



A Decade of PVC Influenced Polyolefins & Elastomers Global Activities

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Presentation Outline

- Introduction
- Status of intermaterial competition of plastics vs. paper, glass, Aluminum and wood
- Intermaterial substitution in plastics
- PVC and Polyolefins – similarities & differences
- A decade of Polyolefin Efforts
- The future direction
- Conclusions & Discussion

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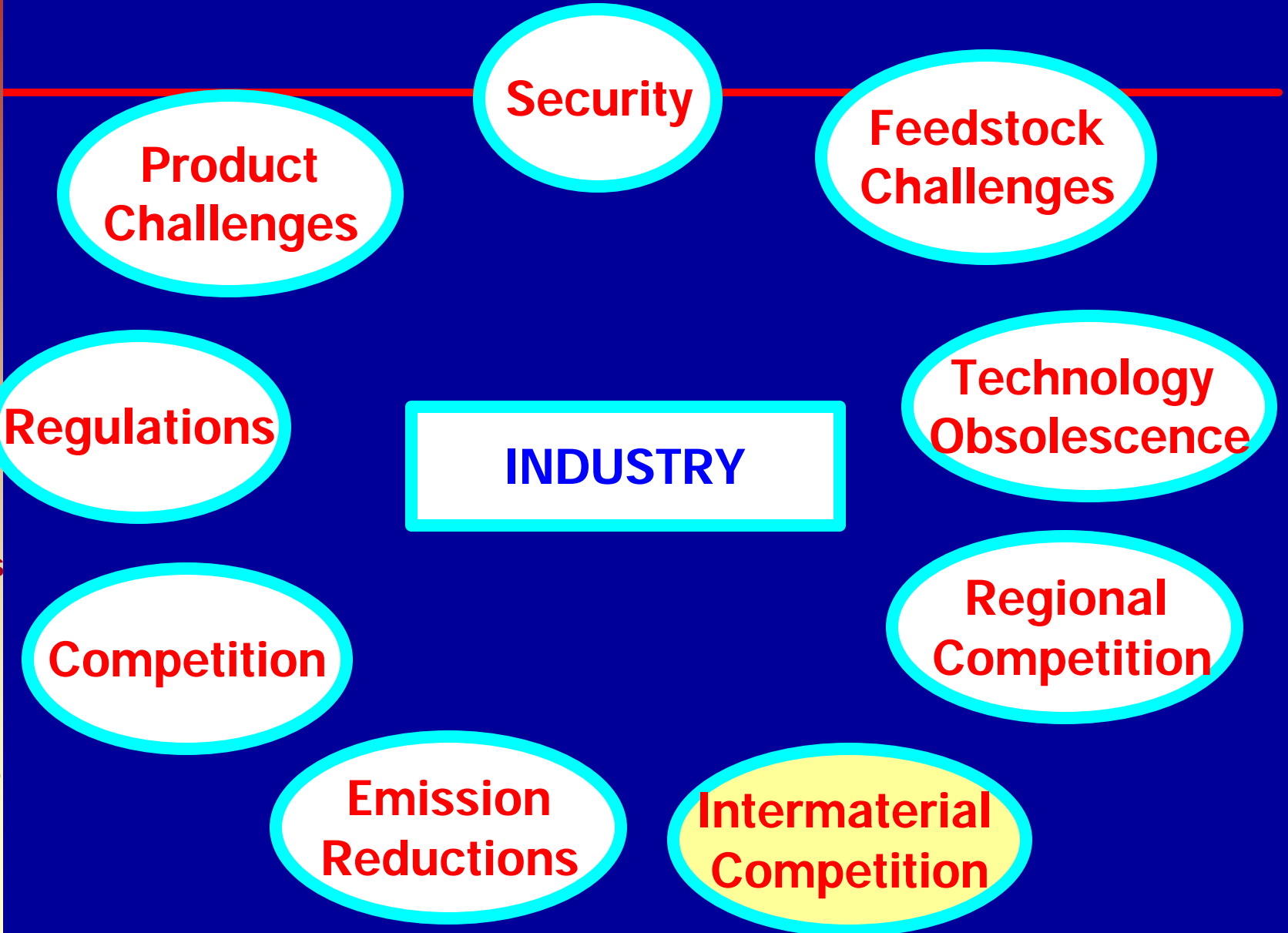
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Introduction

- ◆ **Plastics successfully replaced glass, paper, aluminum and wood where possible**
- ◆ **Interplastic substitution started in late 80s**

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Intermaterial Competition

- The Interplastic Substitution
- LDPE and LLDPE
- ZN and Metallocene Catalyzed LLDPE
- Polyolefins and PVC
- ZN and Metallocene Catalyzed PP
- Polyolefins and Polystyrene
- Polyolefins and all polar polymers

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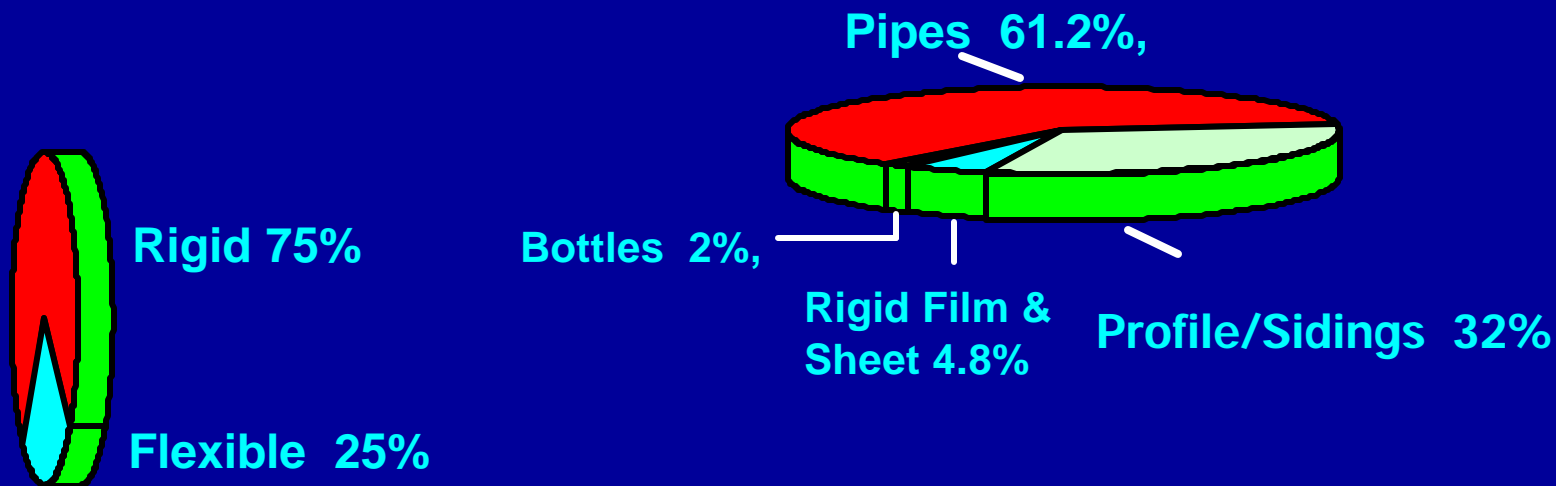


