An Overview of the N.A. Aluminum Extrusion Market
N.A. Aluminum Extrusion Market Overview
Historically, the NA extrusion market has exhibited significant volatility. 

**NA Extrusion Consumption**

- **Extent of downturn**
- **Timing: trough to peak**

**Source:** The Aluminum Association, Lawrence Capital Management, CC analysis
Demand: Historic Market Development

... and is only now approaching it’s last (2006) peak,

Source: The Aluminum Association, CC analysis

NA Extrusion Consumption

- 5.5% vs. ’06 peak
- 10.8% vs. ’99
+54% vs. ‘09 trough

Source: The Aluminum Association, CC analysis
Demand: Recent Market Development

While the market has regained about 85% of its recessionary decline, overall volume remains 6% below the 2006 peak, with most sectors continuing to lag.

Source: The Aluminum Association, CC analysis
Demand: Market Composition

Currently (2016) Extruded Shapes represent about 82% of NA Extrusion Consumption

North American Extrusion Consumption

- **Shapes**: 82.3%
- **Rod/Bar**: 9.2%
- **Pipe/Tube**: 8.5%

Since 2003, Shapes have represented between 79 and 82% of North American consumption.

Rod & bar has represented between 9 and 12%, and is generally less sensitive to the overall economy, thereby increasing their relative presence in down markets; pipe & tube has ranged between 8 and 9% of consumption.

Source: The Aluminum Association, CC analysis
Demand: Market Composition

Construction and Transport are the predominant end markets

Source: The Aluminum Association, CC analysis
Demand: Market Composition

The Global Market Mix Looks Quite Different

Global Consumption

- Construction: 64%
- Transport: 12%
- Consumer: 6%
- Electrical & Energy: 6%
- Machinery: 8%
- Misc: 4%

Global Consumption 2014

Source: The Aluminum Association, CC analysis
Demand: Market Composition

Though cyclical factors are currently evident, structural changes may lead to Transport applications equaling Construction within the next 5 years.

Source: The Aluminum Association, CC analysis
Demand: Building & Construction

A number of paradigm shifts point to reduced growth for B&C

VERSUS:

The old standby issue: Bricks & mortar retail

Online shopping (videos, music, books, travel agencies)

But many more examples now:

Single-family residential (high square footage per unit)

Multi-family residential (low square footage per unit)

Street-corner retail banking branches

Banking over the Internet (PayPal; etc.)

Hotels/motels

The 'sharing economy' (e.g., Airbnb)

University & college campuses

Proliferation & convenience of lower-cost online courses

Medical office buildings

Health care Google searches / digital transfer of records

Office space

Working from home / 'hoteling' or sharing of space

Source: CMD
Demand: Building & Construction

Commercial façade applications (curtain wall, storefront systems, commercial windows) are the dominant Building & Construction application.

Building & Construction

2016

100% = 1,974 million lbs

- Commercial Façade: 40%
- Residential w&d: 20%
- Street, Hwy: 2%
- Stadium Seating: 2%
- Railings: 3%
- Interior Partitions: 2%
- Louvers, Ducts: 2%
- Other: 29%

Notes:
- Some residential applications, especially those for high-rise projects would be included as commercial. “Residential window & door” is primarily single-family or low-rise projects.
- “Other” includes a range of small applications (e.g. shower cabins, swimming pool components, sunrooms) as well as unidentified B & C uses.

Source: The Aluminum Association, CC analysis
Demand: Building & Construction

Over the past decade, commercial B&C markets have increased in importance, due to both economic and material choice factors.

- Residential markets remain deeply depressed, with new home sales ~60% of 2006 levels and home resales – a stimulus to remodelling – at ~85% of 2006 levels.
- Vinyl has continued to displace aluminum for residential windows and now accounts for ~70% of the market, vs. aluminum at 8% (vs. 62% in 1980).
- Aluminum has maintained ~85% share in commercial applications, though composites and fiberglass are challenging.
Demand: Transportation

Due to increased usage in autos, cars and light trucks have surpassed trailer trucks & semis as the largest transportation segment.

![Transportation Pie Chart]

- **2016**
  - Trailers, Semis: 29%
  - Cars, Light Trucks: 36%
  - RV: 13%
  - Truck/Bus: 8%
  - Military, Air: 4%
  - Other: 8%
  - Rail: 2%

**Notes:**
- Pick-up trucks and SUVs are considered Light Trucks; Panel Vans and Urban Delivery trucks (4-6 axle) are classified in Truck/Bus, while “Class 8” Truck Cabs for towing long haul trailers are included in Trailers & Semis.
- “Other” includes a range of small applications (e.g. motorcycles, shipping containers, small personal trailers) as well as unidentified transport uses.

