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## Innova Award Winner: BTI Introduces its Power Horse Utility Vehicle Series

Blazing Technologies, Inc. (BTI) has launched a multi-functional utility vehicle, which is being debuted in a personnel carrier for Creekside Mushrooms. Creekside required the vehicle to be able to maneuver 300 feet under the earth in a 150 mile labyrinth of mushroom tunnels originally created by limestone mining.

Named the PC-122 Personnel Carrier, BTI's new vehicle has the ability to transition itself into multiple configurations for off highway applications in the mining, construction, agricultural, turf and landscape markets with corresponding attachments. Because of its design the PC-122 also features a robust carrying and towing capacities. The vehicle can carry a 3,000 lbs. payload while also having the ability to simultaneously tow trailers with GVWs of 4,000 lbs.

To handle these types of payloads BTI integrated the V2003MT, 56 hp Kubota turbo diesel, tier III engine with electronic governor into the PC-122. This water-cooled, 4-cycle, vertical engine was selected because BTI wanted a utility vehicle that was not only maneuverable and powerful but could also traverse many types of terrain at multiple grades.

Top transfer power BTI selected a Sauer Danfoss, full time 4-wheel hydrostatic transmission that consists of double tandem pumps that independently drive two wheels on each side of the unit. The wheel speed and torque transfer is synchronized with Poclairn, radial piston drive motors that have a series-parallel Twin Lock feature, thus maintaining limited slip between the front and rear, as well as each side of the unit. The unit is able to attain speeds up to 15 mph and gradeability up to 40 percent.

The vehicles drive-steer network has been developed with a "shift under motion" feature from 2W-steer to 4W-steer, thus allowing either crab or coordinated steer for optimum maneuvering in all types of environments without coming to a complete stop. The PC-122 can boast a 4-foot inside turning radius when the 4W-steer mode is activated.

"Front steering is performed through the use of a hydraulic steering orbital attached to the steering wheel and powered by a

power steering pump attached to the rear of the hydrostatic transmissions, said Don Blasdel, president of BTI. "Located above a king pin on the front and rear axles, an angle sensor is mounted that tells the computer what the steering angles are. Both the front and rear axles are steered through the use of hydraulic steering cylinders. In 2 Wheel steer mode, the rear axle locks its steer knuckles in the zero angle position (centered position)."

In 4 Wheel Coordinate steer mode, which is only available below 5 mph only, the operator steers the front wheels normally and the front steer angle sensor sends its angle to the computer. The rear wheels are then steered hydraulically until the steer sensor located on the rear axle matches the inverse of the front steer sensor angle through the use of a PID controller located in the computer. In other words, if the front wheels are steered to +30 degrees, the rear wheels are automatically steered to -30 degrees and thereby reducing the steering radius to a very small number.

In addition to the mechanical aspect of the 4-wheel steering, the angle sensors are used to calculate the inside and outside Ackermann steering geometry for both the front and rear wheels.

"This geometrical data is used to reduce the speed of the inside turning wheels by reducing the flow to the hydrostatic pump controlling the left or right side of the vehicle and thereby providing the correct speed for the inside and outside wheels at whatever steering angle is chosen by the operator." "This makes the dominate drive wheel not overpower the opposite wheel and cause tire scuff. In 4-wheel crab mode, the rear wheels are steered to match the front angle, in other words, if the front wheels are steered to +30 degrees, the rear wheels are also steered to +30 degrees also. This allows the vehicle to move either left or right at the angle chosen by the operator. In 4-wheel steer crab mode, there is no reduction in left or right hydrostatic pumps, as there is no tire scuff in this condition, continued Blasdel."

The PC-122's suspension system has been designed to allow high levels of flex and added responsiveness by having an oscillating front axle, stabilized by McPherson struts to help keep all



"The PC-122 was designed for a particular customer with a specific need, but was engineered to have a versatile chassis with power systems robust enough to meet countless heavy duty applications."

**Don Blasdel, president, BTI**

tires on the ground. The rear axle assembly includes heavy-duty leaf springs for maximum load carrying including a smoother ride at higher speeds.

To complement the hydrostatic propel system, BTI outfitted the unit with Parker fluid connectors in order to meet the parameters of its Genuine Parker Parts (GPP) program that enables the company to offer a three year, leak free warranty program. The program also incorporates high performance Seal-Lok type connectors



To manage the aforementioned power train, the PC-122 employs a Sauer Danfoss Plus1 controller. The system incorporates a graphical programming environment that simplifies inputting specification parameters and offers the end user a diagnostic tool. This control system coordinates both vehicle and engine speed based on operator input from respective foot pedals that manage acceleration and de-acceleration functions. Likewise, the Plus1 controller is responsible for inputs from steer angle sensors and speed sensors that are part of the 4W-Steer option that calculates speed differential between inside and outside wheels thus minimizing scuffing when turning, while maintaining full anti-slip characteristics for maximum tractive effort.

The PC-122 represents three years of planning and development by BTI via its integrated product development (IPD) process that weighs customer and end user requirements while engineers design the project. The process establishes five stages from concept to production, with predefined deliverables at each gate before continuing to the next stage.



"BTI's IPD Process or (BTIIPD) is a rather detailed process for developing new products along with the customer's input and approval during the entire process," said Blasdell. "The process is broken down into five distinct stages with gates (or approvals) at the end of each process stage that does not allow the project to go forward until that gate is closed (approval given) and all of the specific deliverables from that stage are met. The purpose of having a gated process with the customer approving each stage is to eliminate or minimize the number of changes to the design going forward and to ensure that the customer receives the product (design, features, performance) that they expects. There is nothing worse than spending thousands of hours on design and then delivering a prototype to the customer only to have them say that the product was not what they was expecting. The BTI IPD process eliminates or significantly reduces that possibility."

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Blazing Technologies, Inc. or "BTI" was formed to service the electric powered vehicle need for the equine industry. Blazing Technologies, Inc. is an engineering and manufacturing company specializing in Custom Electric Powered (AC & DC), engine driven, and hydraulic engineered products and utility vehicles for the commercial and residential markets. In addition, BTI has a contract division that specializes in the design and manufacture of steel fabrications for many regional industries. The principals and employees of BTI have over 75 years Experience in the aerial work platform industry from various manufacturers and in several disciplines including Engineering, New Product Design, Manufacturing, Procurement, and Operations. This experience is an important attribute for the design of your product. BTI is knowledgeable in the technologies and codes necessary to design a reliable, quality manufactured, and proven piece of equipment to fit your needs. Our Manufacturing process incorporates Design For Manufacturing and Assembly (DFMA) as well as Flow Through principles. The inherit design will be the epitome of standardization in conjunction with extraordinary simplicity. Contact them at: 717.765.8662, [sales@blazingtech.net](mailto:sales@blazingtech.net) or visit [www.blazingtech.net](http://www.blazingtech.net).