A NOVEL SOLUTION TO ORE & COAL TRANSPORT FROM MINE TO HARBOUR

An Introduction of

the high capacity solution based on Nowait train technology

July 2012

THE HIGH CAPACITY SYSTEM FOR PROFITABLE BULK FREIGHT TRANSPORTATION

NOWAIT® is a direct solution to challenges within the new mining transport industry from a few million tons per year to 100 Mton/year or more. It has a new approach to bulk freight of iron ore and coal that radically changes all previous conceptions, one being our cars travel sideways at the terminals.

Contrary to all conventional wisdom, we go for lowest possible axle loads. We use 60 kg/m rail and operated with 5 ton load along curvy roads when needed.

Transportation in the 21st century will have increasing demands on economy, capacity, customer satisfaction and sustainability. Mining companies are confronted with exorbitant heavy haul railway construction costs. NOWAIT® is the solution when conveyor belts are not suitable due to distance and investment costs in new railways is considered to risky for volume or lifetime of the mine.

NOWAIT® is a result of a complex equation - here presenting an innovative solution that is responding to our current challenges, constructed around very viable financial models for all involved parties in order to make it profitable. Therefore, it is also an opening for the developing world to cope with one of the most daunting task we find in ill placed mines.

The NOWAIT® technology is based on the continuous transport philosophy developed by the NowaitTransit team, originally for passenger service but certainly also applicable for freight, especially mineral transports. NowaitTransit offers a unique solution with low total vehicle weights in the range of 10 ton each, compared to conventional mineral transport solutions with 100-120 ton or more unit weights. This different approach results in a very low track construction cost, especially if the route requires several bridges and/or when the soil conditions are not stable. Further, small curve radii are not an issue.

The transport tube is enclosed and thus rain and snow problems are eliminated.

The low construction and operational cost of the NOWAIT® system creates profitability based on normal profitability calculations and reasonable write off times.

NOWAITTRANSIT AB has its roots in ASEA-Brown Boveri (ABB), ADtranz (ABB Daimler Benz Transportation, now Bombardier) and Hägglund&Söner in Sweden. The company has been formed by life-long experienced people in business in general and rail transportation in particular.
In addition to comprehensive rail technology experience, NOWAIT can offer expertise within control systems, material technology, architecture and design. These resources are found both as in-house resources and as a part of NOWAIT partnership and network.
NOWAITTRANSIT AB is formed with the objective to develop and implement the NOWAIT system both for mineral and container freight as well as passenger service in major cities that suffer from population growth, traffic congestion and dense pollution.

KEY ADVANTAGES

- Low construction cost - Continuous system spreads the vehicle load – Low-weight structure which in turn simplifies ground support structures
- Low operation cost – few moving parts, no drivers, weather protected operation
- Low maintenance costs – few wear parts and unique maintenance procedures of bogies during operation
- Safe – total track area enclosed and not accessible unauthorized persons
- Low energy consumption due to low weight , low speed and efficient energy preservation by minimum mechanical braking and transformation of kinetic into potential energy
- Environmental friendly and sustainable – Electrically powered
- Capacity up to 18 Mton/year on single track and 100 Mton/year or more on double track
- Enclosed track gives possibilities for noise control
- Short set-up time targeted at 12 months for 100-200 km range – Standardized construction elements
- Short time from decision to commercial operation
- Possible disassembly – Preservation of investment cost – Residual value
- No need for separate maintenance and repair facilities

TECHNOLOGY

- Vehicle weight is 4 ton empty, designed for 5 ton load in standard version
- Vehicle mounted load bin size has up to 10x1.6 m floor area
- Vehicles are passive, propulsion is obtained by no-wear Linear Induction Motors (LIM)
- Braking of train when entering a station or passing siding is done by an uphill, in principle storing the energy by lifting each vehicle.
- Brakes only used for emergency braking on reasonably level track
- Acceleration after the station or siding utilizes the stored potential energy in order to increase of speed in the downhill.
- The light weight of the vehicle allows a light weight elevated bridge structure design.
- Very simple signaling systems.
- Designed for 24 hour operation 365 days a year with maintenance during operation.
- No maintenance and night storage sheds needed. Trains stay on track all night.