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PVC Demand



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Film & Sheet Applications 27%

Wire & Cable Applications 18%

Tubing & Profile Extrusion 16%

Flexible PVC

Other Applications 23%

Flooring 6%

Coated Fabric Applications 10%

PVC Core Strengths

- ◆ PVC can be fine-tuned through compounding making it unique and versatile
- ◆ Traditional Markets - Excellent Track Record
- ◆ Life time replacement issues for f-PVC are no different than the rest of the plastics

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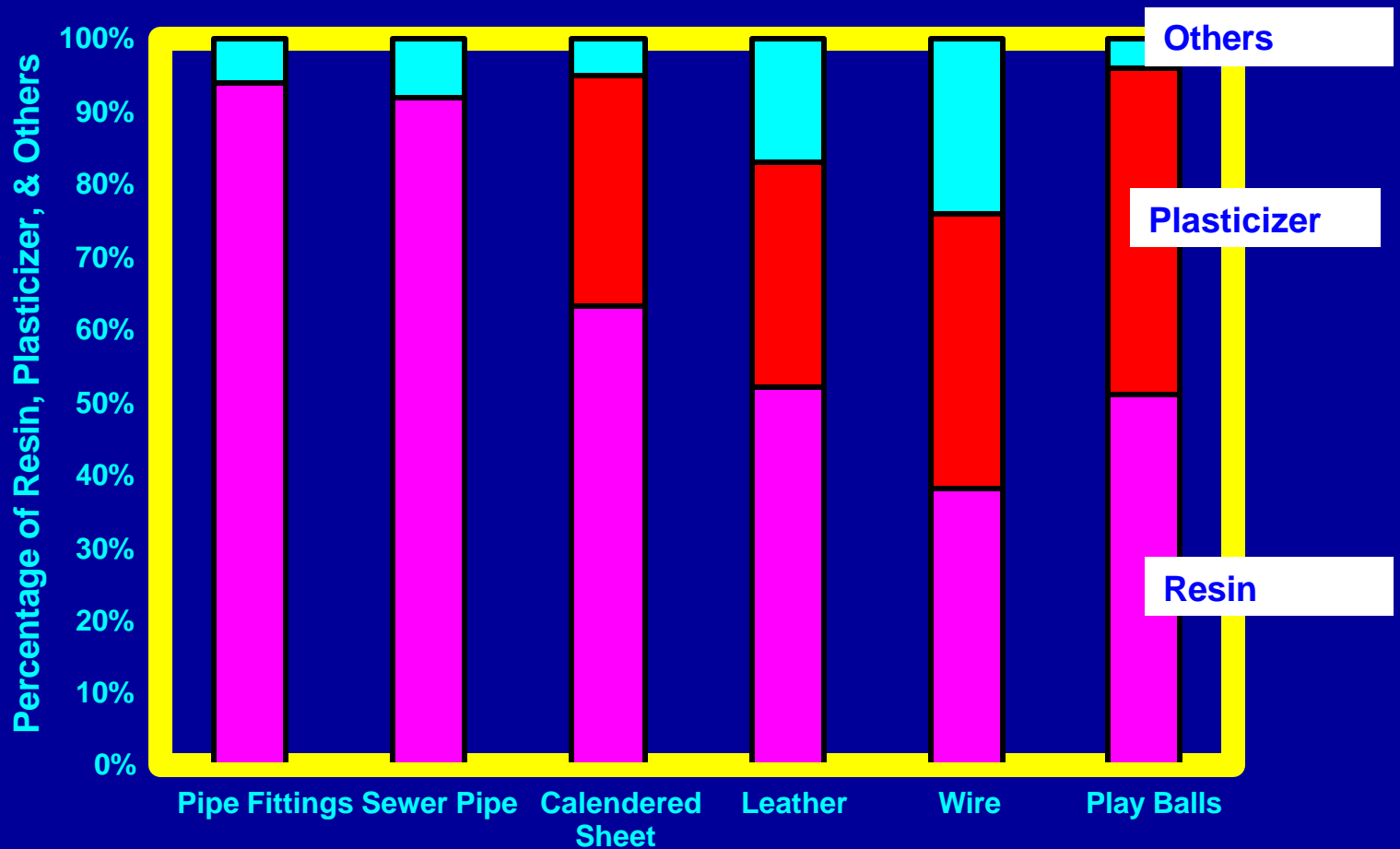


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PVC is one product, easily modified to meet all of the flexibility requirements.... No other thermoplastic can do that



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f-PVC Long Standing Issues

- ◆ PVC is the simplest plastic to use
- ◆ PVC is the most used plastic in construction, packaging, medical and teething toys - without a single attributable death
- ◆ PVC is a poor man's plastic – An economic engine

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Don't drink the water in the PVC pipes. .. plasticizer migration can kill you...!