Source: The Aluminum Association, CC analysis
Demand: Transportation

While currently about equal in consumption, these two segments have dramatically different characteristics, with trailers/semis highly cyclical ...

- Trailers & Semis is highly cyclical overreacting to the general economy and resulting freight traffic; truckers find it easy to defer purchases of cabs and trailers when facing profit pressure.
- Further, vehicle architecture is relatively static. Trailers are traditionally aluminum intensive (and are seeing some penetration from composites). Some Class 8 cab builders (e.g. Paccar) have traditionally been aluminum based, while others (e.g. Volvo) have favored steel.
- With new government fuel economy/emissions regulations there is likely to be a gradual increase in aluminum intensity

Source: The Aluminum Association, CC analysis
Demand: Transportation

...while the Auto & Light Truck Market is realizing substantial gains in extrusion usage as auto manufacturers strive to meet the Government’s 2025 mileage and emission requirements.

Extrusion*/Light Vehicle

<table>
<thead>
<tr>
<th>Year</th>
<th>Shapes/vehicle @ +28%, PT/RB flat</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>20</td>
</tr>
<tr>
<td>2013</td>
<td>25</td>
</tr>
<tr>
<td>2014</td>
<td>30</td>
</tr>
<tr>
<td>2015</td>
<td>35</td>
</tr>
<tr>
<td>2016</td>
<td>40</td>
</tr>
<tr>
<td>2017</td>
<td>45</td>
</tr>
<tr>
<td>2018</td>
<td>50</td>
</tr>
<tr>
<td>2019</td>
<td>45</td>
</tr>
<tr>
<td>2020</td>
<td>50</td>
</tr>
<tr>
<td>2021</td>
<td>45</td>
</tr>
<tr>
<td>2022</td>
<td>50</td>
</tr>
</tbody>
</table>

* shapes, pipe/tube & rod/bar; p/t & r/b flat @ ~ 10.5#
Source: The Aluminum Association, CC analysis
## Demand: Transportation

Shapes growth is concentrated in body structure! (Extrusion Pounds per Vehicle)

<table>
<thead>
<tr>
<th>Type</th>
<th>Example</th>
<th>2012</th>
<th>2017</th>
<th>2025</th>
<th>Incr. in #/yr*</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shapes</td>
<td>Interiors, Seats, Trim, Sunroof, Others</td>
<td>1</td>
<td>1.2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shapes</td>
<td>Exterior</td>
<td>3</td>
<td>3.2</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shapes</td>
<td>Bumpers</td>
<td>4</td>
<td>5.5</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shapes</td>
<td>Body Structures</td>
<td>1</td>
<td>4</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shapes</td>
<td>Steering &amp; Brakes</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube</td>
<td>Drive Shafts</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rod &amp; Bar</td>
<td>Transmission</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shapes</td>
<td>Mounts</td>
<td>1.5</td>
<td>2</td>
<td>2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube</td>
<td>Heat Exchangers</td>
<td>5.3</td>
<td>5.3</td>
<td>5.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shapes</td>
<td>Suspension / Links / Chassis</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>25.3</td>
<td>31.7</td>
<td>49.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Increase from ’17 to ‘25, based on 18 mm vehicle build rate

Source: Ducker Worldwide, CC Analysis
Demand: Transportation

An expected wave of program launches points to a major reshaping of North American light vehicles ...
Demand: Transportation

Electrification, and advances in battery cost/performance, should be bullish for aluminum.

**Solutions for electrical vehicles**

*Case study performed by EAA*

<table>
<thead>
<tr>
<th>Reference Vehicle</th>
<th>Steel Electric Vehicle</th>
<th>Aluminium Electric Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Unibody</td>
<td>Steel Unibody</td>
<td>Aluminium Space frame</td>
</tr>
<tr>
<td>ICE Vehicle</td>
<td>Conversion design</td>
<td>Aluminium Hang-on Parts</td>
</tr>
<tr>
<td>Range &gt;700 km</td>
<td>Battery Electric Vehicle</td>
<td>Battery Electric Vehicle</td>
</tr>
<tr>
<td></td>
<td>Range = 200 km</td>
<td>Range = 200 km</td>
</tr>
</tbody>
</table>

*Conserve structural behaviour of reference vehicle: Crashworthiness / Stiffness*

With improving battery technology, “virtually all lightweight metals ... become the most cost effective means of either reducing EV prices or increasing EV range.”

