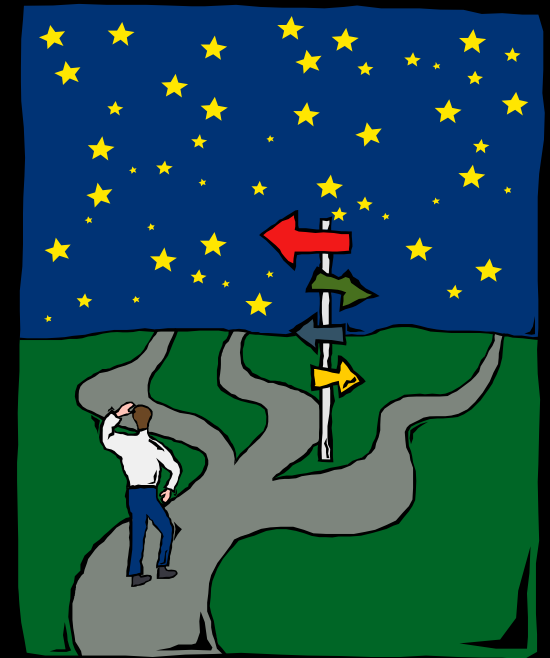


Direction for Penetration of the Consumer Refrigerator Market



Consumer Refrigerator Market – North America

- Size of the market
- Motivators for acceptance
- Why it is starting to be used?
- **What we can do as an industry?**

Market Research

- Scope
 - ◆ North American focus
 - ★ Europe, Far East, etc. have different energy costs, consumer requirements, and design styles
- Methodology
 - ◆ Secondary research
 - ★ Literature research where someone else gathered the data
 - ◆ Primary research
 - ★ Direct interviews

North American Market Size

- Very large
 - ◆ Refrigerators 9.2 million units
 - ◆ Freezers 1.9 million units
- Source: 24th Annual Portrait of the U.S. Appliance Industry
- Potential VIP opportunity
 - ◆ Approx. \$0.75 to \$1.5 billion

Market Motivators - Energy

- Energy Use - \$ (@ 8.03 cents/kWh)
 - ◆ Top-Freezer Models (18 to 22 cu.ft.)
 - ★ \$33 to \$42 / year
 - ★ Retail price \$510 to \$1050
 - ◆ Bottom-Freezer Models (18 to 22 cu.ft.)
 - ★ \$42 to \$46 / year
 - ★ Retail Price \$695 to \$1050
 - ◆ Side-By-Side Models (20 to 27 cu.ft.)
 - ★ \$48 to \$57 / year
 - ★ Retail Price \$800 to \$1700

Source: Consumer Reports January 2002

Market Motivators - Energy

- Manufacturers have done an outstanding job of improving energy efficiency during the last 10 to 15 years
- However, saving **more** energy will be very difficult and expensive
- Use of VIP will be one of the easiest, most reliable, and cost effective options for future savings

Market Motivators - Energy

- If assume 5 year payback
 - ◆ \$165 to \$285 electrical use
 - ◆ At best save about 50%
 - ★ R 10 to 14 goes to R 30 to 35 with VIP
 - ★ Some energy not effected by VIP
 - ◆ Thus, save \$82.50 to \$142.50
 - ◆ Note: increased cost of VIP will be marked-up by Manufacturer and Retailer
 - ◆ Above are reasons manufacturers want to see VIP's at \$2.00/sq.ft. or lower.
- Source: personal interviews

Market Motivators – Energy

- Freezers and freezer walls save almost twice the energy per sq.ft. due to the larger temperature difference
- Not all energy saved is worth the same
 - ◆ In order to reach the required standards, the last 5% energy savings maybe much more expensive than the first 5%.
- Energy prices will likely increase in the future – more motivation to save energy (European market)

Market Motivators – Design Freedom

- Condensation control of thin walls
- Increased internal volume
- Retrofit - energy reduction (doesn't require new design)
- Manufacturers need for unique features
 - ◆ More about this area in a few slides

Refrigerator/Freezers Using VIP

- **Note:** Several models will be introduced in 2002 which use VIP
 - ◆ Very high end consumer models
 - ★ First market entry point

Why Has Market Acceptance Started?

- Some small manufacturers can not get to required energy without major and expensive redesign
 - ◆ VIP can be installed into existing design
- Some manufacturers need VIP to have their new designs reach the required energy

Why Has Market Acceptance Started?

- Some manufacturers require the high R value of VIP to allow the their special design features
- Some manufacturers want the experience because they realize their future will involve VIP

Source: personal interviews

Automobile Composites/Plastics Analogy

- Use of fiberglass or carbon fiber reinforced composites/plastics in automobiles is very analogous to VIP's in refrigerators
 - ◆ They allow weight savings and therefore energy savings
 - ◆ However, the **primary motivator** is the **design freedom** that composites/plastics allow
 - ◆ Stylists/designers can do things with composites/plastics that they can not do with stamped steel or aluminum

Automobile Composites/Plastics Analogy

- The properties and opportunities offered by composites/plastics had to be communicated and periodically reinforced to the stylists and designers
- Once familiar with the materials, stylists and designers used the new freedom to produce new exciting designs
- Gas savings alone was not sufficient to motivate a change to new materials
- New cars are sold based on new features and styling not just performance

New Design Freedom

- Some of the features where VIP can play a roll
 - ◆ Rapid chill zone
 - ◆ Rapid freeze zone
 - ◆ Deep freeze zone (-40 C)
 - ◆ Recessed lights
 - ◆ Ice makers partially hidden in walls
 - ◆ Increase in door storage
 - ◆ Further use of thermoelectric cooling

New Design Freedom

- Additional features where VIP can play a roll
 - ◆ Kitchen cabinets that are refrigerators
 - ◆ Kitchen drawers that are freezers
 - ◆ Ultra thin refrigerator walls (12.5 mm)
 - ★ Dramatic volume increase
 - ★ Huge appearance difference

Existing Refrigerator Design



Potential VIP Refrigerator Design



Showroom Comparison



New Design Freedom

- New features will start on a few high end units and eventually work their way down the line
 - ◆ It is the normal design cycle
- Appliance manufacturers can not just rely on reducing the cost of their units to obtain reasonable margins
 - ◆ They must have new offerings to the customer and VIP can be a critical enabling technology

What Can We Do As An Industry?

- Communicate to the appliance industry's management and designers the properties and features of VIP
- Assist the designers with their new designs incorporating VIP
- Communicate and highlight (to the industry and general public) when VIP's are used in designs
- Continue to work on improving VIP value (lower cost and higher performance)

Success Will Follow

- Appliance industry change is not easy or fast
- However, it can be done

