Ningbo Auto-Real Technology Co.,LTD

宁波里尔汽车科技有限公司

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❑ Profile

Ningbo Auto-Real Technology Co., Ltd. was established in 2015, located in the High-tech Zone, Ningbo, Zhejiang Province, China. It is a high-tech enterprise specializing in the **design, simulation analysis, calibration, and testing of power systems** for road, off-road, marine, and aircraft applications.

- **Over 58** staff members in total.
- Have completed 20+ cooperative development projects with main engine plants and OEMs, as well as applied for 20+ related patents.

❑ Vision, Mission, and Values

1. Vision

- To evolve into a world-class pioneer in green powertrain technology service company.

2. Mission

- All for power, all in service of power.

3. Values

- Put customers first and contributors at the core.
- Embrace collaboration, strive for excellence.

❑ Honors

Profile

Auto-Real is a national high-tech enterprise, a small and medium-sized specialized and innovative enterprise in Ningbo, and an innovative demonstration enterprise in the high-tech zone. It owns the Ningbo Municipal Engineering Technology Center and has led the revision of relevant international standards in the industry multiple times. It undertakes major scientific and technological special projects in the district and owns over 10 authorized invention patents and over 20 utility model patents.




Awards


❑ Business Scope

Road and off-road engine development

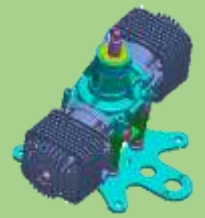
- High-efficiency gasoline engine development
- Road and road-off diesel engine development
- Range extended hybrid controller development

Outboard marine engine development

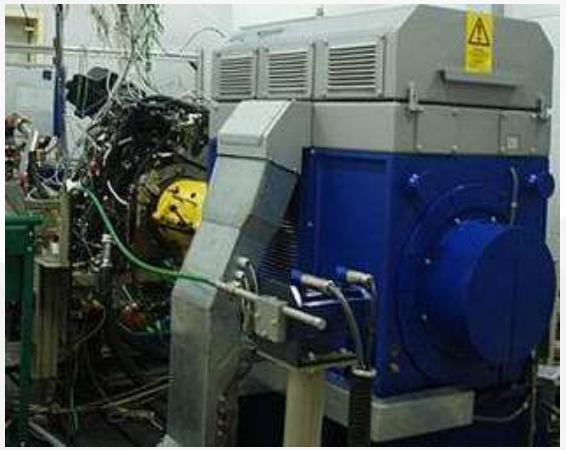
- Vertical shaft gasoline outboard engine development
- Horizontal shaft diesel outboard engine development
- Electric outboard engine development

Aircraft engine and power generation units

- 24V car parking air conditioning battery series
- Single-cylinder diesel engine
- Diesel generator sets



❑ Device Resources



Engine performance test bench

Single-cylinder engine performance test bench

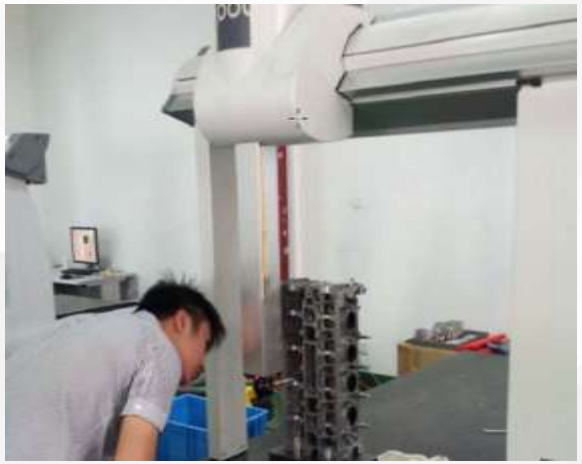
High-power energy cabinet

Laser welding machine for battery cells

Performance testing equipment

CAN bus hacking tool

Three-dimensional coordinate measurement



Laser scanner

❑ Partners

Passenger vehicles
乘用车

Commercial vehicles
商用车

Marine and aircraft
船用及飞行器

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❑ Technical Capacity

Power system development capacity

- **Road and off-road engine development**
- **Outboard marine engine development**
- **Aircraft engine and power generation units**

Design

- Competitive product reverse scanning, modeling
- 3D model design
- 2D drawings design
- Technical documentation preparation, etc.

CAE

- One-dimensional thermodynamic analysis
- Combustion within the cylinder, airway, and combustion chamber optimization analysis
- Airway, water jacket, and other CFD analysis
- Cylinder body, cylinder head, crankshaft thermal coupling strength analysis...

Test

- Performance development
- Rig calibration (fuel injection, post-processing, etc.)
- Vehicle basic calibration
- Extended-range controller vehicle calibration and testing, etc.

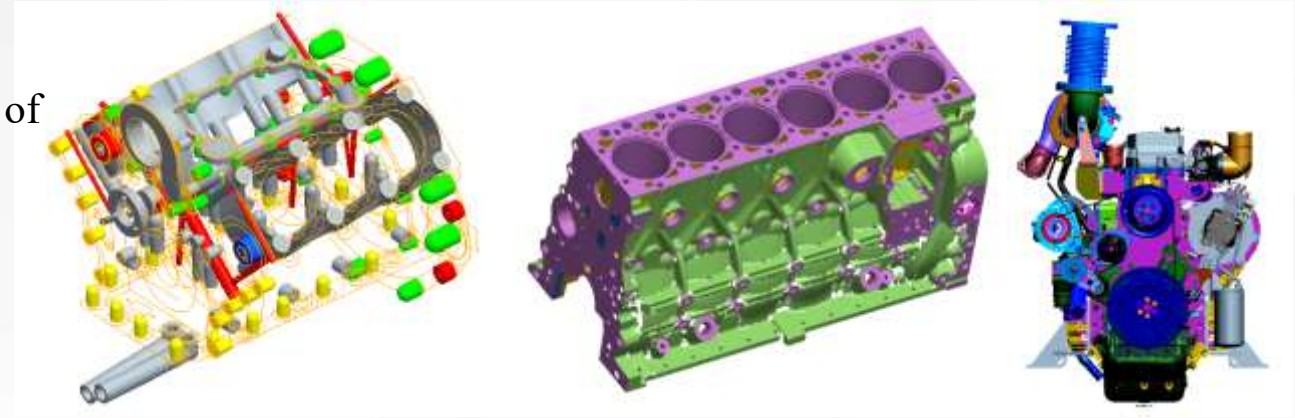
❑ Design Development - Structural Design