Gregg Peterson, LIFT
Demand: Transportation

... with electrification potentially being the “next big thing”

Vehicle Production – Future Production Mix

GM: 20 all-electric vehicles by ‘23; 2 w/in 18 mo. GM “believes in an all-electric future”

Volvo: Electric powertrains for all vehicles by ‘19

JLR: All new models from ‘20 either fully electric or hybrid

Porsche: 50% of output electric by ‘23

**Demand: Electrical & Energy**

Increased use of extrusion for Alternative Energy – primarily solar – and lighting conversion to LED has driven recent growth in the Electrical & Energy Sector.

### Electrical & Energy

<table>
<thead>
<tr>
<th>Category</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative Energy</td>
<td>22%</td>
</tr>
<tr>
<td>Power Transmission</td>
<td>17%</td>
</tr>
<tr>
<td>Lighting</td>
<td>11%</td>
</tr>
<tr>
<td>Electronics, Comm'n</td>
<td>10%</td>
</tr>
<tr>
<td>Bus Bar</td>
<td>10%</td>
</tr>
<tr>
<td>Electrical Equipment</td>
<td>9%</td>
</tr>
<tr>
<td>Other</td>
<td>21%</td>
</tr>
</tbody>
</table>

2016
100% = 525 million lbs

**Notes:**
- Alternative Energy usage has grown from around 15 million pounds/year in the 2006-08 period to around 125 million pounds/year today.
- An additional source of sector growth has been the conversion to LED lighting, with an attendant use of extruded heat sinks and housings.
- A significant portion of the “other” category would be extruded tubing for electrical conduit.

Source: The Aluminum Association, CC analysis
**Demand: Consumer Durables**

Relatively stable recently, the Consumer Durables sector has declined significantly in importance since the early 2000’s.

![Consumer Durables Pie Chart](chart.png)

**Consumer Durables**

2016

100% = 487 million lbs

- Boating: 25%
- Furniture: 25%
- Sporting Goods: 10%
- Other: 16%
- Air Conditioning: 21%
- Major Appliance: 3%

**Notes:**
- Consumer Durables consumption of Extrusion today is less than ⅛ that of the 1998 – 2002 time period, a result of extensive offshoring.
- The decline in Consumer Durables consumption has been most significant in the furniture, sporting goods and “other” markets (e.g. lawn & garden tools, other hand tools, flashlights, etc.)
- Air Conditioning has grown recently as aluminum has replaced copper tubing.

Source: The Aluminum Association, CC analysis
Demand: Consumer Durables

Major segments show high volatility, or have declined substantially due to Offshoring

Shipments of major Durables segments, indexed

Indexed Volume: 2000 = 1, but for AC*

* Air Conditioning sales indexed with 2005 = 1 due to data irregularities
Demand: Machinery

On-shoring and the recovery of business capital investment, had helped consumption for Machinery & Equipment, but the woes of the U.S. Oil and Gas Industry have hurt.

Notes:
- Construction activity drives the ladder/scaffold segment
- Industrial automation and the attendant need for linear motion devices, conveying systems, etc. is another driver for growth

Source: The Aluminum Association, CC analysis
N.A. Aluminum Extrusion Market Overview

Today’s Discussion
• The Demand Side
  • Historic Market Development & Outlook
  • Market Composition & Characteristics
    • Building & Construction
    • Transportation
    • Electrical & Energy
    • Consumer Durables
    • Machinery & Equipment

• The Supply Side
  • Structure & Concentration
    • Recent Investment, Capacity Utilization
  • Supply Chain Composition & Characteristics
    • NA Extruders
    • Vertical Integration
    • Imports
Supply: Supply Structure

Today, there are about 130 Soft Alloy Extruders in NA, with 10 representing about 60% of NA Sales, and about 1/3 of the presses.

**Extruders**
- Largest 10 NA extruders/extrusion groups: 10
- Remaining NA extruders: 119

**Locations**
- Largest 10 NA extruders/extrusion groups: 51
- Remaining NA extruders: 147

**Presses**
- Largest 10 NA extruders/extrusion groups: 164
- Remaining NA extruders: 326

**Soft Alloy Sales**
- Largest 10 NA extruders/extrusion groups: 58%
- Remaining NA extruders: 42%

Significant restructuring has taken place recently. Since 2007:

- ~50 extrusion plants, with over 75 presses, have closed
- Excluding the “big” consolidations, another 13 facilities, with >30 presses, changed hands – often via bankruptcy
Supply: Structure, Concentration

Today’s supply structure is significantly more concentrated and more “industrial” (less family) than that of just a few years ago. “Financial” ownership has come and gone during the interim.

