

IRPC's Polypropylene Expand On Consumer Needs



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Outline...

➤ Polypropylene Market Outlook

➤ IRPC Polypropylene Business Development



➤ Key Drivers & It's Opportunity



Outline...

➤ Polypropylene Market Outlook

➤ IRPC Polypropylene Business Development

➤ Key Drivers & It's Opportunity



Principle of Petrochemical Manufacturing

“Break it down and re-fabricate at molecular level”

Macromolecule

(Carbon 1~250)
Mixed Hydrocarbon
(Saturated)

Coal
Oil
Natural Gas

Biomass

Disintegration
→

Heat, Catalyst
(Cracking,
Reforming)

Micro molecule

(Carbon 1~8)
Monomer
(Unsaturated)

Methane
Ethylene
Propylene
Butenes, -diene
Benzene
Toluene
Xylenes

Bio-based feed

Reconstitution
→

Catalyst
(Polymerization)

Ultra-large molecule

(Carbon 20K-1M)
Polymer
(Saturated)

Polyethylene

Polypropylene

Polyvinylchloride

Polystyrene

Polyester

Polyamide

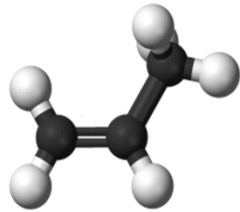
Polycarbonate

Etc.

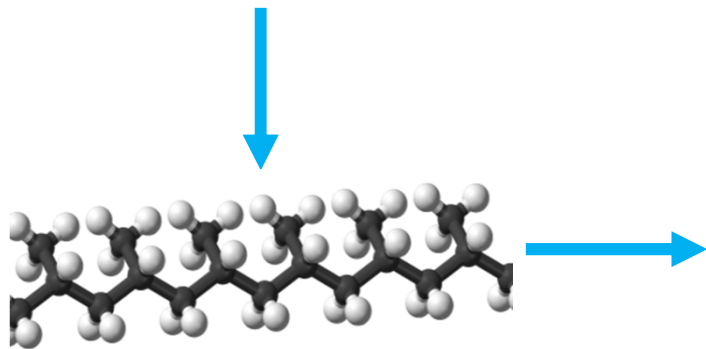
Bioplastics;
PBS, PLA, Etc.

“To do all of these, investment and technology are the keys”