➢ Conceptual design

-Frame assembly of the complete engine

-Definition of system conceptual schemes, definition of main parameters

-3D model design



➢ Layout design

-Cabin layout optimization

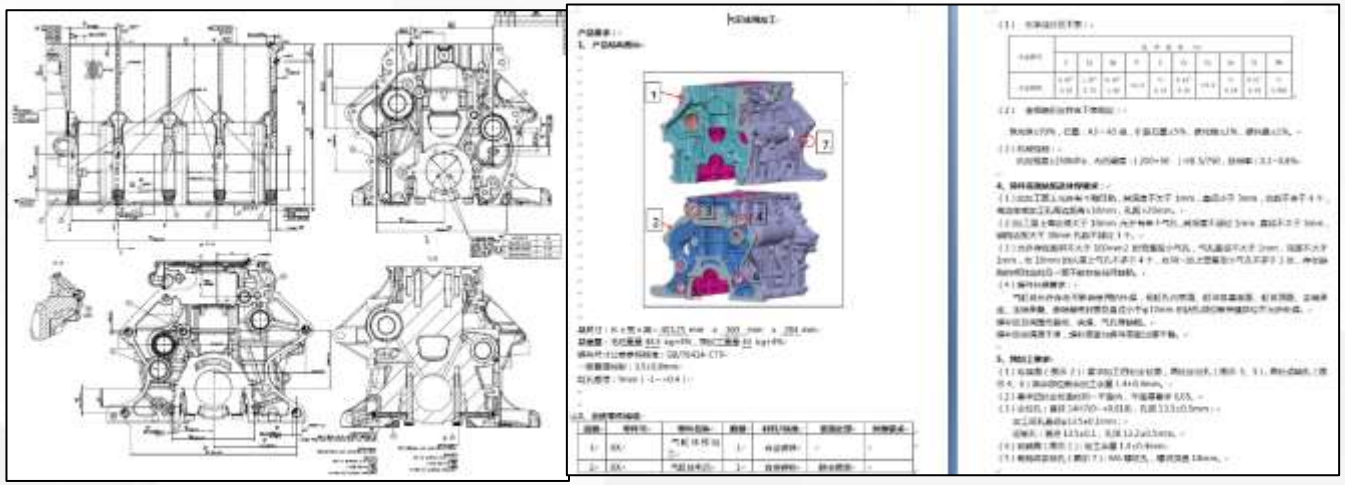
-3D design optimization

➢ Detailed design

-2D drawings design

-Design report, technical documentation preparation

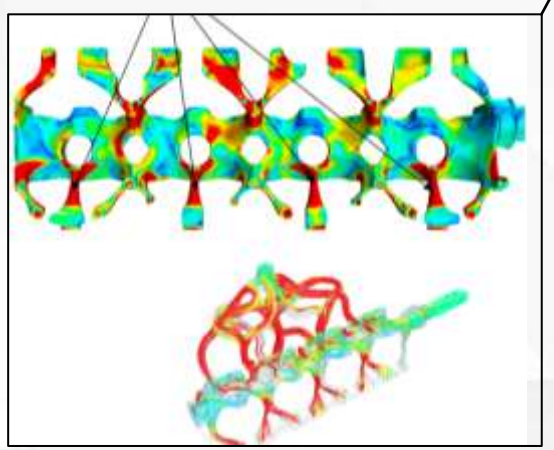
-Dimensional chain, overall layout verification



❑ Design Development-CAE Analysis

Performance Analysis

- Thermodynamic analysis of engines
- One-dimensional cooling system analysis
- One-dimensional lubrication system analysis



CFD Flow Analysis

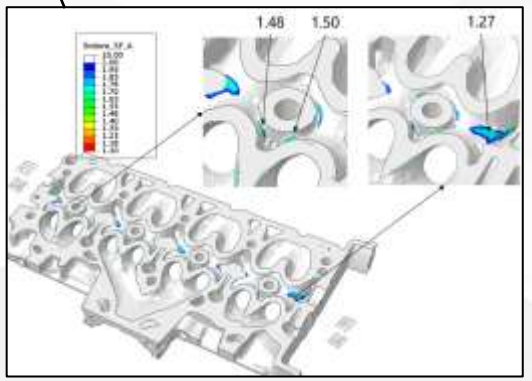
- CFD analysis of in-cylinder flow
- Cooling water jacket fluid analysis
- CFD analysis of intake and exhaust ducts
- CFD analysis of intake and exhaust manifold
- Vehicle thermal management analysis
- Cabin thermal management analysis

FEA Strength Analysis

- Cylinder block and head thermal coupling analysis
- Crankshaft torsional vibration, strength analysis
- Piston structure strength analysis
- Connecting-rod structure strength analysis
- Shell, support strength analysis
- Gear tooth, spline strength analysis
- Bearing life analysis
- Valve train simulation analysis
- Bolt axial force calculation analysis

NVH Analysis

- Powertrain modal analysis
- Modal analysis of components
- Suspended cushion matching analysis



❑ Design Development-Testing Verification

Performance Calibration

- Performance development
- Engine original emission calibration
- Aftertreatment calibration

Mechnical Development

- Component fatigue testing
- Piston cylinder barrel development test
- Cylinder Block and Head thermal load test
- Piston thermal load test
- Lubrication system function test
- Cooling system function test
- Timing system function test
- Respiratory system function test
- Front-end wheel system function test

Bench Durability

- Cool and thermal shock test
- Full load test
- Variable condition durability test

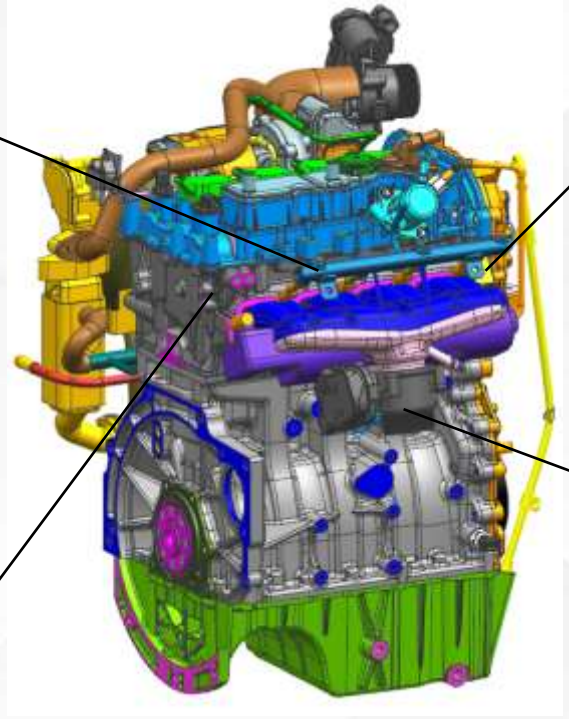
Vehicle Test

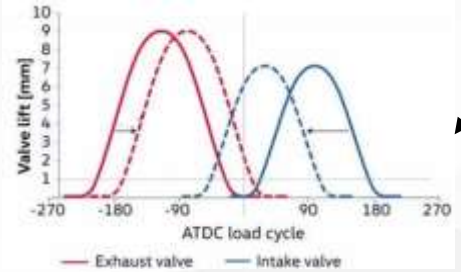
- Range extender controller debugging
- Vehicle basic calibration
- High-temperature adaptability calibration
- Altitude adaptability calibration
- High-altitude cold adaptability calibration
- Road reliability test
- User trial usage

❑ Efficient gasoline engine development

500 bar high-pressure injection system

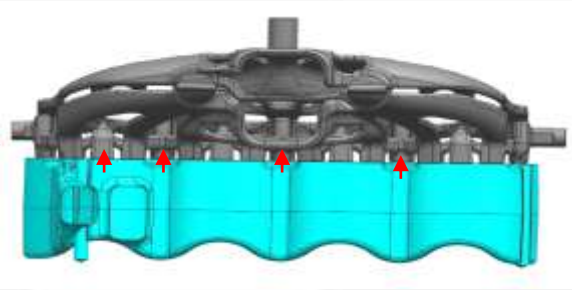
High-efficiency combustion system





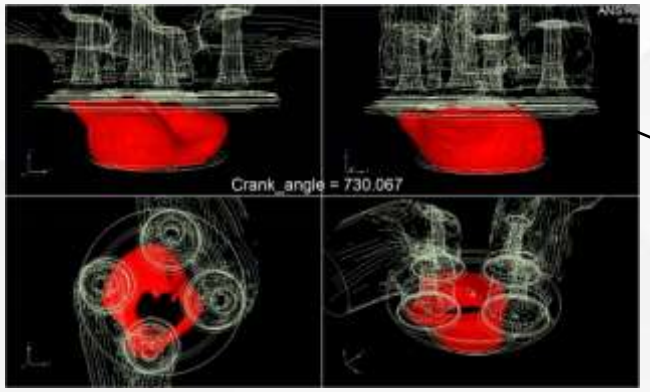
Deep Miller Cycle development

BTE maximum thermal efficiency can be up to 44%.

