



*the First Company in Korea for Micro EV*

*WOOSU Technology Micro Mobility*

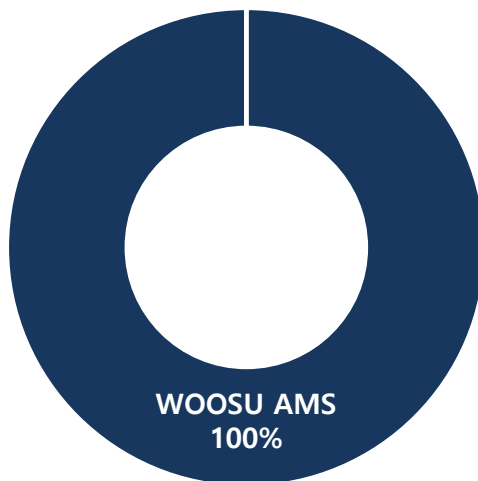


# 1. Company Profile \_ WOOSU TMM Overall & Organization

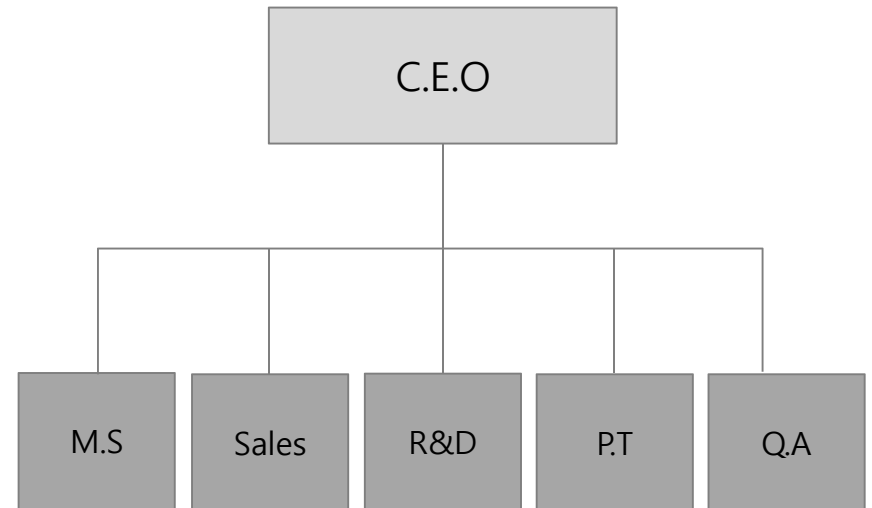
## Overall

|                  |   |
|------------------|---|
| <b>Name</b>      | WOOSU TMM Co.,Ltd.                                |
| <b>Establish</b> | 2018  |
| <b>CEO</b>       | Jongsang, Noh                                     |
| <b>Type</b>      | Venture company                                   |
| <b>Employees</b> | 16  |
| <b>Business</b>  | Develop, manufacture, sales for Electric Vehicles |
| <b>Adress</b>    | #903, 362-11, Jongga-ro, Jung-gu, Ulsan, Korea    |

### Shareholder



## Organization



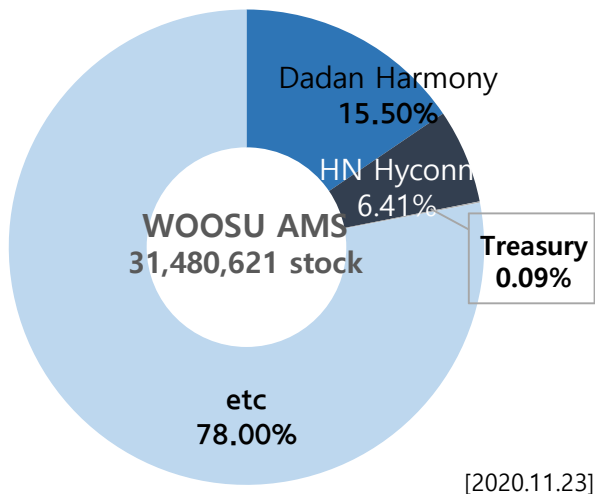
|           |             |               |             |          |
|-----------|-------------|---------------|-------------|----------|
| ·Finance  | ·Sales      | ·Design       | ·Production | ·Quality |
| ·Account  | ·Purchasing | ·Analysis     | ·EV         | ·A/S     |
| ·Managing | ·Marketing  | ·Verification | ·System     |          |
|           |             |               | ·Module     |          |

# 1. Company Profile \_ Group Overall & Organization

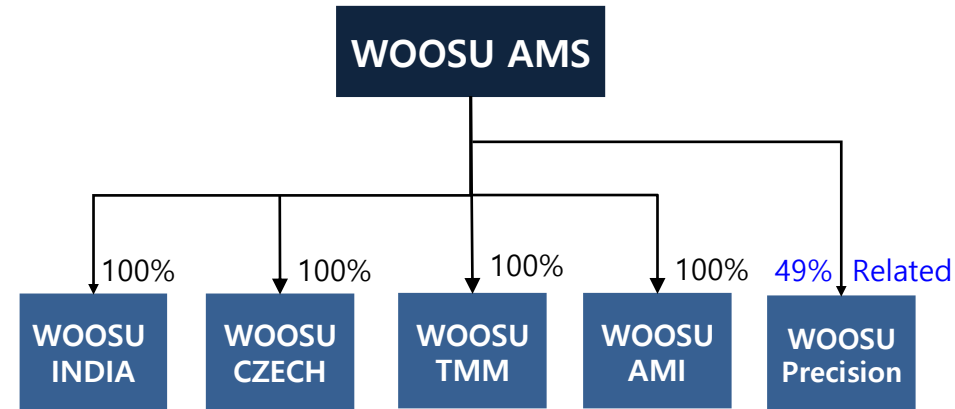
## Overall

|                  |  |
|------------------|--|
| <b>Name</b>      | WOOSU AMS Co.,Ltd.                           |
| <b>Establish</b> | 1983 / Changwon-si, Korea                    |
| <b>CEO</b>       | Seon Woo, Kim                                |
| <b>Type</b>      | Listed on KOSDAQ                             |
| <b>Employees</b> | 342 (2020)                                   |
| <b>Business</b>  | Manufacturing of New automotive engine parts |
| <b>Capital</b>   | USD 10 Million dollar                        |
| <b>Sales</b>     | USD \$220M/ Group Total : \$300M ('2019)     |

