



Modine Global EMTU Presentation Fuel Cell Cooling July / 2009

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- World leader in thermal management
- Provide highly engineered heating and cooling solutions
- Focused on globalization and technology advances
- Believe that close customer relationships are fundamental

Customer Focused – Engineering Driven



Cooling module



EGR cooler



Vehicular HVAC system



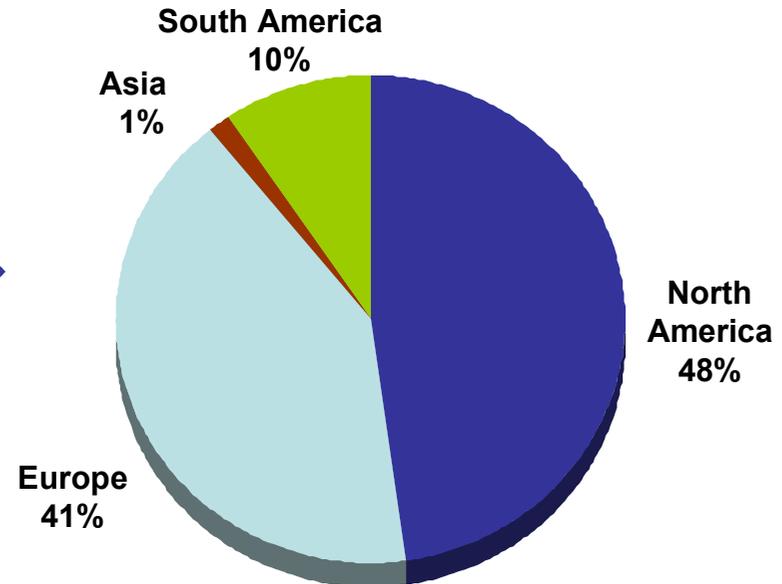
Unit heater

Founded in 1916



World leader in thermal management
FY 2009 revenues of 2,820 R\$ Millions
NYSE listed: MOD
32 global manufacturing facilities
3 Regional Technical Centers (NA, Europe, Asia)
7000 employees

Today



Technology innovation tradition
(over 2,000 patents worldwide)

Strategically diversified by market, customer, products and geography

- Lower volume platforms, focused factories, niche products, technology-driven solutions