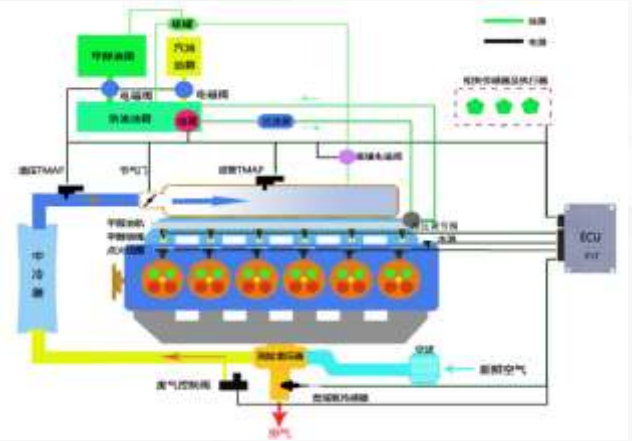


Advanced thermal management design

❑ Development of low-carbon and zero-carbon fuel internal combustion engines - Hydrogen, Methanol, Ammonia



Burning development



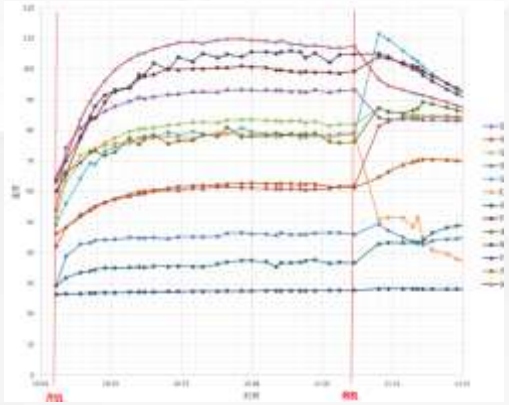
Cold start dual-fuel system

Durability

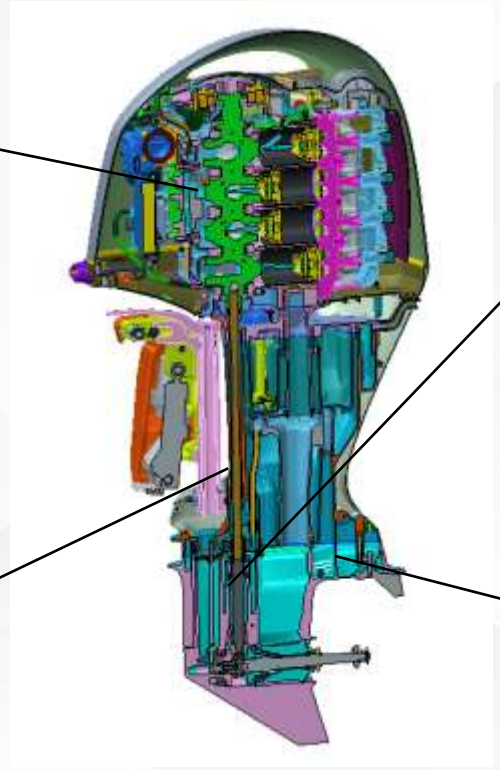
Emission test

Engine optimization development capable of adapting to low-carbon and zero-carbon fuels such as alcohols and hydrogen.

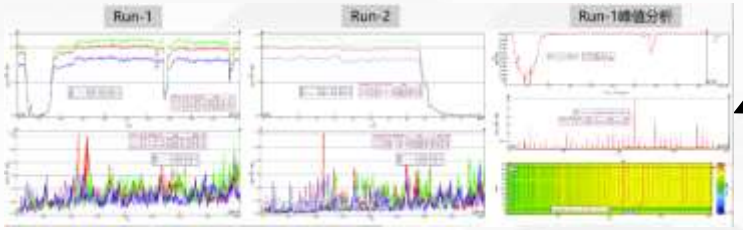
❑Outboard marine engine development-Gasoline, Diesel and Electric



Cabin thermal management development

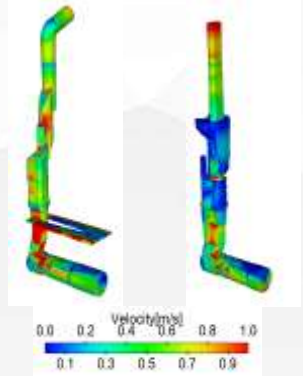


Transmission system strength optimization



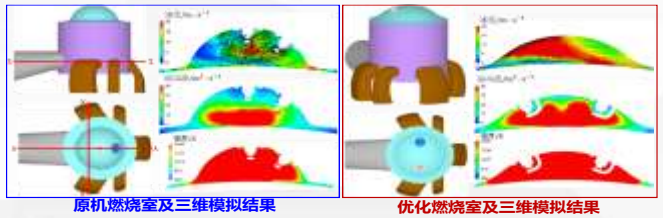
Suspended and NVH matching

Development of multi-platform vertical and horizontal axis serialized product

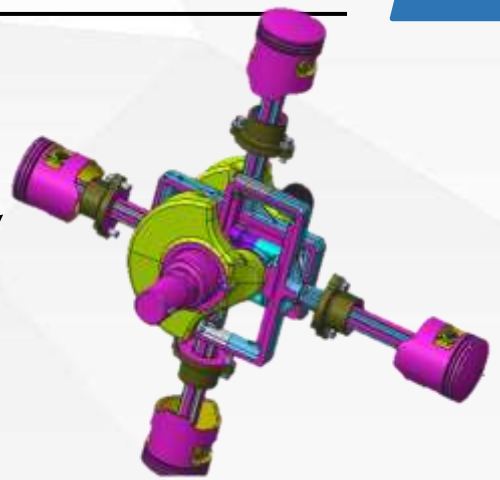


Exhaust channel resistance optimization

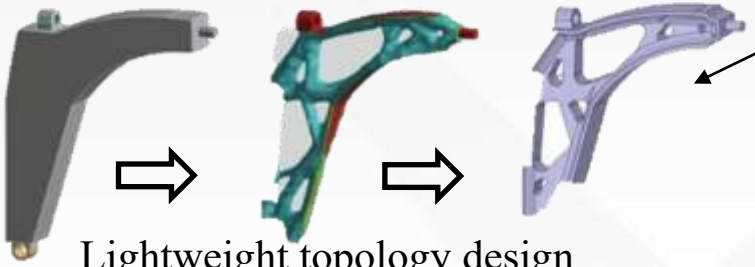
❑ Aerospace engine development



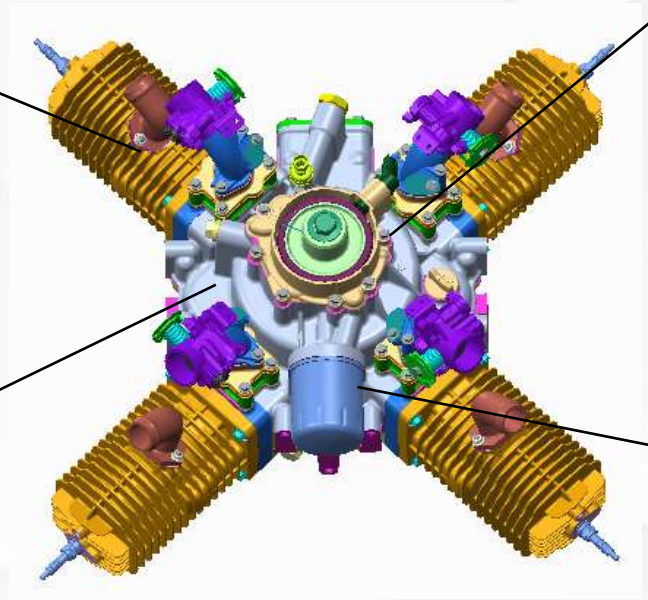
Two-stroke combustion system optimization



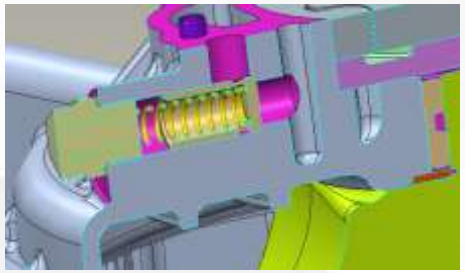
Design of moving parts for complex configurations



