Automotive aluminum castings and market trends

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Market Intelligence
Aluminum
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Nemak’s overview
Nemak is one of the core divisions of Alfa

2014 Revenues $17.2

- Alpek
- Sigma Alimentos
- Nemak
- Alestra
- Newpek LLC

% of Sales

- Petrochemicals 38%
- Food 31%
- Auto-parts 27%
- Telecomm. 2%
- Exploration & Production 1%
Nemak’s growth journey through robust organic growth
Supplemented by strategic acquisitions
Nemak at a glance

**Highlights**

- Leading supplier of complex, high-tech automotive aluminum components
- Global footprint across 15* countries
- Diversified product portfolio and customer base
  - More than 50 customers worldwide
  - Supplying 650+ vehicle platforms
- Experienced management team

**2014 Key Metrics**

- Revenue: 4,622 M USD
- Plants: 35*
- Capacity: 56 Mill. equivalent units
- Employees: ~20,000

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*Considering the recently approved plant in Russia, which will be fully operational in 2015*
Focused on complex high-tech aluminum components for the automotive industry, reducing vehicle weight

### Powertrain

**Cylinder Head**
Main Trends - Increased mechanical properties, Complex designs, integrated manifold

**Engine Blocks**
Main Trends – OEMs starting to switch diesel blocks to aluminum and accelerating replacement of remaining cast iron blocks in gasoline engines

**Transmissions**
Main Trends – Shift to complex automatic transmissions and increasing number of gears

### Structural Components

**Longitudinal Members, Cross Members, Shock Towers, Pillars**
Main Trends – Shift from steel (stamping) to aluminum (integrated castings)
Long-term relationships with key automotive customers
Global footprint serving all major markets

- 35 manufacturing facilities strategically located close to its customers sites
  - North America (17), Europe (12), South America (3), Asia (3)

*Fully operational by 2015*
Nemak Global Aluminum consumption

- 800 kton Aluminum usage for casting production
- Vertically integrated with self alloy production at Monterrey MEX, Wisconsin US, Kentucky US and Bilbao Spain.

NEMAK GLOBAL ‘14 : 794 KMT

- Total North America: 505 kton
- USA/Canada: 200 kton
- South America: 305 kton
- Mexico: 31 kton
- Europe: 224 kton

Alloys Distribution:
- 63% 319
- 24% 380
- 13% 356/356P

* Melting Center
Automotive Industry Overview
Aluminum trends in automotive

- Growing car production in the coming years leaded by emerging economies
  - México will become the 6th world’s car producer, just below Germany and overpassing Korea and Brazil

Source: Nemak research
Global light vehicle sales

- US has reached pre crisis levels, marginal growth expected
- China continues with significant growth
- Europe recovering at a modest pace

Source: Nemak research, IHS Automotive (September 2014)
Light vehicles sales per region

- Developing markets above pre-crisis level
- China with the higher path

Source: IHS
Light vehicle sales per capita

Emerging countries with growing potential

Sales per thousand inhabitants
Top 26 markets of the world.

Source: AMDA with information from OICA and the Population Reference Bureau
World, vehicle production

- Growing production in emerging countries
- Forecast 2021: + 100 mill Units

Source: IHS
NAFTA, Vehicle production

- Regional production increased 16% (1994-2013)
  - México by three times
- Nafta countries contributed 19% to world production (2013)

Source: AMIA with data of Ward’s Automotive Yearbook 2013 and OICA
**Mexico Assembly plants**

- Over 5.0m cars to be produced in Mexico by 2020
  - Premium brands installing plants at central Mexico
  - KIA will be located northeast Mexico (Monterrey)
- México will become the 6th world’s car producer, just below Germany and overpassing Korea and Brazil

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### Forecast of production of light vehicles in Mexico, 2014-2019