Global Presence



**North American TechCenter,
Racine, WI, USA**



**South American TechCenter,
São Paulo, SP, Brasil**



**European TechCenter,
Bonlanden, Germany**



**Asian TechCenter,
Asan City, Korea**

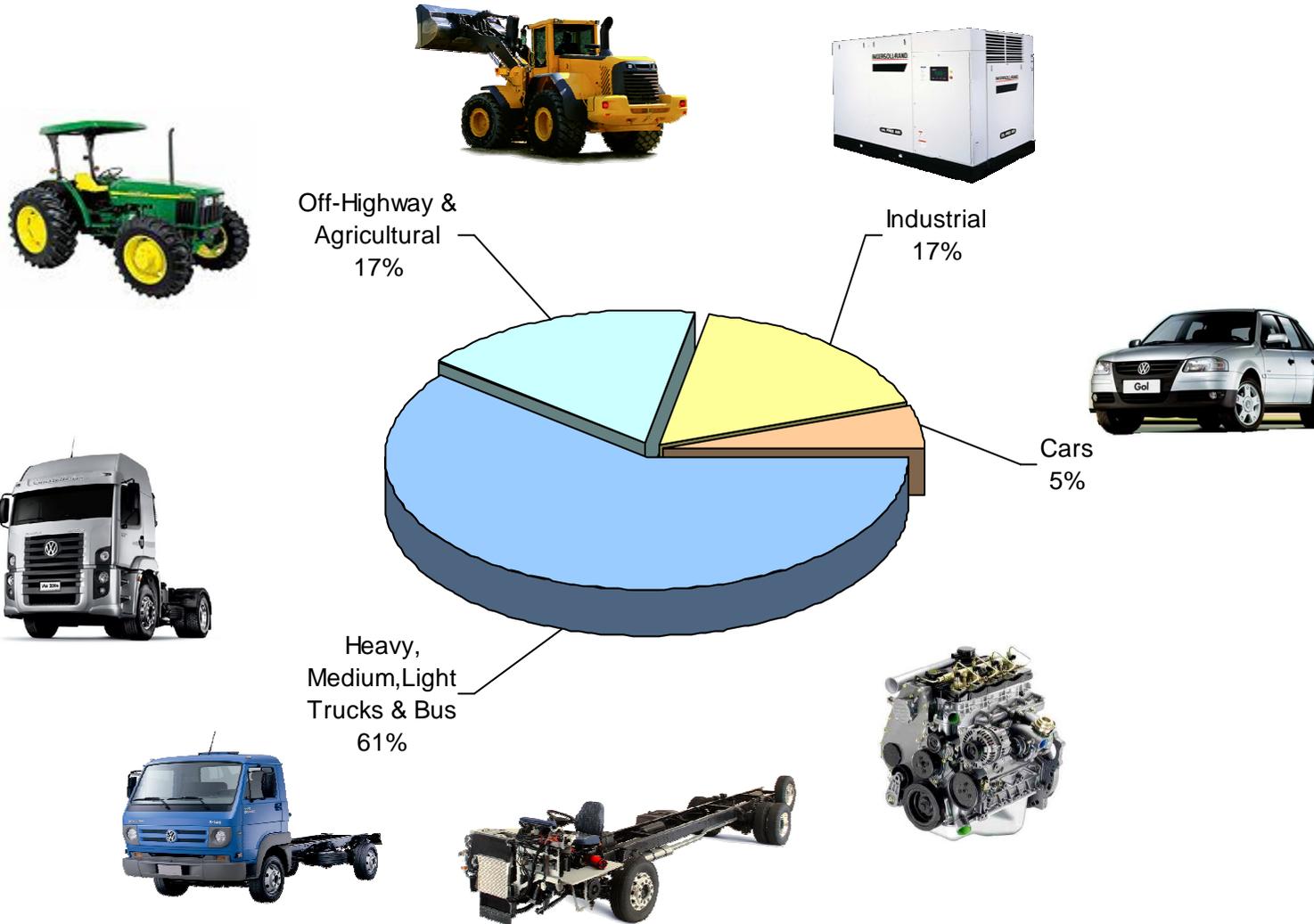


- **Founded in 1966 as RADIADORES VISCONDE**
- **Started own production early 80's**
- **Very high penetration into aftermarket**
- **Aluminum mechanical technology since 1992**
- **Merged with Modine in 1998 – JV**
- **Vacuum furnace for plate oil cooler since 2000 under Modine's patent**
- **CAB technology introduced in 2003**
- **2006 full acquisition by Modine Inc.**

Modine Brasil - Main Customers



Modine Brasil - Market Segments



Facilities in Brasil:

Structural Testing

- Pressure cycle
- Thermal cycle
- Vibration (single axis)

Thermal testing component wind tunnel

Thermal testing component wind tunnel



Materials Laboratory

Corrosion Testing Chambers

Sample / Prototype Facilities

Thermal cycle



Vibration



Fuel Cell Product Group History & Background

- Based at Modine's global headquarters in Racine, Wisconsin
- We began working with Ballard and NuCellSys in 1998 on thermal components for both auto and buses
- A dedicated Fuel Cell Products Group was formed in May 2000
- Full time professional staff of 11
- Access to all process technologies available within the global corporate structure
- 890 m² (9600 ft²) specialty pilot plant
 - 10 hourly employees



Modine Technical Responsibilities

- Design a temperature management system for the following components
 - Ballard fuel cell stacks
 - NuCellSys fuel cell engine water management devices
 - Siemens traction motors
 - Siemens auxiliary drive motors
 - Siemens motor controllers and power converters
 - Brake compressor
- Specify, manufacture and supply thermal management system components
- Provide commissioning support



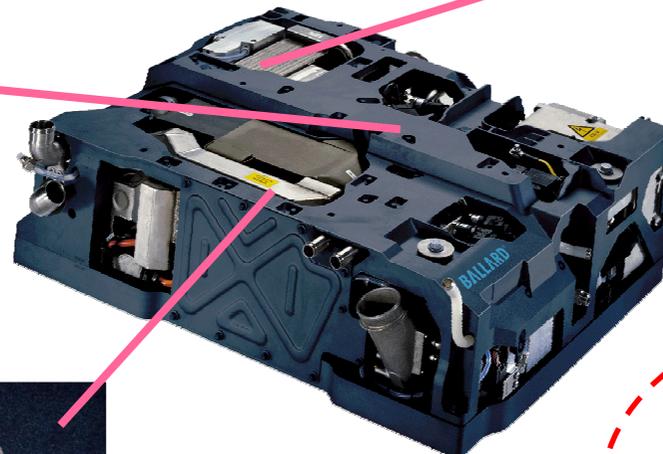
Modine Supplied Fuel Cell System Components



