T. W. BLASINGAME COMPANY, INC.

In 1979, Tom Blasingame, a former plans production manager and equipment designer for Morrison-Knudsen Company, Inc. of Boise, Idaho, formed an independent concrete and steel detailing company. The new company provided these services as a subcontractor to M-K and other large contractors and steel fabricators, and also supplied draftsmen and computer operators to M-K Rail, for that company's Boise and Australian locomotive manufacturing operations. When its personnel were not assigned to outside projects, they were assigned to design and detail the company's own equipment designs.

That company, T. W. Blasingame & Associates, was later incorporated as T. W. Blasingame Company, Inc. The first in-house locomotive project was a Solid Fuel Gasifier Tractive Effort Booster Unit (TEBU) which would gasify coal or other solid fuels and make producer gas available to two adjacent Diesel-electric locomotives. At the time, Burlington Northern was trying to perfect modified EMD locomotives to run on LNG. The railroads were not interested in the Blasingame gasifier because of the possibility of a grade crossing accident with resulting fire. Another factor was the unavailability of Diesel engines capable of readily using the gaseous fuels.

After a considerable amount of research into previous steam-turbine-electric and steam-electric locomotive designs, the Blasingame company began preliminary designs for its own concepts of this type of motive power. A long single unit locomotive capable of producing 6000 HP and utilizing coal or other solid fuels was designed. This locomotive design was reviewed by a number of railroads. The length was objectionable, as were the multi-axle trucks with integral draft gear, although provision had been made in the design for lateral motion devices and blind flanges on the middle axles.

Because the long locomotive would have been applicable only to main line operations, the concept was altered to provide a 6000 HP locomotive on two six-axle chassis units. A smaller locomotive of 4000 HP was designed on two four axle chassis units. These were intended to be medium range locomotives for freight service. To avoid having to turn the locomotives, cabs were provided on each unit, making them equivalent of a Diesel-electric back-to-back consist.

For the above locomotive designs, the Blasingame company had worked up large piston-type steam expander engines. However, the requirement to locate these reciprocating engines over the trucks limited the space available for them, and the company designed an axial-piston engine capable of producing 7000 HP at 500 RPM and 300 PSI steam pressure. This engine was intended to replace the large vertical or V-Type piston engines previously used in the TWBCO steam-electric locomotive designs.

About this time, Boise-based M-K Rail was busily developing LNG fueled switcher locomotives using spark-ignition Caterpillar engines. The Blasingame company made arrangements with a manufacturer of large opposed-piston engines to use their engines in locomotives. These were true dual-fuel Diesel engines, capable of operating either on Diesel fuel or on 1% Diesel fuel and 99% LNG. The locomotives designed were an 1800 HP switcher, a 3000 HP road switcher, a 4200 HP road freight locomotive, and a larger twin-engined locomotive of either 6000 or 8400 HP for long haul service. These locomotives were not built, due to the rise in LNG prices, lack of LNG fueling infrastructure, and failure of the engine manufacturer to provide any assistance monetarily or in the form of a demonstrator engine.

Concurrently with the design of the above Diesel-electric locomotives, the Blasingame company was refining its earlier steam-electric locomotive designs. The design of a new rotary steam expander engine was under way. This new engine had no valves, no pistons, no cylinders, no crankshaft, no camshaft, and only two main bearings. It would turn at 1200 RPM and develop 6395 HP at 300 PSI steam pressure. The estimated weight was 13,500 Lbs., and it would fit in a space envelope of 60" cubed. After reviewing the engine design, the late Dante Porta called it "The Atomic Bomb for Steam". Because of its small size and light weight, this new rotary engine would allow a much more compact locomotive to be designed. Due to its speed of 1200 RPM, it

could be directly coupled to the main generator without any requirement for quill drives or other gearboxes.

Previous Blasingame locomotives had used modifications of Lima's proposed "Double Belpaire" boiler, which had been proposed for Lima's 4-8-6 "Dual Service" (freight & passenger) locomotive. The steam generating unit was redesigned as an all-welded, segmented firebox fire-tube boiler which would eliminate over 5000 staybolts and greatly reduce the maintenance requirements for the steam-generating units.

Other design changes were adopted to reduce the maintenance requirements for the new family of Blasingame steam-electric locomotives. A Zero-Weight-Transfer steering truck design was adopted, as well as DC traction motors without brushes or windings on the rotors. Every effort was made to simplify and eliminate maintenance requirements on all systems.

In 1993, the Blasingame company designed a family of liquid-fueled steam-electric locomotives which could operate on Diesel fuel, unrefined crude oil, or other similar fuels. However, since the cost of these liquid fuels was substantially higher than for solid fuels, these locomotive designs were at a competitive cost disadvantage with solid fueled locomotives.

