coating in it to provide a sliding platform to the cargo ball container. The profile of the sliding tunnel lane is in the shape of smooth parabolic curve with a highly smooth transition of degree of curvature. The tunnel is made in intervals of several miles in separate segments, each segment is elevated from one end and other end is sub grounded in a straight line profile. The elevated part of the tunnel is supported by a elevator tower that will rise the transportation ball to a optimum height and the ball is allowed to slide down the tunnel under the influence of free fall due to gravity. As the surface interface are made nearly frictionless by providing appropriate coating; the loss due to friction is kept minimum as possible for providing longer segments in the tunnel section. A precise monitoring system is maintained between the consecutive cargo balls to avoid any jam or collision.

Keywords: Transportation Engineering, Polymer Technology, Hydrophobic Materials, Tunnel Analysis & Design.

1. Introduction
The study involves the study of frictionless surfaces that are used for creating hydrophobic lanes for various purposes, like Bawling Lanes. The material used for this purpose spans widely from epoxy resin facilitated polymer surfaces to reactive resin matrix structures. The study includes the classification, working and criterions for designing of these frictionless surfaces with keeping in mind the cost effectiveness of the surface production on mass scale. With detailed study of these materials, an economic system for tube ways can be formed that can lay foundation for a highly efficient and fast mode of transportation. Below is described the detailed study of coating materials used on Bowling Alleys construction. These materials contains oil based polymer that are custom modified for absorbing lubricants and acts as solid and durable frictionless sliding surface. Lane coatings are liquid compounds applied directly to the lane surface and may be composed of urethane – or water-based or epoxy formulations. Lane conditioners (commonly known as oil or dressing) are substances placed on top of the lane surface and coating. Bowlers sometimes refer to the “wax” or “grease” on the lane, but these are incorrect terms. All conditioners are oil-based compounds. Lane conditioners have two purposes, the importance of which depends on whom you ask. From a maintenance standpoint, the primary purpose of conditioners and coatings is to protect the lane surface. For the proprietor, conditioners are used to assure consistent scoring. A bowling ball is made from urethane, plastic, reactive resin or a combination of these materials.

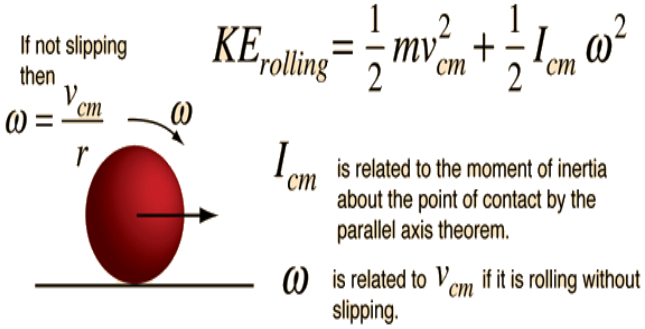
2. Surface Interface Mechanism
Hydrophilic coatings makes good repulsive surfaces. They imbibe water, and most of them are in fact comprised of more than 90% water when wet. Continuous diffusion of water across the thickness of these coatings occurs, and if this would be detrimental to the device, a hydrophilic coating is contraindicated. Granted, most medical hydrophilic coatings rely on primer coats or base coats for adhesion to a surface.



And these primers tend to be relatively hydrophobic, which could cause them to act as water barriers too. However, often they are not designed for these purposes and would not constitute as good a barrier as a material such as polytetrafluoroethylene or polyxylylene.