## Shareholder



## Affiliated and Relationship (2020, 4Q)



### Location

• Chennai, India • Senov, Czech • Ulsan, Korea • Hwaseong, Korea • Ulsan, Korea

### Establish

• 2007 • 2012 • 2018 • 1994 • 2007

### Business

• Shaft complete  
Rail-shift sub

• Rail sub  
CSC

• Micro Mobility  
Traction module  
EV Parts

• HUD Cluster  
Lamp, Mirror

• Shaft Complete  
Park'g Rod

### Capital

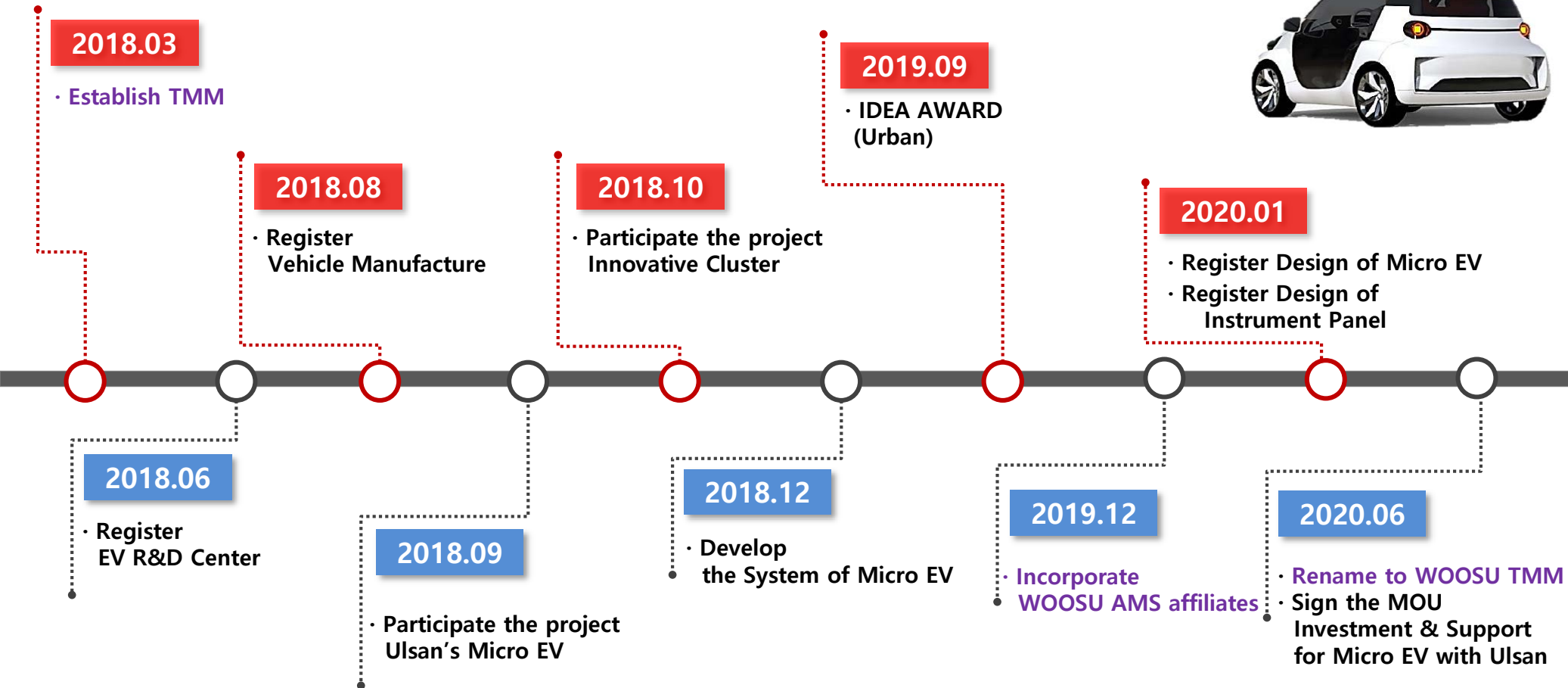
• \$32M • \$4M • \$3M • \$25M • \$50M

### Sales

• \$40M • \$7M • \$0.4M • \$35M • \$81M

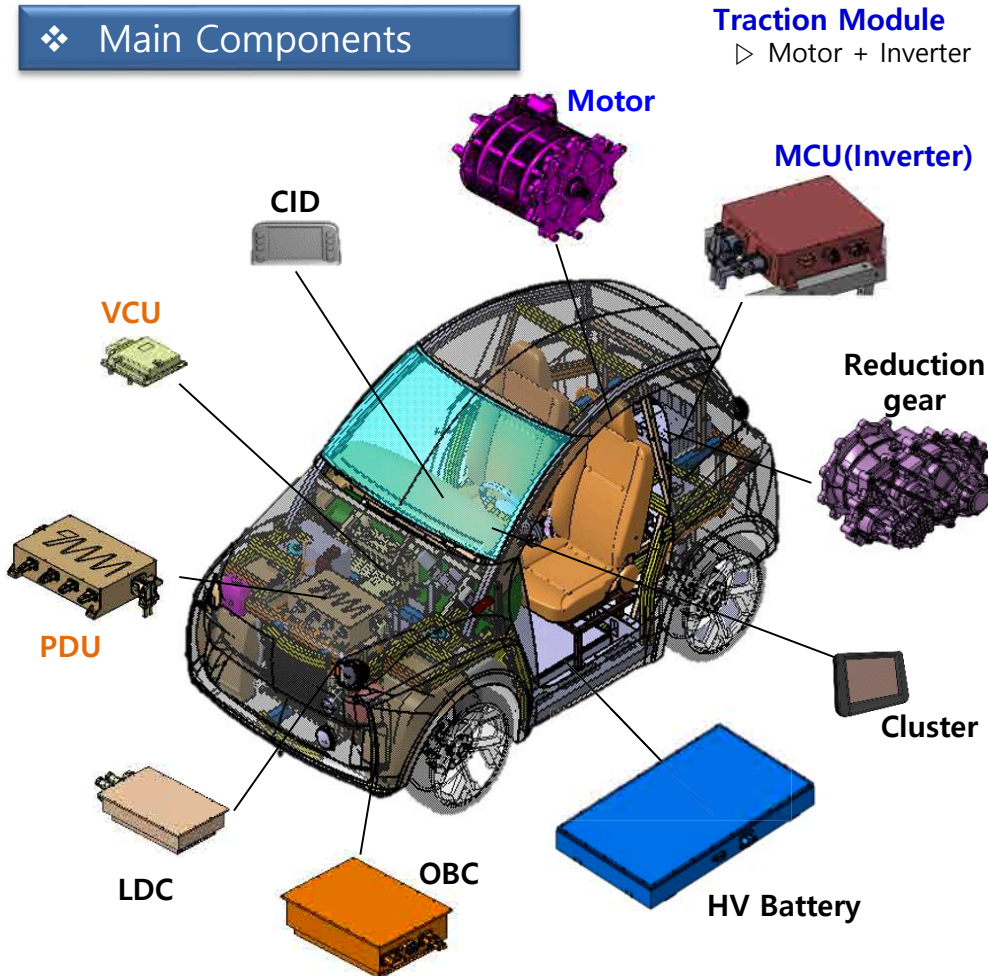
## 2. Company History

### *Global leading Company in Micro EV Industry*



# 3-1. Micro EV \_ Overall

## ❖ Main Components



**Traction Module**  
▷ Motor + Inverter

### System

- ▷ Traction Module + PDU
- ▷ Traction Module + LDC
- ▷ Traction Module + LDC + VCU
- ▷ Traction Module + VCU

- VCU : Vehicle Control Unit
- PDU : Power Distribution Unit
- LDC : Low Voltage DC-DC Converter
- OBC : On-Board Charger
- MCU : Micro Control Unit

## ❖ Specifications

| Contents         | Regulations in Korea | TMM                 |
