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The Intermodal EXPO 2009: A Tale of Two Cities

RailRunner – puts a new spin to Bi-modal

Port development Yangshan Deepwater Port

Content

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RailRunner – puts a new spin to Bi-modal

Bi-modal Technologies have been used in the transport and intermodal market for over 30 years. RailRunner's solution-based innovation opened a new era in making intermodal transport more flexible, energy efficient and environmental friendly while increasing its market value to users. In 2005 RailRunner received operating approval for its products in the USA and since 2007 has been marketing its technology world-wide. A recently signed license agreement in India demonstrated the viability of the system for rail intermodal not only for industrial countries, but also for countries where infrastructures are not as well developed and Intermodalism is gaining broader acceptance.

RailRunner Train

RailRunner's concept:

RailRunner's approach is market driven targeted to reduce the cost of service and expand functionality and application. Total ownership cost is lowered by designed-in reductions in operating and maintenance cost. The following principles were realized with the development:

1. Expansion of intermodal transport by adding and/or including trailers and container chassis to rail movements without requiring expensive high terminals investments and shipping volumes. This encourages better train utilization and more flexible back-haul load balancing.

2. Substitution of lower cost rail transport for higher-cost trucking over a range of distances.

3. System operation under electric wires (like it would be required in Europe and many other countries), avoiding extra locomotives for shunting to and from intermodal yards.

4. Reduction of terminal investment, using low-cost, eliminating the requirement for heavy lifting equipment and heavily paved ground structures (only 'parking lot' type infrastructures are necessary).

5. Direct door-to-door service without any additional equipment for distributing and collection of cargo as typical for intermodal.

6. New design and innovations (such as air suspension, light weight design, articulated wheel attachment, etc.) to make bi-modal be more competitive versus Trailer-on-Flatcar (TOFC), Roll-on-Roll-off (RORO/ROLA) and Container-on-Flatcar (COFC) intermodal transport.

The System:

RailRunner's system consists of two functionally independent groups of transport products, which are elegantly combined by offering an advanced intermodal product. The bi-modal product groups are

- long-lifetime rail vehicles (30 year depreciation), called bogies and

- medium-lifetime road vehicles (10 to 15 year depreciation), such as container chassis and highway trailers.

Both products when connected with each other form units of a 'RailRunner Train' or 'RailRunner Consist'.

Auxiliary products for business planning tools and operational software complement the technology.

Rail bogies can be 'Transition Bogies', which connect a RailRunner built train or consist to a standard freight car or train and/or a locomotive or 'Intermediate Bogies', which by assembly with RailRunner road vehicles transform the later to a railcar. As part of an intermodal transportation system, bi-modal technology has evolved during the last 30 years; RailRunner has built on this rich history to bring a new approach in component and bogie design to its rail products.

The Design:

Specially designed rail trucks, called bogies, connect the road vehicle (trailer or container chassis) to rail forming consists or trains. The bogies incorporate all connecting functions so that chassis and trailers can be built at optimized weights reducing the weight penalty of the load carrying structure from the extra strength required to transform the road vehicle into a railcar. The extra strength is the result of the in-train forces arising from braking and accelerating a train, namely 400,000 lbs tension and contraction forces.

1. Rail bogies

RailRunner bogies incorporate several innovative features uniquely enhancing bi-modal technology:

RailRunner Intermediate Bogie

a) The bogie has two articulated lower frames connected to each other. This allows for self-steering of each of the axles, reducing the typical sinusoidal sway of wheels moving over track thus reducing friction as well as wear and tear. Less friction between wheel and track reduces energy consumption.

b) Less wheel friction also reduces the wear of the wheel saving maintenance cost because of less frequently required wheel reshaping thus increasing wheel useful life.

c) The load carrying upper frame which connects the road vehicles to the bogie rest on an air suspension. This primary system renders a passenger-train-like smooth ride reducing vertical forces and allows the transport of sensitive cargo with less packaging requirements. A secondary air suspension is applied in the case of a malfunction of the primary suspension.

d) The combination of articulation and air suspension with additional shock absorbers and dampeners also reduce rock and roll of the bogie and trailers allowing for higher speed. Railrunner bogies have been tested for 106 miles/hr (170 km/hr) and are approved fo 70 miles/hr or 112 km/hr.

e) The combination of all the above features with the significantly lighter weight of a RailRunner train represents an environmentally friendly product that reduces energy use, curtails carbon emissions and lowers noise levels of the running equipment. Of equal importance, when connected to the bogie the road vehicles are so closely positioned to each other, that the small intra-unit gap reduces aerodynamic turbulence, which saves even more energy when compared to conventional intermodal trains.

f) Unlike conventional rail trucks, Railrunner bogies are equipped with fork-lift pockets, which allow the vehicle to be taken easily off the track. During slow traffic periods this can become a significant cost saving as equipment owners can avoid parking fees for valuable track space ($ 1.00 per day/EURO 2.00 to 4.00 per railcar).