Anode Water Knockout



Cathode Exhaust Condenser

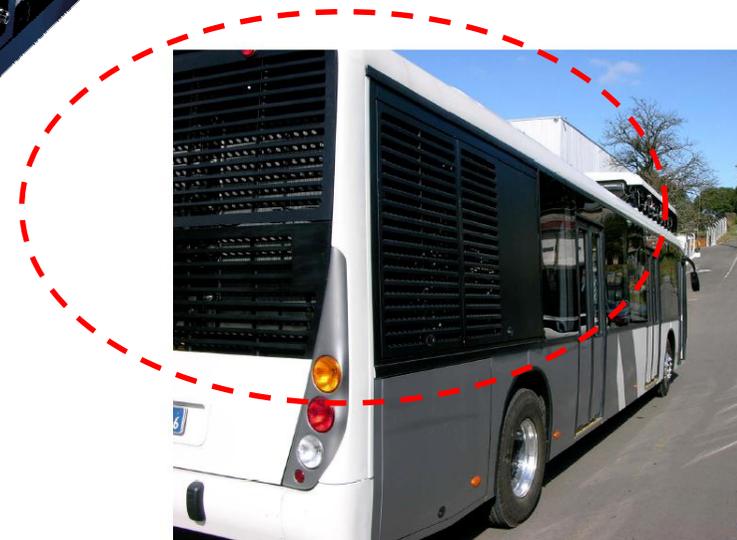


**Ballard HY-80
Fuel Cell Engine**

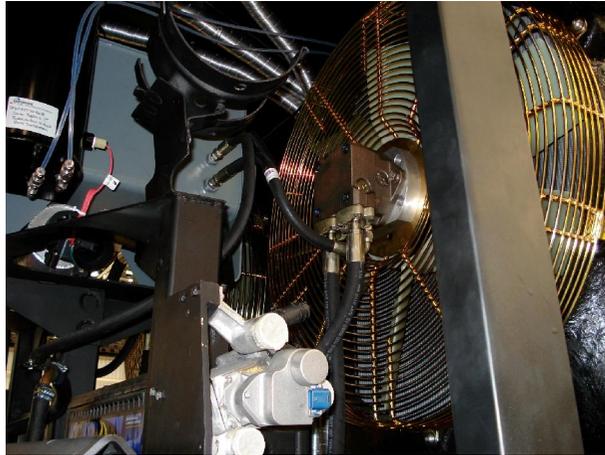


Humidifier Module

- Anode Humidifier
- Cathode Humidifier
- Integrated water separators



Modine Supplied Cooling System Components

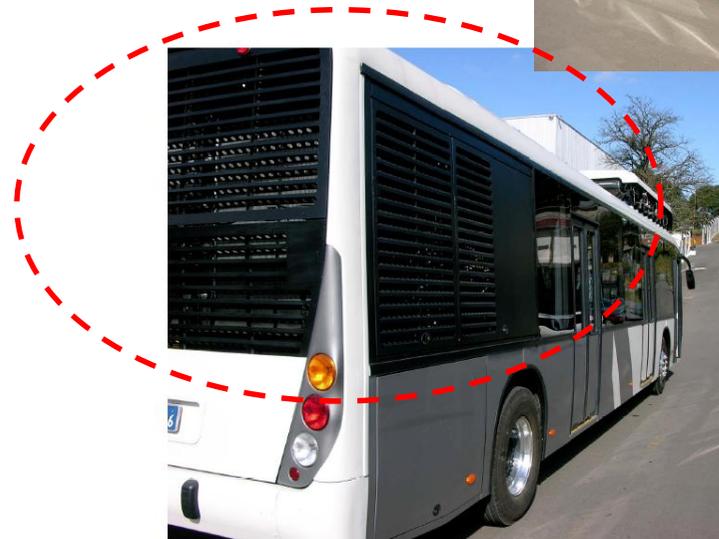


Cooling Module

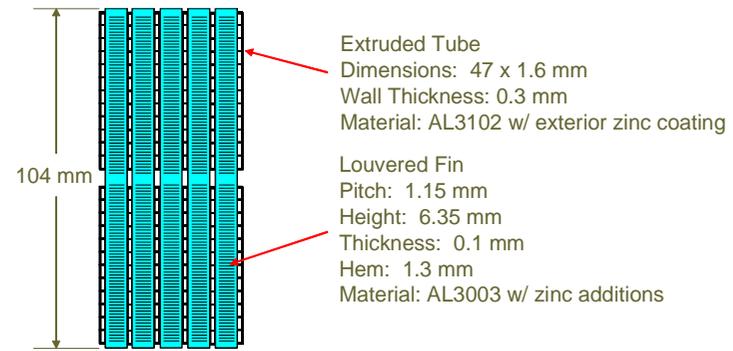
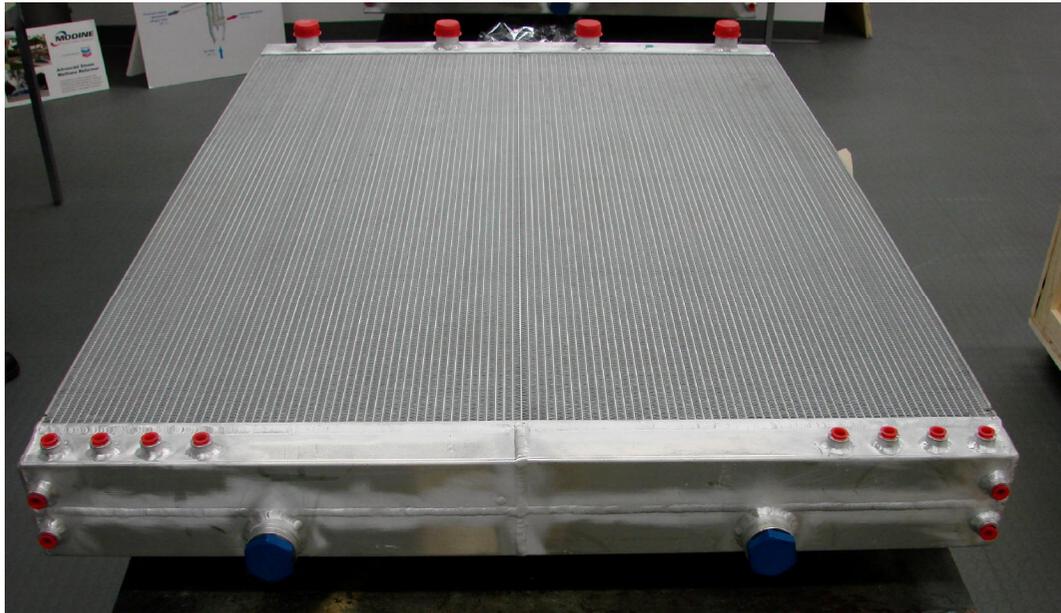
- Low temperature radiator
