What Makes Mahindra Truck & Bus Create New Benchmark

By T Murrali

Mahindra Truck and Bus Division (MTBD), part of the USD 20.7 billion Mahindra Group, has been making rapid strides in the commercial vehicle (CV) segment since its inception. From a fledgling player, MTBD has reached the number three position in certain segments of the Indian heavy commercial vehicle industry.

MTBD has evolved from Mahindra International that began in 2005. It was expanded as a Navistar joint venture in 2009 and renamed as Mahindra Navistar. The joint venture came to an end in 2013 and the fully-owned Mahindra Truck and Bus Division was floated.

MTBD established itself with the success of the Blazo series of trucks that was launched at the Auto Expo 2016. Nearly 15,000 Blazos are on Indian roads now. This achievement can be attributed to several initiatives such as mileage guarantee, prompt service and guaranteed availability of parts from parts plazas and dealerships. Its promise of guaranteed customer experience has set a new benchmark for superior products and after-sales support.

The recently-launched Furio range has further cemented the company's reputation as a full range commercial vehicle player. The full range of Furio, being launched, will place the company in a unique position having CVs from 0.5 tonne to 49 tonne. Both the Blazo and Furio have been acclaimed to be technologically advanced Smart Trucks, with features like FuelSmart, smart SCR BS-IV technology, future ready (BS-VI ready) engine, several new technology offerings to support driver comfort and mileage guarantee. These attributes have been giving good numbers for the company. Recently the company challenged its own offering by giving six year or six lakh km warranty for Blazo. It is extended to Furio too.

Other attractive customer support offerings from MTBD include

increased oil change intervals, reduced oil prices and six-year or six lakh km warranty that is transferable, 48-hour uptime guarantee, two-hour reach guarantee on Mumbai-Delhi corridor, and 36-hour turnaround guarantee at its dealership service stations. The company also offers guarantee for all critical maintenance parts from its parts plazas and dealerships or offers them free of charge.

For a heavy commercial vehicle, about 52 percent of the operating cost is for fuel, 17 percent for tyres and the rest for service maintenance. The company introduced the concept of fluid efficiency rather than fuel efficiency by reducing the cost of AdBlue, the urea solution for the selective catalytic reduction (SCR), along with diesel to cut the cost per km of operation. Now it offers guaranteed breakdown assistance, repair and parts availability. Since it is unable to offer similar commitment on tyres, as it is a bought-out item and each company has its own norms, MTBD gives value addition to customers on the service portion of its operating cost.

Vinod Sahay

Well, what makes the company create new benchmarks and offer these kinds of sops? To check this out, this correspondent visited its plant recently and tried to correlate them with the manufacturing process. MTBD is directly responsible for entire business strategy, vehicle engineering, development, validation, sales and marketing of the division.

However, it has outsourced the vehicle manufacturing to Mahindra Vehicles Manufacturers Limited (MVML) and powertrain development to MRV Chennai, both functioning under the Automotive and Farm Equipment division of Mahindra Group. Spread across 700 acres in Chakan industrial area near Pune in western India, the facility is a major hub of the company and is responsible for all the manufacturing activities of the group. Right from the tools and dies, the facility makes everything for the manufacturing of the vehicle. As the same line makes all the vehicles irrespective of the markets to be sold, quality is ensured at every level.

Among the several equipment in the press shop are the robotic-controlled progressive dyes. Irrespective of the vehicles produced, the operators just have to make relevant changes in the PLC controller and accordingly change the dyes. Flexibility in manufacturing, though good in one sense, is not conducive as the die changeover time hampers the production. The criterion, Single Minute Exchange of Dies (SMED), determines the capability of the manufacturing; currently the average is three minutes at MVML, while the benchmark is one minute or less.

For the customers MTBD shows the differentiation with engine performance and cabin that constitutes about 30 percent of the total cost. The company makes them in-house. Engine is manufactured by Mahindra Heavy Engines Private Limited (MHEPL), an organisation within the Automotive and Farm Equipment division of Mahindra and Mahindra. Items like gearbox,

axles, tipping body, chassis frames, clutch and othe items are outsourced by MTBD. Some OEMs outsource engines and some even cabins.

Between MTBD and MHEPL it is a customer-supplier relationship and therefore, right from cost to quality, production schedule, and technology- everything can be questioned. Hence the challenge for MVML is to produce quality vehicles. The press shop is common for CVs and passenger vehicles while the assembly is customised. Yet another common feature is the test track and dispatch area. Currently up to 97 percent of the heavy commercial vehicles are manufactured with cabin and the rest are offered with cowl.

