Spray Foam Insulation
For an Energy Efficient Home
Who is Icynene Inc.?

- Founded in November, 1986 in Toronto Canada
- Product: soft low density foam insulation.
- A Green product
  - which uses water as the agent of expansion
  - contains no HCFC's, HFA's, formaldehyde
  - PBDE’s or volatile organics.
- BBA, ETA, IAB certified
- Tested & Approved by The Fraunhofer Institute
- Approved by AMICA, The European Association for the environmental & Chronic Toxic Injury.
Who is Icynene Inc.?

• An air barrier and insulation in one which is breathable
• Breathability is 0.0049 L/s-m² at 75Pa of pressure
• Standard for any material to be considered an air barrier is less than 0.02 L/s-m² at 75Pa according to the only known standard ASTM E-283
• Icynene is vapor open and facilitates vapor diffusion and bi directional drying
The Icynene Insulation System®

- Icynene Inc. is a member of Green Building organizations around the world
- The product has been used in “Health Houses” for asthmatics sponsored by the American Lung Association
- 28 years of experience and over 300,000 buildings of all types insulated – schools, hospitals, museums, art galleries, laboratories, churches, factories, residential
Stone/Masonry Wall
Dry Lining Frame
Icynene
Vapour Barrier
Plasterboard
Plaster/Skim
GMS Renewable Products
Fuel Prices

Oil Prices, 2006-2008
NYMEX Light Sweet

May 2008 $130
GLOBAL WARMING

Climbing temperatures.
Melting glaciers. Rising seas.
All over the earth we're feeling the heat.
Why isn't Washington?
Types of Energy Transfer

» Conduction
» Convection
» Radiation
» Mass Transfer

Note that U or Lambda value only measures conduction
Convection? Mass Transfer?

**Convection**

Air movement transporting heat and moisture

**Mass Transfer**

Warm air can carry a great amount of water in the form of water vapor / humidity

And water vapor can store 4000 times the heat energy of dry air.

With the combination of these two, air leakage contributes up to 50% or more of the heating & cooling loads in insulated buildings.

Air Leakage: 50%
The Myth of insulation depth and U value

Total Heat Flow Reduction with Increasing Insulation Thickness

- 0%
- 80%
- 89%
- 92%
- 94%
- 95%
- 96%
- 97%
- 97%
- 97%
- 98%
- 98%
- 98%

Total Heat Flow Reduction (%)

Thickness of Insulation (Inch)
Conductive Heat Flow Reduction with Decreasing U-value

- Conductive Heat Flow Reduction
- U-Value of Insulation (W/m²K)

- 78%
- 89%
- 93%
- 94%
- 96%
- 96%
- 97%
- 97%
- 98%
- 98%
- 98%
- 98%

Values range from 1.420 to 0.118.
The Problem with U Value

- Decreasing U-Value by increasing wall thickness greater than 125 mm
  - Will not substantially save energy
  - Is not cost effective
  - Does not address air leakage or condensation issues
  - Energy Calcs are U driven and do not give adequate credit for Air Barrier – makes it hard to introduce innovative products to the market

Controlling Air Leakage is key
Conductive & Convective Heat Flow

**Insulation Performance Varies with Temperature**

Outside Temperature*

- **Foam Insulation**
  - 15% rise to -50c/+50c

- **Fibre Insulation**
  - 65% rise to -50c/+50c

*Assuming a constant 20c interior temperature
Buildings will get wet

- Many buildings at some time will experience water in the interior in some fashion eg. roof leaks, condensation.
- The idea that a building can be totally waterproof is virtually impossible to achieve.
- Better to design using materials which, if they do become wet, can dry and resume their function without slumping or distorting.
Moisture Accumulation

- The most common cause of building problems is:
  
  Moisture Accumulation

Moisture Accumulation

Condensation
Leaks
Wet Building Materials

How It Affects Us?

Structural Damage
Damage to Interior Finishes
Mould and Mildew
Poor Indoor Air Quality
Unhealthy Buildings
Legal Concerns
Moisture Control

How do buildings get wet?

1. **Liquid Water Intrusion**
   - Foundation, Walls, and Roof Leaks
   - Improper window detailing
   - Plumbing Leaks
   - Capillary Action (Rising Damp)

2. **Moisture Vapour Condensation**
   - Air Transport
   - Vapour Diffusion
Moisture Transport via Vapour Diffusion

Diffusion
-Migration of moisture by means of vapour pressure differential
-Occurs in either direction based on climate conditions and interior levels of humidity.

4 X 8 sheet of Gypsum Board
70°F / 40 % RH

One Heating Season

1/3 Litre of Water
Moisture Transport via \textbf{Air Leakage}

One Heating Season

4 X 8 Sheet of Gypsum Board with a 3/4 “ hole

\(70^\circ\mathrm{F} / 40\%\ \text{RH}\)

30 Litres of Water
Condensation & mold
Under a steel roof
## Health & Humidity

<table>
<thead>
<tr>
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<th>Percent Relative Humidity</th>
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<tbody>
<tr>
<td><strong>Bacteria</strong></td>
<td></td>
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<tr>
<td><strong>Viruses</strong></td>
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<td><strong>Fungi</strong></td>
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<td><strong>Mites</strong></td>
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<tr>
<td><strong>Respiratory Infections 1.</strong></td>
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<tr>
<td><strong>Allergic Rhinitis and Asthma</strong></td>
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<td><strong>Chemical Interactions</strong></td>
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<tr>
<td><strong>Ozone Production</strong></td>
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- **Optimum Zone**
- **Decrease in bar width indicates decrease in effect**

1. Insufficient Data Above 50% R.H.
Soft Foam Insulation - a new Insulation Category

Benefits:

- Air Leakage control
- Draught free environment
- Helps control condensation / mould
- Significant reduction in energy usage
- Sound Attenuation
This Concludes our Presentation

- Thank you for your attention
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