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Nissan</td>
<td>643,666</td>
<td>683,770</td>
<td>762,841</td>
<td>884,158</td>
<td>922,294</td>
<td>939,069</td>
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<td>General Motors</td>
<td>670,988</td>
<td>670,185</td>
<td>621,438</td>
<td>760,621</td>
<td>786,997</td>
<td>781,662</td>
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<td>Volkswagen</td>
<td>537,840</td>
<td>564,204</td>
<td>603,346</td>
<td>617,047</td>
<td>611,667</td>
<td>649,607</td>
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<td>Chrysler</td>
<td>375,373</td>
<td>417,947</td>
<td>586,641</td>
<td>544,818</td>
<td>562,147</td>
<td>555,425</td>
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<td>Ford</td>
<td>471,551</td>
<td>456,968</td>
<td>432,410</td>
<td>355,967</td>
<td>442,292</td>
<td>530,675</td>
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<td>Honda</td>
<td>170,722</td>
<td>251,950</td>
<td>279,427</td>
<td>322,326</td>
<td>321,022</td>
<td>318,748</td>
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<td>Mazda</td>
<td>89,696</td>
<td>178,972</td>
<td>200,129</td>
<td>253,245</td>
<td>257,192</td>
<td>236,283</td>
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<tr>
<td>Toyota</td>
<td>54,682</td>
<td>71,557</td>
<td>154,723</td>
<td>160,235</td>
<td>168,589</td>
<td>164,398</td>
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<tr>
<td>BMW</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>150,000</td>
</tr>
<tr>
<td>Audi</td>
<td>0</td>
<td>0</td>
<td>72,503</td>
<td>131,270</td>
<td>155,300</td>
<td>149,837</td>
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<tr>
<td>Infiniti</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>51,237</td>
<td>49,863</td>
<td>46,708</td>
</tr>
<tr>
<td>Mercedes-Benz</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>19,071</td>
<td>68,836</td>
<td>73,554</td>
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<tr>
<td>Fiat</td>
<td>90,160</td>
<td>67,014</td>
<td>24,386</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>KIA</td>
<td>10,000</td>
<td>150,000</td>
<td>200,000</td>
<td>300,000</td>
<td></td>
<td></td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>3,104,698</strong></td>
<td><strong>3,352,567</strong></td>
<td><strong>3,747,824</strong></td>
<td><strong>4,249,885</strong></td>
<td><strong>4,546,199</strong></td>
<td><strong>4,895,967</strong></td>
</tr>
</tbody>
</table>

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### Assembly Lines

**Top auto-producing countries’ rankings**

1. China
2. U.S.
3. Japan
4. India
5. Germany
6. Mexico
7. S. Korea
8. Brazil
9. France
10. Italy

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*Source: INA with information from HIS*

*Source: WSJ with information from IHS*
Market trend
Aluminum trends in automotive

- Growing car production in the coming years leaded by emerging economies
  - México will become the 6th world´s car producer, just below Germany and overpassing Korea and Brazil

- Stringent emissions regulation driving aluminum substitution
  - Vehicle weight is a key lever to meet such regulations

- Next wave of aluminum substitution to come from body-in-white, including Structural Components
  - Trend has already begun with European premium OEMs

Source: Nemak research
Auto Industry Trends

Growing Markets
- China, India and Europe will be major contributors for future growth
  - China and India will account for ~35% of the total sales by 2020
  - Europe gradually recovering pre-crisis levels

Fuel Efficiency
- Stricter fuel efficiency regulations
- Light weighting, powertrain improvement, hybridization & electrification

Connectivity
- Infotainment, traffic assist, autonomous cars
- All major OEMs making alliances with tech companies

Safety
- Drive assistance in emergency situations
- Traffic recognition and pedestrian detection
Light-weighting trend

- OEMs implementing actions to reach aggressive fuel economy targets
  - Powertrain, weight, transmissions, electrification
- Light weighting trend will continue pushing aluminum usage
  - Aluminum usage for vehicles will increase by US$30 B

**Fuel Economy – Normalized to US Standards (MPG)**

**Targets in MPG:**
- US 2025: 56.2
- EU 2021: 60.6
- Japan 2020: 55.1
- China 2020: 50.1

**Pounds Per Vehicle**

Source: International Council of Clean Transportation, Ducker Worldwide
Five different avenues to accomplished fuel emissions regulations