Uniqueness Of Plant

MTBD is the first company to offer six years and six lakh km warranty for the cabin, engine and a few key aggregates. This was possible for the company because every major module is designed and manufactured in-house. The cab for instance, will not rust even after five years and this is possible as the cabin is tumbled during phosphate dipping process, a pre-painting operation, while it is not done by majority of the OEMs. This helps the solvent penetrate to the nook and corner of the cabin, making it rust-proof. For instance, there are 96 parts in a sleeper cabin and all of them are manufactured in-house. In case of any accidental repair, it helps the customers to change just the child part and not the entire cabin. This minimises the maintenance cost to the customers.

MVML makes every model and variant in a single line, which is unique in this industry. Though it throws up many challenges, it helps conserve energy and save costs. Mahindra Quality System that is practised by its group companies globally has helped MVML achieve quality standards. It makes trucks from three tonne to 49 tonne covering the entire spectrum right from LCV to ICV to MCV and HCV. The sequence of the models and variants vary depending on the order book and the entire assembly is planned accordingly. This is a challenge as different models have different TAKT (the rate at which a finished product needs to be completed in order to meet customer demand) times.

In order to manage these challenges the company follows 'kitting' of parts for assembly and these are fed as per the sequence. There are several poka yokes and it has 'gate-systems' to prevent non-conforming assembly operations from progressing to the next station. After every second stage it has a 'quality gate.' The vehicles are checked thoroughly based on two dynamic lists – on the uniqueness of the product and the current defects, which are primarily the inputs on failures received from the field. These inputs are immediately communicated to the quality gate. Besides, it has several check points before handing over the vehicle to the marketing department, handled by MTBD. Those defects are also passed on to the 'gate' for dynamic checking.

QCRT

The manufacturing system is made to take corrective action then and there. It has provided some space in the design itself to check the repair and also to take Quality Concerned Resolution Test (QCRT). There are three levels of QCRT and it depends on the escalation matrix; it is classified as V1, V2 and V3 defects. V1 represents cases where the customer is not willing to take the vehicle because of quality issues or defects or any statutory non-compliance. All the issues pertaining to V1 reach the plant head who stops the line and ensures that the corrections are carried out without fail. V2 represents defects that can be passed and repaired before the vehicle leaves the plant. V3 is minor issues and non-functional defects.

MVML monitors these defects in Repair Per Thousand (RPT) units and according to the plant head, it has drastically reduced during the past few years. Initially, because of less volume RPT was quite high. Due to initiatives taken in engineering and posture of associates, the parameter has reduced. Data shows that there has been up to 90 percent improvement in the past three years.

The company imparts extensive training on assembly dexterities and best practices before deploying the new recruits for manufacturing operations. The passenger car industry follows this specialised training while it is rare in the CV industry. Towards this MVML has formulated simulated training modules.

The assembly line has 26 stations with six quality gates. As the TAKT times are different, the balancing of the line is done only for the base models. Therefore, the actual challenge is in unique fitments. Depending upon the time availability in assembling, the free time of the associates, if any, is utilised in taking up sub-assemblies.

The entire process is operated by Manufacturing Execution System (MES) since the inputs are different - like cabin, engine, chassis and axle. The challenge is to place these required aggregates at the junction where they are assembled at the right time. For example, the correct engine should get dropped at the right time at the right station. When the first lead, which is the cabin, is taken for production, the sequence is broadcast to all the assembly points simultaneously with the calculated lead time. The Work in Progress – WIP from cabin till axle and chassis is calculated and accordingly the entire line is sequenced. Yet another step to ensure quality is validation based on MES. The system validates when every aggregate is dropped at the respective station. Without validation the VIN – vehicle index number, which is the reference number for the vehicle, is not to be generated.

Every unit is monitored based on BWT (Basic Work Team) encompassing several parameters including productivity, quality, cost and delivery. BWT for every major aggregate is synchronised with MES. Currently the plant makes around 400 variants, however, the total number including repeated models and one-offs is around 700. Normally, in the manufacturing set-up the production and the warehouse are separated. However, MVML has designed the plant to have storage closer to where the aggregates are consumed. This is to reduce unnecessary movement of aggregates within the shop floor without any value addition. The plant is

designed to make nine Jobs Per Hour (JPH) and currently it has reached seven.