Propylene → Polypropylene



Propylene
 $\text{CH}_3\text{-CH}=\text{CH}_2$

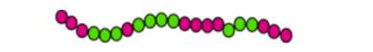


Polypropylene



P = Propylene Monomer

Homo



P = Propylene Monomer E = Ethylene Monomer

Block copo



P = Propylene Monomer E = Ethylene Monomer

Random copo



Food Packaging & Disposables



Agricultural and Industrial Packaging

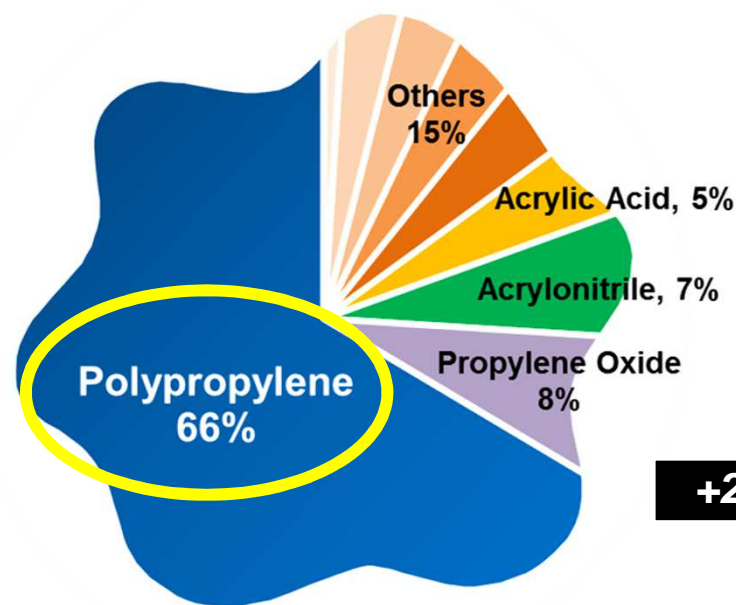


Automotive



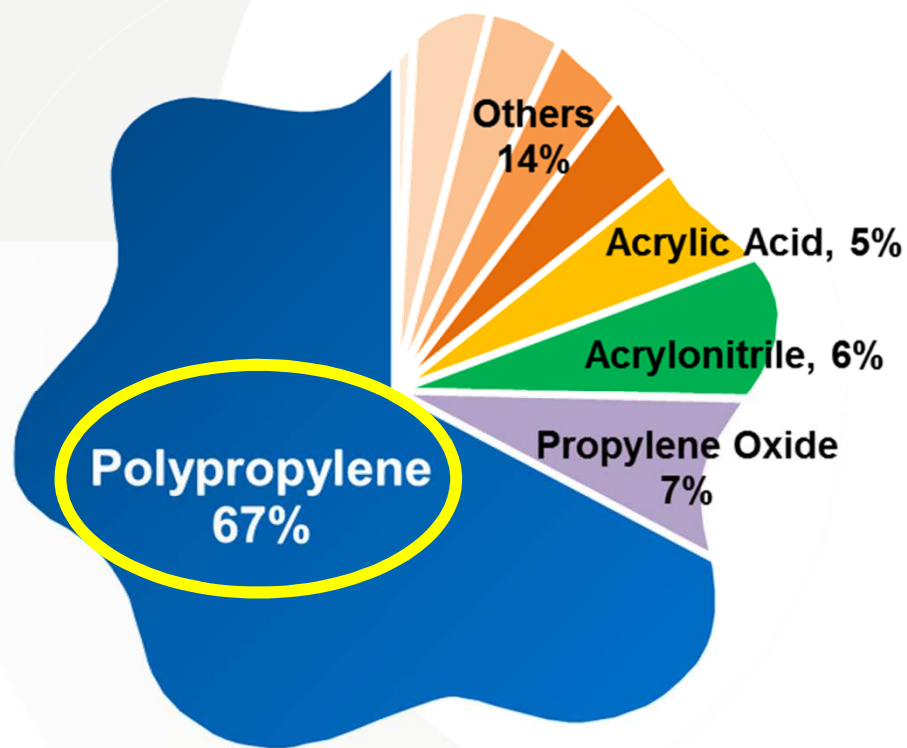
Appliances

World Propylene Demand is Dominated by Polypropylene Production



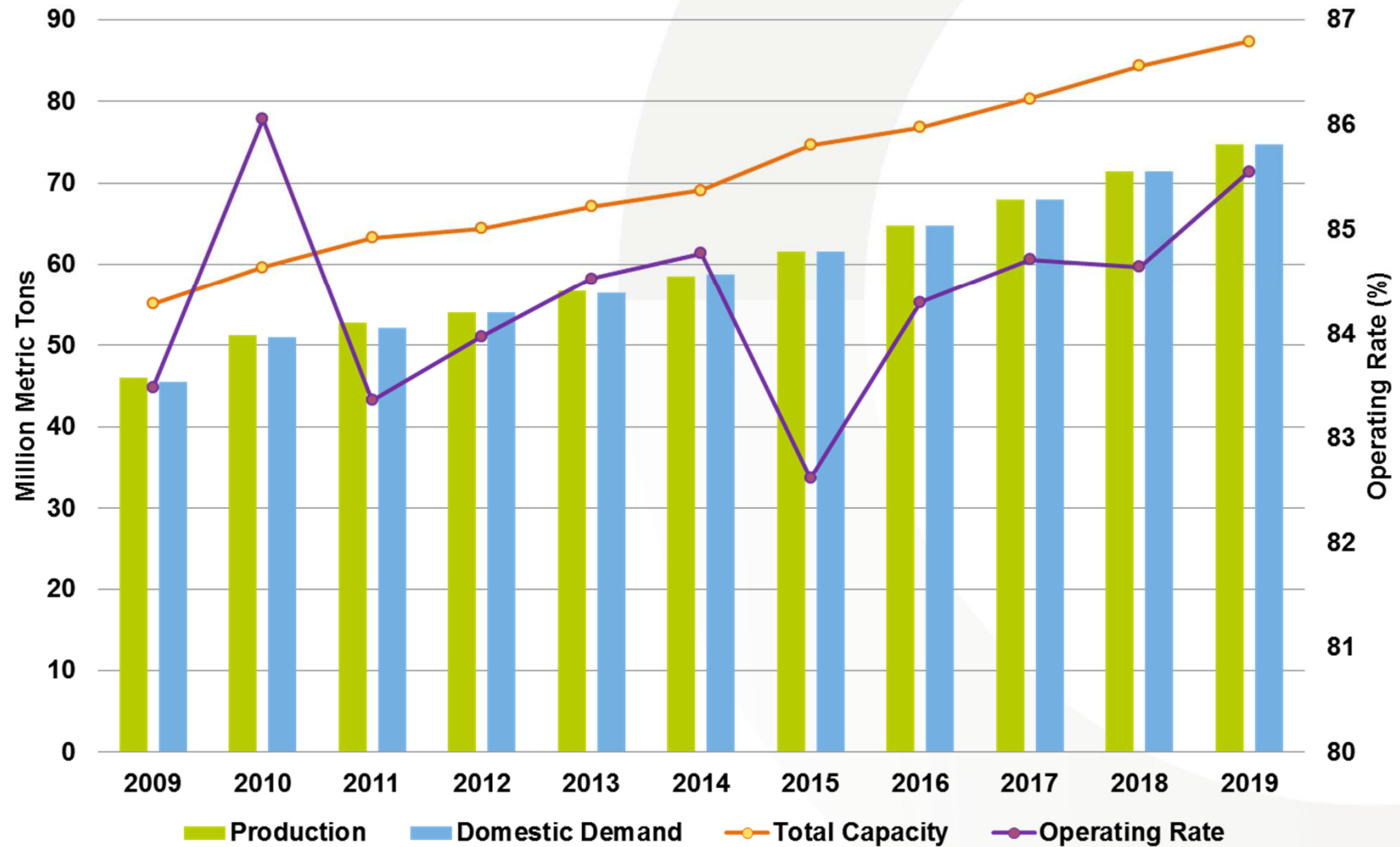
Propylene Market Size Y2014
89 Million Tons

