



ENDURANCE



Endurance Technologies Limited

Research & Development

December -2021

Cautionary Statement



The presentation may contain, without limitation, certain statements that could be considered forward-looking. Such forward-looking statements do not guarantee future performance; and may involve risks and uncertainties that could cause actual performance or results to be materially different from those anticipated in these forward-looking statements. The Company is under no obligation to update any forward-looking statements contained herein, should material facts change due to new information, future events or otherwise.

Endurance R&D in numbers

4 DSIR approved R&D Centers in India for 4 product lines

2 Tech Centers in Italy

29 Acre Proving Ground

8 tracks in Proving Ground

19 Patents (and 78 in application stage)

15 Design Registrations (and 3 in application stage)

200 dedicated personnel

Endurance Values

C O R P O R A T E V A L U E S



Customer Centricity



Integrity



Innovation



Teamwork



Transparency

INNOVATION is a core value at ***ENDURANCE***.

*We attempt to address the stated and latent needs of the customer. Through **INNOVATION** and **CUSTOMER CENTRICITY**, we have demonstrated the ability to win new customers, add new products with existing customers and increase our share of business.*

*Annual **PRASHANSHA** Awards, **IDEAFEST** and **ASPIRE** events fuel a culture of **INNOVATION**.*



Performance

Products are designed to meet and exceed customer performance requirements.

