WOOSU TMM overview

2020 Company Profile

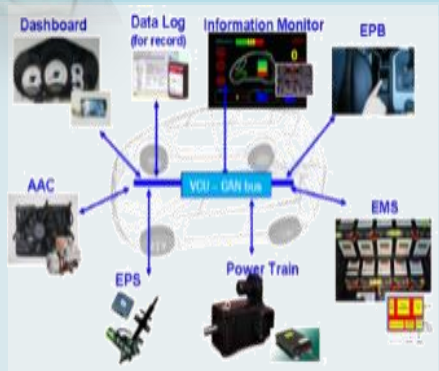
Content

Through Passion ,Innovation, Creativity WOOSU TMM corporation is becoming very important company in Ulsan Korea especially in business field concerned with Micro size EV and 1ton truck EV. To become a leader of micro sized EV, TMM continues to pioneer a broader world.

GROUP OVERVIEW

Core values

CEO	Noh Jong Sang
HQ	(44428) Jongga-ro 362-11, Green car Technology Center 903 Jung-gu, Ulsan, Korea
EV R&D CENTER	(44428) Jongga-ro 362-11, Green car Technology Center 906 Jung-gu, Ulsan, Korea
Total sales('18)	60billion
Core Technique	·EV System Technology ·Lay-out Technology ·EV Manufacturing Technology ·Traction Module, Driving Module Design



EV Car System Design

Manufacture & Sales

BUSINESS DIVISION

Company Profile

Business Introduction

Through Passion ,Innovation, Creativity TMM corporation is becoming very important company in Ulsan Korea especially in business field concerned with Micro size EV and 1ton truck EV. To become a leader of micro sized EV, TMM continues to pioneer a broader world.

▶ Main business

Automobile components

- Differential Case
- Carrier Plate
- Air Compressor

WOOSU AMS

▶ Main business

Automobile components

- Control Shaft Ass'y
- Rail-Sub Ass'y Shift
- Bracket etc.,

WOOSU 정기

WOOSU TMM 주식회사 우수티엠엠

▶ Main business

Electric Vehicle

- Electric Vehicle development
- Micro-size Electric Vehicle
- Electric Truck
- Power train module

Milestone

2010.11	2012.12	2013.08	2018.03	2018.05	2018.06	2018.07	2019	2020.05
Modify EV	Develope 1ton EV		Established TMM	Micro EV kick off	Established EV R&D Center	Certified EV producer	Proto EV Develope	TMM is incorporated as a subsidiary of WOOSU AMS

BUSINESS DIVISION

Planning

1st year

2nd year

3rd year

▶ Plan 2018

2019 ~ 2020

2021 ~

Experts Recruitment :

VCU Design Engineers

EV System Layout Engineers

Motor/Inverter Design Engineers

Performaned In National Research Project :

Development of Micro Electric Mobility

WOOSU TMM

▶ DO ▶ ▪Motorcycle (Under 100cc) Development and Sales

▶ DO ▶ ▪Micro Electric Mobility Development, Sales, and Export
▪ Micro Electric Cargo Development and Sales

▶ DO ▶ EV module Industry [traction module]

▪110kW Motor/ Inverter Development/ Sales
▪ 10kW Motor/ Inverter Development/Sales

▶ Check ▶ Integrated E-Vehicle Company

ELECTRIC VEHICLE DEVELOPMENT

Micro EV on developing

- Max speed: 80km/h
- Travel Distance: 100Km
- Grade ability: 25%
- Size: 2725*1486*1557

• Joint development with Ulsan city, Ulsan Techno park

1ton Electric Truck

- Max speed: 110km/h
- Travel Distance: 120Km
- Grade ability: 25%

• Developed 1ton electric truck in 2017
• Supplied to Ulsan Techno Park
• Equipped in-house-developed motor
• produce 1ton electric truck in 2018

Avante EV

- Max speed: 120km/h
- Travel Distance: 120Km
- Grade ability: 25%

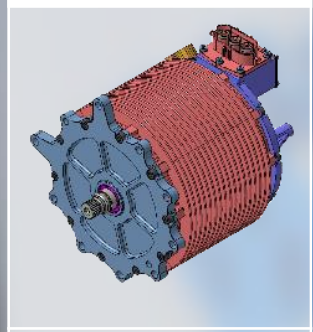
• Modify - Developed EV Avante in 2011
• Supplied to Ulsan Techno Park