+26%



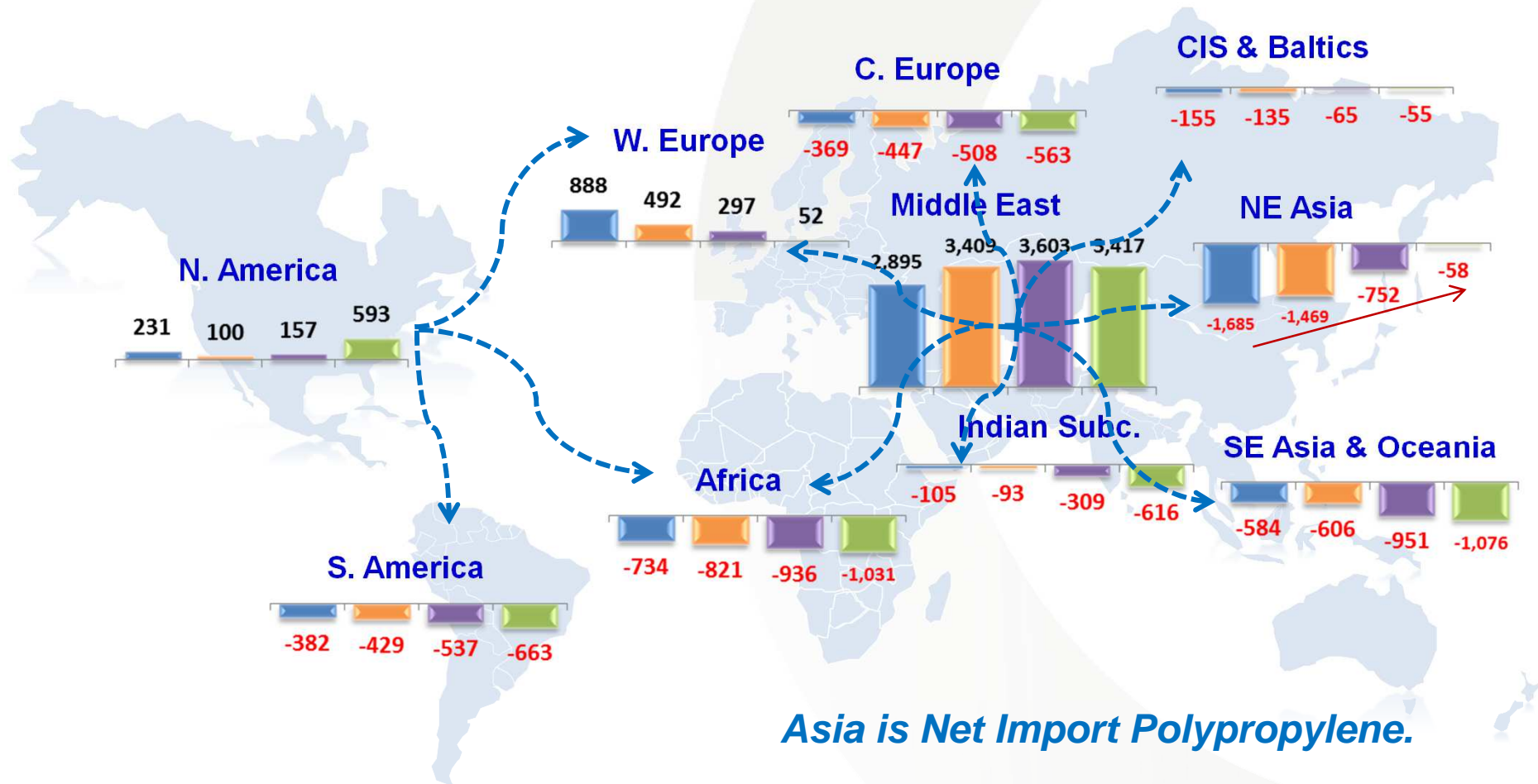
Propylene Market Size Y2019
112 Million Tons