Lightweight topology design

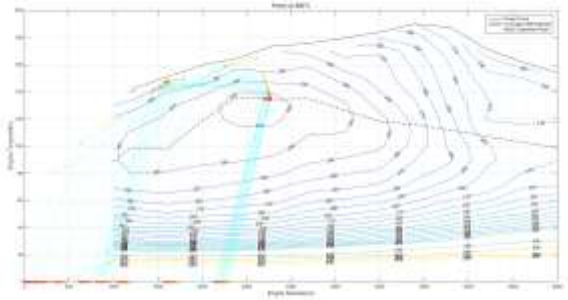


Development of drone power units with various configurations



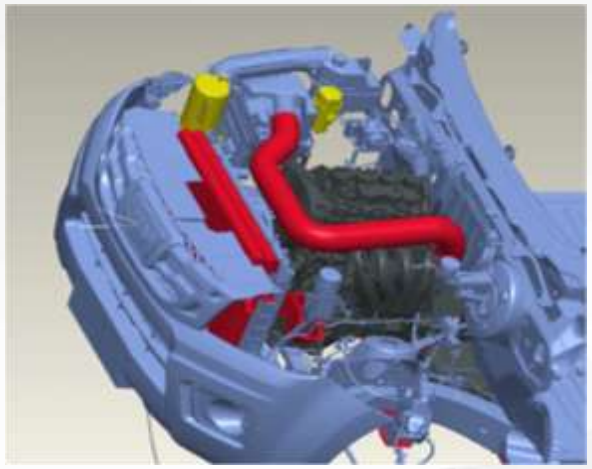
Active Lubrication System Design

❑ Range-Extender system development



System matching simulation

Controller hardware and software development



Structural layout optimization

Development of road and off-road range extended hybrid systems

Test development experiment

❑ Technical Service

Vehicle benchmarking big data analysis technical services

- Engine system benchmark analysis
- Vehicle performance benchmark analysis
- Analysis of Vehicle Control Strategy

Power System

- Static scanning, mapping
- Performance test
- Strategy analysis
- Disassemble and analyze, etc.

Vehicle Performance

- Dynamic test
- Economic test
- Emission test
- Handling stability test, etc.

Strategy analysis

- CAN hacking
- Drive, braking, energy management strategy analysis
- DBC documentation preparation
- Strategy model validation, etc.

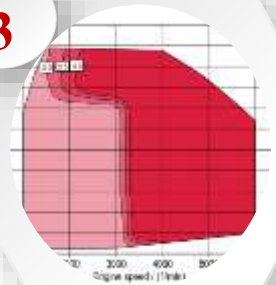
❑ Vehicle benchmarking big data analysis - Powertrain Section

1

➢ Performance Test

- Engine universal characteristic test, friction loss test
- Motor efficiency test
- Battery efficiency testing, charge and discharge, energy density test

3



➢ NVH Test

- Engine bench noise test at 1 meter
- System noise separation test
- Modal testing of key components

5

➢ Data Analysis

- Key assembly and component parameter industry database benchmark analysis
- Key system, component 3D reverse modeling
- Compile a competitive analysis report.

➢ Static measurement

- Powertrain appearance measurement, scanning, layout data mapping
- Centrefold, moment of inertia measurement
- Schematic diagram of key system layout

2

➢ Control Strategy

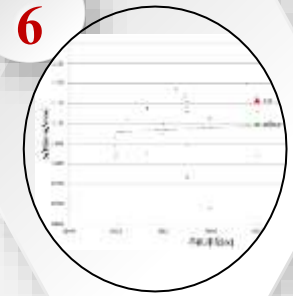
- Testing of combustion parameters such as ignition timing, fuel injection timing, intake and exhaust pressures.
- Control strategy testing for variable actuator systems
- BMS test

4

➢ Disassemble and analyze

- Assembly torque, assembly clearance measurement
- System, component critical dimensions three-coordinate inspection
- Key component material inspection

6



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❑ Engine Development Cooperation Project

Real 里尔汽车

Project Name: 1.5T GDI China VI Phase B design and development

◆Main Engine Plant：

◆Cooperation period：2019~2020

◆Our work includes platform optimization design.

◆Main work includes complete engine numerical modeling and drawings.

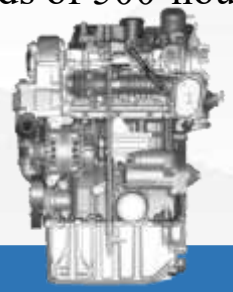
◆Current situation：

1）The 1.5TGDI engine has now completed the bench durability test and the complete vehicle emission test.

2）Performance test results meet development requirements, bench emissions meet National Standard VI.

3）The bench durability test has completed three rounds of 500-hour durability assessment.

4）Mass production time is 2021.



Number	Item	Content
1	Engine Model	CE15
2	Engine type	L4、DOHC、DVVT
3	Displacement（mL）	1496
4	Bore x Stroke（mm）	74.5×85.8
5	Compression ratio	12.5
6	Cylinder block material	Aluminum Alloy
7	Fuel injection pressure（bar）	Side-mounted injector 350bar
8	Maximum power（kW/rpm）	110/6000
9	Power Per Liter（kW/L）	73.5
10	Maximum torque（Nm）	240
11	Torque Per Liter（Nm/L）	160.4
12	Minimum fuel consumption rate（g/kW·h）	220
13	Emission standards	China VI Phase B
14	Mass production status	Mass-produced

❑Engine Development Cooperation Project

Project Name： 1.5T Miller China VI Phase B design and development

◆Main Plant Engine：

◆Cooperation period: 2021

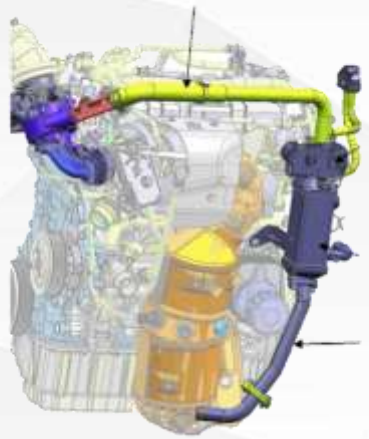
◆Our work includes CAE analysis, structural design, and drawing design.

◆Current situation：

1）The bench durability test and the complete vehicle emission test have been completed.

2）Performance test results meet development requirements.

3）Mass production is in 2022.



Number	Item	Content
1	Engine model	
2	Engine type	L4、DOHC、DVVT
3	Displacement（mL）	1451
4	Bore x Stroke（mm）	73.8x84.7
5	Compression ratio	11.2
6	Exhaust manifold method	Cylinder head integrated exhaust
7	Cylinder block material	Cast iron
8	Fuel injection type	Airway injection
9	Maximum power（kW/rpm）	95/5500
10	Power Per Liter（Kw/L）	65
11	Maximum torque（Nm/rpm）	220/(2200～3400)
12	Torque Per Liter（Nm/L）	152
13	Fuel consumption rate at 2000rpm and 2 bar（g/kW·h）	350
14	Emission standards	China VI Phase B
15	Mass production status	Mass-produced

❑Engine Development Cooperation Project

Project Name： TZ Series Atkinson Cycle gasoline engine development

◆Main Engine Plant：

◆Cooperation period：2022~2023

◆Main technical feature is four-cylinder naturally aspirated.

◆Our main work includes 3D and 2D design of the entire machine, CAE simulation analysis.

◆Current situation：

1）The bench calibration has been completed, and all development objectives have been achieved.

2）Small-scale production is done.