Morning EV

- Max speed: 120km/h
- Travel Distance: 120Km
- Grade ability: 25%

• Developed remodeled EV Morning in 2010
• Supplied to Jeju island
• Supplied to Ulsan Techno Park

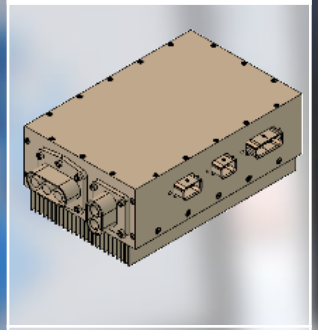
ELECTRIC VEHICLE PARTS DEVELOPMENT



Micro EV Motor

- Capa & efficiency : 15KW, 95%
- RPM : 6000rpm
- PM motor
- Natural air-cooled

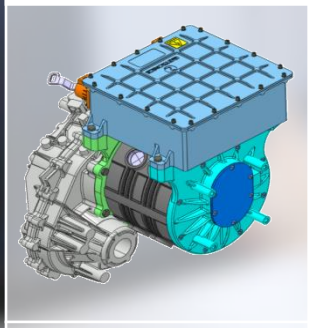
• Rotor patent application registered
• Housing patent application registered



Micro EV Inverter

- Capa & efficiency 20KW, 95%
- Operating Voltage : 60V ~ 200V
- Operating temp : -40℃ ~ 125℃
- Natural air-cooled

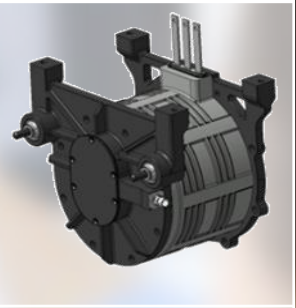
• Independent radiant heat patent application registered



EV Power train module

- Embedded motor platform
- Durability Evaluation: 500hr
- System Capacity: 110kw

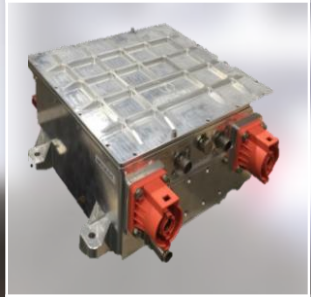
• Joint Development project
With UlsanTechnoPark
• Developed the first PM-type
traction motor(100kW) in Korea