Dahl! Without the PVC pipes we don't even have water to drink.. Get off your high horse.. ..





f-PVC Issues

Europe

- Non-PVC producing Nations in favor of banning, PVC, while the producing Nations are not.

Japan

- Dioxin is a major issue from incineration

Rest of the World

- Not a major issue and PVC growth is the fastest

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f-PVC Issues – North America

PVC Industry

- No American leader; Asian producers have less incentive for the domestic issues

Public Organizations – Vinyl Institute, SPE, SPI

- Too defensive and reactive; Lack proactive initiatives

Environmental Groups

- Doing what they do best – Sensationalization – No serious actions to identify and solve the root problems

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Are VCM, DOP and Chlorine Bad for the environment????

Without a Doubt!

It's just a question of cost/benefit ???...

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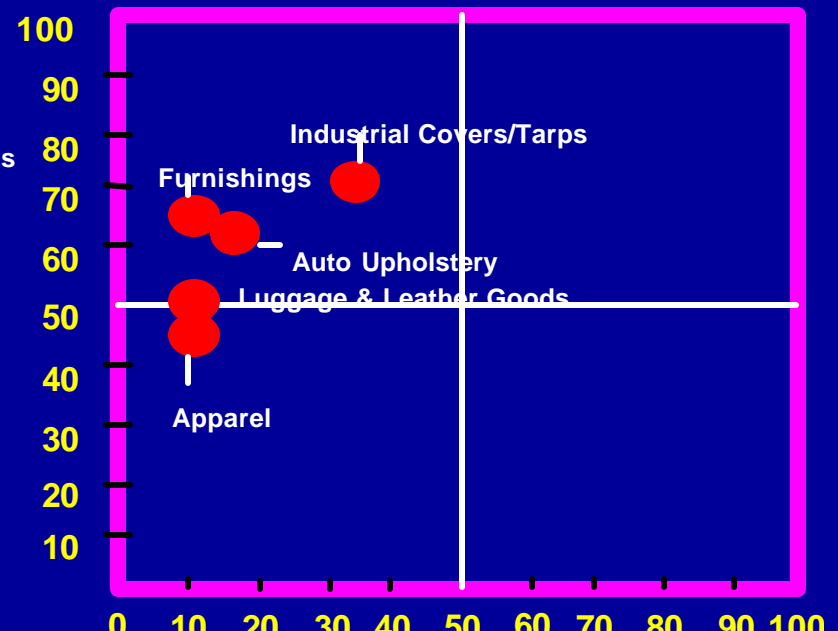
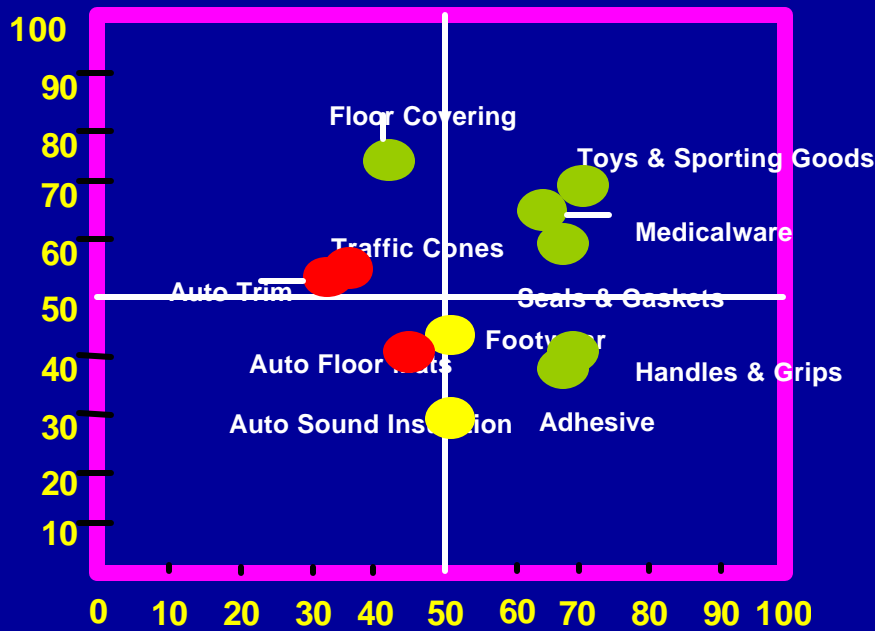
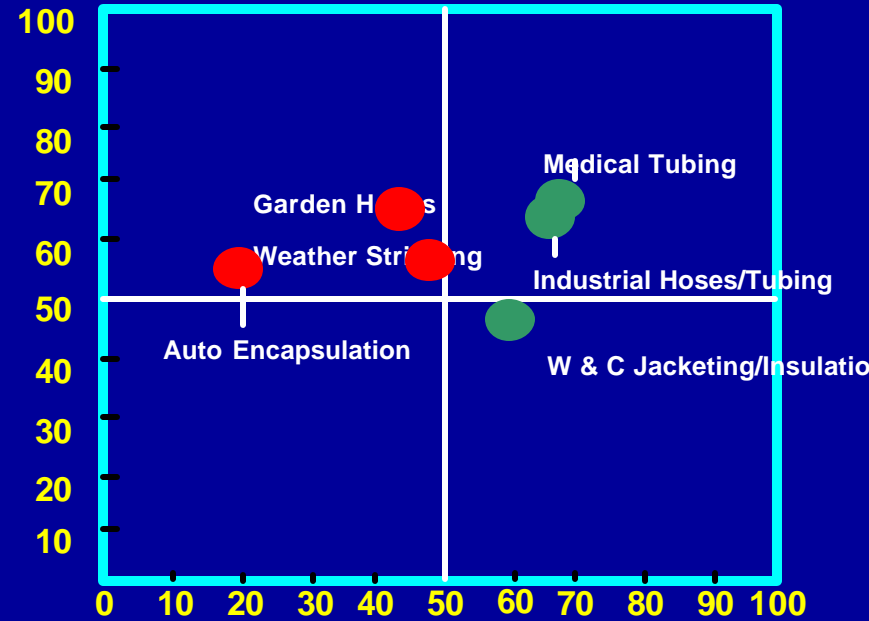
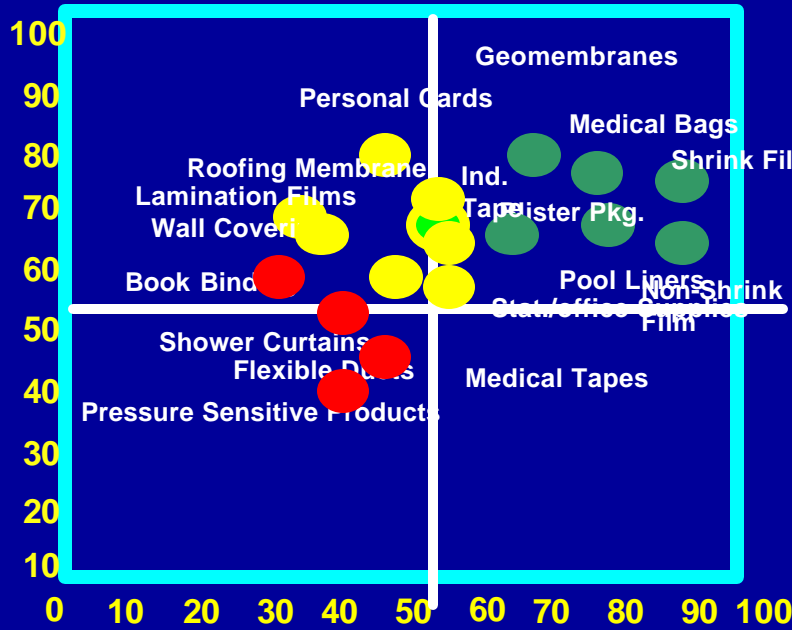