World Polypropylene Supply & Demand



© 2015 IHS

Regional Polypropylene Net Trade Patterns

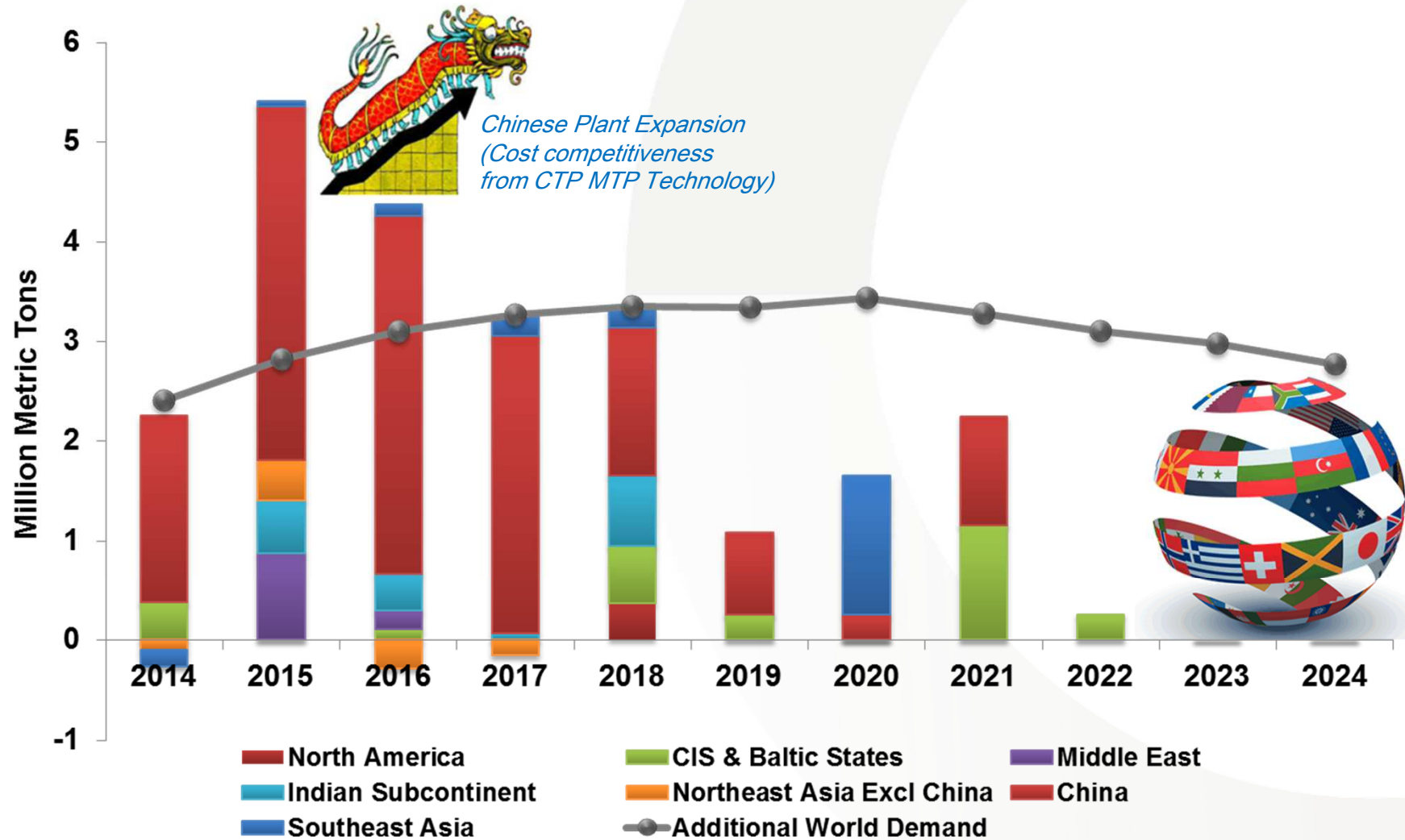


Asia is Net Import Polypropylene.

Remark: (+) Net Export and (-) Net Import

2014 2015 2016 2017

Polypropylene Capacity and Demand Direction



IRPC Polypropylene Capacity Share

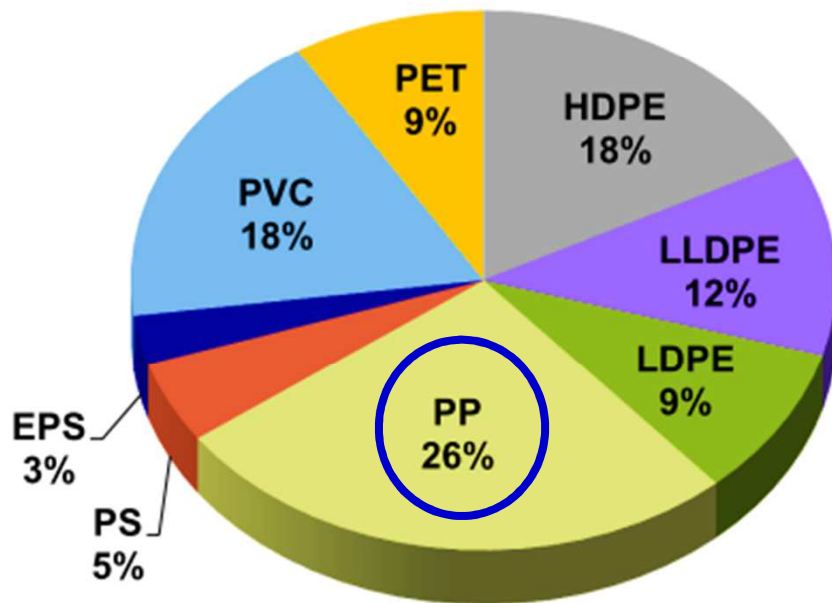
Year	IRPC Nameplate Capacity	World	Southeast Asia	Thailand
2014	475 KTA	<p>IRPC 0.7% Other 99.3%</p> <p>69,123 KTA</p>	<p>IRPC 9% Other 91%</p> <p>5,344 KTA</p>	<p>IRPC 24% Other 76%</p> <p>1,970 KTA</p>
2019	775 KTA	<p>IRPC 0.9% Other 99.1%</p> <p>87,320 KTA</p>	<p>IRPC 13% Other 87%</p> <p>5,814 KTA</p>	<p>IRPC 34% Other 66%</p> <p>2,270 KTA</p>