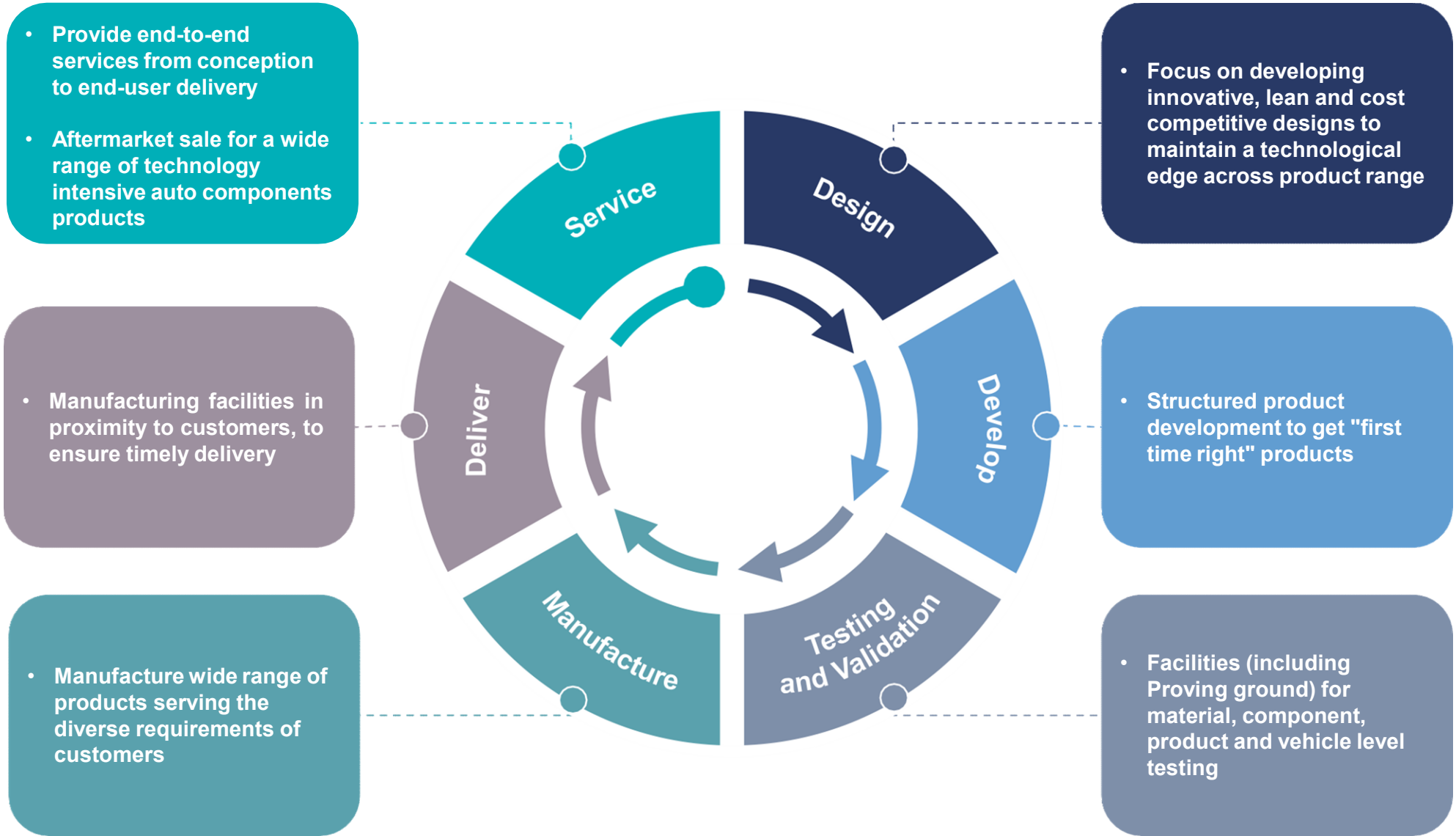
Durability

Products are designed and tested to ensure long life.

Cost

Value engineering leads to a win-win situation for us and our customers.

End-to-end Solution Provider to Customers



Our cognitive capabilities in technology help us in creating new products and increasing our customer base.

We use Technology in

-  New Product Development
-  Understanding Materials
-  Deploying the Right Machinery
-  Process Efficiency
-  Quality
-  Post Sales Service
-  Combining Information Technology with Production Systems

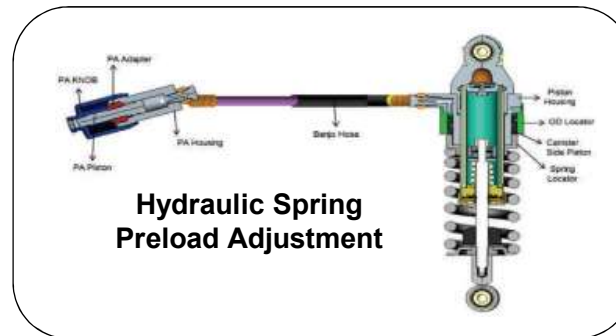
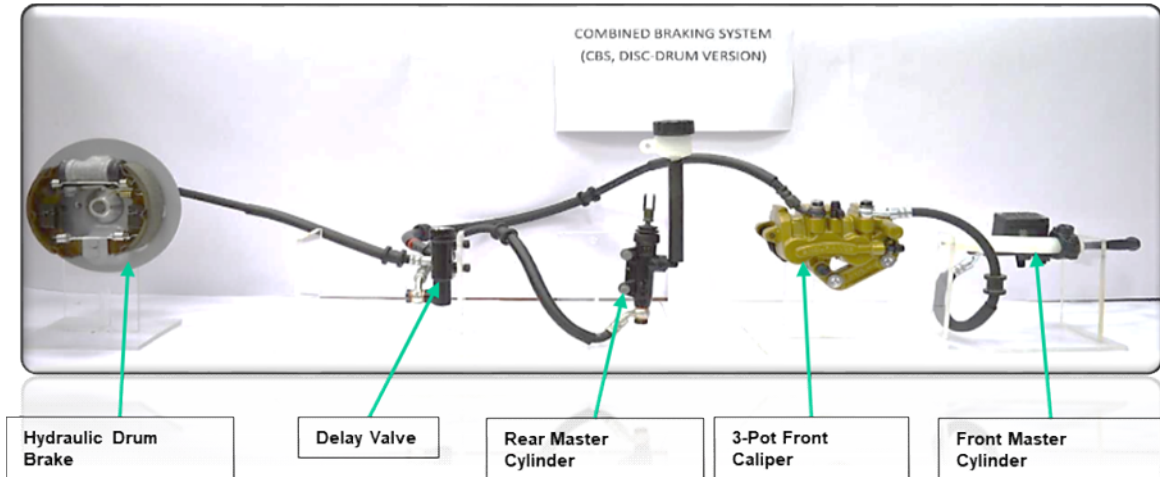
Deep Expertise and Collaboration

- **Dedicated Cells with specialists to assist all 4 R&D Centers:**
 - Computer aided engineering and road-load data acquisition activities
 - Electronic control system team for advance electro-mechanical systems
 - Elastomers team
 - Oil and friction team
 - Metallurgy
- **Dedicated IP Cell to guard against infringement of patents and designs.**
- **Cross learning across R&D Centers in India and Europe, and among the specialist cells**
- **Close coordination with technical partners**
- **Structured product development to get "first time right" products**
- **Working with customers from concept design to rapid prototyping and accelerated testing**
- **Close engagement with customers to ensure satisfaction on QCDDM parameters**
- **Continuous benchmarking of products for performance, quality, reliability, durability and cost**