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PVC Attractiveness/Vulnerability



The Polyolefin Attraction!

- ◆ Polyolefins and elastomers blends are the major contenders for flexible applications due to their flexibility range and recyclability
- ◆ Polyolefins can **potentially** offer cost advantages over “compounded f-PVC”
- ◆ Polyolefins were re-positioned with the copolymer and “metallocene” revolution of the early 90s – as a perfect replacement for PVC

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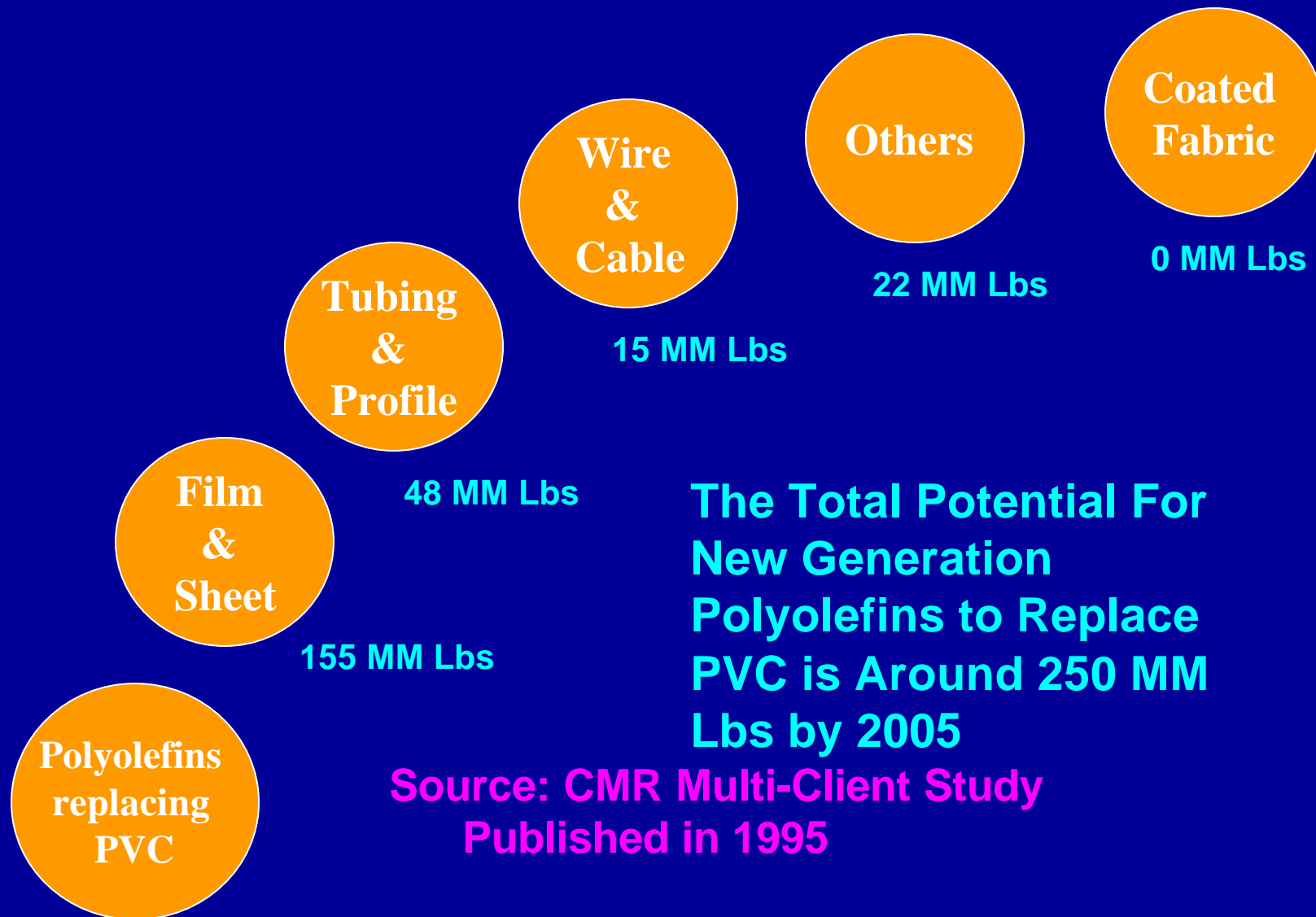


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The Polyolefin Potential



The Total Potential For
New Generation
Polyolefins to Replace
PVC is Around 250 MM
Lbs by 2005

Source: CMR Multi-Client Study
Published in 1995

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What Did The Polyolefins Do?

