Enabling Technologies for SMART MOBILITY

Phil Burnside 25th April 2018
Everything begins with measurement. HORIBA’s “Measurement Technologies” and analysis solutions are always at the front lines of innovation.
Global mega trends information was consolidated and synthesised from 11 sources (120+ reports)

Source: MIRA
Global mega & automotive trends interact & reinforce key product attributes / services which will be critical in defining the future of the market

12 key automotive trends
- Connectivity (Con)
- Mobility as a service (MaaS)
- Autonomous vehicles (AV)
- Electromobility (xEV)
- Big data & Analytics (BD&A)
- Regulation (Reg)
- Collaboration & partnerships (C&P)
- New business models (NBM)
- New competition (NC)
- Cyber & data security (C&DS)
- Skills shortage (SS)
- Emerging markets (EM)
- Skills shortage (SS)

5-6 key trends Measurement and Analysis technologies will enable the progress

Independently identified global mega trends
- Urbanisation (U)
- Rapid technology change (T)
- Shift in demographics (D)
- Macro resource pressure (RP)
- Climate change (CC)
- Shifts in economic power (EP)

Influence on Automotive Industry
- >60% of the population will live in urban cities, with >30 mega cities
- Internet users ~5billion, Connected devices ~75billion.
- Transformation driven by aging population & millennial workforce
- Population growth & climate change increase stress on resources
- Desire to reduce GHG, noxious gases & nano-particles
- ~50% of the world’s $800trillion + companies based in emerging markets & 46 of the top 200 cities will be in China


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May 2, 2018
Headline: Reductions in national and city-level regulated emission levels are expected and nanoparticles & VOCs will come under increasing scrutiny

- Regulation remains a principle driver of electro-mobility (xEVs) penetration
- Regulators remain distrustful of OEMs ~10 years after “Diesel-gate” scandal
- Further GHG reductions expected. Will include well-to-wheel and life-cycle assessments
- Nano-particles & VOCs are expected to be the next areas for control and reductions
- Noxious emissions limits plateaued with China & India almost harmonized with the developed economies
- Cities set vehicle & emissions limits to improve local air quality
- ICE remains in >80% of vehicles by 2025
- BEV penetration will be 10%-20%
- xEV penetration will be 30%-60%
- Fuel cells remain a niche in 2025
- Majority of OEMs offer a wide variety of hybrids and BEV only vehicles, with most offering multiple xEV Powertrains variants
- Uncoordinated infrastructure roll-out risks delayed EV acceptance

Source: MIRA, McKinsey & Company, EY, Ricardo, PWC (Strategy&), KPMG, Roland Berger
Headline: Connectivity, MaaS & Autonomous vehicles are all interlinked with cyber security central to delivering successful robust products

Cyber security is not one of the core product areas driven by the trends but it will be at the heart of products with connectivity, autonomous capabilities & mobility as a service offerings.

Global ADAS market will grow to $26 billion by 2025
By 2025, 80% of the top ten OEMs will have or will be launching highly autonomous vehicles
By 2030, up to 15% of the market could be fully autonomous (L4)

Global mobility ~$10 trill market
MaaS - most applicable to high density urban living ~3 bill people
MaaS to reduce the cost of transport (from ~$1 to ~$0.3/mile) challenging ownership models
MaaS may reduce global vehicle sales by ~13 million units (2030)

2025 = 100% of cars connected
Enables new revenue streams related to MaaS, OTA updates, service fees, data monetisation
Revenue stream = ~$500 billion (2025) & ~$1.5 trillion (2030)
Digital revenues expected to be greater than vehicle hardware revenues


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Diesel decimated, massive growth in xEV, but unprecedented levels of investment for battery production required

EVs: ~20% in 2025 & >50% in 2030

Massive growth in EV and xEV products across major markets

Diesel decimated. Niche application on SUV & large saloons. FCEV niche

Source: MIRA, vehicle OEMs, PWC (Strategy&), Ricardo, McKinsey & Company, * industry wide
Impact - The trends are putting the OEMs under increasing strategic & operational stress

- Connectivity
- Autonomous vehicles
- Electrification - xEV
- Regulation
- Cyber & data security
- Mobility (enablers hard + software)

- Collaboration & partnerships
- Big data & Analytics
- New business models
- Cyber & data security

- Competition
- New (ICT) competition
- Skills shortage ("war-on-talent")
- Emerging markets

ICT = Information, communications and technology companies: A collective term referring to silicon valley type companies e.g. Apple / Uber / Google

Source: MIRA

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The motto originates from the belief that if we take interest and pride in the work that occupies most of the active time in our lives, in the place where we spend the large part of each day, then as a result our satisfaction with life will increase, and we will be able to enjoy our lives even more. Taking interest and pride in our work leads us to “Joy and Fun.”