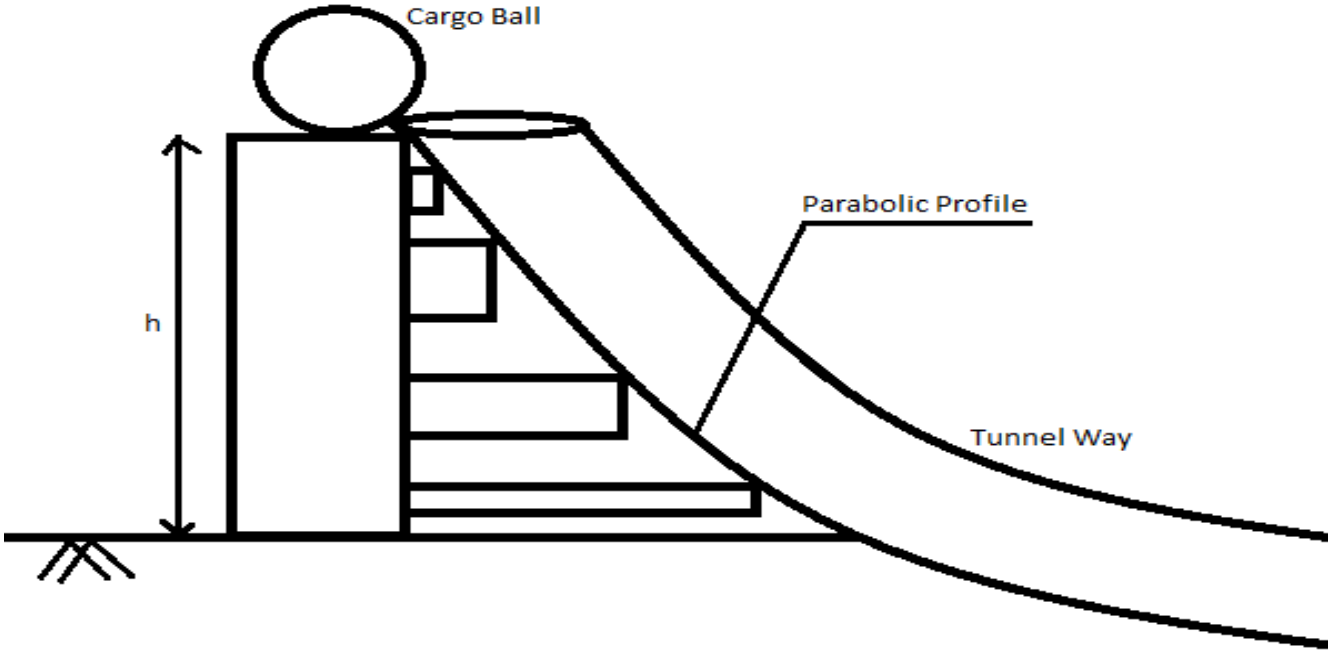
3. Kinetic friction Dependency

The equation to find the kinetic friction is : μk=Fk/mg. *μk* stands for the coefficient of kinetic friction and *Fk* stands for the Force due to kinetic friction, *m* is the mass of the ball and *g* stands for gravity.



The above equation shows the dependency of the energy of rolling on the angular velocity and the linear velocity of the cargo ball. Design track for rolling is aimed to utilize full gravitational energy into full linear momentum, or linear kinetic energy.

4. Elevation Profiling

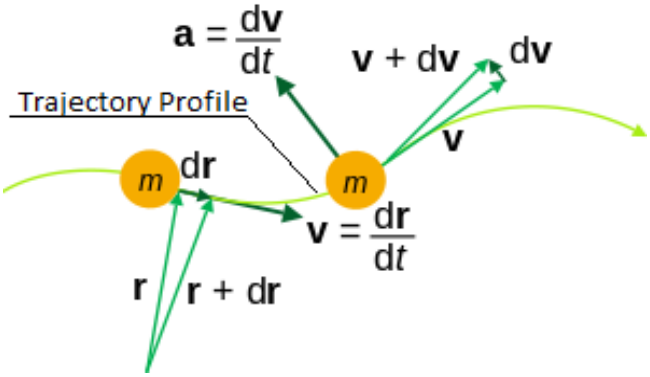


Above diagram shows the Rise Tower, Cargo ball, and the tunnel way system. The elevation height is described in the design and target friction loss consideration is the factor deciding the relative height required to slide down the cargo ball to the designed tunnel segment section with an optimum approach velocity.