- ◆ Every major polyolefin producer was caught-up in extending the polyolefins' reach into flexible applications through blending and/or "Metallocenes"
- ◆ Too much focus on polyolefin technology and without studying the PVC industry structure and end use needs
- ◆ Polyolefins players put a bit more emphasis on environmental issues than they should have

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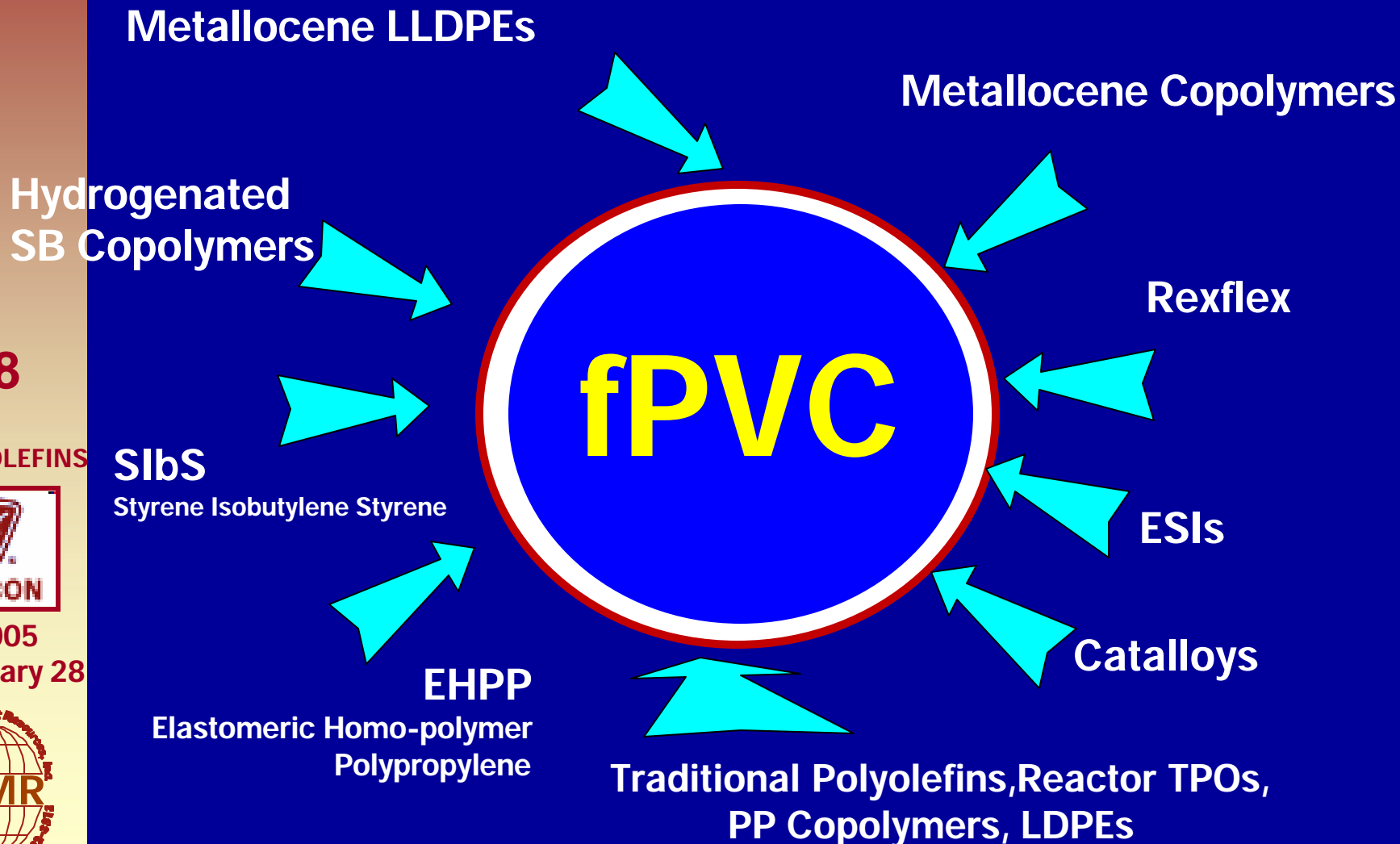


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THE CONTENDERS.....,



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THE CASUALTIES..,

Metallocene LLDPEs

Metallocene Copolymers

Hydrogenated
SB Copolymers

Rexflex

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fPVC

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SibS

Styrene Isobutylene Styrene

ESIs



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EHPP

Elastomeric Homo-polymer
Polypropylene

Catalloys

Traditional Polyolefins, Reactor TPOs,
PP Copolymers, LDPEs



THE SURVIVORS..because of other uses..

Metallocene LLDPEs

Metallocene Copolymers

Hydrogenated
SB Copolymers

fPVC

Catalloys

Traditional Polyolefins, Reactor TPOs,
PP Copolymers, LDPEs

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The Status....,

fPVC

The Current Penetration ...,

Shrink/nonshrink films, auto trim and Interiors, handles & Grips, weather stripping, auto encapsulation, laminated films..,

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The Most Vulnerable... ,

Wall Papers, Flooring, Tarps, Industrial Covers, Blood bags, medical tubing, IV bags, toys, shower Curtains, luggage, medical tapes etc.,

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Can PVC be replaced?.....

In the next five years? ... **NO !**

In the next Ten years?..... **NO !**

Can it ever be replaced?

NO ! ...Not Ever!