2. Road vehicles

RailRunner container chassis & trailers are designed as conventional road vehicles, which can be used like regular road vehicles in non- bi-modal applications or in highway moves to mitigate freight or asset imbalances.

RailRunner Intermediate Bogie

a) As the vehicles are used as a railcar during the train operation they need to have a stronger frame structure to withstand the 400,000 lbs buff & draft forces.

b) The air supply for the train brake system needs to be delivered from the locomotive to each bogie and therefore the road vehicles are equipped with an airline running from the front to the rear and fitted with standard pneumatic coupling devices.

c) At either end of the road vehicle "receiver boxes" are incorporated in the frame structure, which serve as receptacles for coupling the bogie tongue or drawbar to the chassis/trailers. Once connected, all the units in a RailRunner train form a uniform slack-less rail vehicle.

These additions, combined with weight optimization measures in the design, result in an approximate extra weight of only 680 to 780 kg or about 3% of the payload in road transport. (Because of the higher allowable gross weight for intermodal road vehicles in Europe of 2 metric tons, this additional weight is offset by additional gross load.)

Operations:

RailRunner can be operated easily and safely and its design significantly simplifies assembly and disassembly of trains. The built-in ramp on the bogie permits to lift the road vehicle wheels off the track without manipulating the landing gear. (In the case of low-height bogies as required in Europe, the lift function is additionally supplied through lift-axles operated in combination with an air-suspension in the road vehicle.)

The chassis are connected with the help of a tractor pushing the road vehicle onto the ramp and connecting receiver box to the bogie tongue. As soon as the vehicles are connected an automatic brake blocks the wheels of the road vehicle from spinning. A vertical pin then semi automatically connects both vehicles (bogie and chassis/trailer) together and secures the pin from any disengagement. The air suspension is inflated, and the secondary spring suspension consisting of conventional coil springs is activated. This safety feature prevents the bogie operating without a suspension and loosing part of its ride capabilities. The control box is closed and optionally locked thus securing all controlling and safety functions - the train is ready to operate. The disassembly of the RailRunner units follows the reverse procedure with an additional automatic 'brake release' of the road vehicle brakes once it comes off the bogie and its sliding suspension is extended to its rear end position. The air lines of the chassis brake system are connected to the tractor and the road vehicle is ready to be transported over the road.

Most Important Economic Advantages:

Today's most important challenges in transport can be summarized as the requirement to provide more environmentally sustainable products and to preserve resources thus saving both energy and cost. With better payload-to-gross weight ratio and length-optimized design, RailRunner

Leaving the Station

responds to these challenges better than nearly any of the intermodal technologies in operation today. This especially is true for TOFC, RORO/ROLA (Iron Highway) and single stack COFC. In Europe other systems like MODALOHR or CARGOBEAMER also are much too heavy and more expensive an investment than Railrunner.

1. Most important is the length and weight optimized design of the Railrunner products. In combination this allows to put more loads in one train without higher trailing tonnage. When looking at typical 53' trailer-on-flat car (TOFC) operation in the US, this can result in up to 14% more trailer units per 10,000 ft train, namely 177 RailRunner units versus 155 units in a TOFC train. More important is the weight and energy saving per train. A typical with 155 x 53' trailers loaded on a TOFC train operating for example with 60' long railcars has a 54% higher (8990 tons) trailing tonnage than a RailRunner train with 177 units weighing only 5,841 tons. In Europe such benefits are even more important as the train length is much shorter and limited to 600 to 700 meter and required braking distances are much shorter.

2. Another macro economical advantage addressed by RailRunner's bi-modal technology is its technological and commercial flexibility in adapting to future market trends in transport. The inherent advantage comes from splitting the life and depreciation cycle of the rail product from the same of the load carrying car or platform, namely the chassis and/or trailer. Today one business risk in transportation is a major markets or technical standards resulting in new vehicle. Longer road vehicles, increase or change in container dimensions, new allowable vehicle gross weights, higher speeds, etc. - all influence older existing equipment, requiring their modification or replacement in order to make them competitive again. For shorter life cycle products, like road vehicles this causes less of a problem, as they can be replaced relatively quickly (foe example, by sale to secondary markets). However, for long life rail products this lack of flexibility in adjustment to market trends or economical necessity always has been regarded to be a major disadvantage.