At the forefront of new technology

- **Focus on new technologies for higher value added products:**

- Combined Brake Systems (CBS)
- Anti-lock Brake Systems (ABS) catering to tough Indian road conditions
- Advanced technology Slip & Assist clutches for motorcycles
- Paper-based friction plates for motorcycle clutches
- Adjustable inverted front forks and rear shock absorbers for high cc motorcycles
- CVTs and scooter front forks
- Comprehensive die-casting solutions for complex light-weight parts
- Aluminium Forgings



Electronically Controlled Suspension
(Fully developed In-house)

At the forefront of new technology (contd.)

- **Incorporate latest technologies from overseas technical partners**, value-engineering and re-engineering based on Indian conditions and deep know-how acquired over the years.

Long relationship with global leaders in technology for existing products. New relationships forged for products required for backward integration and expanding the addressable market.

Acquired ~100% stake in technical partners in Europe to further enhance the level of cooperation, and to ring-fence their technology.



APTIC PLUS

APTIC EVO



**Aluminium Forging
Axle Clamp**

- **The only Auto Ancillary company with Proving Ground facilities of this scale.** Riders trained by international expert. Close interaction between our riders and OEM riders. Greater ability to service customer needs, as evidenced in our ABS development.

Product Development for EV components

- ❑ Endurance's vast experience in designing Suspensions and Brakes for ICE vehicles, also comes in handy for designing these parts for EVs.
- ❑ The core process of product development remains unchanged. The designs would change based on customer specifications / vehicle parameters such as speed, braking distance, kerb weight, load bearing ability, vehicle stability etc.
- ❑ Design and validation initiatives aligned to the vehicle configuration, which for EV is different from ICE.
- ❑ For Endurance, Castings is a 'build-to-print' product. Nonetheless, our deep understanding of the product, the process and tooling enables us to provide valuable design inputs to established OEMs. EV manufacturers will also benefit.
- ❑ In view of light-weighting needs, EVs have more structural parts made of aluminium. Certain EVs have an all-aluminium chassis.
- ❑ Overall value for Castings suppliers like ETL is not likely to be impacted due to more EV production.
- ❑ ETL technology tie-up and facility for production of forgings will help secure EV aluminium forging orders.
- ❑ No Transmission products in EVs. Bulk of ETL Transmission revenues are from motorcycles, where EV has not shown early promise. Also, we are moving towards high cc clutches, where launch of competing EV would be difficult.

Technology Tie-ups

Leading European Suspension company

- Technology tie-up since 2008 for development and manufacturing of suspension components.
- Current agreement was executed in 2015; it is valid for a period of 10 years and is renewable.
- It is for technology for a new series of motorcycle suspension components.

Endurance Adler Spa

- Technology tie-up since 2002 for development and manufacturing of Transmission components.
- Agreement for sub-license of technology and IP was executed in 2021.
- Acquired 99% stake in Adler in April- 2020 and name is changed to Endurance Adler SpA. Gained access to range of clutch and CVT related IP, licenses, trademarks and customers. Shareholding increased to 99.86% in May-2021.

Leading global brake and suspension company

- Entered into an agreement in 2017.
- For manufacture of Anti-lock Braking System (“ABS”) for application in 2W & 3W.
- Agreement is valid for a period of 20 years.

Grimeca Srl (Since merged into Endurance Adler Spa)

- Technology tie-up since 2015. Agreement for sub-license of technology and IP was executed in 2021.
- Endurance Adler has acquired 100% stake in the technology provider in May 2020. Gained access to a range of brakes related IP, licenses and trademarks.

European technology provider in Aluminium Forgings

- Entered into an agreement in 2019.
- Technical support related to Aluminium Forging Technology.

Endurance Proving Ground (EPG) at Aurangabad



Endurance Proving Ground (EPG) at Aurangabad (Contd.)



Only Auto Ancillary in the country to have such an extensive proving ground facility.

Tracks designed by UK based expert, and constructed under close supervision of ETL R&D team.

