A GLOBAL OVERVIEW OF THE SPF INDUSTRY

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CONTENTS

• Who is IAL?

• SPF Global Trends

• Overview of Global PU Industry’s Development

• Global Construction Industry’s Performance and Outlook

• SPF Industry Overview

• Challenges and Opportunities
IAL OVERVIEW

- Formed in 1966
- Privately owned
- Offices in London, San Francisco, CA, Summit, NJ, New Delhi, Mendoza and Beijing
- FTE model - c. 25 executives plus administrative support

Geographical Focus

- North America 35%
- Europe 35%
- Asia Pacific 15%
- South America 10%
- Other 5%

Consulting Services Focus

- Market Analysis 40%
- Business Model Analysis 30%
- Cost and Profitability Analysis 20%
- Due Diligence 10%
## OUR PU COVERAGE

### Raw Materials
- PMDI
- MDI
- TDI
- NDI
- Aliphatic Isocyanates
- Specialty Isocyanates
- Polyether Polyols
- Polyether Graft Copolymer Polyols
- PTHF Polyether Polyols
- Acrylic Polyols
- Polyester Polyols
- Other Materials

### Flexible Foam
- Slabstock
  - Polyether
  - HR/CMHR
  - Polyester
  - Viscoelastic
  - Other
  - Molded
  - Transport Seating
  - Furniture
  - Carpets & Sound Insulation
  - Semi-Rigid
  - Integral Skin
  - Automotive
  - Furniture

### Rigid Foam
- Rigid-Faced Panels
- Flexible-Faced Panels
- Slabstock
- Sprayed Foam
- Refrigeration
- Aerosol Gap Filling (OCF)
- Molded Rigid Foam
- Pipe-in-Pipe Insulation
- Others

### PU Coatings
- Transport
  - Auto OEM
  - Auto Refinish
- Commercial Vehicles
- Marine
- Other Transport
- Construction
  - Architectural
  - Roof, Tank & Deck
  - Maintenance
- Industrial Coatings
- Plastic Coatings
- Textile & Leather
- Wood & Furniture
- Others

### Adhesives & Sealants
- Adhesives
  - Automotive
  - Construction
  - Flexible Packaging
  - Footwear
  - General Assembly
  - Others
- Sealants
  - Auto Direct Glazing
  - Construction
  - Insulated Glazing
  - Other Transport
  - Others

### Elastomers
- Cast Elastomers
- Fibers/Spandex
- Footwear
- RIM/RRIM
- Technical Microcellular
- TPU
- Synthetic Leather
- Others

### Binders
- Forest Products
- Foundry Core
- Rubber Crumb
- Others

### Major End-Use Markets
- End-Use Sectors
  - Automotive
  - Building & Construction
  - Footwear
  - Furniture & Bedding
  - Refrigeration
SPF MARKET TRENDS
NAFTA MARKET TRENDS AND ISSUES

- Strong performance - some suppliers reported double-digit growth.
- Construction outlook remains positive
  - US housing starts increased in 2013 and 2014
- Shale gas exploration creating more application opportunities.
- Industrial output continues to improve.
- Closed cell growth > open cell growth.
- Demand largely driven by renovation of existing buildings and weatherization projects.
- Canadian housing market struggling.
- Mexican market remains underdeveloped.
GLOBAL MARKET TRENDS AND ISSUES

- Global growth driven by increasing demand in North America.
- Slowdown in Asian economies.
- Difficult period in China, the largest SPF consumer.
- Health and safety considerations gaining importance.
- 4th generation blowing agents emerging in the market.
- Demand in the emerging markets remains small.
GLOBAL PU INDUSTRY
Global PU Production, 2013

- Adhesives: 27%
- Flexible Foam: 21%
- Coatings: 17%
- Elastomers: 5%
- Binders: 3%
- Rigid Foam: 2%
- Sealants: 2%