Going Forward

"We are looking at being a credible player; right now, we are at 15,000 units a year with around five percent market share in trucks. We are aspiring for seven to eight percent market share. Volume terms depend on the industry. But for sure, like last year, both in LCV trucks and M&HCV trucks we will grow faster than the industry average. In the industry LCV truck had grown by 20 percent to 22 percent, we grew by 27 percent. LCV is the more matured portfolio for us because it has been there for a while and we have about 10 percent market share," Vinod Sahay, CEO, MTBD, told *AutoParts Asia*.

BS-VI, he said, is a good thing for MTBD since the engine is common on account of electronics. There are OEMs working on changing their engines. Integrating different sub-systems in the exhaust throws up challenges since the space within and under the chassis is increasingly becoming scarce. The industry is now moving towards plastic fuel tank that helps in better packaging, creating additional space, since its profile can be customised. The company is also mulling options to shift some of the implements from outside the side member (of the chassis frame) to within, creating space. Now the engineers are working on the list of what items mandatorily should be outside. The challenge is even more in tippers due to shorter wheel-base and the hydraulic mechanism.

Scope For Improvement

"We still have lots of things up our sleeves. The good thing is that we may be a small division but we have a large ecosystem to tap from such as Mahindra Research Valley near Chennai. The entire powertrain development of all our products happens there. As a small business I can't afford a full-fledged engineering centre for making an engine. So that is the same resource which works. For example, when we launched the Blazo, the Fuel Smart Technology actually has its lineage from Maximo. It didn't do well in Maximo with various criteria. We brought the technology from there. Secondly, we have mastered the art in achieving variable power points matched with six or nine different gear ratios matching the duty cycles," Sahay said. APA

Furio To Fill Segment Gap For Mahindra

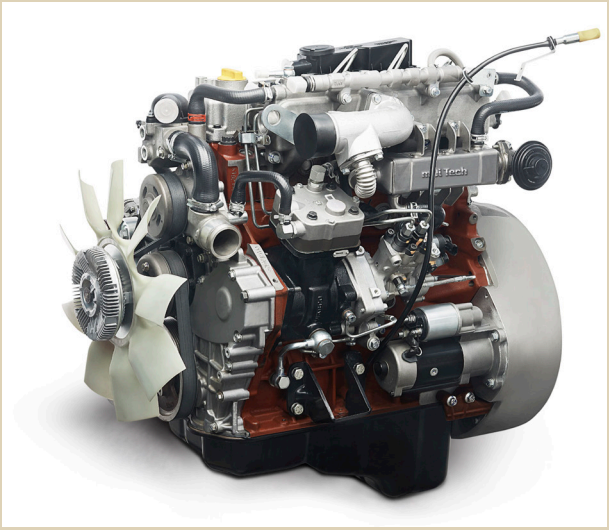
The recently unveiled Furio marks Mahindra's entry into the Intermediate CV segment and is set to make the company a full range commercial vehicle player. The range of vehicles is the culmination of efforts from more than 500 Mahindra engineers, 180 suppliers and an investment of Rs 600 crore.

Dr Pawan Goenka, Managing Director, Mahindra & Mahindra Ltd said, "The unveiling of the new Furio range of ICV trucks is a defining moment for our truck and bus business as we are set to enter a new orbit and become a full range commercial vehicle player. With the Pininfarina inspired design, the Furio is set to be a game changer for us and perhaps for the industry, giving the new truck one of the safest, most ergonomic and comfortable cabins that will set new standards."

Rajan Wadhera, President, Automotive Sector, Mahindra & Mahindra, said, "The launch of the Furio comes closely on the heels of the successful introduction of Blazo, which also resulted in substantial volume and market share growth. With the addition of this new range of ICVs, MTBD will emerge as a complete trucking solutions provider in the Indian CV market."

According to Vinod Sahay, the Furio range has been built around Indian ICV customers' expectations such as delivering higher earnings, lower operating costs, better safety, improved ergonomics, comfortable ride and better ownership experience.

Powered by specially developed mDi Tech 3.5 litre engine the Furio range has Mahindra's FuelSmart technology that energised Blazo first, to optimise fuel consumption. The highlight of this technology is the multimode switches to optimise fuel consumption to the load and road conditions. With five options (four in diesel and one in CNG), the engine delivers maximum power of 140hp at 2,400 rpm and 500Nm torque in the range of 1,250 to 1,800 rpm. The engine was put to two phases of accelerated test running 8,000 hours each with different test cycles.