|------------------|----------------------|---------------------|
| Size(L*W*H)      | 3,600*1,500*2,000mm  | 2,710*1,485*1,560mm |
| Max Power        | 15kW ↓               | Max. 15kW           |
| Weigh            | 600kg ↓              | 600kg ↓             |
| Max Speed        | 80km/h ↓             | 77km/h              |
| Grad ability     | -                    | 25%(STD. GVW)       |
| Mileage/1 Charge | -                    | 140km(MCT)          |

## ❖ Features

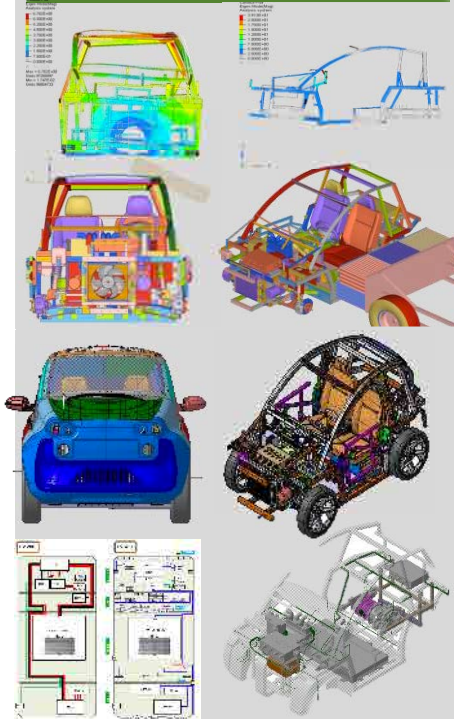
- OEM Level control algorism
  - ↳ Limp Home Mode, Regenerative Brake System
  - Charging Safety Mode etc,
- Localization Supply Chain (Raise Durability)
  - ↳ Traction Module(Motor + Inverter + Reduction Gear)
  - Charging System(OBC + LDC)
  - Vehicle Control(VCU + PDU)
- Mileage per Single Charging(15kW Optimization Designed for heating)
  - ↳ 10kW Battery of Driving 140km (Cylindrical Shell \_ SAMSUNG SDI)



# 3-1. Micro EV \_ Core Technology

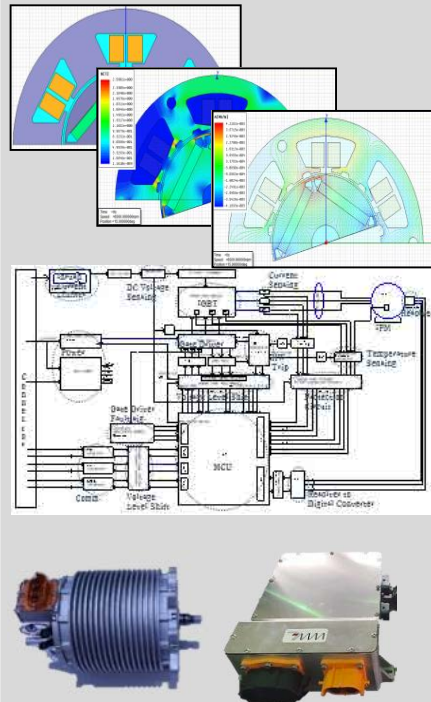
## Micro Electric Vehicle(e-Mobility) Total Solution