Number	Item	Content
1	Engine type	Naturally aspirated
2	Displacement（L）	1.998
3	Bore x Stroke	Ø86×86
4	Rated power（kW/rpm）	100/5600
5	Power Per Liter（kW/L）	50
6	Maximum torque（Nm/rpm）	175/3200
7	Torque Per Liter（Nm/L）	87.5
8	Compression ratio	13
9	Exhaust manifold	Integrated cylinder head exhaust
10	BSFC（g/kW.h）	216
11	Emission standards	China VI Phase B

❑ Engine Development Cooperation Project

Project Name : Ultra-high thermal efficiency engine development

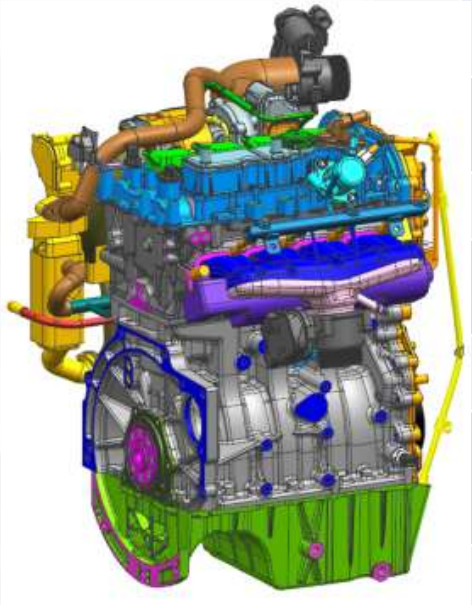
◆Main Engine Plant：

◆Cooperation period: 2023~Present

◆Our work includes complete engine design, simulation analysis, and performance development.

◆Current situation：

1）Prototype trial production is underway.



Number	Item	Content
1	Engine model	H15S
2	Engine type	L4、Direct injection turbocharging
3	Displacement（mL）	1499
4	Bore x Stroke（mm）	72×92
5	Compression ratio	14.5
6	Exhaust manifold method	Integrated exhaust
7	EGR	Low-pressure EGR
8	Fuel injection pressure（bar）	500
9	Maximum power（kW/rpm）	105/5500
10	Power Per Liter（Kw/L）	70
11	Maximum torque（Nm/rpm）	220/2000
12	Torque Per Liter（Nm/L）	147
13	Minimum fuel consumption rate（g/kW·h）	≤193
14	Emission standards	Chinese Satge VI
15	Mass production status	Under development

❑Engine Development Cooperation Project

Project Name： CNG engine design and development

◆Main Engine Plant：

◆Cooperation period：2016

◆Main work includes converting gasoline engines to natural gas internal combustion engines.

◆Our work includes structural design, CAE simulation analysis

◆Current situation：

1）Mass-produced

Number	Item	Content
1	Engine model	
2	Engine type	L4、Naturally aspirated 、i-VVT
3	Displacement（mL）	2378
4	Bore x Stroke （mm）	88.7x96.2
5	Compression ratio	10
6	Exhaust manifold	Traditional
7	Cylinder block material	Cast iron
8	Maximum power （kW/rpm）	100/4800
9	Maximum torque （Nm/rpm）	185/3200
10	Emission standards	Chinese Satge V
11	Mass production status	Mass-produced

❑Engine Development Cooperation Project

Project Name： CNG engine design and development

◆Main Engine Plant：

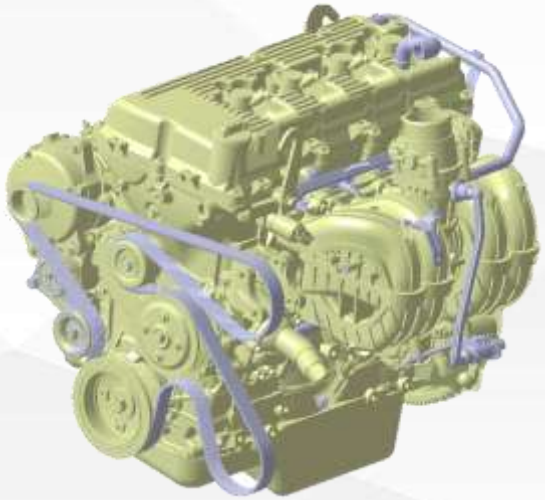
◆Cooperation period：2019

◆Main work includes converting gasoline engines to natural gas internal combustion engines.

◆Our work includes structural design, CAE simulation analysis.

◆Current situation：

1）Mass-produced



Number	Item	Content
1	Engine model	
2	Engine type	L4、Naturally aspirated、DVVT
3	Displacement（mL）	2693
4	Bore x Stroke（mm）	95x95
5	Compression ratio	10
6	Exhaust manifold	Traditional
7	Cylinder block material	Cast iron
8	Maximum power（kW/rpm）	100/4400
9	Maximum torque（Nm/rpm）	235/3600
10	Emission standards	Chinese Satge VI
11	Mass production status	Mass-produced

❑Engine Development Cooperation Project

Project Name： CNG engine design and development

◆Main Engine Plant：

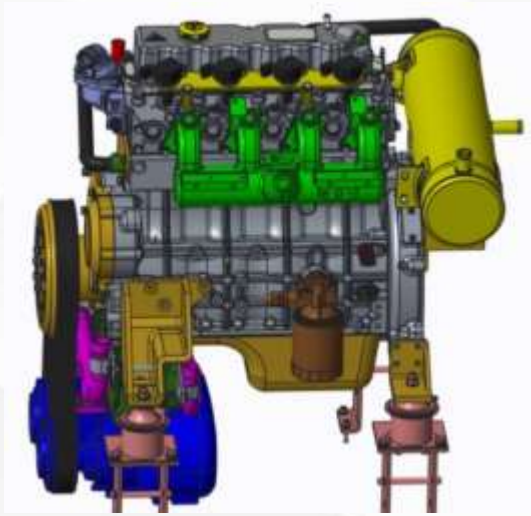
◆Cooperation period：2020

◆Main work includes converting diesel engines to natural gas internal combustion engines.

◆Our work includes structural design, CAE simulation analysis.

◆Current situation：

1）Mass-produced



Number	Item	Content
1	Engine model	
2	Engine type	L4、Naturally aspirated、Atkinson
3	Displacement（mL）	2850
4	Bore x Stroke（mm）	93×105
5	Compression ratio	10
6	Exhaust manifold	Traditional
7	Cylinder block material	Cast iron
8	Maximum torque（Nm/rpm）	100/2200
9	Purpose	Combined Heat and Power (CHP)
10	Emission standards	Non-Road Chinese stage 4
11	Mass production status	Small-scale production

❑ Hydrogen ICE Development

Project Name：2.8L Turbocharged Intercooler Hydrogen Engine Development

◆Customer：

◆Cooperation period：2022~2023

◆Main work concludes converting natural gas engines to hydrogen internal combustio engines.

◆Our work includes structural design, CAE simulation analysis.

◆Current situation：

1）Bench calibration has been completed.

Number	Item	Content
1	Engine model	4E
2	Engine type	L4、Turbocharging with intercooling
3	Displacement（mL）	2776
4	Bore x Stroke（mm）	94×100
5	Compression ratio	12
6	Maximum power（kW/rpm）	75/3200
7	Maximum torque（Nm/rpm）	350/2000
8	Thermal efficiency	38%

❑2.7L Naturally Aspirated Hydrogen Engine

Project Name： 2.7L Hydrogen ICE development

◆Main Engine Plant：

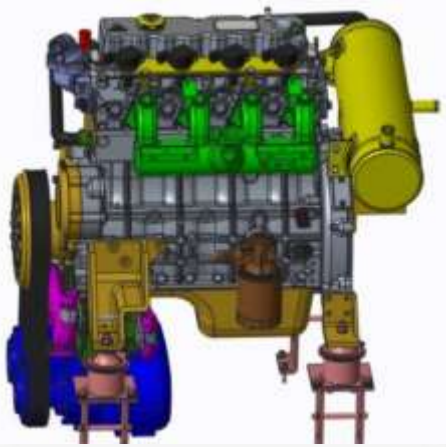
◆Cooperation period：2022~2023

◆Main work includes converting diesel engines to hydrogen internal combustion engines.

◆Our work includes structural design, CAE simulation analysis and bench calibration.

◆Current situation：

1）The structural design and bench calibration have been completed.