The development of Furio range began in 2014 with the product conceptualisation process involving an in-depth interaction with over 500 customers across India to gain insights on current as well as latent needs. This was followed by the Quality Function Deployment methodology-based study for firming up the platform strategy, which in turn led to modularity of all major models.

Masculine Outlook Feminine Interior

The key attraction of Furio is the unique combination of style and functionality in the looks and interiors. One of the key aspects of the development is the design of the cabin, which was done by Pininfarina, the renowned Italian design house and is currently owned by Mahindra. One of the designers from Pininfarina said it was easy for the company to design a sports car while it was tough to make just a cabin for Furio. This was because several aspects had to be taken in to account, since the truck is a business tool and the driver will spend in it several hours daily.

Its car-like interiors add gleam to the ambience. The position of the driver seat, the pedals and the gear shift lever are positioned optimally to enhance efficiency of the driver. The position of instrument panel is placed well, minimising the need for the driver to take his face off from the road ahead. There are eight air vents – four for natural ventilation and the rest for the blower or air-conditioner. This makes the cabin temperature drop by about five degrees. Overall the feminine interiors and ambience defy the external look of a macho truck.

The vehicle comes with metal fenders and bumpers coupled with composite headlamps. The cabin meets R2 crash norms and is compatible to adhere to R3 crash norms. Cornering lamps add yet another feather in its cap.

Venkat Srinivas, Principal Chief Engineer and Head, Engineering and Product Development, Mahindra & Mahindra, told AutoParts Asia that driver-roominess was a key aspect to be considered while designing the cabin for a custom-designed truck for India. Walk through cabin, integrated sleeper seats, improved ventilation and visibility were the important requirements while developing the cabin. The noise, vibration and harshness have been contained in the cabin due to various design processes and also by having car-like cable-shift gears in lieu of shaft gear shifters. The company used Ramzes software for ergo design.

“Beyond that we validated the vehicles through many customer clinics; we brought a lot of drivers and made them sit in static buck with pedal / seat position and instrument panel and we made them experience the vehicles. This was followed by dynamic trials. We got certain confirmation in static tests and received more refinement in dynamic tests, which validated the results from static trials.”

The rake angle of the windscreen is kept more vertical than in other vehicles in this segment. This is to reduce the sunlight getting into the cabin. While it serves the purpose, it might have gone against the aerodynamics as the increased rake angle is directly proportional to the drag coefficient that acts parallel and in the same direction as the airflow, impacting the way the truck passes through the surrounding air. Srinivas said to balance the straight windshield, its design is engineered using computational fluid dynamics. Accordingly the windshield is modified to reduce the drag. Unlike an almost flat windshield, that of Furio has enhanced curvature to deflect air. “We went through multiple iterations of design, analysis and wind-tunnel testing. The curves on the front side of the cabin are the result of ensuring vertical windshield for the driver but at the same time transition for the aerodynamics, so that the flow is smooth. Similarly the aero corners are features that help minimise the drag,” he said.

Srinivas dwelt upon the light-weighting structure of Furio. At any given GVW, “we wanted to offer our customers maximum payload and this has been our objective. As Furio is a new platform, we have been able to re-design, use high-strength materials and technologies to offer better value proposition,” he said.

Interestingly the air deflector, while helping in reducing the drag, is also designed in such a way that it cleans the door handle as the air is passed through that. This helps keep the door handle always clean.

The Furio range of vehicles have been tested for over 17 lakh km on roads during the validation process and trials. Further, rigorous highway durability trials were undertaken across the ghats, other treacherous road conditions, cities and state highways (single and double lane roads), and high and low speed applications. Over 1,000 such performance tests were carried out. Structural durability validation was accomplished for the equivalent of 10 years of vehicle service life, involving all four platforms. Further endurance tests such as sea level to high altitude trials and sub-zero to high ambient temperature trials were also undertaken.

The company plans to launch 21 Furio trucks in the range of 6.5 tonne up to 16 tonne. At present it has unveiled four trucks in 11, 12, 13 and 14 tonnage. It will launch two more trucks in the last quarter of this fiscal. The remaining will be introduced as BS-VI compliant vehicles, after the introduction of the emission norms in 2020. APA