### Design Chassis&System



Hardly Body  
Optimized Layout&System

### Development Motor&Inverter



Development a Suitable  
Motor & Inverter

### Manufacture EV&Parts



Manufacture EV  
&Traction Module

### Test

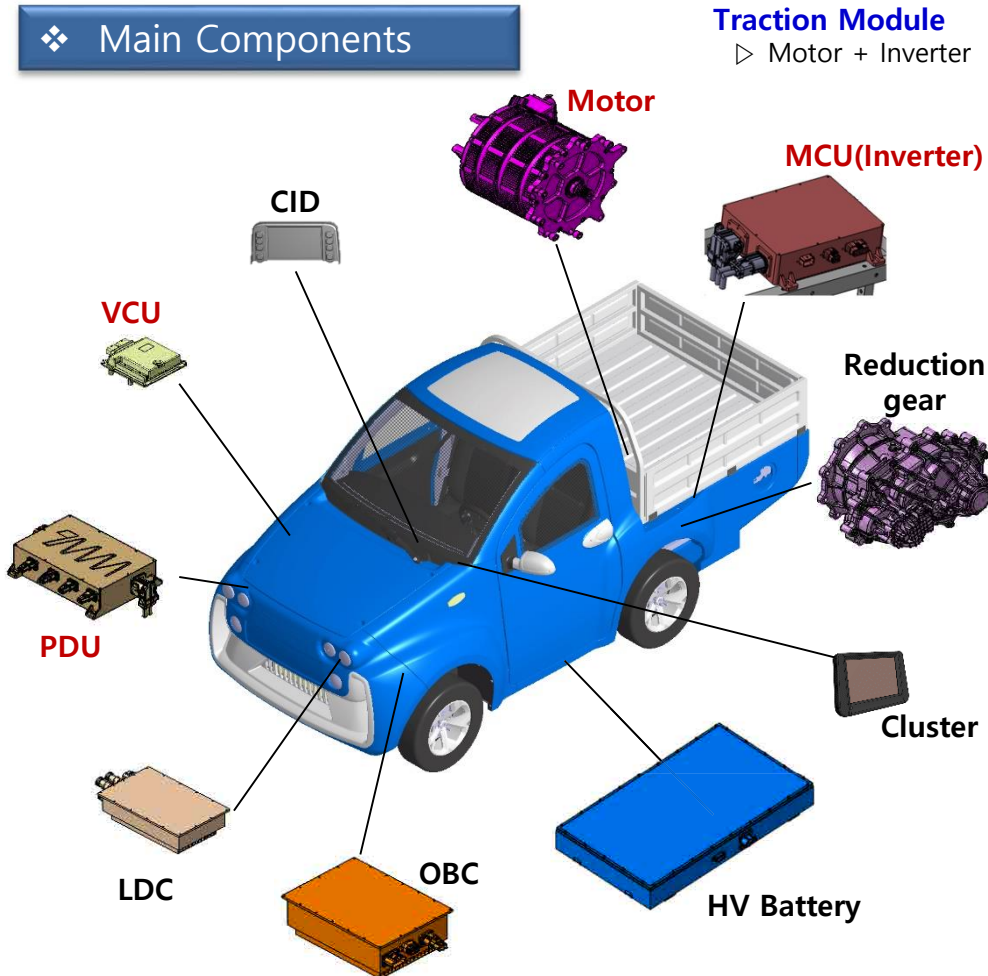


Test  
Durability&Environment

Core Tech. : Design, Manufacture, Test for Micro EV & System

# 3-1. Micro EV Truck \_ Overall

## ❖ Main Components



**Traction Module**  
▷ Motor + Inverter

### System

- ▷ Traction Module + PDU
  - ▷ Traction Module + LDC
  - ▷ Traction Module + LDC + VCU
  - ▷ Traction Module + VCU
- VCU : Vehicle Control Unit
  - PDU : Power Distribution Unit
  - LDC : Low Voltage DC-DC Converter
  - OBD : On-Board Charger
  - MCU : Micro Control Unit

## ❖ Specifications

| Contents         | Regulations in Korea | TMM                 |
|------------------|----------------------|---------------------|
| Size(L*W*H)      | 3,600*1,500*2,000mm  | 2,710*1,485*1,560mm |
| Max Power        | 15kW ↓               | Max. 15kW           |
| Weigh            | 750kg ↓              | 750kg ↓             |
| Max Speed        | 80km/h ↓             | 77km/h              |
| Grad ability     | -                    | 26%(STD. GVW)       |
| Mileage/1 Charge | -                    | 140km(MCT)          |