- EPG enables us to test our products on vehicle and further strengthens our position as a Complete Solution Provider.
- EPG is meant for Handling & Manoeuvrability, Ride Comfort, Driveability, Brake/ABS performance and Reliability evaluation.
- Consists test surfaces required for evaluation of Suspension, Transmission & Brake assemblies of 2W, 3W & Quadricycle.
- ABS test surfaces have provision of testing the brake system under wet and dry condition on different friction surfaces (Basalt tile, Ceramic tiles, High μ (0.9) asphalt, Polished concrete and loose Gravel).
- Ride & Evaluation track comprises of Belgian pave, Pot holes, Cobble stone, Speed breakers, Long/Short wave pitching, Kerbs etc.

Ride Tuning Van



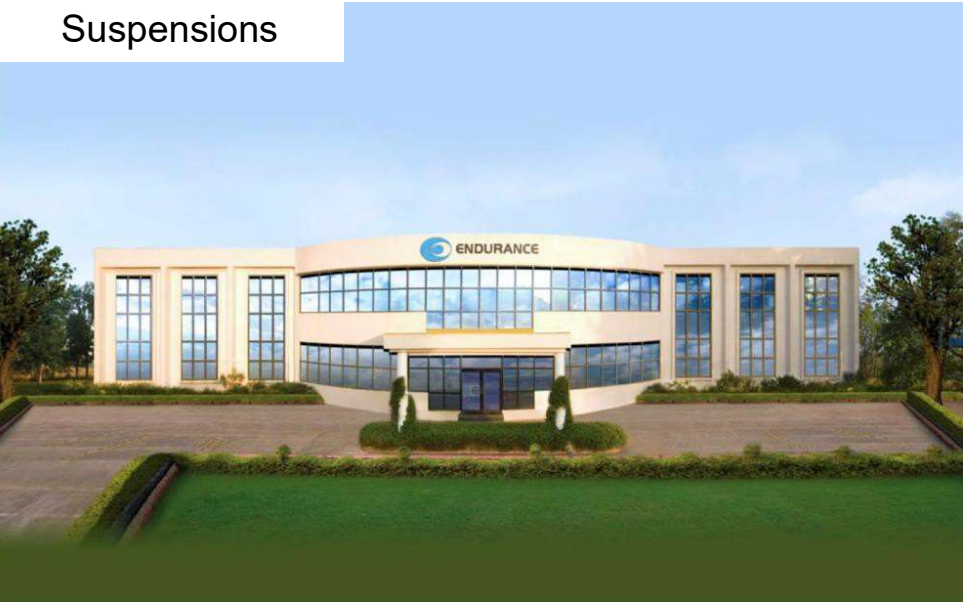
4 R&D Centers in India



Brakes



Castings



Suspensions



Transmission

ABS development – Case Study from R&D perspective

The product

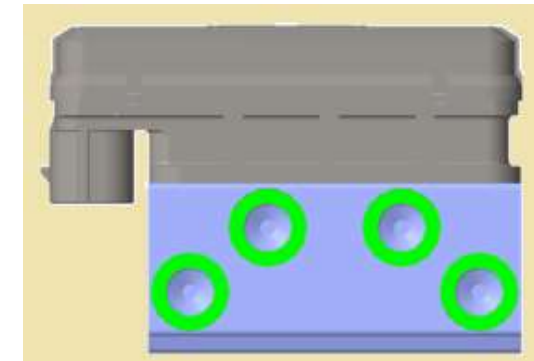
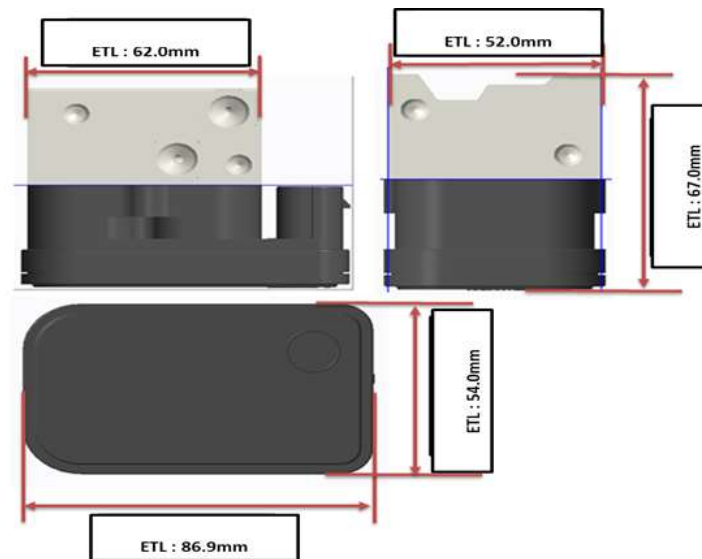
ETL *single-channel* ABS launched for one model. Evaluation ongoing for 3 more models. Shorter lead time expected for next models.