Traction Motor

- Max Output: 110kW
- Motor Efficiency: 95%
- Max rpm: 11,500rpm

• RE-EV Government Task
• Joint Development project
With UlsanTechnoPark



Inverter

- Output: 120kW
- Motor Efficiency: 96%
- Network: CAN 2.0

• RE-EV Government Task
• Joint Development project
With UlsanTechnoPark

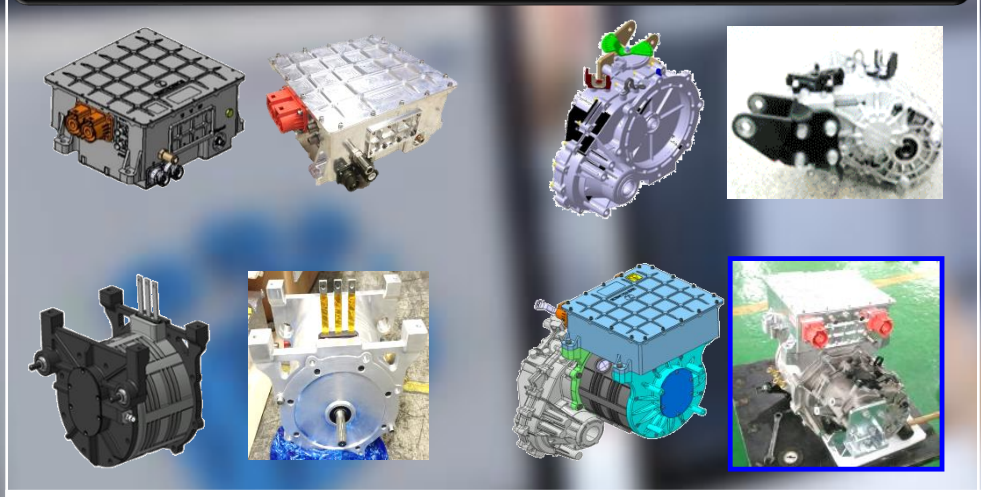
Compressor

- Output: 10kW
- Motor Efficiency: 95%
- Max rpm: 100,000/45,000rpm

• Variable Pressure, PEMFC R&D
• Joint Development project
with HMC

ELECTRIC VEHICLE PARTS DEVELOPMENT

Watercooling 110kW Integral drive module

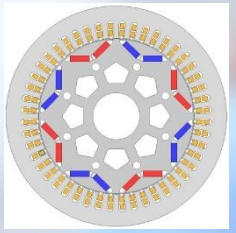


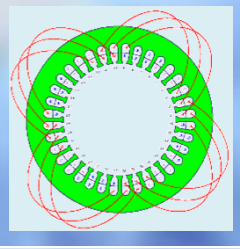
Specifications

Max power capacity	110kW
Max efficiency, Torque	95%, 330Nm
Max RPM	11,000rpm
Gear ratio	9.486
Cooling Method	Watercooling
Assemble Structure	Hollow spline

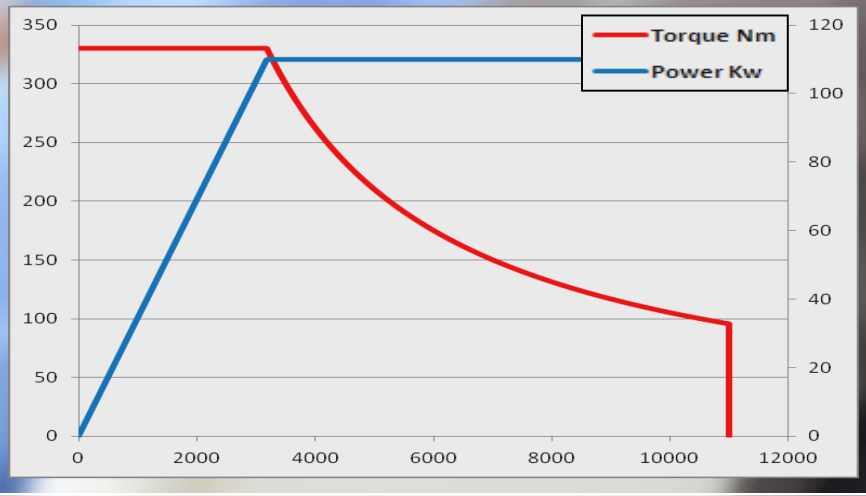
Electromagnetic field analysis

Parameter	Figure	Unit
Max. Power	110	kW
Max. Torque	330	Nm
Speed (Base / Max.)	3,180/11,000	rpm
residual voltage (Constant torque / Constant power)	270/300	V_{dc}
Current density (Max)	21.11	A/mm^2
Pole / Slot	8/48	-