## ❖ Features

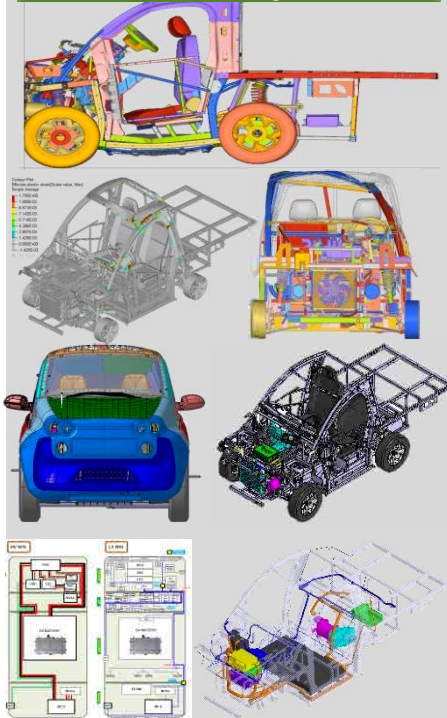
- OEM Level control algorism
  - ↳ Limp Home Mode, Regenerative Brake System
  - Charging Safety Mode etc,
- Localization Supply Chain (Raise Durability)
  - ↳ Traction Module(Motor + Inverter + Reduction Gear)
  - Charging System(OBC + LDC)
  - Vehicle Control(VCU + PDU)
- Mileage per Single Charging(15kW Optimization Designed for heating)
  - ↳ 10kW Battery of Driving 140km (Cylindrical Shell \_ SAMSUNG SDI)



# 3-2. Micro EV Truck \_ Core Technology

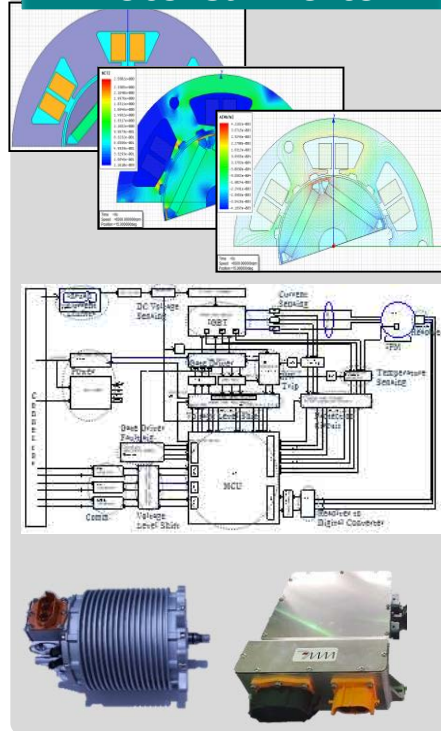
## Micro Electric Vehicle(e-Mobility) Total Solution

### Design Chassis&System



Hardly Body  
Optimized Layout&System

### Development Motor&Inverter



Development a Suitable  
Motor & Inverter

### Manufacture EV&Parts



Manufacture EV  
&Traction Module

### Test



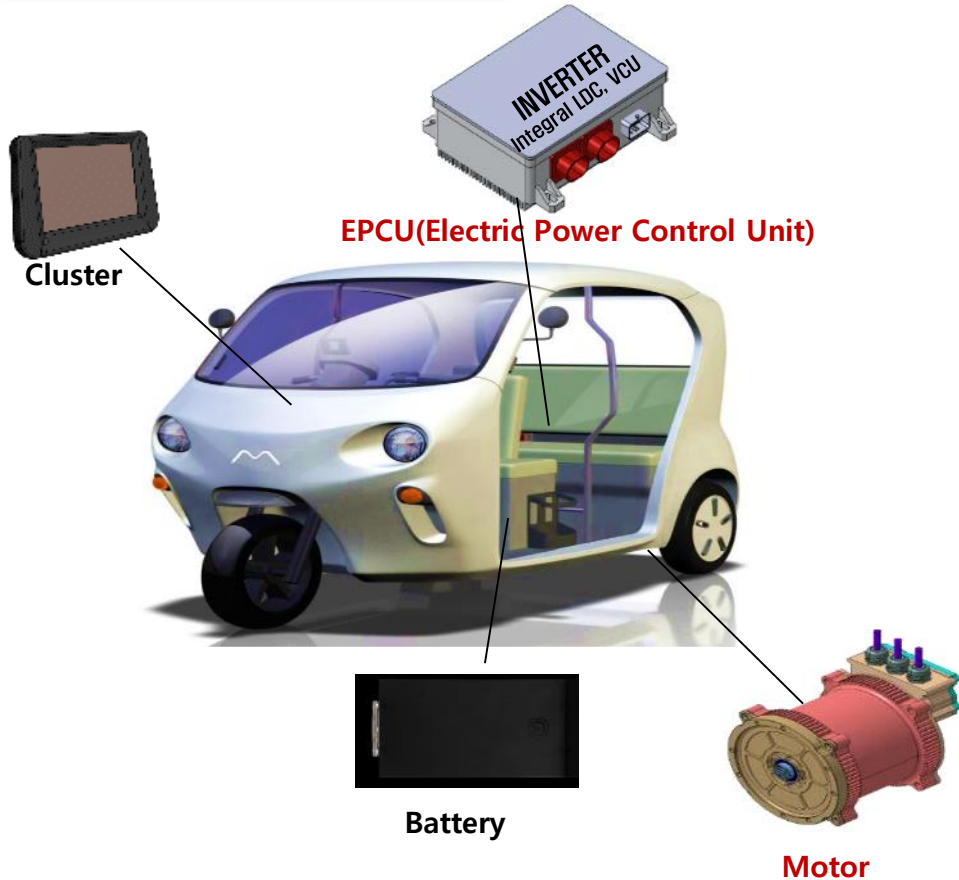
Test  
Durability&Environment

Core Tech. : Design, Manufacture, Test for Micro EV & System



# 4. e-Rickshaw \_ Overall

## ❖ Components



### System by WOOTU TMM

- ▷ EPCU(Inverter + LDC + VCU)
- ▷ Traction Motor
- ▷ Swappable battery

### Rickshaw by Maker

- ▷ System provided from WOOSU TMM
- ▷ Battery & Cluster needs developing
- WOOSU TMM has infra who can supplier