Number	Item	Content
1	Engine model	4D
2	Engine type	L4、Naturally aspirated
3	Displacement（mL）	2850
4	Bore x Stroke（mm）	93×105
5	Compression ratio	10
6	Maximum power（kW/rpm）	35/2500
7	Maximum torque（Nm/rpm）	180/2200
8	Thermal efficiency	36%

❑2.0L Turbocharged Direct Injection Hydrogen Engine

Project Name：2.0L supercharged DI hydrogen engine development

◆ Customer：

◆Cooperation period：2022~2024

◆Main work includes development of hydrogen fuel lean-burn dedicated engines.

◆Our work includes cylinder head system structural design, CAE simulation analysis.

◆Current situation：

1）The structural design has been completed.

2）Durability test verification is in progress.

Number	Item	Content
1	Engine model	4GC
2	Engine type	L4、Supercharged direct injection
3	Displacement（mL）	1994
4	Bore x Stroke（mm）	78.5×103
5	Compression ratio	14
6	Maximum power（kW/rpm）	120/4500
7	Maximum torque（Nm/rpm）	260/1700~3500
8	Thermal efficiency	43%

❑ Engine Development Cooperation Project

Project Name： 3.6L diesel engine design and development

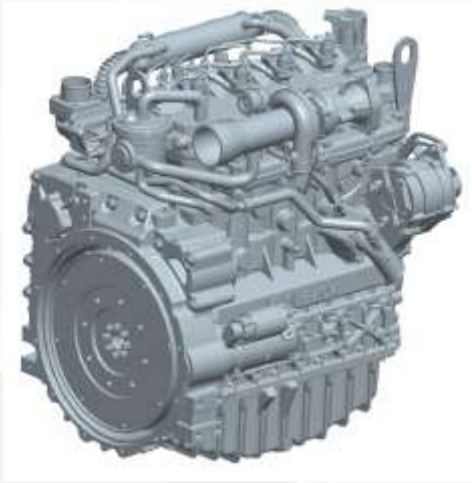
◆Main Engine Plant：

◆Cooperation period：2020

◆Our work includes vehicle 3D design and CAE analysis.

◆Current situation：

1）All performance and durability tests have been completed, and mass production is done.



Number	Item	Content
1	Bore x Stroke（mm）	98×120
2	Displacement（L）	3.6
3	Rated power PS(kW)	140 (103)
4	Rated speed (rpm)	2300
5	Maximum torque (N.m)	500
6	Speed at maximum torque(rpm)	1550~1800
7	Maximum burst pressure（bar）	180
8	Idling speed（rpm）	800±50
9	Maximum no-load governed speed（rpm）	Rated speed×5%
10	Specific fuel consumption（g/kW.h）	215
11	Minimum specific fuel consumption（g/kW.h）	195
12	Oil consumption rate（g/kW.h）	0.15~0.2
13	Durability test assessment（h）	1000
14	Highland power loss（%）	≤5%（2000m）
15	Emission standards	Non-Road Chinese Stage Ⅳ

❑ Methanol Engine Development

Project Name： Methanol ICE development

◆Customer：

◆Cooperation period：2022~2023

◆Main work concludes converting diesel engines to methanol internal combustion engines.

◆Our work includes structural design, CAE simulation analysis.

◆Current situation：

1）Structural design completed, CAE simulation analysis work done.

2）The A prototype has been completed.

Number	Item	Content
1	Engine model number	13L
2	Engine type	L6、Common rail high pressure
3	Displacement	12.8L
4	Power(kW)	300/1900
5	Torque(N.m)	1800/1200-1600
6	Intake method	Supercharged
7	Compression ratio	12.5
8	Emission standards	China VI Phase B
9	Fuel system	Methanol M100 (for gasoline cold start)
10	BSFC(g/kW.h)	420

❑ Outboard Engine Development Cooperation Project

Project Name：300 horsepower horizontal shaft diesel outboard engine development

◆Main Engine Plant：

◆Cooperation period：2022~

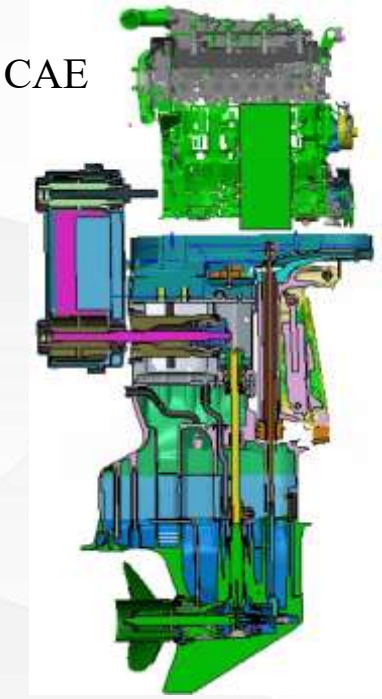
◆Main technical feature is the development of a 300 horsepower outboard engine with horizontal shaft.

◆Our work includes complete engine 3D and 2D design and CAE simulation analysis.

◆Current situation：

1）Design and development have been completed.

2）Prototype is testing.



Number	Item	Content
1	Engine power （kW）	220.6(300HP) @3600-4000rpm
2	Maximum engine speed （rpm）	4000
3	Belt drive ratio	4/3
4	Water gear ratio	13/26
5	Underwater gear ratio	26/13
6	Total gear ratio	4/3
7	Propeller rotation speed （rpm）	3000
8	Weight(kg)	450

❑ Outboard Engine Development Cooperation Project

Project Name: 200-horsepower outboard engine development

◆Main Engine Plant：

◆Cooperation period：2023~

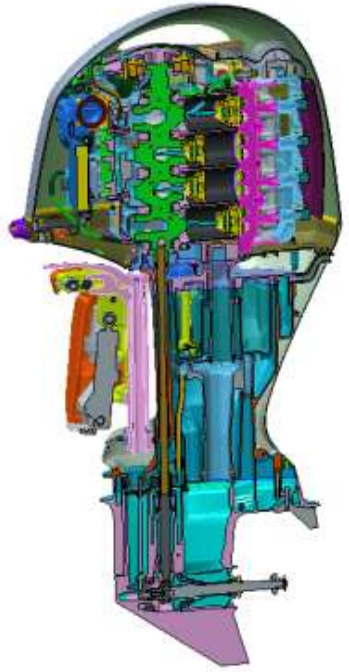
◆Main technical features are development of a 200-horsepower outboard engine.

◆Our work includes vehicle 3D and 2D design and CAE simulation analysis.

◆Current situation：

1）Design and development have been completed.

2）Prototype is testing.



Number	Item	Content
1	Engine power（kW）	147(200HP) @5600-6000rpm
2	Maximum engine speed（rpm）	6000
3	Speed ratio	1.86：1
4	Engine type	In-line four-cylinder, 4-stroke, 16-valve, naturally aspirated, electronic fuel injection
5	Fuel	Gasoline
6	Bore x Stroke	96*96.2
7	Compression ratio	10.3：1
8	Weight(kg)	220

❑ UAV Development Cooperation Project

Project Name: Opposed two-cylinder engine design and development

◆Main Engine Plant：

◆Cooperation period：2023

◆Main technical features are two-stroke and opposed two-cylinder.

◆Our work involves 3D and 2D design of the complete engine and CAE simulation.

◆Current situation：

1）The drawing design has been completed.

2）Prototype is under test.

Item	Content
Engine type	Horizontally opposed two-cylinder, two-stroke, naturally aspirated, air cooling
Bore x Stroke（mm）	Ø76*69
Displacement（cc）	630
Rated power（kW/rpm）	38/7500
Injection method	Airway jetting
Iginition method	Spark ignition
Fuel	≥93#
Lowest fuel consumption ratio（g/kW.h）	≤385
Oil supply system	EFI
Weight (kg)	18.6

❑ Aerospace Development Cooperation Project

Project Name： Model aircraft engine design and development

◆Main Engine Plant：

◆Cooperation period：2018~2019

◆Main technical features are two-stroke and opposed twin-cylinder.

◆Our work includes vehicle 3D and 2D design and CAE analysis.

◆ Current situation：

1）Small-scale production has begun.