Propulsion

The propulsion power to compensate for wheel-rail friction and air resistance is arranged by static linear motors fixed to the main track structure. The motors are located along the track at needed spacing requirements and the reaction beam is mounted on the car- and distance beams.

Control system

The vehicles are driverless and the operation is supervised from an external control room. Minimal signal system is required since the vehicles are connected to each other and very few switches are used. Sensors are monitoring the moving components with potential malfunctions detected before they occur.

Maintenance

The only moving components on the vehicles subjected to mechanical wear are the wheels, bearings and the load bin bearings. The bogies can be replaced during operation and that takes about 20 s. Also the load bins can be replaced/ maintained during operation meaning that the system never has to stop, no separate maintenance facilities are required and the maintenance cost is kept to a minimum

Construction

The elevated tube at 0.5m to 5 m above ground according to need, is assembled at site from prefabricated flat steel structures and cover sheeting. Shipping dimensions are made to 40 foot container standards. We use 60 kg/m rail for ease of construction and less or no maintenance during foreseeable time.

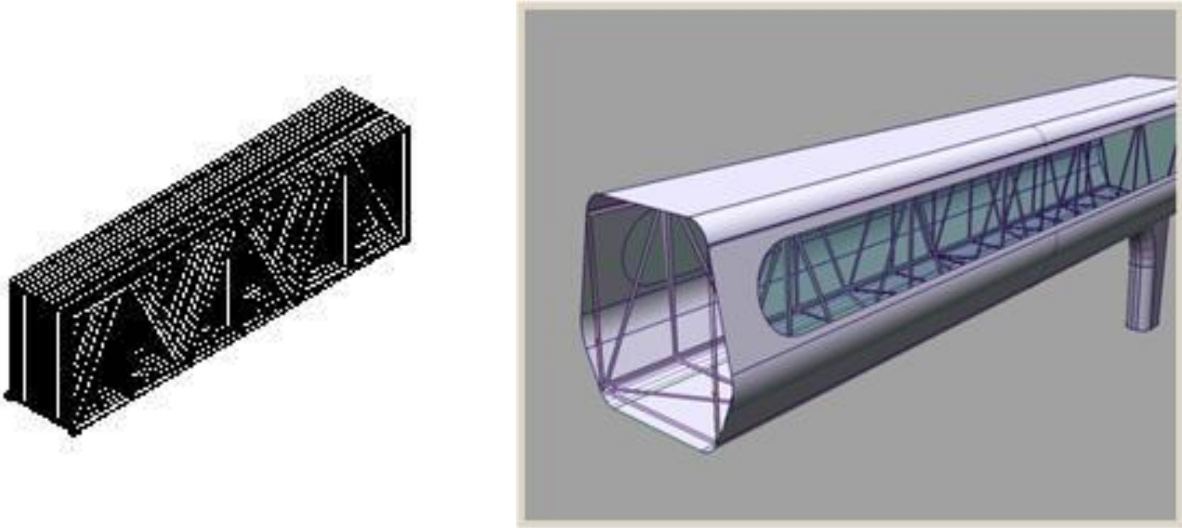
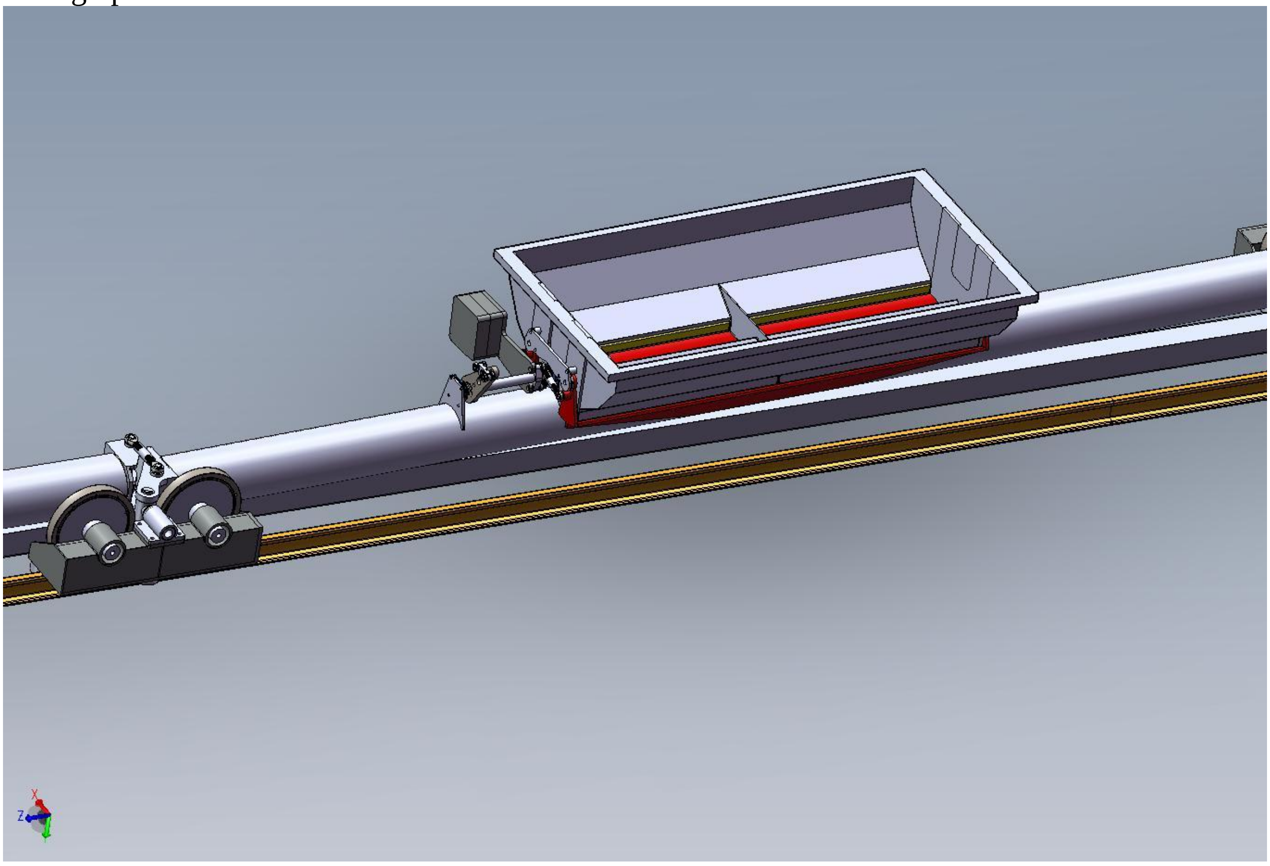


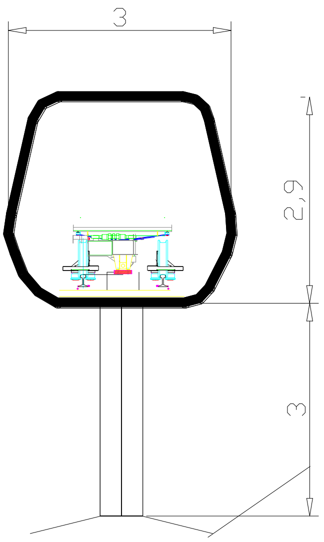
Fig.1 Tube construction from flat packed steel frames

The tube dimensions for a single track solution is nominally 2.4 x 2.4 m and the standard span distance between pylon supports is 36 m. A double track version with track above each other increases the capacity dramatically up to 100 million ton per year in standard version and to 200 million ton per year with increased payload. The double track tube dimensions are nominally 3.6 x 3.6 m high.

