DLS Aluminum Co., Ltd

DLS Aluminum is a technology driven enterprise aiming to provide high quality materials and components for aluminum heat exchangers what focus on Automotive industry. We have successfully achieved advanced multi-layer alloying, higher machining performance, high precision tolerance control and lower consumption during heat-exchanger manufacture process in order to ensure provide value-added heat transfer strip in the lightweight material aluminum to Automotive consumers. Our strength is in the world-class level technology and service.
Dalishen Aluminum Co., Ltd
Dalishen Heat Transfer Co., Ltd

Danyang Headquarter:
DLS Aluminum
Founded in 2010
Registered Capital RMB 611,000,000

Headquarter/ Manufacture site / Quality/R&D

Address: No.8 West Shengchang Road, Danyang Development Zone, Jiangsu Province, China
Marketing/ Sales/ Customer Service/Operation
Dalishen Aluminum Co., Ltd
Dalishen Heat Transfer Co., Ltd

Milestone

- Initial Construction of flat rolled project (2010)
- SOP of flat rolled products (2012)
- Integrally acquired Aleris Canada and relocated equipment back to China
- SOP of heat transfer products, capacity is 250,000 Ton (2014)
- Go to stock market (2015)
DLS acquired Canadian ALERIS in 2010. ALERIS originated from the USA and Canada weapons laboratories during World War II. It has over 70 years experience in production and R&D technology. ALERIS is the material supplier of Airbus, AUDI and VW. It is one of the largest special aluminum producer of the world and tied for the world's five major aluminum provider Juxtaposed Alcoa, Alcan, Nowe Ritz and Hydro Aluminium.
Overseas Acquisition

中国人在短短的6个月内，把加拿大三河市一个花了50年时间建起来的工厂内的设备全部拆运回国，创造了一个可怕的奇迹！

——加拿大《三河日报》
Overseas Acquisition

Acquired US UNITED Heavy hot rolling mill, United States Mai Sita cold rolling mill, Germany Achenbach cold finishing mill, Germany SMS composite production line, German Kampf slitter and other top-level international special aluminum processing equipment. Based on the most advanced electronic control system to conduct a comprehensive upgrade, the entire production line is already a global leader.
1) Heat Transfer Material

Alloy Grade: DFH111、DFH121、DFH131、DFH141、DFH151、DFH161
Alloy status: O、H14、H16、H24
Dimension: Thickness (0.005 ~ 3.0) * Width (8 ~ 1550) mm

Application: Radiator, Condenser, Oil cooler, Evaporator, Charger air cooler, HVAC, Power station Etc.
Segment marketing future

Heat exchangers made of aluminum alloy foil and vehicle production was positively correlated, in 2014 global vehicle production of about 85 million, according to 95% of the vehicle using a heat exchanger made of aluminum composite foil (Note: 5% due to the operating environment of heavy truck bad, still use copper foil produced by the heat exchanger), taking into account the 25% of the heat reserve market, in 2014 the global heat exchanger brazed aluminum composite foil consumption is about 1 million tons, with an average annual growth in production and consumption rate of 16%.

2014 China's auto output 23.89 million, an aluminum composite foil consumption 250,000 tons, which includes a heat exchanger retail market 50,000 tons. In China, the automotive industry is the largest field of aluminum composite foil consumption, but also the most mature industry, but subject to the installed capacity of domestic enterprises and technology, high-end material is still dependent on imports.
2) Automotive Body and BIW Material

Alloy Grade: 2117, 2036, 5052, 5754, 5182, 5083, 5383, 6016, 6181, 6082, 7020
Alloy status: O, T4, T6, H24, H32, H321, H34, H36
Dimension: Thickness (0.5~12) * Width (1000~2600) * Length (1000~12000) mm

Application: Chassis, BIW, Body, Engine Cover, Roof Frame, Fender, Door, Spoiler, Trunk lid Etc.
Automotive Industrial Policy

- The EU requires that in 2020, the automobiles CO2 / km have to be reached 90g, 2016 years can not exceed 100 km fuel consumption 4.5L; the new US federal law enacted: 2016 cars required to achieve fuel consumption of 100 kilometers 7.6L, 2025 years should be reduced to 4.5L. Japan provides: 100 km fuel consumption of cars in 2015 should reach ≤5.5L, 2015 shall be the amount of CO2 emissions down 29% compared with 2010.
- "new material" five "plan" states: Automotive 6016,6022,6111 aluminum alloy sheet to achieve a thickness of 0.7 ~ 2.0mm, width 1600 ~ 2300mm automotive aluminum plate industrialization.
- 2014, 7 state ministries jointly developed the "key material upgrading project implementation plan." Support high-quality aluminum plate automobile industry, key technologies capture large ingot, plate-shaped, tissue and surface state control, heat treatment, forming an annual output of 50,000 tons aluminum car body panels and the ability to achieve large-scale application.