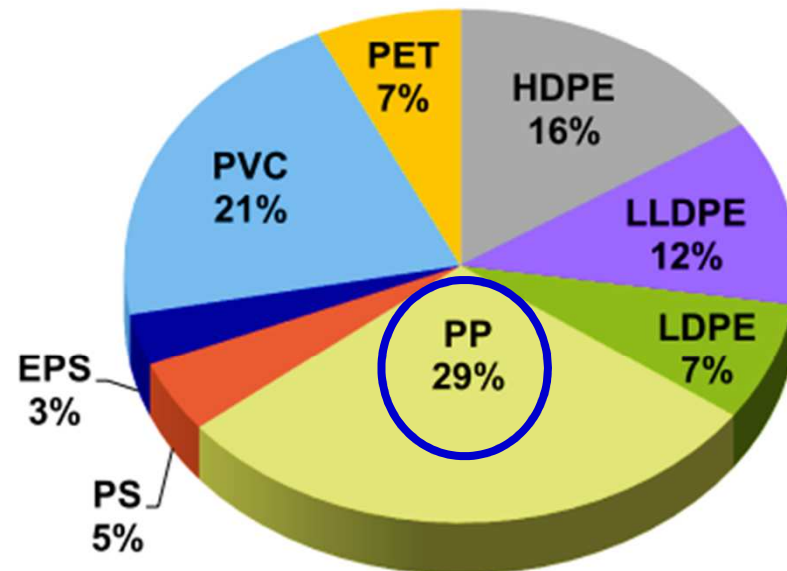
Source: IHS, Market Survey, Mitsubishi Corporation