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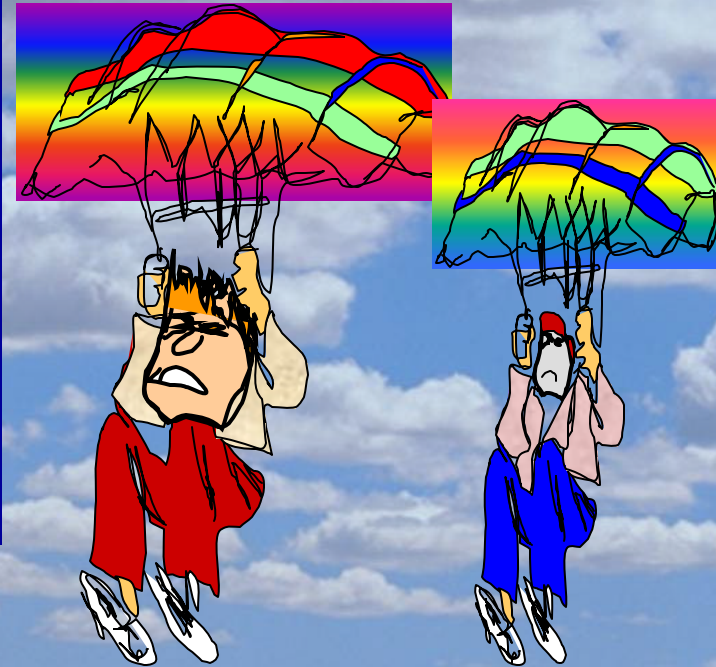
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**FOR GOD'S SAKE NEXT
TIME THEY ASK YOU,
CAN PVC BE REPLACED?
REMEMBER TO SAY
NO !**





Should polyolefins continue
the effort to replace PVC?.....

Definitely Yes!

fPVC still represents the best opportunity for polyolefin market development based on environmental issues for now and price performance with time,

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What Will The Polyolefins Bring ?

- ◆ Simple Elegant molecules
- ◆ Reduced Cost
 - Equal performance at same/lower price
 - Recyclability
 - Freedom from chlorine and aromatics
- ◆ Polyolefins are the preferred materials world over – both from users, processors, recyclers and of course, the environmentalists

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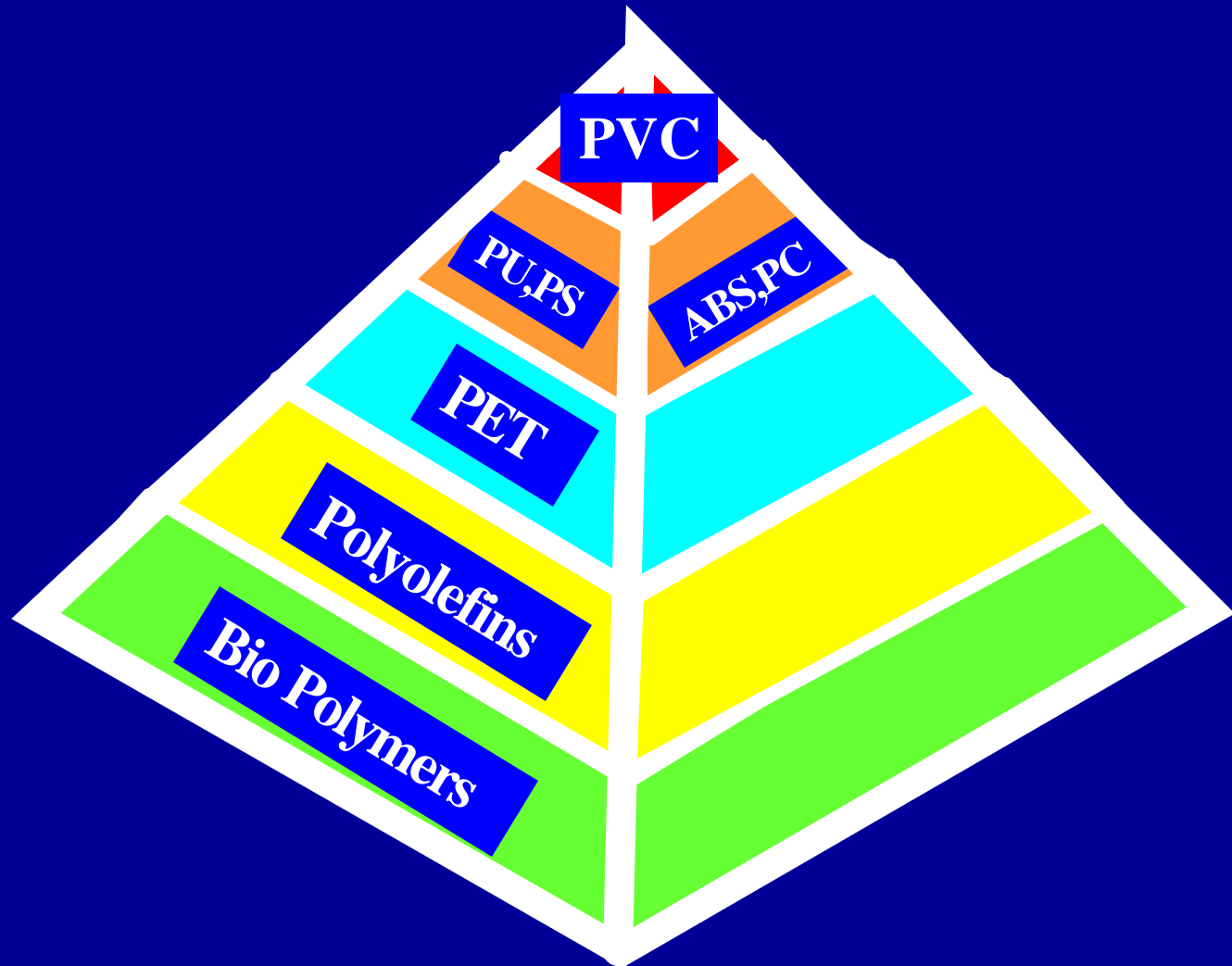
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Rationale For Future ????