Customer:

[Logos]
3) Rail Transportation

Alloy Grade: 5052, 5754, 5083, 5383, 5A03, 6082
Alloy status: O, H111, H24, H32, H321, T6
Dimension: Thickness (0.5 ～ 100) * Width (1000 ～ 3100) * Length (1000 ～ 13000) mm

Application: High Speed Rail / EMU / Metro front, insulation plates, sandwich material, power equipment, assemblies, wheels, suspension systems, brakes, traction facilities, body structure etc.
Segment marketing future

"Thirteen Five" period, the city as the center of the area Intercity High Speed Rail plan to reach 19,500 km, of which 2016-2020 was completed mileage of 11,000 km, passenger rail mileage will reach total completed 17,000 kilometers, more than "ten five" 16,000 kilometers up 7%, with an average annual mileage of 3400 km completed. Thus, the aluminum body of the EMU market demand continue to be optimistic. Foreign high-speed rail project in cooperation with China and will facilitate Chinese aluminum high-speed rail EMU manufacturing and consumption of sustainable development of aluminum alloy sheet, aluminum alloy sheet with an average annual consumption growth will continue to maintain 12% -15% level.

Customer:
Technology Capability
Full Product Range for HEX Systems

Rolled Products
- Braze sheet

Tubes
- Welded tube
- Cutting

HE Tubing
- Extruded tube
- Piercing

Customer
- Piercing

Assembly

Manifold
- Braze sheet
- Press

End caps + Baffles
- Braze sheet
- MPE tube
- Corrugation
- Cutting

Tubes
- Welded tube + Insert
- Press
- Cutting

Fins
- Braze sheet

Side Support
- Braze sheet
- Press
- Cutting
Manufacture Technology

- Compositing various alloy
- Rolling to customer’s thickness
- Slitting and cut
Manufacture Process

1. Melting
2. Casting
3. Milling
4. Composite Alloy
5. Heating
6. Hot rolling
7. Cold rolling
8. Packing
9. Testing
10. Shaping
11. Straightening
12. annealing
Development Capability - Tube

Strength Before Brazing (Mpa)

- Yield Strength
- Shearing Strength

Strength Before Brazing Chart:

- AA3003
- F1A6
- F7A6
- F8A6
- F9J6

Corrosion穿孔天数

- FM101
- F9J6
- F8A6
- F7A6
- F1A6
- AA3003

Corrosion Chart:

- AA3003
- F1A6
- F7A6
- F8A6
- F9J6
Development Capability- Fin

- AA3003
- F216
- F416
- F416A
- FS101
DLS's common unit for research and development
- 45 specialists in materials technology, technical physics, chemistry and more
- Instruments for structural studies, chemical analysis, mechanical and corrosion testing

Technology Areas
- Brazing Technology
- Chemical Analysis and Environment
- Corrosion
- Engineering Technology
- Heat Management
- Mechanical Properties
- Metallography
- Metallurgy
- Surface Chemistry
R&D Center

Spectrometer
ZWICKUniversal Testing
Zeiss microscope
STRUERS Grinding
FTIR Spectrometer
Low-etching trough
# R&D Achievement – Fan Mat’l Alloy