With RailRunner bi-modal products this risk is greatly diminished, because only the load platform (chassis or trailer) for road transportation needs to undergo any of the required changes or has to be renewed, while the bogie still can be operated in its original design. Additionally, the slider suspension design allows the most expensive component of the road vehicle to be easily swapped to a new or modified platform or trailer, thus saving additional money.

Applications:

Most economical RailRunner applications depend on the existing transport environment, applicable standards and the logistic environment. Each case has to be analyzed for its economic viability. For this Railrunner has developed sophisticated operations and cost computer models, which enable efficient and quick business decisions.

In regions where double-stack transport is in wide use, RailRunner serves as an efficient feeder system on short haul lanes and as a primary mode on lanes not cleared for double-stack. In Europe and many other countries in the world with electrified rail systems, due to overhead wires, only single-stack container transport is possible. In these markets RailRunner provides highly competitive service over short, medium and long haul routes. A major cost and time savings arises from the capability to be assembled and disassembled under the wire; this eliminates the need for separate operation of trains with shunting locomotives into and from intermodal terminals. RailRunner also operates easily as a smaller consist behind general freight or intermodal trains.

	Length over Buffer	RR Center to Center	Units per train	RR gain per train	Railcar Tare weight	RR Bogie + Trailer weights	Tare weight per 720m train	Payload per trailer	Payload per train
	m	m	m	T-3000/T-5	tons	tons	tons	tons	tons
Train length w/o loco	720								
Chassis & Trailers									
RailRunner IU bogie	4,00	n/a			n/a	6,60	n/a		
RailRunner 13.65m trailer	13,72	14,66	49	+16%/36%	n/a	7,55	735	33,5	1645
Pocket-railcars									
T-5	20,00	n/a	36	-36,00%	21,5	n/a	1086	34	1224
Twin 3000	34,03	n/a	42	-16,00%	34,0	n/a	1079	34	1439

European RailRunner versus Trailer on Flatcar Comparison

RailRunner offers unique effectiveness at gauge changes between rail systems or at borders, for instance at a switch from wide to standard track width. Such switches can be made at any border crossing location by a simple "rubber tire" crossing and do not require expensive investments of equipment for exchanging axles as is necessary for present railcars.

In addition no special railcar design changes are required for being adaptable to lifting equipment and to regular and wide track axle width. RailRunner has high-speed operating capability and has been tested for 106 miles/hr or 170 km/

hr. This benefit allows RailRunner to be integrated easily into higher speed passenger networks. Additional RailRunner services are numerous; it is obvious that certain freight and transport solutions are more suitable from a logistic point of view than others. Some solutions with largest economic benefits are as follows:

1. Movements of 20' to 45' containers in short and medium distant lanes with smaller volumes, and long distance lanes where double-stack operations are technically not possible. Because of its light weight and compact design and its interoperability with conventional intermodal transport equipment RailRunner can be used as feeder service or as an add-on consist behind regular intermodal trains. The inherent flexibility of the RailRunner operation over the road or over rail offers the ability to by-pass bottle necks or supply express services.

2. Services requiring uninterrupted door-to-door transport, such as refrigerated transport. RailRunner provides an uninterrupted cold chain over long distances (≥5 days) with a continuous power supply, on road, rail or both. Customers are not burdened with the need for extra chassis, gensets or multiple refueling stops. Optional GPS enables seamless event tracking and cargo monitoring. A special security pack and door immobility during transport provides high security transport and offers peace-of-mind to customers concerning cargo theft , parts pilfering or manipulation of the power supply. Similar advantages apply to 'just-in-time' (JIT) distributions as in the automotive market. If a shipment is needed immediately, an alternative to rail, namely trucking 'urgent hot loads' is a significant logistical benefit to the customer.

3. Other suitable applications are services with limited or no backhaul possibilities but where the rail equipment, because of its special character has to be returned empty, e.g. reefers, tank cars, bulk railcars, etc.. Such 'closed loop' applications are typically found in the waste, aggregates, beverage distribution and forest product business. Depending on each business case, such applications can be very profitable organized with RailRunner, because expensive transloading is avoided, and back-haul cargo pick-up and distribution is facilitated via RailRunner containers, without the necessity of additional equipment.