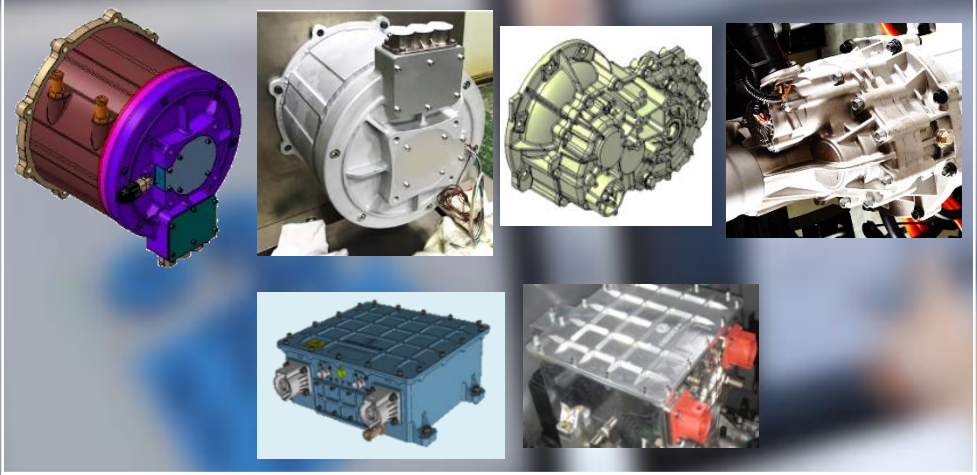


T-N Curve



ELECTRIC VEHICLE PARTS DEVELOPMENT

Watercooling 110kW Separated drive module

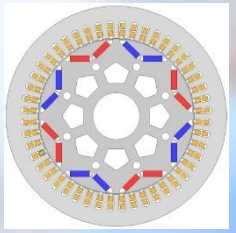


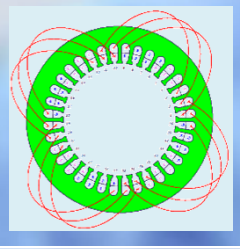
Specifications

Max power capacity	110kW
Max efficiency, Torque	95%, 330Nm
Max RPM	11,500rpm
Gear ratio	9.719
Cooling Method	Watercooling
Assemble Structure	Hollow spline

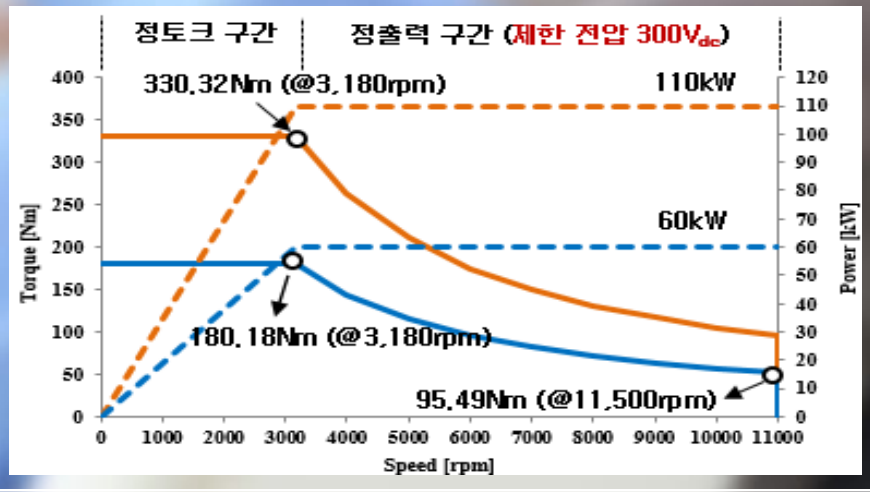
Electromagnetic field analysis

Parameter	Figure	Unit
Max. Power	110	kW
Max. Torque	330	Nm
Speed (Base / Max.)	3,180/11,500	rpm
residual voltage (Constant torque / Constant power)	270/300	V_{dc}
Current density (Max)	21.9	A/mm^2
Pole / Slot	8/48	-