The Greenpeace Pyramid of Plastics



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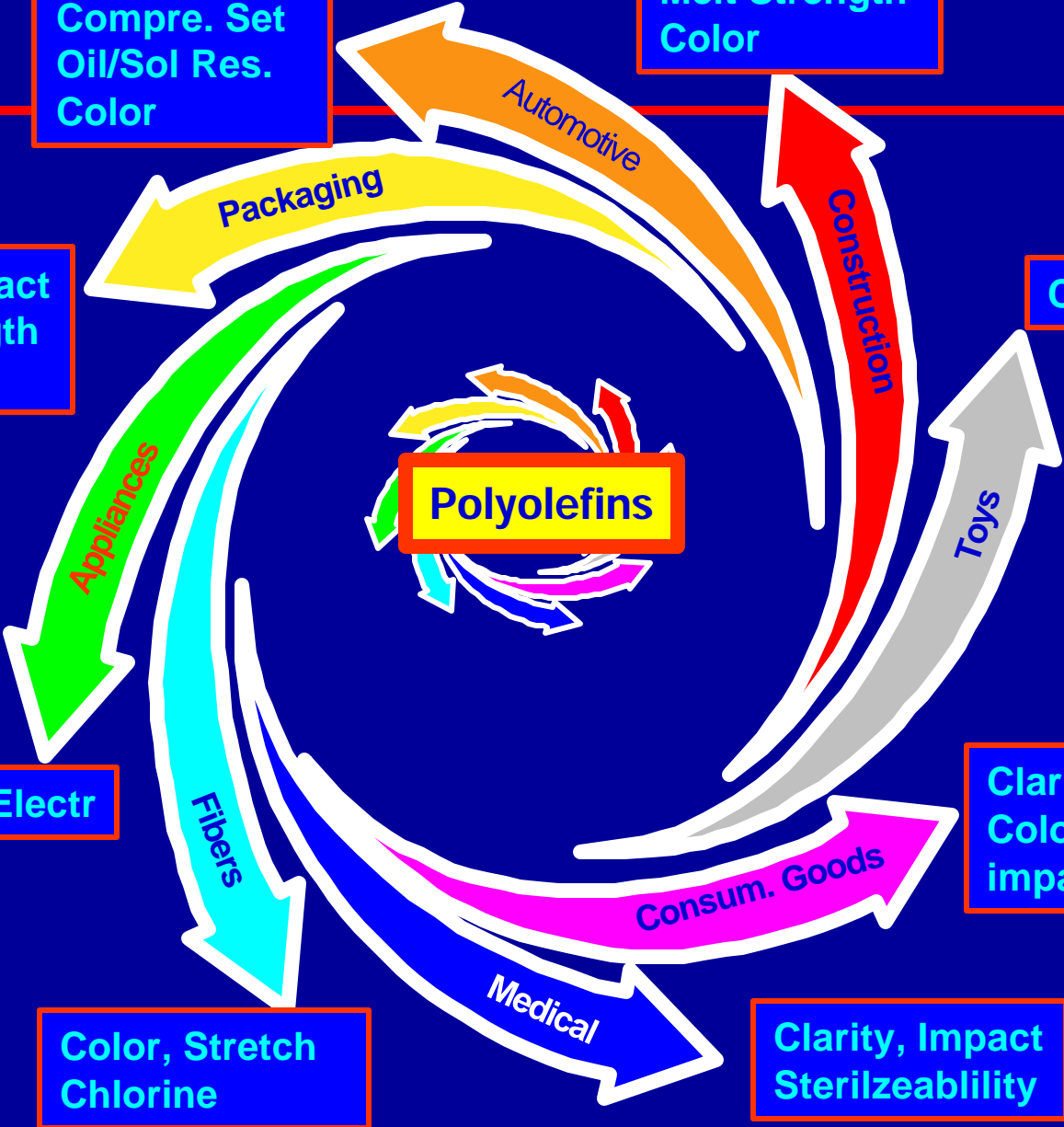
Heat, Clarity
Compre. Set
Oil/Sol Res.
Color

Clarity, Impact
Melt Strength
Color

Clarity, Impact
Melt Strength
Color

Color

Polyolefins



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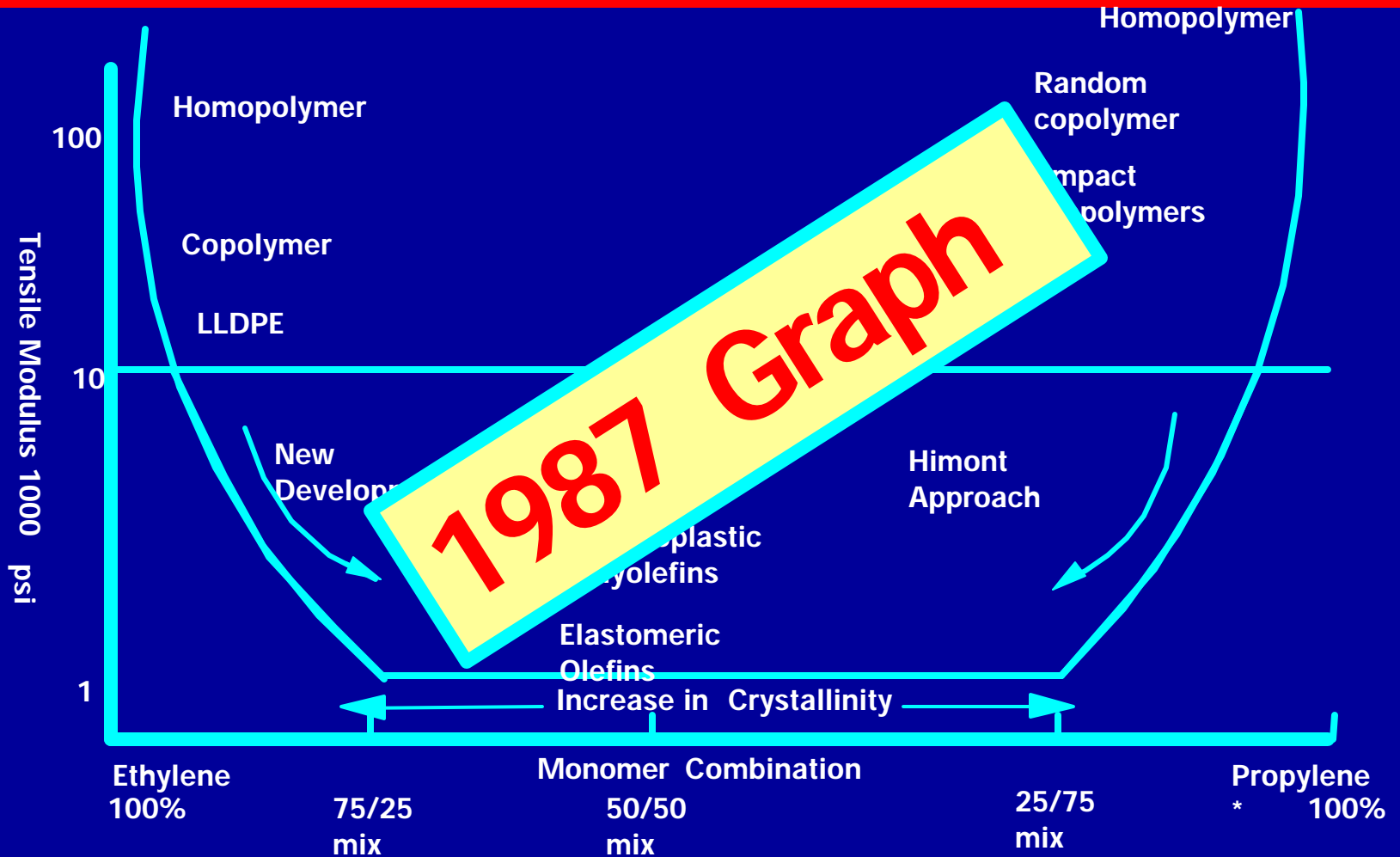
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Versatile Polyolefin Processes