- **Engine technology**
  - Engine Downsizing
  - Energy loss reduction
  - Turbo housing
  - Vaporization & combustion optimization
  - Start-stop system

- **Weight**
  - Lightweight material
  - New manufacturing technologies
  - Content optimization

- **Transmissions**
  - Dual clutch
  - Increase numbers of gears
  - Continuous variable transmissions

- **Aerodynamics**
  - Optimized design (drag coefficient and frontal area)
  - Optimized tires

- **Power management**
  - Switch from mechanical to electric accessories
  - Optimization of accessories' electric consumption

2020 max potential % CO₂ reduced:
- Engine technology: ~40%
- Weight: ~8 – 12%
- Transmissions: ~5 – 10%
- Aerodynamics: ~5%
- Power management: ~3 – 5%

Nemak Opportunities

Source: European Aluminum Association, BCG analysis, Nemak research
### Structural Components with the highest projected growth

#### NA and EU LV Aluminum Content

*(pounds per vehicle)*

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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<tbody>
<tr>
<td>Cylinder Heads</td>
<td>52</td>
<td>53</td>
<td>54</td>
<td>55</td>
<td>55</td>
<td>57</td>
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<tr>
<td>Engine Blocks</td>
<td>51</td>
<td>55</td>
<td>60</td>
<td>65</td>
<td>71</td>
<td>79</td>
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<tr>
<td>Transmissions</td>
<td>45</td>
<td>47</td>
<td>49</td>
<td>51</td>
<td>53</td>
<td>57</td>
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<tr>
<td>Wheels &amp; Brakes</td>
<td>55</td>
<td>58</td>
<td>61</td>
<td>64</td>
<td>67</td>
<td>71</td>
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<tr>
<td>Heat Transfers</td>
<td>31</td>
<td>33</td>
<td>34</td>
<td>35</td>
<td>37</td>
<td>39</td>
</tr>
<tr>
<td>Others</td>
<td>43</td>
<td>46</td>
<td>50</td>
<td>54</td>
<td>58</td>
<td>64</td>
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<tr>
<td>Structural Components</td>
<td>301</td>
<td>324</td>
<td>350</td>
<td>380</td>
<td>426</td>
<td>475</td>
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</table>

Source: Ducker Worldwide, Nemak research
Premium OEMs expected to drive aluminum growth

Top 20 vehicle models with highest Aluminum content (2012)

<table>
<thead>
<tr>
<th>Model</th>
<th>Al weight percentage</th>
<th>Units produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range Rover</td>
<td>21%</td>
<td>27</td>
</tr>
<tr>
<td>Jaguar XJ</td>
<td>30%</td>
<td>15</td>
</tr>
<tr>
<td>Audi A8</td>
<td>28%</td>
<td>36</td>
</tr>
<tr>
<td>Jaguar XK</td>
<td>27%</td>
<td>4</td>
</tr>
<tr>
<td>Mercedes S-Class</td>
<td>19%</td>
<td>61</td>
</tr>
<tr>
<td>BMW 7</td>
<td>18%</td>
<td>57</td>
</tr>
<tr>
<td>Audi A7</td>
<td>18%</td>
<td>29</td>
</tr>
<tr>
<td>BMW 5</td>
<td>19%</td>
<td>370</td>
</tr>
<tr>
<td>Porsche Panamera</td>
<td>17%</td>
<td>27</td>
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<tr>
<td>Porsche Cayenne</td>
<td>13%</td>
<td>83</td>
</tr>
<tr>
<td>Audi TT</td>
<td>18%</td>
<td>22</td>
</tr>
<tr>
<td>Audi Q5</td>
<td>13%</td>
<td>210</td>
</tr>
<tr>
<td>VW Touareg</td>
<td>10%</td>
<td>88</td>
</tr>
<tr>
<td>Volvo XC60</td>
<td>11%</td>
<td>113</td>
</tr>
<tr>
<td>Mercedes C-Class</td>
<td>13%</td>
<td>394</td>
</tr>
<tr>
<td>Audi Q3</td>
<td>12%</td>
<td>107</td>
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<tr>
<td>BMW 3</td>
<td>13%</td>
<td>415</td>
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<tr>
<td>Land Rover Evoque</td>
<td>11%</td>
<td>112</td>
</tr>
<tr>
<td>Volvo S60</td>
<td>12%</td>
<td>68</td>
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<tr>
<td>Audi A3</td>
<td>13%</td>
<td>165</td>
</tr>
</tbody>
</table>