## ❖ Specifications

| Contents         | Values              |
|------------------|---------------------|
| Size(L*W*H)      | 1,350*2,650*1,700mm |
| Max Power        | Max. 3.5kw          |
| Weigh            | 380kg ↓             |
| Max Speed        | 43km/h              |
| Grad ability     | 10%(STD. GVW )      |
| Mileage/1 Charge | 40km(MCT)×2         |

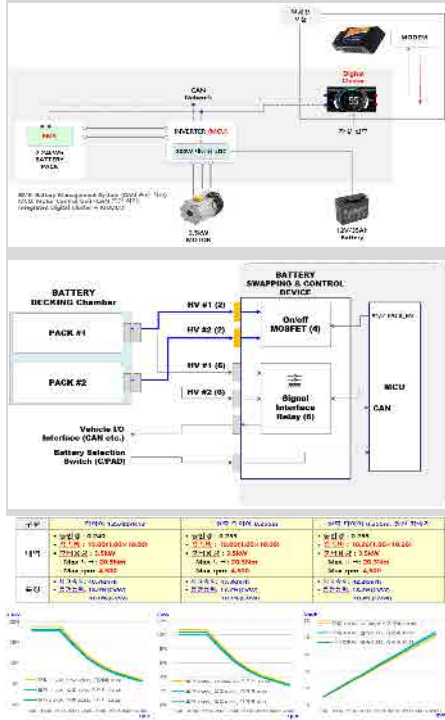
## ❖ Features – WOOSU TMM

- Integral Module(Inverter + LDC + VCU)
  - ↳ Limp Home Mode, Regenerative Brake System
- Swappable Battery
  - ↳ Battery : 2.24kWh X 2pack
  - ↳ User click a swap button, Battery has change the connection.
- Safety Driving and Algorism
  - ↳ Safety function, Optimized driving with monitoring Battery State.

# 4. e-Rickshaw \_ Core Technology

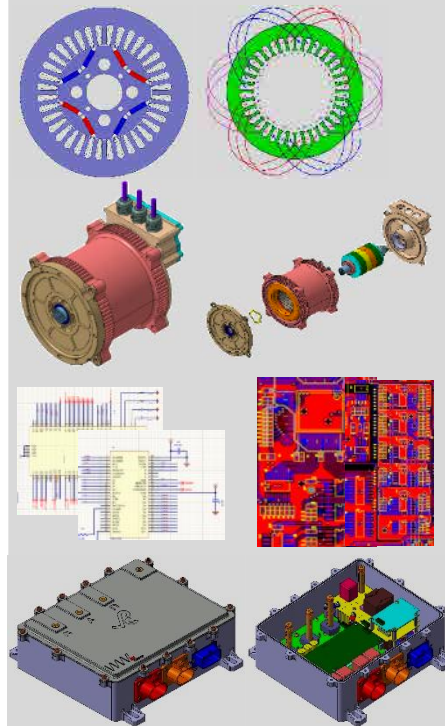
## e-Rickshaw(3 Wheeler) Total Solution

### EV System Design



EV System Rickshaw Performance

### Motor&Inverter



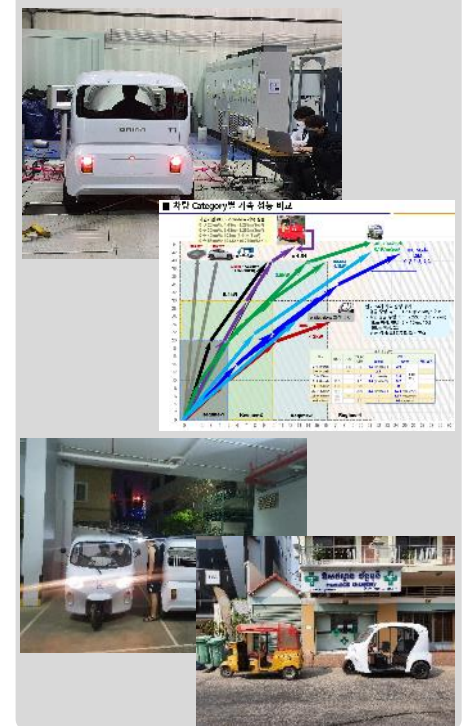
Analysis the Magnet Field Design the Circuit & Logic