Vehicle

The vehicle principally consists of two bogies and two steel beams plus the load tray. This extremely simple design caters for reliability and dependability. The oversized propulsion machinery is stationary located between the rails and thus available for any service they may need during operation.





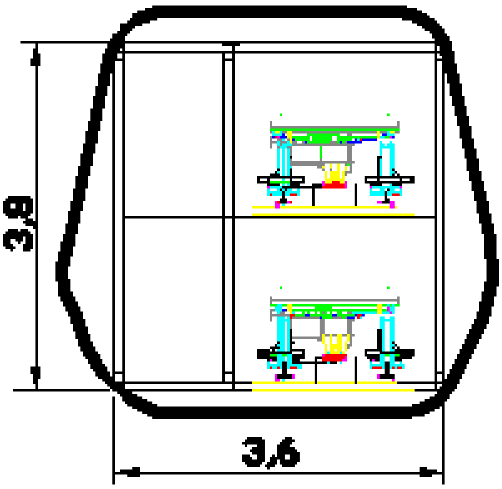


Fig 2. Individual vehicle with load bin - 10 ton capacity

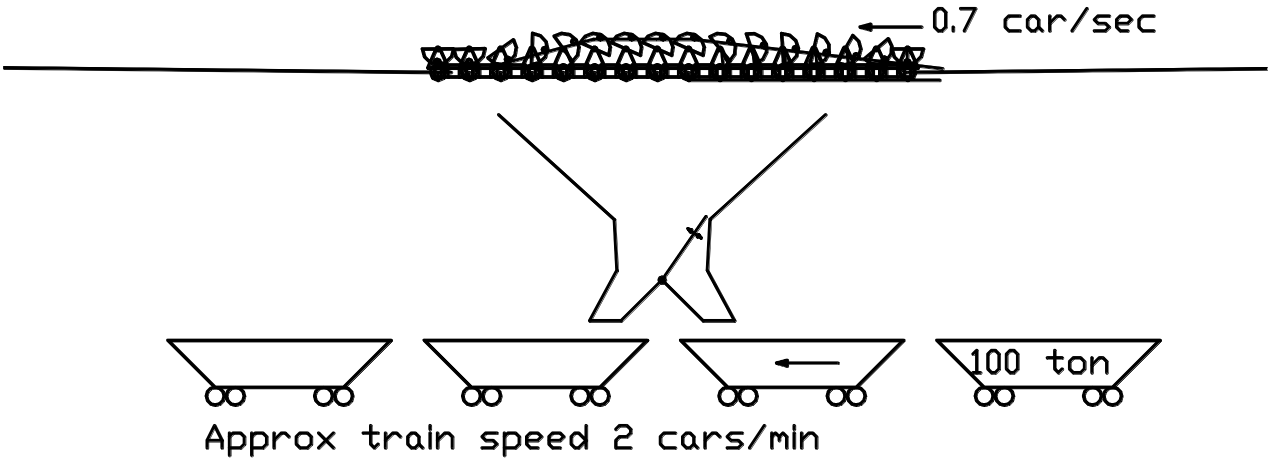


Fig 3. Continuous unloading at a rate of 12,000 ton per hour

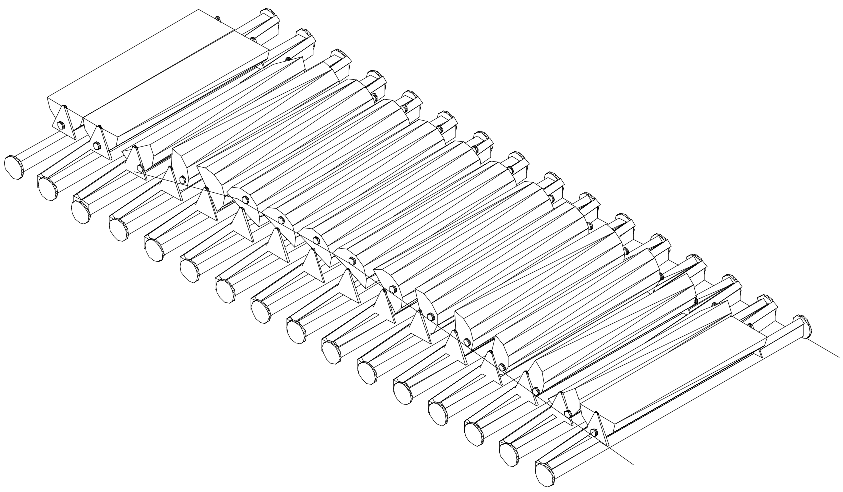


Fig 4. Unloading station

Ecology

NOWAIT preserves any delicate environment to a maximum by using existing road corridors and construction above ground. The transport is done on rails with carriages enclosed in a tube of approximately 2.5 m diameter, protected from snow and rain.

The inherent system solution has the following key environmental advantages

- No emissions or air pollution
- Zero animal hurt or killed, for ever
- Zero birds hurt or killed, for ever
- No insects hurt after construction
- No mammals and birds habitat influence, now and for ever
- Lowest noise solution of all alternatives due to enclosure and low speed
- No need for land purchase outside road perimeter
- No trees to cut down

- No water level impact
- No water pollution
- Very limited construction noise due to preassembled tube elements
- Recycable construction material
- Dismountable at the end of commercial service
- Fastest construction time due to preassembly
- Zero need for snow removal
- Zero traffic accidents, injuries and fatalities

Alignment

Due to the relatively low speed and light weight of the system, it can be installed along available land along existing roads, at an elevated height with a standard span of 36 m between pylons, to allow free and unobstructed passage underneath of people, machines, animals and other general traffic. The low weight of 1 ton/m tube and the customary single ownership of the road and road bank simplifies the provision of Right of Way and bridge crossings considerably.

Fig 5. Artist view of enclosed and elevated transport tube along the road

A case study