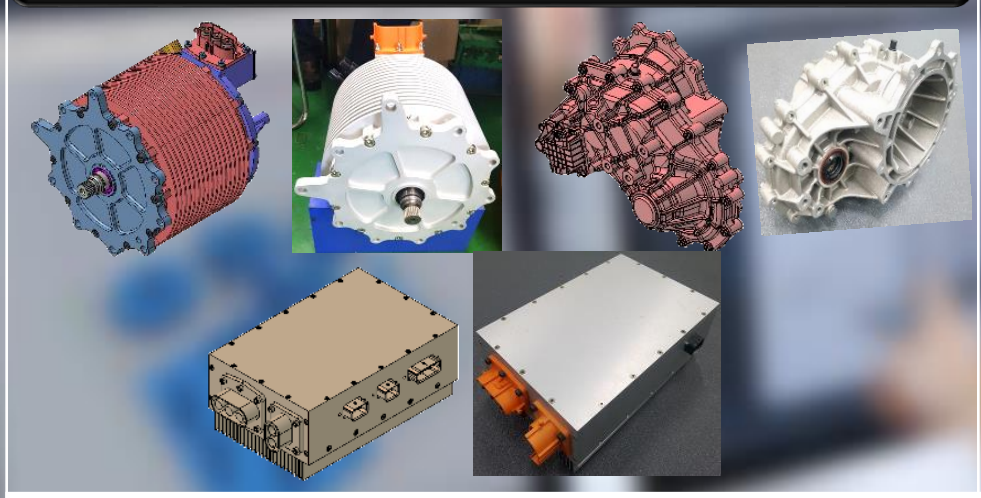


T-N Curve



ELECTRIC VEHICLE PARTS DEVELOPMENT

Aircooling 15kW Separated driving module

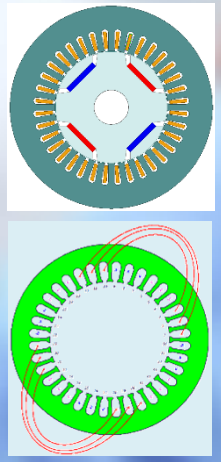


Specifications

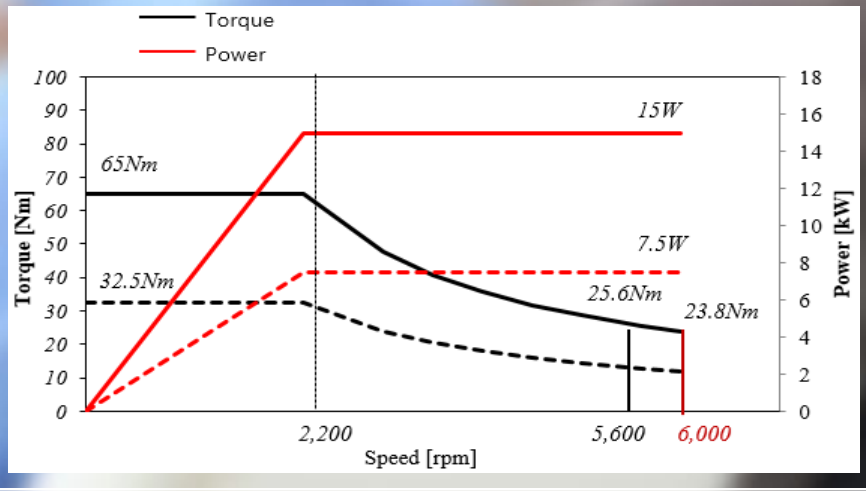
Max power capacity	15kW
Max efficiency, Torque	95%, 65Nm
Max RPM	6,000rpm
Gear ratio	8.61
Cooling Method	Air natural cooling
Assemble Structure	Spline

Electromagnetic field analysis

Parameter	Figure	Unit
Max. Power	15	kW
Max. Torque	65	Nm
Speed (Base / Max.)	2,200/6,000	rpm
residual voltage (Constant torque / Constant power)	60/65	V_{dc}
Current density (Max)	7.875	A/mm^2
Pole / Slot	4/36	-