### Algorism



EPCU Software Control Algorithm

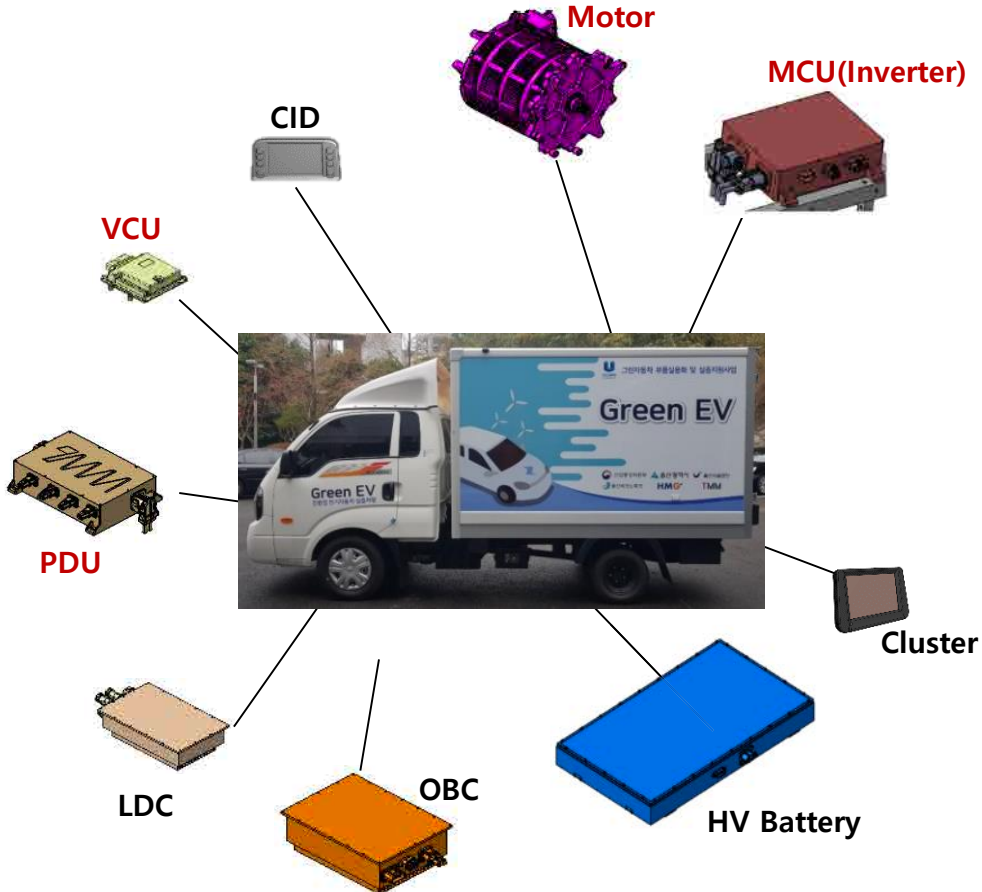
### Local Test



Local Driving Dynamo

# 5. Remodel EV Truck \_ Overall

## ❖ Components



## System

- ▷ EV System Design : WOOSU TMM
- ▷ Motor, Inverter, PDU, VCU: WOOSU TMM
- ▷ Others Parts: Supplier
- ▷ Supplier's Spec. requested by WOOSU TMM

## ❖ Specifications

| Contents         | Values              |
|------------------|---------------------|
| Size(L*W*H)      | 5,430*1,750*2,085mm |
| Max Power        | Max. 150kw          |
| Weigh            | 2,500kg ↓           |
| Max Speed        | 120km/h             |
| Grad ability     | 26%(STD. GVW)       |
| Mileage/1 Charge | 120km(STD. MCT)     |

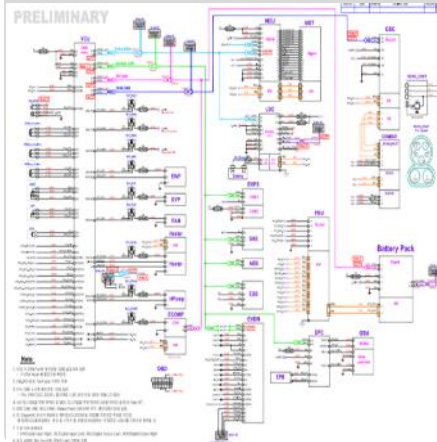
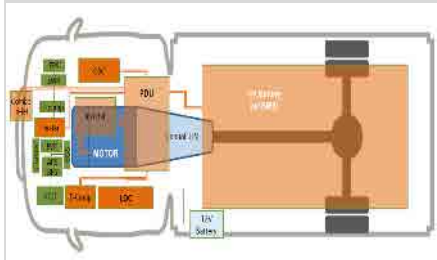
## ❖ Features

- OEM Level control algorism
  - └ Limp Home Mode, Regenerative Brake System
  - └ Charging Safety Mode etc,
- Localization Supply Chain (Raise Durability)
  - └ Traction Module(Motor + Inverter by WOOSU TMM)
  - └ Charging System(Quick and Slow)
  - └ Vehicle Control
- Mileage per Single Charging(120kW Optimization Designed for heating)
  - └ 33.4kW Battery of Driving 120km

# 5. Remodel EV Truck \_ Core Technology

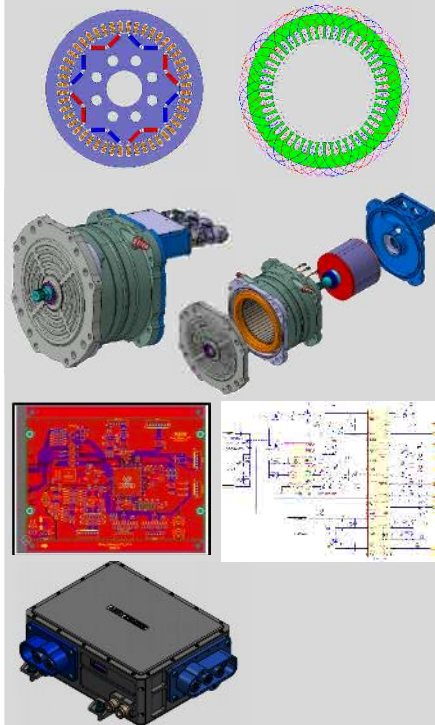
## Electric Vehicle Total Solution

### EV System Design



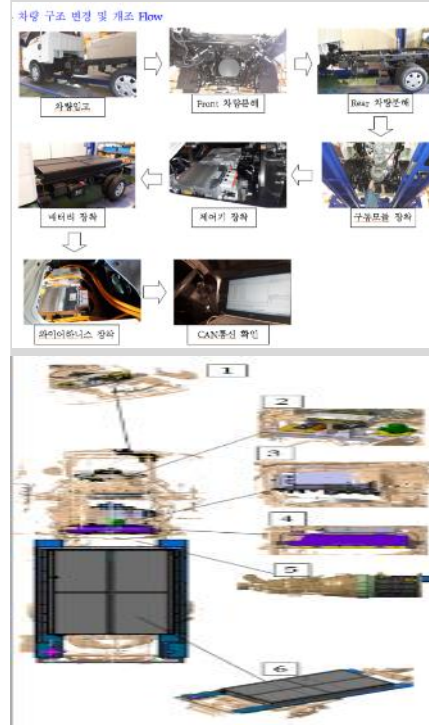
EV System  
EV Truck Performance

### Motor&Inverter



Analysis the Magnet Field  
Design the Circuit & Logic

### Product&Remodel



Remodel to EV Truck  
Control Algorithm

### Local Test

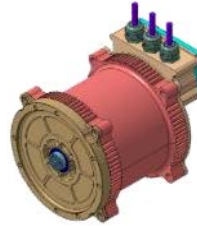
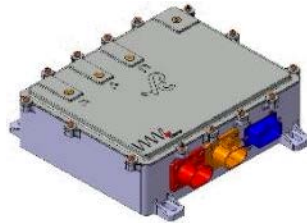