5. Design Factors

- The material of the sliding surface;
- Material of the transporting ball;
- The coating for frictionless property;
- The mass distribution of the transporting ball;
- Position of center of gravity of the whole ball;
- Static frictional constant;
- Kinetic frictional constant;
- The linear design velocity of the ball;
- The angular velocity Limitation of the ball;
- The moment of inertial of the ball;
- Linear moment distribution of the Ball;
- The angular momentum of the ball and its limitations over the transportation;
- Mass limit of the luggage;
- Size limit of the ball;
- Surface area to volume ration of the ball along with stress handling limits;

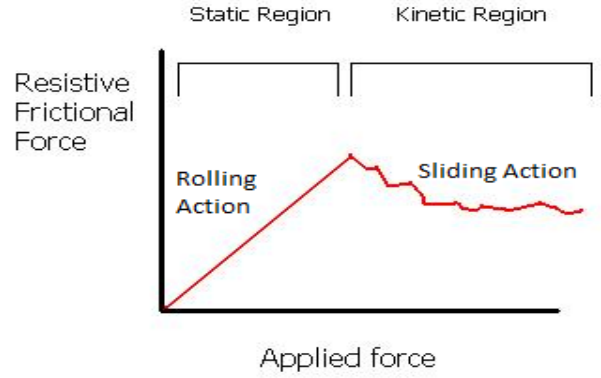
Following factors needed to be considered for the design of the tunnel and the cargo ball.



Above figure shows the dependency of the instantaneous linear properties of the emotion of the cargo ball of mass "m". The surface to surface interaction time will decide the actual friction loss, depending upon the resisting impulse provided by the kinetic friction. The trajectory of the cargo ball is set to be helical inside the tunnel tube to gain a three fourth less frictional impulse provided by the kinetic friction.

6. Kinetic Motion Transactions

The following graph shows the action profiling of the frictional impulse that is provide by the surface to surface interaction between the cargo ball and the tunnel way. The kinetic friction has a average magnitude less than that of the maximum static frictional value.



The static region is the initial phase of the rolling of the ball in the tragectory in the parabolic curved segment of the tunnel tube; while the kinetic region shown the designed profile and the value of the epected and most favourable frictional impulse requird for maximum efficiency.

7. Scope in transportation

The future scope of this research study involves a very low cost transportation sysytem that runs on the concept of frictionless sliding of cargo ball in smooth coated tunnel ways made from recycled plastic waste. Thes transportaion van be efficiently designed for intre city transportation as only one tme installation cost is only involved. There is virtually no lomit for cargo transportaion density possible in this system as compared to conventionbal automobile transportration involving diesel engin and heavy maintaince of machinery with very low output efficiency.

8. Acknowledgment

We wish to thank my mentors and college for supporting us in completing our work on Polymer Tunnel Way Transportation System; Hypothesis Analysis and Material Methodology. We also wish to thank our parents for providing us with assets that helped us completing research regarding this concept.

9. References

1. Climate forcing from the transport sectors, Jan Fuglestvedt, Terje Berntsen, Gunnar Myhre, Kristin Rypdal, and Ragnhild Bieltvedt Skeie, January 15, 2008, vol. 105, no. 2, PNAS.org
2. "Claverton-Energy.com". Claverton-Energy.com. 2009-02-17. Retrieved 2010-05-23.
3. Data on the barriers and motivators to more sustainable transport behaviour is available in the UK Department for Transport study "Climate Change and Transport Choices" published in December 2010.
4. Environment Canada. "Transportation". Retrieved 30 July 2008.
5. Painter, Paul C.; Coleman, Michael M. (1997). Fundamentals of polymer science: an introductory text. Lancaster, Pa.: Technomic Pub. Co. p. 1. ISBN 1-56676-559-5.
6. McCrum, N. G.; Buckley, C. P.; Bucknall, C. B. (1997). Principles of polymer engineering. Oxford; New York: Oxford University Press. p. 1. ISBN 0-19-856526-7.
7. Rubinstein, Michael; Colby, Ralph H. (2003). Polymer physics. Oxford; New York: Oxford University Press. p. 6. ISBN 0-19-852059-X.
8. De Gennes, Pierre Gilles (1979). Scaling concepts in polymer physics. Ithaca, N.Y.: Cornell University Press. ISBN 0-8014-1203-X.