Source: IAL
PU Raw Material Consumption, MLbs, 2013

Source: IAL
PU GLOBAL MARKET TRENDS
MARKET DRIVERS

• Energy costs (heating and cooling) rising
• Government construction projects
• Cold chain improvements
• Social housing programs
• Building improvements and upgrades with government support on energy efficiency
• Population growth
• Rebuilding
• Increased general wealth
• New financial opportunities
• A rising middle class in emerging markets
• Internet shopping
PU GLOBAL MARKET TRENDS
MARKET RESTRAINTS

- Economic crisis and threat of renewed recession
- Fire regulations
- Price pressure from buyers
- Raw material cost increases
- Concerns over isocyanates
- Overcapacity
- High plant capital costs
- “Bogus” new plant announcements
- Political turmoil and conflict
- Recycling potential of thermosets (automotive)
# RAW MATERIAL DEMAND

## GLOBAL PICTURE (TONNES)

<table>
<thead>
<tr>
<th>Product Type</th>
<th>MMDI</th>
<th>PMDI</th>
<th>TDI</th>
<th>Specialty Isocyanate</th>
<th>Graft Polyol</th>
<th>Polyester Polyol</th>
<th>PTHF Polyol</th>
<th>Polyether Polyol</th>
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</thead>
<tbody>
<tr>
<td>CASE</td>
<td>2,385</td>
<td>1,868</td>
<td>1,076</td>
<td>753</td>
<td>10</td>
<td>3,269</td>
<td>1,020</td>
<td>2,861</td>
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<td>Flexible Foam</td>
<td>390</td>
<td>654</td>
<td>3,018</td>
<td>0</td>
<td>1,158</td>
<td>265</td>
<td>0</td>
<td>6,117</td>
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<tr>
<td>Rigid Foam</td>
<td>0</td>
<td>6,318</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1,196</td>
<td>0</td>
<td>2,266</td>
</tr>
<tr>
<td><strong>Total Demand 2013</strong></td>
<td>2,774</td>
<td>8,841</td>
<td>4,094</td>
<td>753</td>
<td>1,168</td>
<td>4,731</td>
<td>1,020</td>
<td>11,244</td>
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<tr>
<td>Estimated Capacity 2013</td>
<td>2,700**</td>
<td>10,800**</td>
<td>5,900</td>
<td>610*</td>
<td>1,800</td>
<td>6,700</td>
<td>1,450</td>
<td>20,700</td>
</tr>
</tbody>
</table>

Source: IAL

*Aliphatic isocyanates only

** Based on 6,125,000 tonnes of capacity split at 80:20 PMDI to MMDI
TECHNICAL TRENDS

• Cost reduction
  ▪ Reduced density (less material) but same performance

• Light weighting
  ▪ Auto foams
  ▪ Insulation panel fitment

• Use of MDI in flexible foam

• Increased flame retardancy

• China moving towards more sophisticated PU products
  ▪ Low value materials will be produced in lower cost countries

• Sustainability
GLOBAL CONSTRUCTION MARKET PERFORMANCE AND OUTLOOK
## GDP GROWTH RATE FOR MAJOR ECONOMIES (%)

<table>
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<tr>
<th></th>
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<td>6.4</td>
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<td>6.6</td>
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<td>2.2</td>
<td>3.1</td>
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<td>2.7</td>
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<tr>
<td>Canada</td>
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<td>2.3</td>
<td>2.4</td>
<td>2.4</td>
<td>2.2</td>
<td>2.1</td>
</tr>
<tr>
<td>Mexico</td>
<td>4.0</td>
<td>1.1</td>
<td>2.4</td>
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<tr>
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<td>0.5</td>
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<td>1.8</td>
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<td>Japan</td>
<td>1.5</td>
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<td>0.9</td>
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<tr>
<td>Eurozone</td>
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<td>-0.4</td>
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<td>1.3</td>
<td>1.7</td>
<td>1.7</td>
<td>1.6</td>
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<td>World</td>
<td>3.4</td>
<td>3.3</td>
<td>3.3</td>
<td>3.8</td>
<td>4.0</td>
<td>4.1</td>
<td>4.0</td>
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</tbody>
</table>

