



BENEFITS of Unitsky String Transport



Ecology — minimum land acquisition, lack of embankments, cuts, culverts, logging, the possibility of building in vulnerable areas (permafrost, tundra, taiga, jungles, mountains, deserts, sea shelf, etc.), significant resource-saving construction with safety for existing natural landscapes and ecosystems.

Profitability — lower OPEX and CAPEX compared to the railway and tram trestle and subway. Low transportation costs and fast ROI (3–5 years).

Infrastructure — opportunities for creating of freight and passenger network infrastructure, combined with electricity, television, radio and multimedia communications, as well as wind and solar power.

Security — elevated location, anti-derailment system of rolling stock, tenfold safety for track structure and its high resistance to vandalism and terrorism, resistance to extreme climatic conditions.

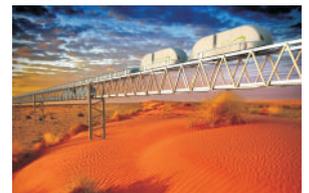
Savings per kilometer of route will be:

- land acquisition: 5 hectares;
- steel: 500–750 tons in comparison with high-speed monorail;
- concrete: 15–20 thousand cubic meters compared to rapid railway trestle;
- the volume of excavation: reduction of 20–25 thousand cubic meters compared to the mounds of railways and roads.

UST track structure is cheaper than rail, monorail and automobile trestles at USD 30–40 million per kilometer.

Transport module (unibus) at a speed of 360 km per hour is more economical than rapid rail by 4–6 times, while reducing the cost of the rolling stock for one passenger at 2–3.

Stations, depots are much cheaper compared to similar rail and aviation infrastructure (with the same amount of traffic).



The report of the Institute of Transport by Russian Academy of Sciences:
“Unitsky String Transport is the most economical transport system ever known: in comparison with the plane – 8 times, with train on magnetic suspension – 9 times, with rapid rail – 3 times”



The Brief Description of Distinguishing Features of the «String Transport Systems» Technology by Engineer Unitsky

The basis of the rail track structure of the «String Transport Systems» by engineer Anatoly Unitsky (further – «UST» technology) are pre-stressed by tension continuous string rails (light transport system) or pre-stressed by tension of continuous supporting string-truss (heavy and multi-freight transport system).

Due to obvious reasons, the pre-stressed by tension continuous structure is of a perfect straightness and with smooth curves, which is essential to achieve the highest operational performance for any transport system - high speed, minimum impact loads, low energy consumption, etc.

Thanks to the anchor (2-3 km or more) and intermediate (40-60 m or more) supporting columns the rail track structure is always located high above the ground level. Anchor columns are used for loopback longitudinal forces arising from the pre-stressed continuous rail track and/or supporting truss structure and pre-stressed string reinforcement. Intermediate supporting columns are used to support the pre-stressed continuous rail track and/or supporting truss structure bearing mainly vertical load and also suffer some horizontal loads - the weight of the supporting framework and rolling stock, side wind, etc.



The high above the ground level of the rail track is essential to reduce the cost of construction, for the most caring attitude to the ecological and economic environment along the entire route, as well as to ensure the highest level of caused safety in transport.

Rolling stock is always with steel wheels for the rail track system with completely unique algorithms of organization and traffic control.



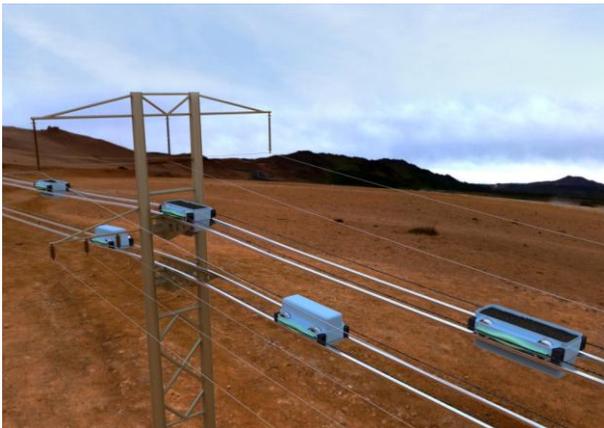
The minimum rolling resistance of steel wheel rolling on steel rail, and in any climatic conditions, is the only thing that makes the «UST» technology similar to the traditional railway transport system.

In all other respects, and mainly in the organization and traffic control algorithms, «UST» technology is fundamentally different from the traditional railway transport system, and thus showing a much greater efficiency.

Pre-stressed truss structures are known in bridge construction for long time and widely used all over the world. However, pre-stressed by tension of string continuous truss structures of «UST» technology has a significant difference. String tension forces are closed not on supporting truss structure, which loading capabilities are very limited.

Up to «UST» technology string tension forces are closed on the surface of the Earth's crust, loading capabilities in comparison to caused forces are virtually unlimited. The latter circumstance allows for «UST» technology rail track and support truss structure display very high load capacity at a very low consumption of materials.

It is important to note that the total construction cost of «UST» technology is slightly depends on tension load capability of heavy anchor support columns, because basically there may be only two of them - at the ends of the rout. But for the reasons related to the streaming method of construction, certain profile along the route, the formation of repair areas and to provide greater safety margin, and so on – it is better to set an anchor supporting columns at distances up to 10 kilometers apart.