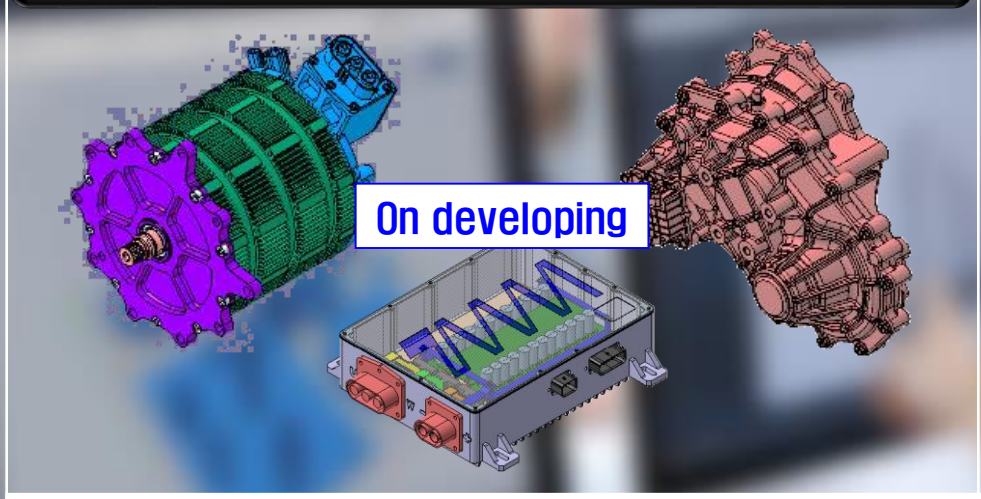


T-N Curve



ELECTRIC VEHICLE PARTS DEVELOPMENT

Aircooling 15kW Separated driving module

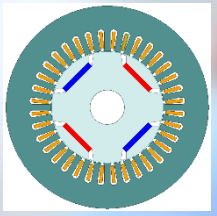


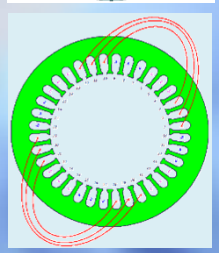
Specifications

Max power capacity	15kW
Max efficiency, Torque	95%, 65Nm
Max RPM	6,600rpm
Gear ratio	9.61
Cooling Method	Air natural cooling
Assemble Structure	Spline

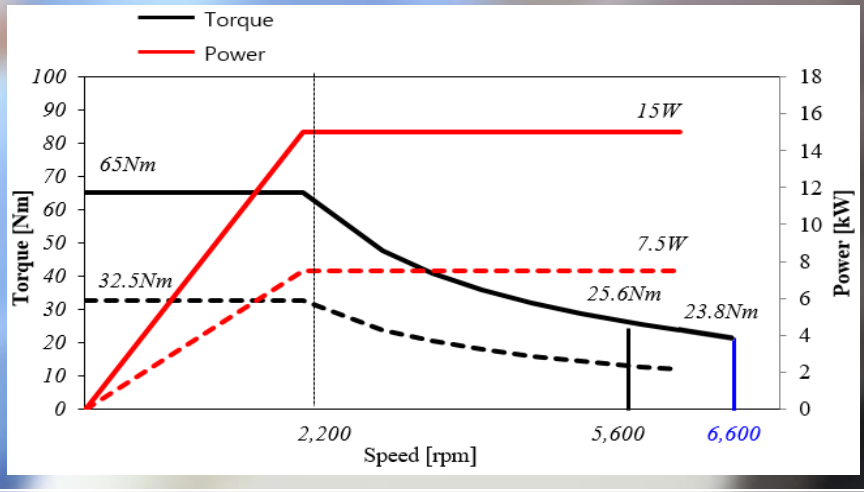
Electromagnetic field analysis

Parameter	Figure	Unit
Max. Power	15	kW
Max. Torque	65	Nm
Speed (Base / Max.)	2,200/6,600	rpm
residual voltage (Constant torque / Constant power)	60/65	V_{dc}
Current density (Max)	7.875	A/mm^2
Pole / Slot	4/36	-



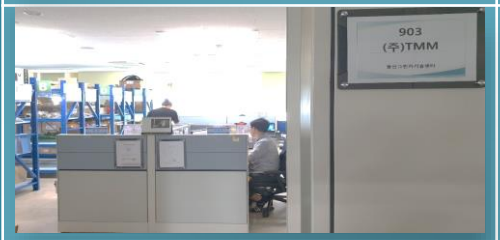
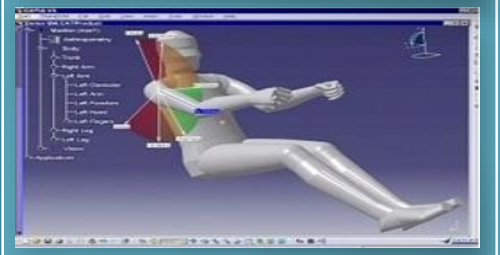
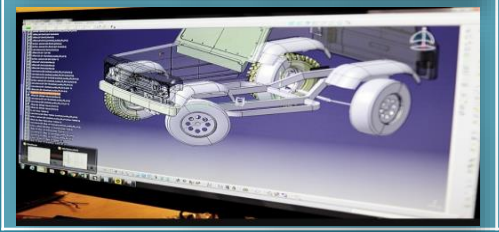