Dr Masao HORIBA – founded HORIBA in 1947
HORIBA Enabling Technologies

Renewable energy resources

Centralised power and heat generation

Electrification of transport

Storage

Compressed air

Pumped hydro

Smart transmission and distribution

Smart energy system control

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www.energylivenews.com/2016/01/29/energy-storage-batteries-worth-3-6-billion/619x205?psig=AOvVaw0nrsRpP7YFAQd5hNzZm66&ust=1521813980332490

Scientific

Semiconductor

Process & Environmental

Automotive Test Systems
Enabling Technologies – Automotive Engineering

Providing powerful support to the automotive development industry

HORIBA’s automotive EMS (Emission Measurement Systems) are used by national certification bodies throughout the world and hold a global market share of 80%. HORIBA provides complete test and measurement solutions to the world’s leading automotive manufacturers, including test systems for chassis, engines, power trains, catalysts and brakes. In July 2015 HORIBA acquired HORIBA MIRA, Ltd., a U.K. registered vehicle engineering consultancy and testing services provider. With the addition of HORIBA MIRA, Ltd., the company has expanded beyond analysis and measurement to include the Engineering Consultancy & Testing (ECT) business. It is now well positioned to respond to diverse customer demands as future mobility requirements expand to include advanced vehicle performance, autonomous vehicle development, battery development and general vehicle R&D challenges.

Principal Products and Services

Emission measurement systems Automotive emission analysers On-board emission measurement systems Driveline test systems Engine test systems Brake test systems Drive recorders Vehicle development engineering Testing engineering Lease and management of R&D facilities

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Enabling Technologies – Flow Control & Measurement

Contributing to yield enhancement and technology innovation in semiconductor manufacturing processes

HORIBA’s flow control and measurement technologies are enabling the manufacturers of next generation automotive semiconductors, batteries, displays, LED’s, and coated plastics. These high-precision gas and liquid controllers regulate flow rates in component manufacturing processes. They are indispensable components for high quality semiconductor and LED production. Our Chemical Concentration Monitors are used in semiconductor manufacturing to monitor concentrations of chemical cleaning agents. They ensure cleaning fluids are precisely delivered and properly used, thereby optimizing the cleaning process and boosting production yields. We own approximately 60% market share.

Connectivity, E-mobility & Autonomous

Electro-mobility
Connectivity
Mobility as a Service
Autonomous Veh.
Enabling Technologies – Scientific Instruments

**Scientific Instruments & Systems for use at the leading edge of scientific technology**

HORIBA’s analysers provide solutions for data acquisition and analysis for advanced research and pursuit of innovative products and processes that will enhance our lives and the world that surrounds us. Our instruments are used in energy, automotive industries, materials science, semiconductor processing and batteries. HORIBA’s analysers use gas analysis by infrared rays, X-ray solid analysis, and dispersion technologies such as Raman or fluorescence spectroscopy. HORIBA’s analysers are widely used in basic research, foreign-object examination and defect analysis for electronic components. The segment develops basic analytical methods and core measurement technologies.

HORIBA’s air pollution analysers have won high acclaim in the field as highly reliable analysers that demonstrate excellent precision and long-term stability at ppb* concentrations. They are used in over 50 countries to monitor air quality by municipal governments and private industries. Demand has been expanding for PM2.5-related monitoring.

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Our Future Together....

Continuous investment to accelerate growth

Proactively facing the changing trends in the automotive industry and mobility with our “Measurement Technologies”

Investing to respond to an increase in demand in the semiconductor industry

Accelerating multiple technology solutions

HORIBA operates five business segments in 27 countries providing indispensable products and solutions.

HORIBA will keep investing in technologies and talents and refining “Invisible Values” with the spirit of “Joy and Fun”

Chairman & CEO Atsushi Horiba
Your invitation to join us…

Visit our stand .... Hall 27 G55
Take the driving challenge
Meet our team of Japanese and German colleagues
Discuss HORIBA’s Enabling Technologies
We want to hear about how we can help you?
Enjoy Happy Hour 1700hrs – 1800hrs

EXPLORE THE FUTURE

Hall 27 Stand G55
Thank you
Thank you

감사합니다

ありがとうございます

Dziękuję

धन्यवाद

Grazie

Σας ευχαριστούμε

Obrigado

Σας ευχαριστούμε

Obrigado

Danke

谢谢

감사합니다

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나나

Obrigado

 зависим

Σας ευχαριστούμε

Большое спасибо

Gracias