Number	Item	Content
1	Engine type	Opposed, two-cylinder, naturally aspirated, air-cooled, two-stroke
2	Displacement（L）	0.264
3	Bore x Stroke（mm）	Ø58×50
4	Rated power（kW/rpm）	16/7200
5	Combustion chamber compression ratio	10
6	Crankcase compression ratio	1.3
7	Injection method	Airway jetting
8	Ignition method	Spark ignition
9	Burst pressure（bar）	45
10	Weight (kg)	7

❑ Aerospace Development Cooperation Project

Project Name： Aerospace engine design and development

◆Main Engine Plant：

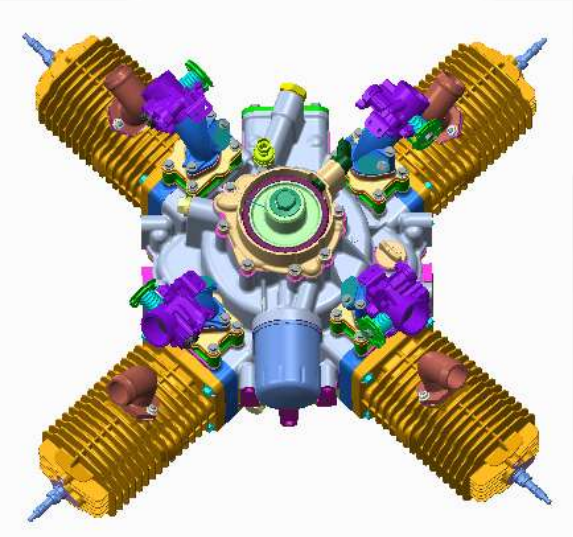
◆Cooperation period：2023~Present

◆Main technical features are two-stroke and opposed four-cylinder.

◆Our work includes vehicle 3D and 2D design and CAE analysis.

◆ Current situation：

1）Performance development testing is in progress.



Number	Item	Content
1	Engine type	Crossed-over, 4-cylinder, naturally aspirated, air-cooling, two-stroke
2	Displacement（L）	1.5
3	Bore x Stroke（mm）	Ø75×75
4	Rated power（kW/rpm）	60/4000
5	Combustion chamber compression ratio	12
6	Crankcase compression ratio	1.35
7	Injection method	Airway jetting
8	Ignition method	Spark ignition
9	Burst pressure（bar）	60

❑ Aerospace Development Cooperation Project

Project Name： Four-cylinder opposed engine design and development

◆Main Engine Plant：

◆Cooperation period：2024

◆Main technical features are four-stroke and horizontally opposed.

◆Our work includes 3D and 2D design of the complete engine, CAE simulation.

◆Current situation：

1）The design of the 3D model of the competitor has been completed.

2）Detailed design is underway.

Number	Item	Content
1	Engine type	4-cylinder、supercharged、air-cooled、4-stroke
2	Displacement（L）	1.415
3	Bore×Stroke（mm）	Ø84×61
4	Rated power（kW/rpm）	105/5800
5	Jet method	Airway jetting
6	Ignition method	Spark ignition
7	Weight (kg)	80

❑ Engine Development Cooperation Project

Competitive model data reverse engineering

- ◆ Cummins ISF 2.8L engine
- ◆ Mitsubishi 4A95TD four-cylinder gasoline engine

…….

Covering 1.0L, 1.2L, 1.5L, 1.6L, and 2.0L turbocharged direct injection gasoline engine product platforms.

Forward development of the engine

- ◆ Development of 1.5L Miller Cycle China VI Phase B Gasoline Engine
- ◆ Development of 4.3L Chinese StageVI vehicle Emission Standards Diesel Engine
- ◆ Development of 1.1L Non-Road Chinese Stage Ⅳ Diesel Engine

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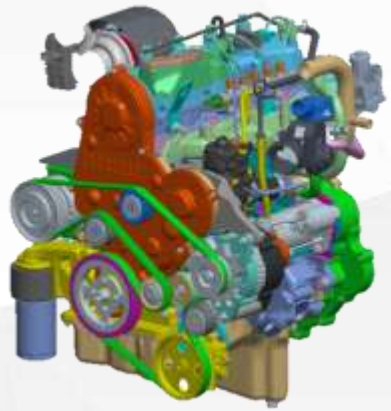


Covering 1.1L, 2.0L, 2.8L, 4.3L, 6.5L, and 13L diesel engine product platforms.

❑ Vehicle Benchmarking Big Data Analysis Development Cooperation Project

e-POWER Benchmarking Analysis

Work tasks:

- **Performance tests**
  1）Vehicle coast-down resistance coefficient test
  2）Vehicle dynamics testing
  3）Vehicle fuel consumption and emission testing
  4）Vehicle energy consumption test
  5）Vehicle standby current test
  6）Analysis of vehicle structure and design
- **Strategy analysis**
  1）CAN hacking
  2）Energy drive management
  3）Energy recovery management
  4）Driving mode and gear shifting management
  5）Mechanical braking in conjunction with energy recovery
  6）Single pedal management
  7）Specific condition management

❑ AMT Heavy-Duty Truck Transmission Development

Project Name： AMT heavy-duty truck transmission

◆Main Engine Plant：

◆Cooperation plants：2021~2022

◆Main technical features are the AMT 12-speed gearbox.

◆Our work includes vehicle 3D and 2D design and CAE simulation analysis.

◆Current situation：

1）The A sample box has been completed.

2）Durability test in progress.

Number	Item	Content
1	Gear position	12
2	Torque（Nm）	2800
3	Speed ratio	＞16.688~1
4	Length（mm）	≤910
5	Comprehensive transmission efficiency（%）	≥98.3%
6	Dry weight(kg)	≤283.5
7	Fuel quantity（L）	13.5
8	B10 Lifespan(10 thousand km)	120
9	Maximum acoustic power of radiation(dB(A))	Comparable to similar industry products

❑ Thermodynamic Single-cylinder Engine Development

Project Name: Thermodynamic single-cylinder engine development

◆Customer：

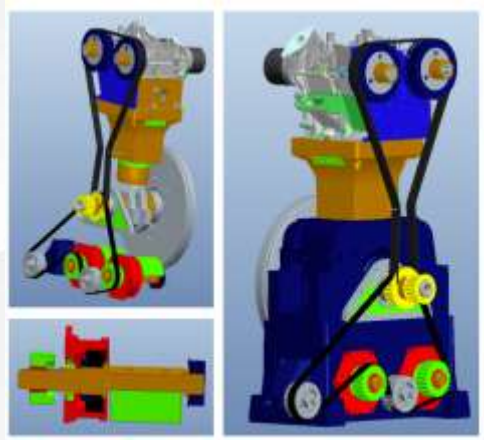
◆Cooperation period：2017~2018

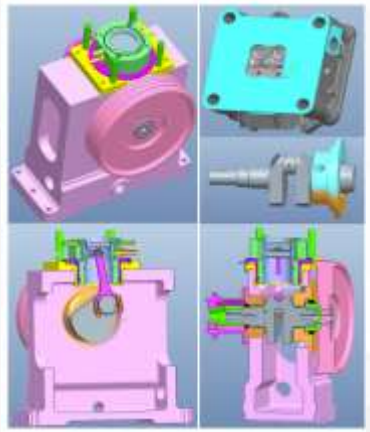
◆Main work concludes design and development of thermodynamic single-cylinder engines.