T-N Curve



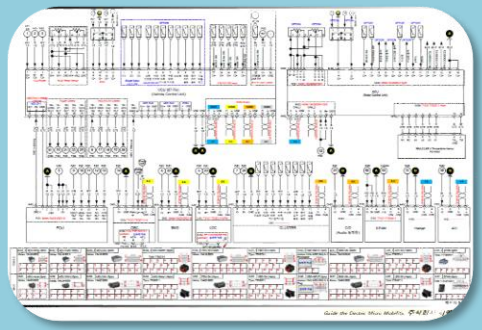
ELECTRIC VEHICLE PARTS DEVELOPMENT

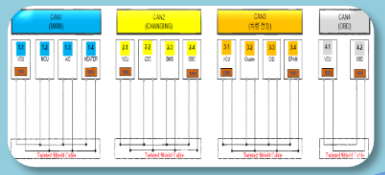
Development field

TMM	Motor production line	Inverter production line	Car assembly line
			Preparing
			 
			 
			

KEY TECHNOLOGY

- EV performance-design technology
- EV Wiring Harness Assembly
- CAN system



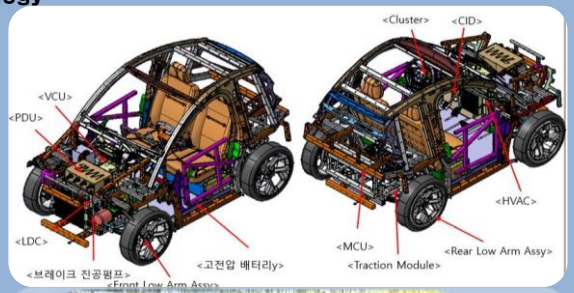


<Micro EV electrical system >

EV system design

EV LAY-OUT

- Center of gravity design technology
- Driving module Lay-out design
- Hardness design

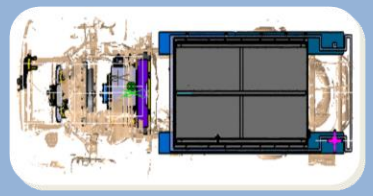


<Micro EV Lay-out Design>

EV PRODUCTION

Power train module design&analysis

- Small quantity production
- Mass production
- Remodeled vehicle production

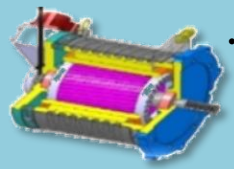


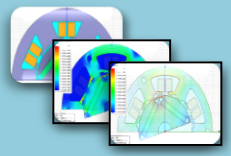
<Remodel 1Ton EV>

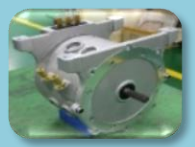
<Micro EV Rendering>

<Produce Micro EV>

- Electromagnetic field analysis
- motor design, inverter design







<110KW Traction Module>

<9KW hydrogen car compressor>

CERTIFICATION

MINISTRY OF LAND

Permission to make micro size, small size Tw
o-wheeled Vehicle

국토교통부
Ministry of Land, Infrastructure and Transport

MINISTRY OF SCIENCE AN
D ICT(MSIT)