Source: CMR based on Union Carbide Information

* Other monomers may also be used

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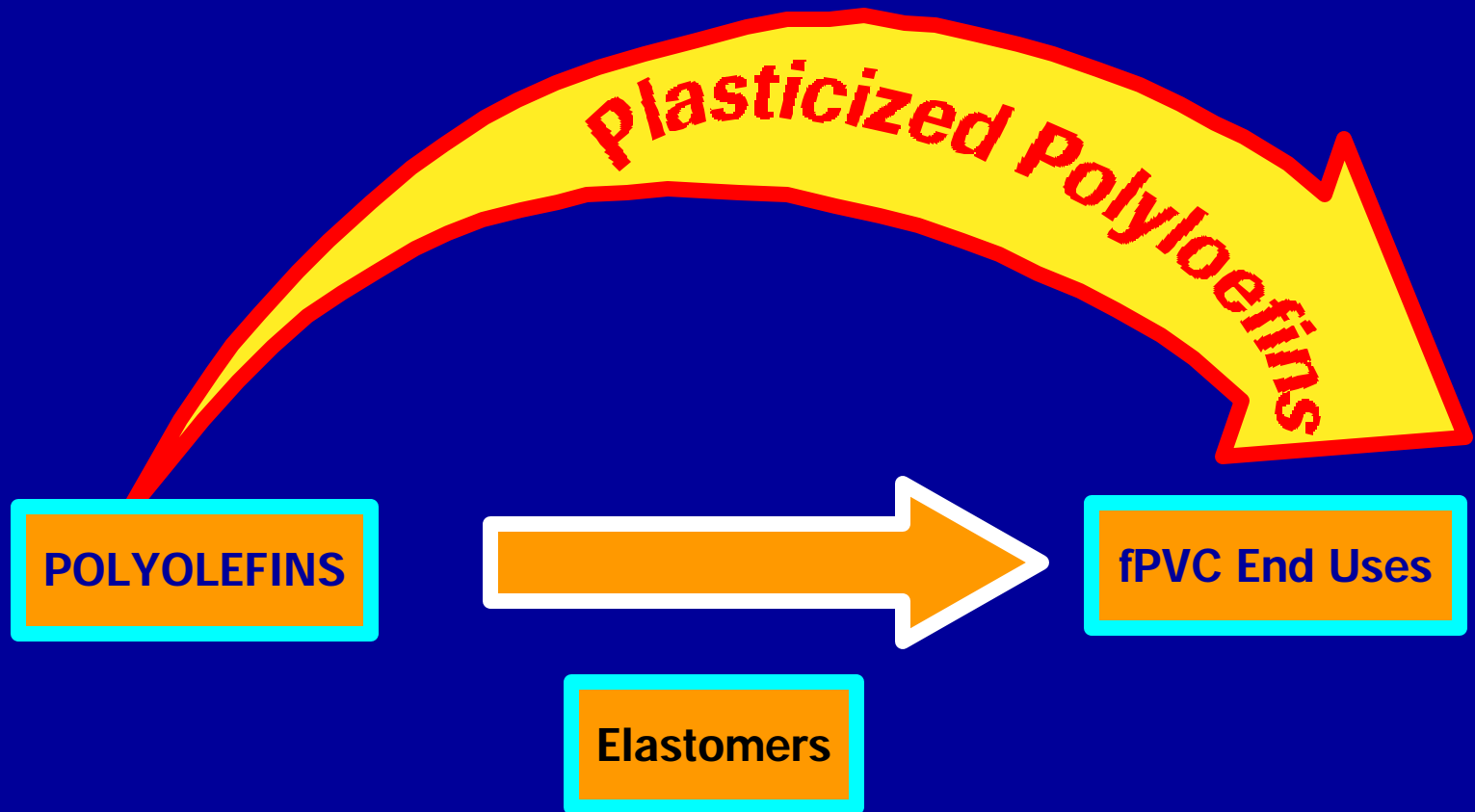


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The Silver Bullet.....,



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Slow Boat to China..., One grade at a time...,

15 years of



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Polyolefins Excellence

1990-2005