In 1996, a new single-unit 6000 HP solid fueled steam-electric locomotive was designed by the T. W. Blasingame Company. This new locomotive would have been four feet longer than the N&W's Jawn Henry, and it would fit on a 100' turntable or transfer table. With the cab in front and the fuel bunker in the rear, two units could operate back-to-back with a consist horsepower of 12,000 in fast freight service. With a long haul tender of the same length feeding both locomotives, the operating range would be over 1000 miles. Fully condensing, the locomotives would use treated boiler water as proposed by Dante Porta for reduced boiler maintenance, and would not have been required to make frequent water stops for the long haul operations. Capable of using coal instead of Diesel fuel, these 6000 HP locomotives would not be dependent on foreign crude oil production or Diesel fuel. A fuel cost reduction of 75% would be possible, and would net a user railroad a 6.5% better bottom line compared with modern Diesel-electric locomotives.

In conjunction with these upgraded locomotive designs, the Blasingame company also included refinements such as oxygen-enhanced combustion to insure that all combustible materials would be completely consumed in the firebox. A special scrubber was designed to precipitate all particles that were not combustible within the smokebox. These systems were designed to insure that the new family of steam-electric locomotives would operate cleaner, cooler and quieter than Diesel-electric locomotives.

Subsequently, the two-unit solid fueled locomotives were redesigned with the new rotary steam-expander engines and the new all-welded segmented firebox boilers. The 4000 HP locomotive was upgraded to 4500 HP, and the two-cab version would compete with two 2250 HP Diesel-electric locomotives in heavy hump yard or branch line service. The 6000 HP two-unit locomotives were upgraded to 9000 HP, and would compete in medium range freight service with two 4500 HP Diesel-electrics. The 4500 HP steam-electric locomotive could also operate as a 3.2 MW mobile electric generating plant for standby, emergency or industrial power generation. The 9000 HP steam-electric locomotive could generate 6.4 MW of electric power in these services.

In 2001, the Blasingame Company designed a new heavy haul single unit solid fueled locomotive of 7500 HP. Using the same basic upper unit, but with steam pressure increased to 360 PSI, the new unit would have 2 more axles than the 6000 HP fast freight locomotive. The wheelbase was increased by one foot. Again designed to operate back-to-back, with or without a long distance solid fuel tender, these locomotives were designed specifically for long haul drag freight or helper service on mountain railroads. With the additional carrying capability, a BTU Recovery System can be provided to utilize the electric power generated during Dynamic Braking to generate additional steam rather than dissipating the energy into the atmosphere as is done on many Diesel-electric locomotives.

Fueling of these solid fueled steam-electric locomotives can be accomplished using the same equipment that is used to load unit-train coal cars. The largest bulk materials handling company in the United States has stated that they would build, own and operate the solid fuel dispensing stations at no capital cost to the railroads if suitable long-term fuel supply contracts can be arranged. The T. W. Blasingame Company has designed solid fueled semi-tractors which can deliver the solid fuels to locomotives in the field when such services are requested by the railroads. The cost of these domestic solid fuels is approximately 25% the cost of Diesel fuel.

The T. W. Blasingame Company has a program of licensing the manufacture of its locomotive designs on a non-exclusive basis. This program includes the supplying of its proprietary components through its subsidiary Neutral Vender marketing company, DST Special Products Group, Inc. These components are available to the manufacturing licensees and to the railroad industry worldwide.

T. W. Blasingame Company, Inc., and its licensees will provide these locomotives, long distance tenders and other equipment on a full service lease in which all maintenance services will be provided. This eliminates any requirement for a railroad to stock special parts for the steam-electric locomotives or retrain its maintenance personnel, since all maintenance services are provided through the full service lease program.

The steam-electric locomotives designed by the Blasingame company have not been built to date. The company has requested funding from the federal government to build and test the prototypes, but has been advised that such funding is not available. The T. W. Blasingame Company continues to seek funding for its alternate fueled locomotive development project through grants, strategic alliances or joint ventures. With the prospect of worldwide crude oil production peaking, increased crude oil demand from China, India and other emerging countries rising, and the prospect of loss of crude oil processing capability in the United States, the factors encouraging such funding are increasing.

The current practice of US railroads to add fuel surcharges to their freight bills to recover the high cost of fuel for Diesel-electric locomotives removes the incentive for these railroads to adopt solid fuels as a replacement for Diesel fuel. The railroads have stated that they will continue to add these fuel surcharges regardless of how high the cost of Diesel fuel may go. When asked what they would do if Diesel fuel was not available at any cost, these US railroads have no contingency plan. Only when Diesel fuel is no longer available, or until required to do so by the federal government, will the US railroads become interested in leasing alternate fueled motive power.

In the interim, the T. W. Blasingame Company is adapting its alternate fueled locomotive designs to meet the requirements of railroads in other countries that do not wish to pay excessive prices for petroleum based fuels. These foreign railroads have access to low cost solid fuels which allow them to avoid the high fuel costs of imported petroleum fuels.

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