**Capacity: 2006**

- Alcoa
- Indalex
- Hydro
- Kaiser
- Bonnell
- Signature
- Al Shapes
- SAPA
- Western
- Extrudex

**Capacity: 2014**

Note: Capacity is based on either public statements or estimates derived from press populations operating at average AEC productivity at 5.5 days, 50 weeks/year.
North American Extrusion

The Competitive Landscape has been relatively stable recently

Extrusion Capacity*: US + Canada 2014

- Bonnell press additions + Futura acqn
- Kaiser press additions

Capacity: 2014

Source: CC analysis
Supply: Vertical Integration

Around 14% of NA soft alloy presses are owned by vertically integrated manufacturers.

- 86% Merchant
- 14% Integrated

Presses with Integrated Ownership:

- 2007: Benteler, MI: 2 presses; automotive
- 2015: Valmont, IN: 1 press; light pole
- Recent vertical integration: Dee Zee (IA) 3/15 - 1 – new, auto
  Thor (IN) 5/15 – 4 – Postle, RV
- Winnebago, IN: 2 presses; recreational vehicle
- YKK, GA: 2 presses; commercial B & C

Other
Building
+ Electrical, Auto, RV, Distribution, Light Pole
Supply: Imports

Except for the dramatic surge in Chinese imports – curtailed by AEC’s successful trade action – imports’ share generally ranges between 3.5 – 7%.

At present, imports are primarily from Mexico, Malaysia & Vietnam, with some high-tech product from Europe.
A new factor is foreign-owned extruders in NA

Chinese owned extruders
- **Nanshan, IN**
  - Greenfield, began operating 2014
  - Remelt and 2 presses:
    - **Aluminum Shapes, NJ***
      - Acquired 2013 by Zhongwang
      - Remelt and 7 presses: 7”-16”
    - **Signature/Canada, ONT***
      - Acquired 2013 by Zhongwang
      - Remelt and 4 presses: 9-11” + fab

Other foreign ownership
- **Bowers, MI**
  - Purchased 2013 by Erbsloh
  - 3 presses
- **Whitehall, MI & KY**
  - Acquired 2016 by UACJ
  - 2, now 3 presses, extensive fab
- **Kobelco, KY**
  - Greenfield, 2018 start-up
  - Remelt, presses, bumper fab
Supply: Recent Investment

With recovery and stability, the industry has been reinvesting. In the past 5 years, about 35 additional soft alloy presses have been put in place or put on order, with larger presses predominant.

New presses by size

- 8": 10%
- 9": 13%
- 10": 20%
- 12": 34%
- >12": 23%

16+ of these new presses are dedicated to automotive

North American Press Population*

- >12": +57%
- 10-12": -9%
- 7-10": -16%
- <7": -63%

*Note: Press reporters are not consistent. Thus population numbers should be viewed as directional, not absolute.
Supply: Recent Investment

Investments are being made in Remelt and Fabrication capacity as well.

There are at least 20 extruder-operated remelts in North America.
Creation of “added value” beyond extrusion appears key to profitability

Source: Aluminum Extruders Council, 2013-16 Operating Ratio Surveys
1. Overall demand has moved in a band for 20 years
2. While some segments have grown significantly, weakness in others has offset that growth
3. Recent capacity additions have offset the capacity rationalization of the recession, hence overcapacity remains an issue
4. With one notable exception, the industry remains one of local or regional competitors
5. While extrusion profitability has increased with the market rebound and metal price drops, returns are enhanced with:
   • cost effective casthouse or high value downstream operations
   • Investment in sales activities

*Sharp focus on where to compete ... and how to add value*
The big “take-aways” continued

“Growing the pie” means:
- The market is aware of our process & potential
- Extruders are invited to the discussion early ... and add real value

Focus sharply on where to compete ... and how to add value
N.A. Aluminum Extrusion Market Overview

October 2017
Lynn Brown
lfbrown@consulting-collaborative.com
01.443.994.7096
Supply: NA Extruders - Economics

Generally, “added value” beyond extrusion has been key to profitability.