The basis of the UST-technology know-how is not only a string tension forces closing diagram, but also much more: - the choice of special materials, especially for strings and special fillers of supporting string-truss structure; - methods of engineering calculations that take into account a number of specific parameters inherent to pre-stressed continuous structures; - application of optimal design and engineer decisions in the formation of strings reinforcing ropes and there anchoring, in fabrication, transportation and installation of kilometers long string-rail track and/or string-trusses into one for the entire route; - optimal solutions and design of systems and components of the rolling stock and the whole serving



infrastructure; - unique algorithms for automated control; - technologies for servicing and maintenance procedures regarding string-rail tracks and/or string-truss, rolling stock; and as well as dozens of other know-how that are essential for the establishment and subsequent operation of safe and efficient «UST» technology freight system.

The innovative nature of the «UST» technology is largely formed by additional synergy, which is composed of "simple and clear" solutions, each of which individually is well known to any engineer educated person.

For this reason, the practical implementation of the projects based on «UST» technology assumes using only the best of finished product samples from leaders of appropriate industries in its elemental structure.

Due to this latter fact, the «UST» technology based freight systems meet all the stringent technical, environmental and other requirements of local regulations of the construction of bridges and railways, rolling stock and engineering infrastructure objects, etc.



And due the latter both facts really innovative «UST» technology virtually has no innovative component within investment risks.

Within «UST» technology and under the supervising of the General Designer Anatoly Unitsky it was developed a series of transport systems covering the full range of carried goods in combination with the full range of route distances.

These are high (up to 250 million tons per year) transport systems for transportation of technological goods (coal, ore, gravel and other bulk cargo). This is high-speed (up to 500 km) long-distance cargo and passengers transportation systems. These are urban public transport systems. This is so called the horizontal lift in-between the high points for passengers.

It is clear without saying that the anchor and intermediate supporting columns (or by the string-rail track and/or string-trusses supporting structure) will be used for the construction of electrical and fiber-optic cable lines to provide the needs of the route and its infrastructure, as well as for delivering electricity and information between rout end points.



Based on his «UST» technology engineer Anatoly Unitsky has developed innovative pre-stressed pipeline to transport pump gas and liquids. Also the pipeline transport could be added with any of above mentioned series of transport systems.

Longitudinally and radial pre-stressed pipeline could be of 30-50% reduced wall thickness. Due to the ideally linear walls and no water hammer phenomenon pump gas and liquids flow with minimal friction losses. Pre-stressed pipeline have no (doesn't need) any temperature compensation zigzags – so the pipes capacity and energy consumption will be fundamentally reduced. Due to high above the ground position of pipeline and its ideally linear shape in vertical and horizontal planes is crucial for the reduced operational costs.

It is not the complete list of «UST» technology pipeline advantages.

The development of the «String Transport Systems» technology history has begun in far 1977. In 2012 «UST» technology reached its 4th generation.

During so significant period of time engineer Anatoly Unitsky has passed a long way from the innovative ideas through a myriad of engineering and scientific researches and experiments and to the 8-year set of tests of the world's first full-size string transport system, built in 2001 by his own company in Ozyory (Moscow region, Russia).



The «String Transport Systems» technology has already received many experts' opinion reports and has been awarded several prizes and grants. It was awarded two grants by UN (HABITAT), FS-RUS-98-S01 in Oct.1998 and FS-RUS-02-S03 in Jan.2002.

The «UST» technology current level of development allows immediately starting of the rout design and rolling stock manufacturing order placement.

But whatever the effectiveness of the «String Transport Systems» technology there is no chance for it to compete effectively on the same field with any of transport system – railway, auto, conveyer, etc. which have more than one hundred years of successful all over the world operation. Their main advantages – are practical clarity and well-functioning infrastructure, especially scientific and educational, engineering and design, manufacturing and operating, and finally - a market of consumers and standard transport services.



That is the reason for the basis for the «String Transport Systems» technology promoting strategy – looking for the new transport system construction, when the customer has to choose the most effective transport - rail, road, rope, conveyor or «UST».



In the broad understanding of the strategy the most interesting application of it is the development of a projects aimed at the development of remote and rich with mineral resources areas with extreme climate and terrain conditions, so that the use of traditional transport systems either ineffective or generally impossible.

An example of such a project could be the development of an iron ore deposit in Bolivia, the development of which largely complicated with the transportation issue. Applying the «String Transport Systems» technology, ore from Bolivia can be delivered for 1500 km through the jungle and swamp to the seacoast of Brazil for USD 20-25 per ton.

It can be summarized the following:

The «String Transport Systems» technology distinguishes high technical and economic efficiency, and in all phases of its practical implementation - design, construction and operation, as well - a high degree of reliability, and as a result - a high level of safety, both caused and environmental.

And the fact that the «UST» technology is able to provide transport infrastructure within inaccessible areas rich in mineral and other resources, means it unique ability to expand the resource potential of the global economy and, therefore, means its unique market potential.