

2WD Utility ATV 1999 BearTracker YFM250XL

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Fig.1 BearTracker YFM250XL

1 OBJECTIVE

The fruits of 32 months of design, testing, and production preparation were realized April 6, 1998 with the on-schedule start-up of BearTracker (Fig. 1) ATV production at Yamaha Motor Manufacturing Corporation of America (YMMC), Newnan, Georgia, USA.

With 90% of total ATV sales in North America and a steady yearly market growth in double digits, YMMC was the ideal choice for expanded ATV production. Immediate benefits from U.S. production are development in the heart of the ATV market, shorter delivery time from production to dealer, and increased manufacturing capacity.

An economical utility 2WD ATV was selected as the basis for the first U.S. developed and produced model due to its high popularity. Priorities during the BearTracker program were a design for optimized utility appeal, simplification forease of

manufacturing, and establishment of high quality domestic Suppliers.

2 CONCURRENT ENGINEERING

To streamline the project from development through to production activation the ATV program was organized under the guidelines of Concurrent Engineering principles. From the earliest stages involvement with production and support personnel was encouraged. Increased communication resulted in significant downstream benefits.

- (1) Teaming of P/E, Purchasing, and Quality on vendor selection, pricing negotiation, and design for ease of manufacturing.
- (2) Teaming of P/E and Quality on resolution of Supplier challenges and the development of functional gauging.

(3) Teaming of P/E, M/E, and Assembly in the fabrication of prototype vehicles to identify early opportunities for design and manufacturing improvements.

3 TARGET DEVELOPMENT

Critical to BearTracker development was a constant vigilance on value while providing a variety of styling, performance, and durability enhancements for the customer. Paramount was maintaining the high level of quality evident on all Yamaha product lines.

(1) Frame construction is of 25mm mild steel square tube and 25mm high strength steel round tube. Critical brackets are high strength steel.

Confirmed through FEA (Finite Element Analysis) and physical testing, the goal of reduced parts and minimized welding was realized. Compared to a similar model, BearTracker's frame has 30% fewer parts and 15% fewer welds.

(2) Rear Arm construction has been changed from the typical one piece design to a two piece design. The benefit of the two piece design was more forgiving manufacturing tolerances and reduced machining of gear case mating surfaces.

(3) BearTracker retains an existing 250cc, SOHC engine with external changes for increased breathing efficiency. The engine breather was relocated from the crankcase to the cylinder head. The carburetor was changed from a VM24 to a CV34 with the added benefit of lighter throttle feel. Exhaust length was adjusted for optimized power characteristics and the air box was designed for access to the new cloth type filter without the use of tools.

(4) The goal of BearTracker styling was to provide a more rugged appearance. Plastic body parts were contoured for a large, aggressive, angled look. Deep fender ribbing and 20mm added width to each side met the goal with the added benefit of increased strength and mud protection. Critical to BearTracker's new styling is the large brush guard with a steep approach angle and plastic cover. Select bolt-on parts were "blackened out" for increased visual appeal and the frame is finished with E-dip and powder coat for ultimate durability.

(5) BearTracker handling and responsiveness were given highest priority during design and development. For increase comfort the rear arm was extended 50mm with an increase in wheel travel from 125mm to 135mm. Through evaluation testing the caster angle was increased to 4.0° to slow the "busy" steering feel. Suspension action was improved with increased spring rate and compression damping at the rear and increased spring preload up front.

(6) Ergonomics and rider comfort are an integral part of handling and responsiveness and were addressed as such. The seat was extended 50mm and widened 25mm to benefit the larger American customer. Additionally, the handlebar is taller, flatter, wider, and straighter to better provide a "roomy" feel.

(7) The BearTracker rear brake was improved for reduced "mushiness" resulting from individual component deflection. The lever holder was thickened, the cable core was changed to stainless steel, and the cable/rod bends were reduced for more straight line action.

4 FACTORY PREPARATION

YMMC first opened in 1987 with the manufacturing of Golf Cars; several years later Water Vehicle production was added. To prepare for ATV production the YMMC factory had to undergo a major expansion.

In June, 1997, construction was completed for YMMC's new ATV distribution area. By September 1997 in excess of 20 new welding robots were installed and proofed together with a modified assembly line capable of accepting both Golf Cars and ATV's. Extensive planning and preparation were required to ensure uninterrupted production of current programs.

5 CONCLUSION

First and foremost, the YMMC P/E team owes a great debt of gratitude to Yanagi-san, Kato-san, Tsuzuki-san and Imai-san for mentoring the

Americans on proper ATV design and development methods. Not only have we become respected business associates but we have become close friends also. The entire YMC ATV design and testing staff supports the growing YMMC team each step of the way ensuring our quick progress and continued success.

The success of BearTracker and future ATV's could not be possible without quality Suppliers. Great efforts have been made to improve the skill levels of existing Suppliers as well as "develop" new Suppliers. In all cases, YMMC's policy is to develop long term relationships with Suppliers based on loyalty and trust.

YMMC has truly embraced the Concurrent Engineering philosophy. Individuals from all levels and all disciplines feel ownership and enthusiasm for the ATV program. Communication and participation are free-flowing at YMMC; the perfect atmosphere for "Kando".