Local Driving  
Dynamo

Core Tech. : Design, Manufacture, Test for EV & System

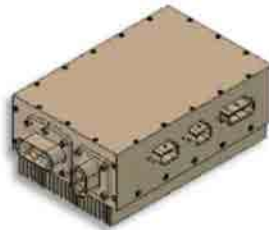
# 6. Components Portfolio

## 3.5kW Traction Module



- Max Power: 3.5kW
- Efficiency : 95%
- RPM: 4,500
- Air cooling

## 15kW Traction Module



- Max Power: 15kW
- Efficiency : 95%
- RPM: 6,000
- Air cooling

## 120kW Traction Module



- Max Power: 120kW
- Efficiency : 95%
- RPM: 11,500
- Water cooling

# 7. Partner



Domestic :



# 8. Certifications

## IDEA Finalist



**INTERNATIONAL DESIGN EXCELLENCE AWARDS**

**2019 Finalist**

Urban

Automotive & Transportation

Designed by Yun-woo Jeong, Eyo-hye Goo, Gae-hil Han, Che-eun Pa & Seung-hoon Lee of DesignTS, UNIST for TMM

On 11/2019  
IDEA Board Chair, 2019-2020

On 10/2019  
IDEA Executive Director

## Patented the Vehicle Design



**디자인등록증**  
CERTIFICATE OF DESIGN REGISTRATION

등록번호 제 30-1040519 호  
Application Number 30-2019-0027434 호

출원번호 제 30-2019-0027434 호  
Application Number 2019년 06월 10일

출원일 2019년 06월 10일

발급일 2020년 01월 02일

발급처 심사 등록  
(Korean Intellectual Property Office)

출원품 Class 제12류  
디자인의 대상이 되는 물품의 종류에 관한 것  
자동차용 인스트루먼트 패널

디자인권자 (Owner) 특허사양안에 기재

출원자 (Applicant) 특허사양안에 기재

위의 디자인은 「디자인보호법」에 따라 디자인등록원부에 등록되었음을 증명합니다.  
This is to certify that, in accordance with the Design Protection Act, a design has been registered at the Korean Intellectual Property Office.

2020년 01월 02일

특허청장  
COMMISSIONER  
KOREAN INTELLECTUAL PROPERTY OFFICE  
박원주

## Patented the Instrument Panel Design



**디자인등록증**  
CERTIFICATE OF DESIGN REGISTRATION

등록번호 제 30-1040520 호  
Application Number 30-2019-0027439 호

출원번호 제 30-2019-0027439 호  
Application Number 2019년 06월 10일

출원일 2019년 06월 10일

발급일 2020년 01월 02일

발급처 심사 등록  
(Korean Intellectual Property Office)

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2020년 01월 02일

특허청장  
COMMISSIONER  
KOREAN INTELLECTUAL PROPERTY OFFICE  
박원주

## Production License for Vehicles

제30조제2항 및 같은 법 시행규칙 제33조제1항(제2항)에 따라 위와 같이 등록을 수리하고 제작등록번호를 배부합니다.

제30조제2항 및 같은 법 시행규칙 제33조제1항(제2항)에 따라 위와 같이 등록을 수리하고 제작등록번호를 배부합니다.

2019년 08월 17일

국토교통부장관 직인

## Production License for Motorcycle

제30조제2항 및 같은 법 시행규칙 제33조제1항(제2항)에 따라 위와 같이 등록을 수리하고 제작등록번호를 배부합니다.

2019년 07월 27일

국토교통부장관 직인

## Certification of R&D Center

제 2018113294 호

### 기업부설연구소 인정서

- 연구소명: (주)티엘엔 기술연구소  
[소속기업명: (주)티엘엠]
- 소재지: 부산광역시 중구 중대로 362-11, 906호(연봉·동신 1리 가톨릭센터)
- 신규년월일: 2018년 06월 27일

과학기술정보통신부

「기초연구진흥 및 기술개발지원에 관한 법률」 제14조의2제1항 및 같은 법 시행령 제27조제1항에 따라 위와 같이 기업부설연구소로 인정합니다.

2018년 6월 25일

한국산업기술진흥협회

**Contact Information : [www.woosu.co.kr](http://www.woosu.co.kr)  
: [www.woosu-tmmev.com](http://www.woosu-tmmev.com)**



**WOOSU AMS  
Head Quarter**

**Tel : +82 55-274-5011**

**Add. : 62, Wollim-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do, Republic of Korea**

**WOOSU AMS  
Ulsan Plant**

**Tel : +82 52-264-8011**

**Add. : 40-5, Sanjeonhuri-ro, Sangbuk-myeon, Ulju-gun, Ulsan, Republic of Korea**



**WOOSU Precision**

**Tel : +82 52-912-0005**

**Add. : 14-23, Gilcheonsaneop 3-gil, Sangbuk-myeon, Ulju-gun, Ulsan, Republic of Korea**



**WOOSU TMM**

**Tel : +82 52-245-7395**

**Add. : 362-11, Jongga-ro, Jung-gu, Ulsan, Republic of Korea**