Polypropylene is the Largest Share of Total Polymers Demand

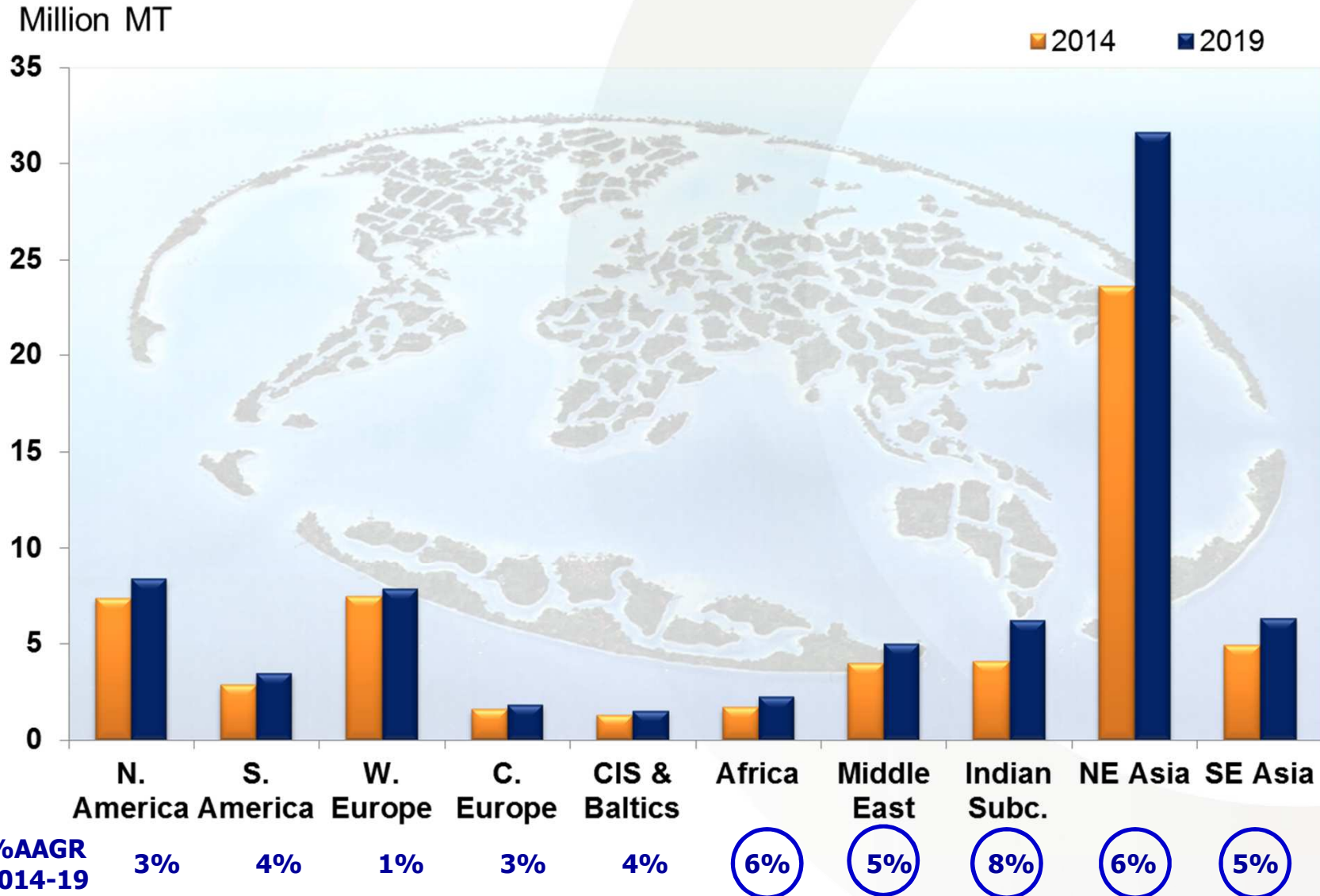
World = \$ 320 Billion



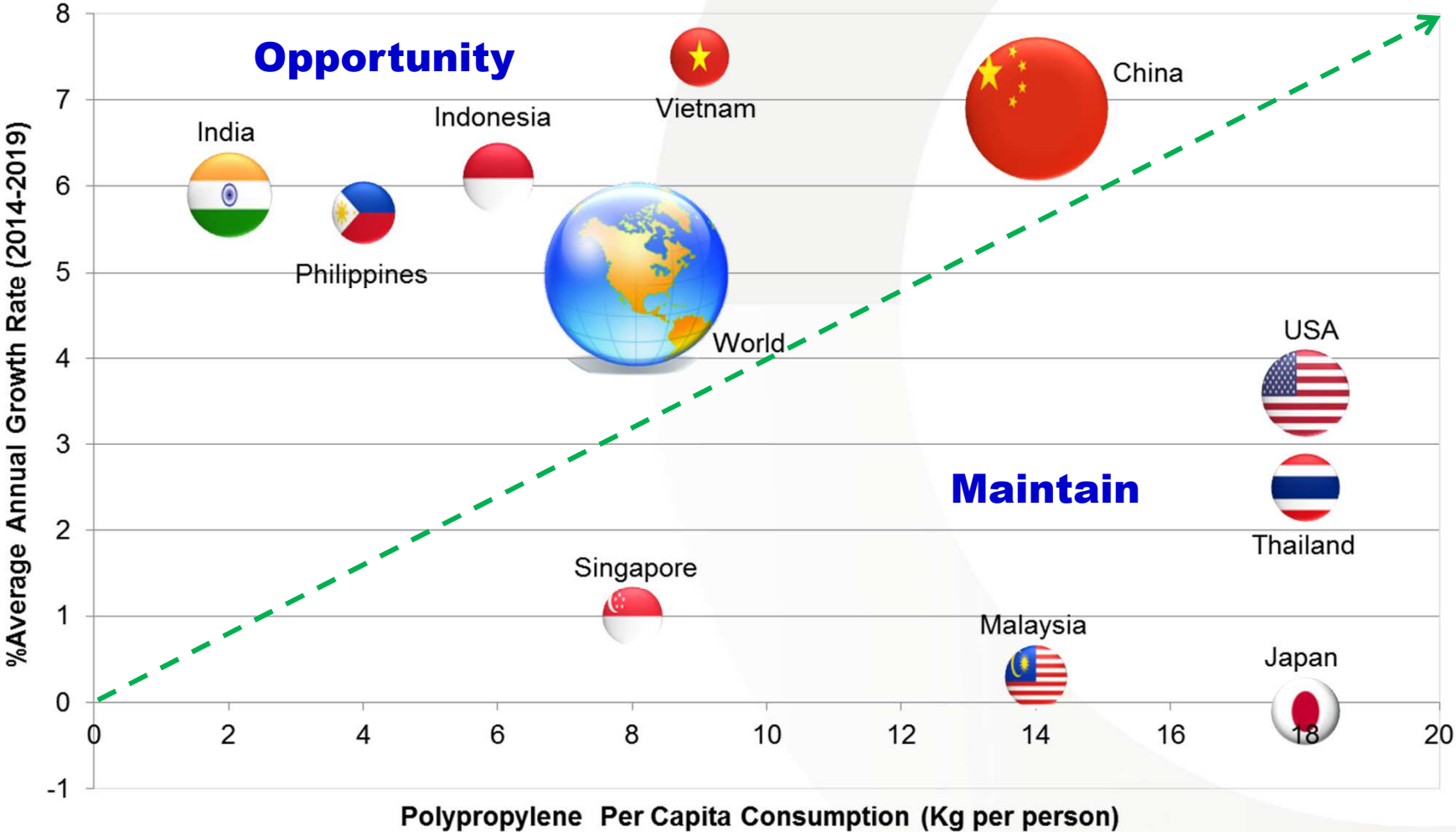