*Source: IMF*

*Forecasts*
KEY ISSUES AFFECTING THE GLOBAL CONSTRUCTION SECTOR

- Population growth
- Government spending
- Higher living standards
- High per capita income
- Increased urbanization
- Credit availability
- Consumer spending
- Improved energy efficiency
- Greater use of new technologies
- Demand for sustainable living
## CONSTRUCTION SPENDING IN MAJOR ECONOMIES 2012-2018 (US$ BILLION)*

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014**</th>
<th>2015**</th>
<th>2016**</th>
<th>2017**</th>
<th>2018**</th>
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<tr>
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<td>681</td>
<td>738</td>
<td>816</td>
<td>925</td>
<td>1,029</td>
<td>1,146</td>
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<tr>
<td>India</td>
<td>331</td>
<td>370</td>
<td>425</td>
<td>491</td>
<td>565</td>
<td>647</td>
<td>740</td>
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<tr>
<td>USA</td>
<td>522</td>
<td>576</td>
<td>672</td>
<td>806</td>
<td>887</td>
<td>922</td>
<td>959</td>
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<tr>
<td>Canada</td>
<td>111</td>
<td>115</td>
<td>119</td>
<td>124</td>
<td>130</td>
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<td>Mexico</td>
<td>104</td>
<td>114</td>
<td>126</td>
<td>138</td>
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<td>158</td>
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<tr>
<td>Brazil</td>
<td>55</td>
<td>59</td>
<td>66</td>
<td>74</td>
<td>82</td>
<td>91</td>
<td>100</td>
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<tr>
<td>Russia</td>
<td>139</td>
<td>153</td>
<td>168</td>
<td>187</td>
<td>205</td>
<td>224</td>
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<td>Japan</td>
<td>241</td>
<td>256</td>
<td>277</td>
<td>281</td>
<td>281</td>
<td>289</td>
<td>298</td>
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<td>France</td>
<td>217</td>
<td>209</td>
<td>206</td>
<td>208</td>
<td>212</td>
<td>213</td>
<td>215</td>
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<tr>
<td>Germany</td>
<td>308</td>
<td>309</td>
<td>317</td>
<td>322</td>
<td>324</td>
<td>329</td>
<td>334</td>
</tr>
<tr>
<td>Spain</td>
<td>80</td>
<td>68</td>
<td>65</td>
<td>65</td>
<td>68</td>
<td>69</td>
<td>71</td>
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<tr>
<td>UK</td>
<td>179</td>
<td>181</td>
<td>188</td>
<td>196</td>
<td>202</td>
<td>209</td>
<td>217</td>
</tr>
</tbody>
</table>

*Source: IHS, Euroconstruct, BRG Building Solutions

*Excluding civil engineering

**Forecasts BRG Building Solutions
NEW CONSTRUCTION BY REGION

New Construction by Region 2013-2018 (Millions of Units)

Source: IHS, Euroconstruct, BRG Building Solutions
## US HOUSING ACTIVITY

<table>
<thead>
<tr>
<th>Housing Type</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Housing Starts</td>
<td>529</td>
<td>609</td>
<td>781</td>
<td>925</td>
<td>1,006</td>
</tr>
<tr>
<td>Single Family</td>
<td>415</td>
<td>431</td>
<td>535</td>
<td>618</td>
<td>648</td>
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<tr>
<td>Multi Family</td>
<td>114</td>
<td>178</td>
<td>245</td>
<td>307</td>
<td>358</td>
</tr>
<tr>
<td>New Single Family Home Sales</td>
<td>310</td>
<td>305</td>
<td>369</td>
<td>430</td>
<td>-</td>
</tr>
<tr>
<td>Existing Single Family Home Sales</td>
<td>4,208</td>
<td>3,786</td>
<td>4,128</td>
<td>4,484</td>
<td>-</td>
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</table>