R&D Center CERITIFICATION

koita 과학기술정보통신부
Ministry of Science and ICT

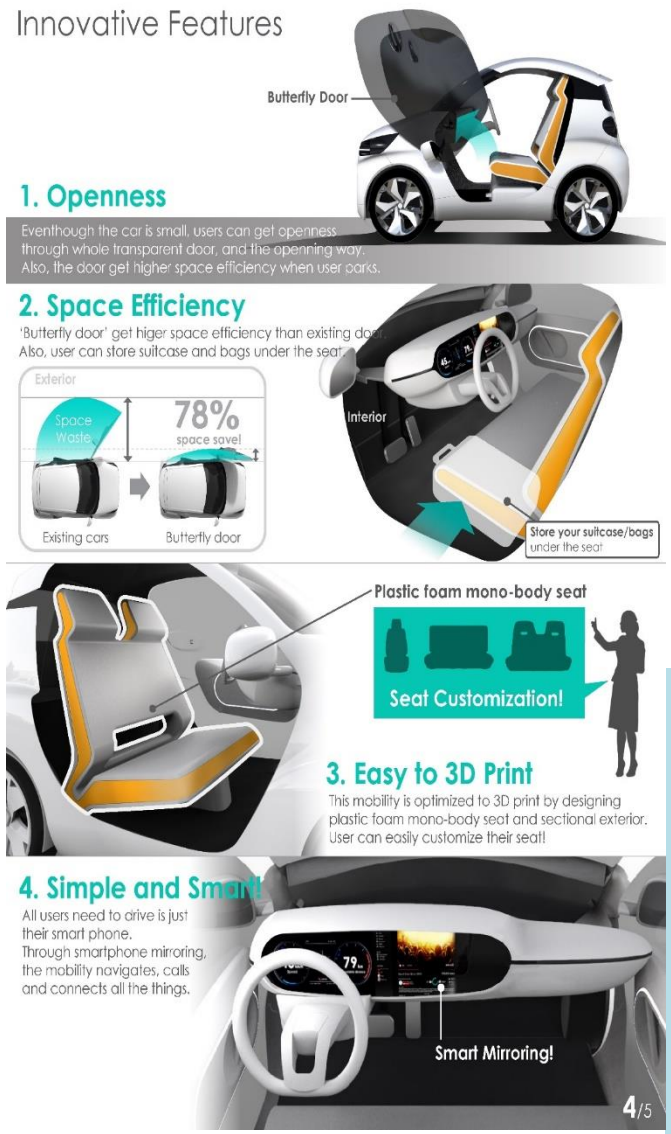
MINISTRY OF LAND

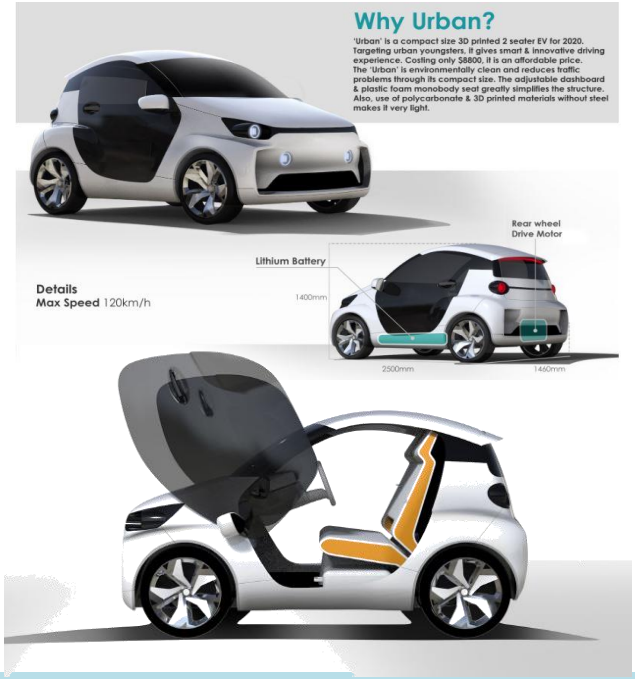
Permission to make micro size,
small size, mid size Sedan,
Commercial Vehicle, Truck

국토교통부
Ministry of Land, Infrastructure and Transport

Certification and Awards

2019.09 IDEA Design award winner





INTERNATIONAL DESIGN EXCELLENCE AWARDS

2019 Finalist

Urban

Automotive & Transportation

Designed by Yun-woo Jeong, Kyo-hwe Goo, Ga-eul Han, Cho-eun Park & Seung-hoon Lee of Disegno19, UNIST
For TMM

Qin Li, IDSA
IDSA Board Chair, 2019-2020

Chris Livaudais, IDSA
IDSA Executive Director

WOOSU TMM

CLEAN & HEALTHY

Innovative leader of future automotive