Our product is comparable with established modulator in terms of physical & electrical parameters, and also compatible with existing wheel sensors.

We have met our customer requirements on performance and durability, by testing on various surfaces and different conditions.



ETL Single Channel ABS



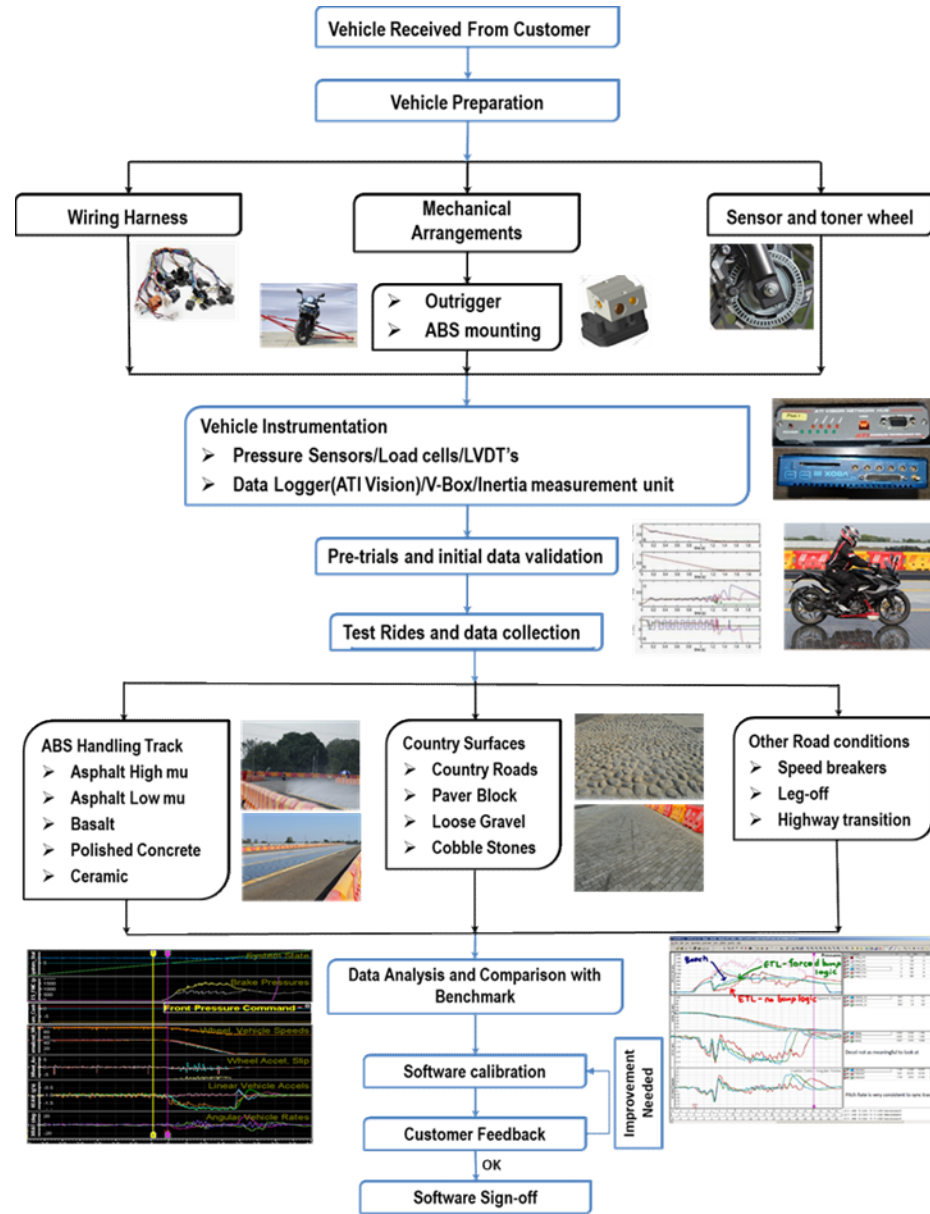
ETL Dual Channel ABS

Mechanical arrangements

Instrumentation arrangements

Data Collection in diverse environment

Analysis, Calibration, Benchmarking, Feedback, Sign-off



Thank You