- High temperature radiator
- Cooling fans and motors
- Hydraulic oil cooler

Subsystem Components

- Coolant pump
- Coolant reservoirs
- Hydraulic fluid system



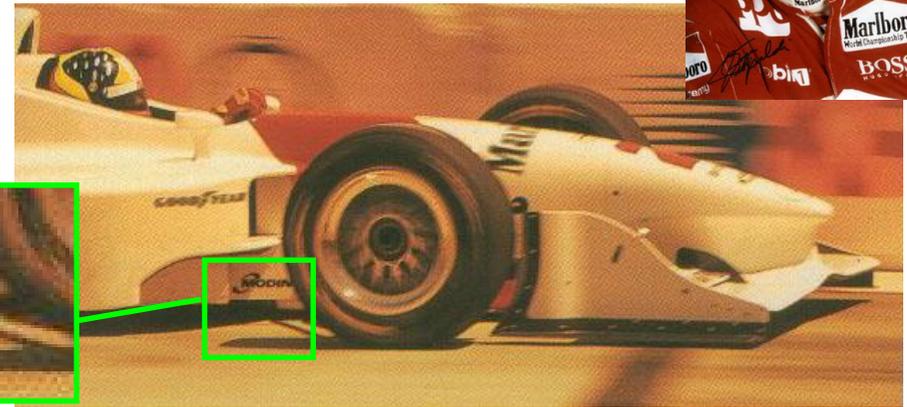
Modine Radiator Technology



Emerson Fittipaldi
1993 Indianapolis 500 Winner



The radiator technology used in this bus has its roots in Indy Car racing and is the highest performing heat transfer surface in the world.





Thank you

Applied Thermal Innovation