<table>
<thead>
<tr>
<th>Thickness</th>
<th>0.1</th>
<th>0.08</th>
<th>0.06</th>
<th>0.05</th>
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<td>Y</td>
<td>N</td>
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<td>D304</td>
<td>Y</td>
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<table>
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<tr>
<th>原材料提供商</th>
<th>用途</th>
<th>合金</th>
<th>厚度 mm</th>
<th>屈服强度 Mpa</th>
<th>抗拉强度 Mpa</th>
<th>延伸率 %</th>
<th>抗塌陷（＜40）</th>
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<tbody>
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<td>DLS</td>
<td>光料翅片</td>
<td>D304</td>
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<td>210</td>
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<td>YYY</td>
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<td>193</td>
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<tr>
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<td>F416</td>
<td>0.07</td>
<td>192</td>
<td>201</td>
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<td>YYY</td>
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<td>194</td>
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<td>XXX</td>
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<td>200</td>
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</table>
Manufacture Capability
Machinery Capacity & Capability

• The present plant capacity is 250,000 MT / year

• Recent investments 2016 in order to meet future demands:
  – Surface detection system
  – New Loop slitter
  – Hot mill improvements
  – Upgrade Cladding Line
  – Scalper upgrade
  – Roller Hearth Furnace Production Line
  – Air Cushion continuous heat treatment production line

• The present capabilities are;
  – Thickness range: 0.005 – 250.00mm
  – Width range: 8 – 3100.00mm
  – OD: max 13000mm
### Production process capability

<table>
<thead>
<tr>
<th></th>
<th>Roll</th>
<th>Sheet plate</th>
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<tr>
<td><strong>Thickness</strong></td>
<td>0.005---4.0mm</td>
<td>0.4---250.0mm</td>
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<tr>
<td><strong>Width</strong></td>
<td>8----1500mm</td>
<td>950----3100mm</td>
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<tr>
<td><strong>Length</strong></td>
<td>L</td>
<td>Max.13000mm</td>
</tr>
<tr>
<td><strong>Inner diameter</strong></td>
<td>100;200;250;300;400;500mm</td>
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</tr>
<tr>
<td><strong>MAX outer diameter</strong></td>
<td>2000mm</td>
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<tr>
<td><strong>Composite layers</strong></td>
<td>Single, Dual view, Multilayer</td>
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<tr>
<td><strong>Composite Rate</strong></td>
<td>4% to 30%</td>
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</tr>
<tr>
<td><strong>Tolerance</strong></td>
<td>4% - 6% +/-1.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6% - 12% +/-2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12% - 16% +/-2.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16% - 20% +/-3%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20% - 30% +/-4%</td>
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</table>
Melting and Casting equipment

Shallow bath design, energy efficient regenerative burner, furnace pressure control and other advanced technology, with a full mouth flue gas recovery hood and automatic control.

**Equipment**
- 35T Melting furnace 2 pcs
- 35T semi-continuous casting machine
- 650X2800 H milling Machine

**Casting Ingot Size**
- Smart width: 900--2800mm
- Max Thickness: 340--610mm
- Max length: 6500mm

**Customizable width**
- Large size ingot
- Large size compositing rate

Heavy metal processing automated production lines base on mechanical, hydraulic and electrical and other new technologies designed.
Hot Rolling equipment

3300 mm Roughing Rolling Mill

2800 mm precise Rolling Mill (Italy Imported)

3300 + 2800 mm "1 + 1" form of a continuous hot rolling Mill
Main Hot Rolling Equipment

First time in China to achieve a "vacuum lifting sucker," "roll brushing" and "Robot automatic welding," "Ingot 180 flip" four major functions.

Maximum tensile length is 20m, width is 3 m, the maximum tensile force of 3000 tons; having set off with protection, automatic measurement function, stretching speed, elongation, tensile strength, and complete pre-stretch stretch and control functions.
Main Cold Rolling Equipment

ACHENBACH C2000 Cold Rolling Mill (ALERIS)

C875 Cold Rolling Mill (ALERIS)
Main Cold Rolling Equipment

C3000Foil Cold Rolling Mill(ALERIS)  
C975 COMM Slitting Machine(ALERIS)
Automatic Feeding

Accessory Tracing System

Material / Quality Tracing System

Assembly / Equipment System

Job Training / Arrangement System

Temperature & Humanity Monitoring System

ESD Online Monitoring System

Motor Cloud Centre (intelligent factory)
Quality management guarantee – process improvement

Data input
- material inspection
- Process control
- Shipment inspection
- marketing feedback

Quality Improvement
- 6σ
- 8D
- QCC
- Lean

Improvement Output
- Work flow
- PFMEA
- Control Plan
- Operation instruction
Thanks