Source: Ducker Worldwide, Nemak research, IHS Automotive
Secondary Foundry Alloy (SFA)

Higher content of hardeners (Si+Cu) and wider ranges for non desired elements (Fe+Zn), allowing the usage of scrap material:

- 380 - AlSi9Cu3 – 226 – ADC12
- 319 - AlSi7Cu3
- 356.1 - 233 – AC2A

Primary Foundry Alloy (PFA)

High aluminum content and lower tolerances to impurities
Main alloy for the upcoming structural components
Only able to be produced with primary metal:

- 356.2 - AlSi10MgCu

Chemical Composition

<table>
<thead>
<tr>
<th>Al</th>
<th>Si</th>
<th>Cu</th>
<th>Mn</th>
<th>Mg</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>50%</td>
<td>70%</td>
<td>80%</td>
<td>90%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Nemak Alloys

- P1020
- 1100
- 2010
- 3003
- 5154
- 6063
- 7021

Industry served

- Packaging
- Naval
- Construction
- Aerospace
- Automotive

*Avg. content (Aluminum Association)*
Aluminum Market
Aluminum trends in automotive

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- Stringent emissions regulation driving aluminum substitution
  - Vehicle weight is a key lever to meet such regulations
- Next wave of aluminum substitution to come from body-in-white, including Structural Components
  - Trend has already begun with European premium OEMs
- Aluminum pricing is volatile and under uncertainty (Financial deals, Queues, Scrap exports, Energy pricing, Forex, China’s exports of semis...)

Source: Nemak research
Primary Aluminum trend

- By 2014, prices remained attractive for producers due to huge demand from financial players for aluminium to finance and make a risk free return higher than for other risk-free assets.
- Smelters covered costs with record premia, pushed by queues and financial deals, reaching on Jan´15, 28% of LME price.
- After step out of financial investors, new warehousing rules and extra offer of semis from China, pricing and premium are dropping.

Source: LME, Platt’s, Nemak Global Metal Report
Aluminum Scrap demand

- Growing interest in western world for recycled material (Alcoa, Hydro, Novelis, Aleris, etc)
- Countries under development the main importers of foreign scrap
- China is limiting the import of lower scrap grades (green fence strategy)
- The US scrap exports remains above 1.7 mtons/year (~1mtons in Europe)

Global demand for aluminium
Primary and scrap-based production

US Exports of Aluminum Scrap (ktons)

Source: Compiled by Nemak with data from Hydro, U.S. Commerce Department and AMM
Die Casting Alloy (380) vs P1020 price (primary)

- Increased alloy demand and scrap shortages supported secondary alloy price (2013 – 2014)
- Even high demand for casting products, the drop in primary prices has pushed down alloy pricing, but with lower slope.

Source: Platt’s
Primary Aluminum, Price forecast

- Bullish sentiment across analysts, but complex year.
  - Low energy pricing, strong dollar, financial deals, queues, China’s exports of semis....

Source: Bloomberg
Aluminum trends in automotive

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Opportunities in the aluminum supply chain

- Direct relationship with producers
- Long term formula contracts
- Closed loops among producers and consumers
- Material Swap, reducing logistics and process cost
- Improve recycling rate and keep it within the region
- Hedge to reduce exposure to market volatility
- Build loyal relationship

Source: Nemak research
Thank you

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