The studied distance is a 150 km line consisting of a dual track and at each end equipped with loading and unloading arrangements. The proposal is based on prevailing altitude differences between the mine site and unloading station. The load per car is quite small and selected to 5 tons, i.e. equal to the passenger load version and thus no new designs are required for a mineral transport project. There is no heavy locomotive to drive the train and thus the track can be engineered for a wheel load of about 5 tons and a vehicle load of less than 0.5 ton/m track.

The proposal is complete and includes

Elevated steel structure track at low or up to 4.5 m height above the ground

Enclosed track inside tube protected from snow, ice and rain

Linear motor propulsion mounted along the track

Brake system

Control System

Vehicles

Train related loading and unloading arrangements at end stations

Implementation time

The NOWAIT design is ready for the vehicle chassis and associated systems. NOWAIT is prepared to arrange completion in less than 2 years after start of construction with planning, system and site tests performed during the Environment Impact Study process.

System Acceptance Test at site

The NOWAIT proposal includes professional test and verification of the technology and climate robustness in the harsh arctic environment prevailing at the location.

Performance characteristics

Vehicle load each	5 tons
Transport capacity/year	20,000,000 t/yr (2400 t/h)
Operation hours	24
Vehicle width	1.4 m

Vehicle speed, with load	36 km/h
Vehicle speed empty	up to 54 km/h
Tube width	2.4 m
Tube height	2.4 m
Pylon distance	36 m
Train length	1 km
Tube weight with full vehicle load	1 ton per meter

Operation Costs

There are no drivers and the operation is supervised from a control room. Further, the limited maintenance work consists mainly of wheel change due to wear and this work is automated to a great extent. Therefore, the major cost item is the electric energy cost, which is low due to low speed and use of heavy rail steel wheel technology.

Double track design for higher capacities and maximum reliability

The proposed double track design is suggested also for smaller capacities since the marginal cost for double tracking within the tube structure is small. The advantage is a totally flexible train size selection and the complete avoidance of turnouts. This technical simplification further enhances the reliability of the operation and maximizes the total competitive advantage.

Environment

The environmental advantages of the proposal are unquestionable.

For further information please visit www.nowaittransport.com