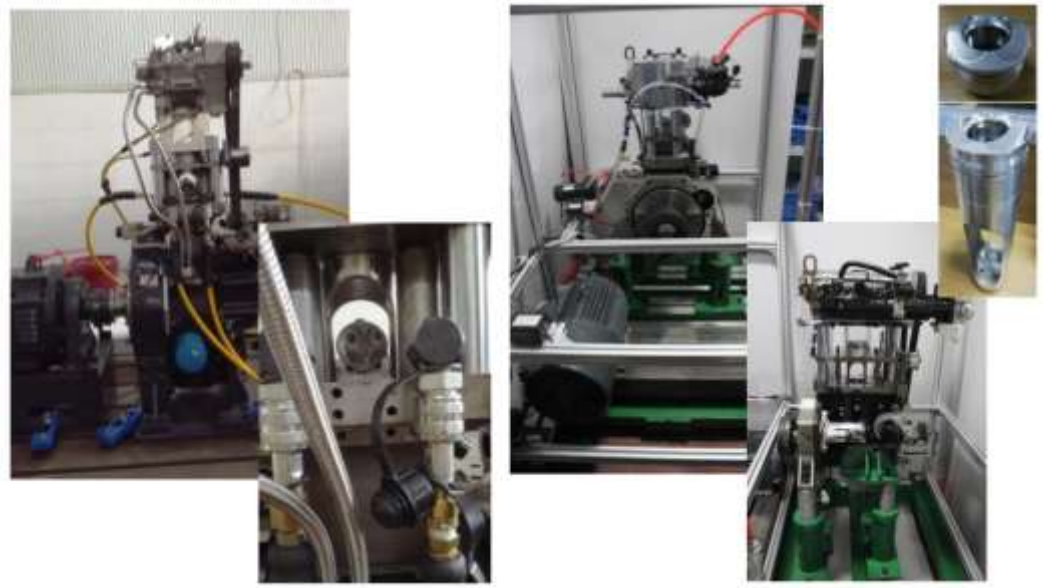
◆Our work includes structural design, prototype manufacturing.

◆ Current situation：

1）Development was completed, and submitted for client use.







❑ Road Range-Extender Cooperation Project

Project Name： Wagon Range-Extender development

◆OEMs：

◆Cooperation period：2020~2021

◆Main work concludes development of the Range-Extender system and optimization of the vehicle’s fuel consumption based on fuel vehicle.

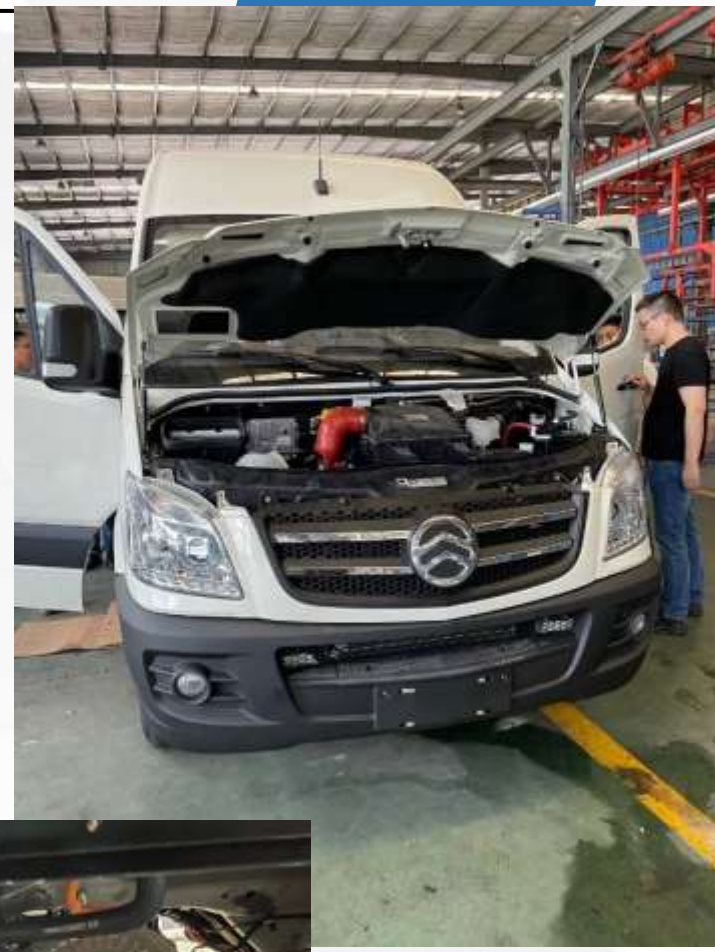
◆Our work includes vehicle performance simulation analysis, part selection, high-voltage architecture design, and range-extender development.

◆Current situation：

1）Complete vehicle assembly and debug.

2）Complete fuel consumption test, and the fuel saving effect can be up to 15% .

3）Complete performance test and dynamic can meet the performance objective.



❑Off-road Range-Extender Cooperation Project

Project Name： Forklift Range-Extender development

◆Main Engine Plant：

◆Cooperation period：2020~2022

◆Main work concludes development of new internal combustion forklift products.

◆Our work includes vehicle performance simulation, component selection, high-voltage architecture design, electrical system design, range extender system development, range extender bench calibration, overall vehicle layout design, vehicle thermal management design, vehicle assembly, vehicle control model development, and vehicle road calibration.

◆ Current situation：

1）Complete all work in the per-research phase and enter the research and development work for mass production stage.

2）Fuel consumption test completed, fuel-saving effect of 43%.

3）Performance test completed, power surpasses electric and internal combustion forklifts.

❑ Passenger Vehicle Range-Extender Development Cooperation Project

Project Name： Pickup truck Range-Extender development

◆OEMs：

◆Cooperation period：2021~2022

◆Main work concludes development of a new range-extended pickup using the pickup truck frame.

◆Our work includes: vehicle performance simulation, component selection, high-voltage architecture design, electrical system design, range extender system development, range extender bench calibration, overall vehicle layout design, vehicle thermal management design, vehicle assembly, vehicle control model development, and vehicle commissioning.

◆Current situation：

1）All work of the first phase has been completed, including vehicle assembly and basic function calibration.

2）Complete the first phase of customer test drives and test rides.

3）Enter the second phase of optimization calibration development and test preparation.

❑ Diesel Range-Extender Development Project

Project Name： Diesel Range-Extender development

◆Customer：

◆Cooperation period：2021~2022

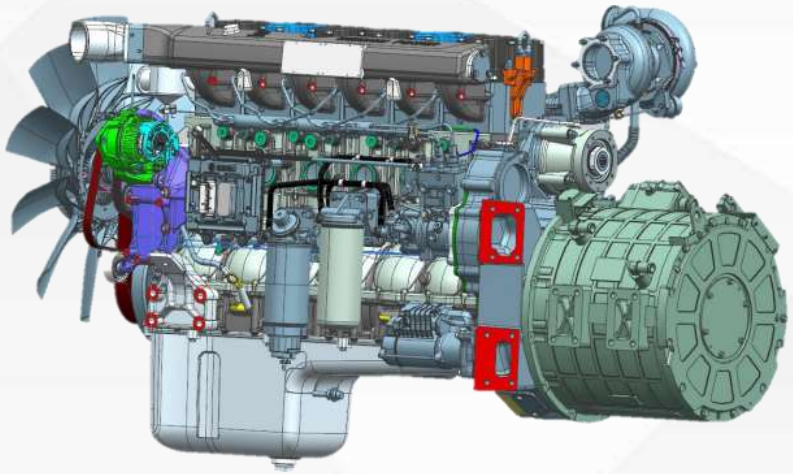
◆Main work concludes development of a 350kW range-extender assembly.

◆Our work includes range extender simulation matching calculation, range extender structural design, range extender control function development, range extender RCU controller development, range extender calibration, and vehicle function integration debugging.

◆ Current situation：

1）Complete all the development work of the range extender.

2）Range-extender prototype vehicle testing was completed.



❑ Methanol Range-Extender Development Project

Project Name： Methanol Range-Extender development

◆Customer：

◆Cooperation period：2022~2024

◆Main work concludes development of a 450kW range-extender assembly.

◆Our work includes methanol engine development, range extender simulation and matching calculation, range extender structural design, range extender control function development, range extender RCU controller development, and range extender calibration.

◆Current situation：

1）Complete the development of the range extender.

2）Access the target vessel's application for boarding.

❑ New Energy Control and Development Application Vehicle Display

Range-extended mining truck

Range-extended luxury touring coach

The first domestically developed range-extended container stacker in China

Co-Power range-extended ming truck

XCMG pioneers the domestically developed range-extended paver.

THANKS !

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