Source: National Association of Home Builders
## CANADA HOUSING STARTS

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Units</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>211,056</td>
<td>-7.6</td>
</tr>
<tr>
<td>2009</td>
<td>149,081</td>
<td>-29.4</td>
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<tr>
<td>2010</td>
<td>189,930</td>
<td>27.4</td>
</tr>
<tr>
<td>2011</td>
<td>193,950</td>
<td>2.1</td>
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<td>2012</td>
<td>214,827</td>
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<tr>
<td>2013</td>
<td>187,923</td>
<td>-12.5</td>
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<tr>
<td>2014</td>
<td>189,401</td>
<td>0.8</td>
</tr>
</tbody>
</table>
SPF MARKET PERFORMANCE
GLOBAL SPF MARKET
MARKET TRENDS

• **Western Europe**: Continued growth despite economic difficulties. Renovation sector driving the demand.
• **Eastern Europe**: Huge potential, but traditional materials and PU panels often preferred.
• **Middle East & Africa**: Political instability putting off investors.
• **South America**: SPF mostly used in commercial and industrial applications.
• **Asia Pacific**: Demand increasing in emerging economies such as India.
• **China**: Interim ban had an impact on construction applications.
• Over 40% of housing built before 1960s, need for renovation.
• Panels considered safer to handle and more reliable.
• **UK and Ireland:** Panels preferred, demand mostly from cavity wall and attic insulation.
• **Benelux:** Now the leading market. Concerns over isocyanate content.
• **France:** Currently experiencing fast growth, most demand from flooring applications.
• **Germany:** Panels preferred. Concerns over isocyanate and fire rating.
• **Spain:** Market collapsed in the housing crisis. Producers now more optimistic.
• **Italy:** Optimism due to tax deduction for renovation to improve energy efficiency.
• **Scandinavia:** Strong preference for mineral fiber. Concerns over isocyanates and blowing agents.
Quality insulation needed for renovation projects.
- Share of traditional materials remains high.
- **Russia**: Largest market in Eastern Europe. High densities (up to 3.75 pcf) usually preferred. District heating pipelines, and oil and gas pipes, creating additional demand.
- **CIS**: Traditional materials preferred for cost reasons. As with Russia, demand for high density foam from tank and pipe applications.
- **Poland**: Domestic demand mostly from residential application, mostly new build. Popular as flat roof insulation.
- **Hungary and Czech Republic**: Demand mostly from roof insulation.
- **Romania**: Presence of former Spanish suppliers. SPF gaining market share from EPS.
• Growth of middle class and increasing income levels boosting SPF demand.
• Slow introduction of building codes, and improved awareness.
• **North Africa:** Spanish and Turkish suppliers present here. Demand mostly from luxury villas and new hotels.
• **Middle East:** SPF used in roofing applications in Saudi Arabia, flat roofs commonplace. UAE demand from hotels and luxury buildings. Qatar experiencing strong growth, driven by large number of construction projects. Iranian demand mostly from storage and agriculture.
• **Turkey:** Residential buildings and cold storage applications. Fast growth has attracted new suppliers and contractors.
• **South Africa:** Legislation encouraging consumption.
• **Nigeria:** Prosperous construction sector.
ASIA PACIFIC

CHINA

• Interim ban introduced after several fires had an impact on residential and public buildings, but the demand has since increased.
• Some reluctance to use SPF still exists.
• Regional restrictions remain in place.
• Fastest growth related to tank, pipe and cold storage.
• Some demand from acoustic applications.
• Production and demand focused on Northern and Eastern regions due to demand for cold storage.
• Closed-cell foam dominates the Chinese market.
• Competition from other materials due to higher cost.
• Environmental issues a growing concern. Cost could increase further if blowing agents banned.
ASIA PACIFIC

REST OF ASIA PACIFIC

- **Japan**: Growth from refurbishment of commercial and residential buildings following few years of decline. SPF PIR-based, with some interest in open-cell formulations.

- **South Korea**: Some recovery following construction slump, most demand from public buildings. Interest in green products increasing.

- **India**: Tremendous potential, competition from other materials. Currently used for roofs, suspended floors and inner wall surfaces.

- **Thailand**: Demand from roofing applications to prevent leaking.

- **Australia**: Demand from roofing and walls, process industry, agricultural storage and transportation. Growth expected from pipeline applications and tanks.

- Only limited demand in **Southeast Asia** due to preference for panels and higher cost. Mostly used in commercial applications.
• Small market in comparison to North America.
• Limited product awareness and technical knowledge.
• Consumption exceeds local production.
• **Brazil:** Most common application is commercial and industrial roofing, followed by wall insulation. Some demand in agriculture. Limited opportunities in residential sector.
• **Argentina:** Commercial roofing and wall insulation of existing buildings. Some demand from tank, pipe and agriculture.
• **Chile:** Roofing the main application, with some demand from wall insulation, marine, mining and agriculture.
• **Colombia:** Residential wall and roof insulation of high and mid-range properties in coastal regions.
GLOBAL SPF PRODUCTION
BY REGION

Global SPF Production in 2011, 2013 and Forecast Production in 2018 (MLbs)

- NAFTA
- South America
- Europe
- MEA
- China
- Asia

2011
2013
2018
LEADING SPF PRODUCING COUNTRIES

SPF Production by Country in 2011, 2013 and Forecast for 2018 (MLbs)
• Fastest growing SPF market.
• SPF gaining market share from other materials, including boardstock and fiberglass.
• Demand for residential wall and especially commercial wall insulation growing fast, as well as tanks.
• Stagnation in roofing applications.
• Limited interest in “green” products.
• New suppliers in the market, more competition. Contractors must be fully trained and the level of awareness has increased.
• Adoption of 4th generation BAs low.
• Low density SPF without ignition barrier.
• Many suppliers expect the double-digit growth to continue!

<table>
<thead>
<tr>
<th>Application</th>
<th>Demand 2013 (MLbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall applications</td>
<td>220</td>
</tr>
<tr>
<td>Roofing</td>
<td>105</td>
</tr>
<tr>
<td>Wall applications</td>
<td>80</td>
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</tbody>
</table>
AMERICAS

CANADA & MEXICO

• Canada experiencing fast growth.
• New market entrants, mainly from the US.
• New systems suppliers.
• Market gains in retrofit residential construction.
• Some interest in “green” products.

• In Mexico demand mostly from roofing.
• Lack of extreme weather hindering growth – currently only 10% of housing has insulation.
• INFONAVIT foundation promoting energy efficiency – no regulations or building codes.
• 141b still in use.

<table>
<thead>
<tr>
<th>Application</th>
<th>Demand 2013 (MLbs)</th>
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<tbody>
<tr>
<td>Wall applications</td>
<td>57</td>
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<tr>
<td>Roofing</td>
<td>6</td>
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<tr>
<td>Other Applications</td>
<td>27</td>
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<table>
<thead>
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<th>Application</th>
<th>Demand 2013 (MLbs)</th>
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<td>Wall applications</td>
<td>10</td>
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<tr>
<td>Roofing</td>
<td>10</td>
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<tr>
<td>Other Applications</td>
<td>10</td>
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</tbody>
</table>
NAFTA SPF Production in 2012 and 2013 (MLbs)
Global SPF Industry

Challenges

• Competition from alternative materials that are cheaper and have a better fire performance.
  • Fire rating
  • Price
• Increased competition due to the growing number of contractors and suppliers.
• New technologies such as aerogel.
• Poor application – damaged reputation, home owner complaints, contractor problems.
• Training required for installation.
• Health and safety issues.
• Volatile raw material costs and availability.
GLOBAL SPF INDUSTRY
OPPORTUNITIES

• Versatility and performance key strengths.
• Government stimulus and legislation to promote energy efficiency.
• Enormous untapped global markets.
• Growth of housing markets.
• Growth in industrial applications.
• Tax credits for insulation.
• Improved installation – better performance, better reputation!
Thank You!

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• Our programs enable better decision making and drive client-specific business initiatives, via a combination of validated evidence and industry-specific analysis by our global team of experts.