Asia Pacific = \$ 155 Billion



World Polypropylene Demand by Region

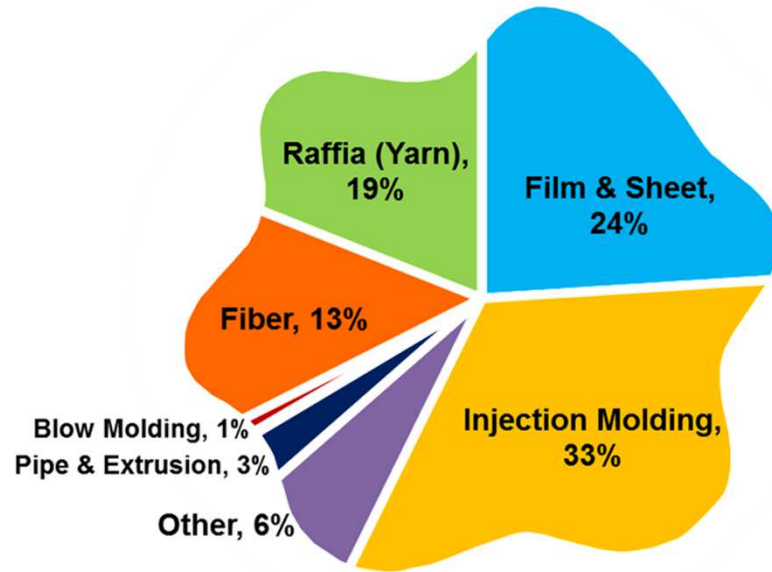


Matrix of Polypropylene Consumption



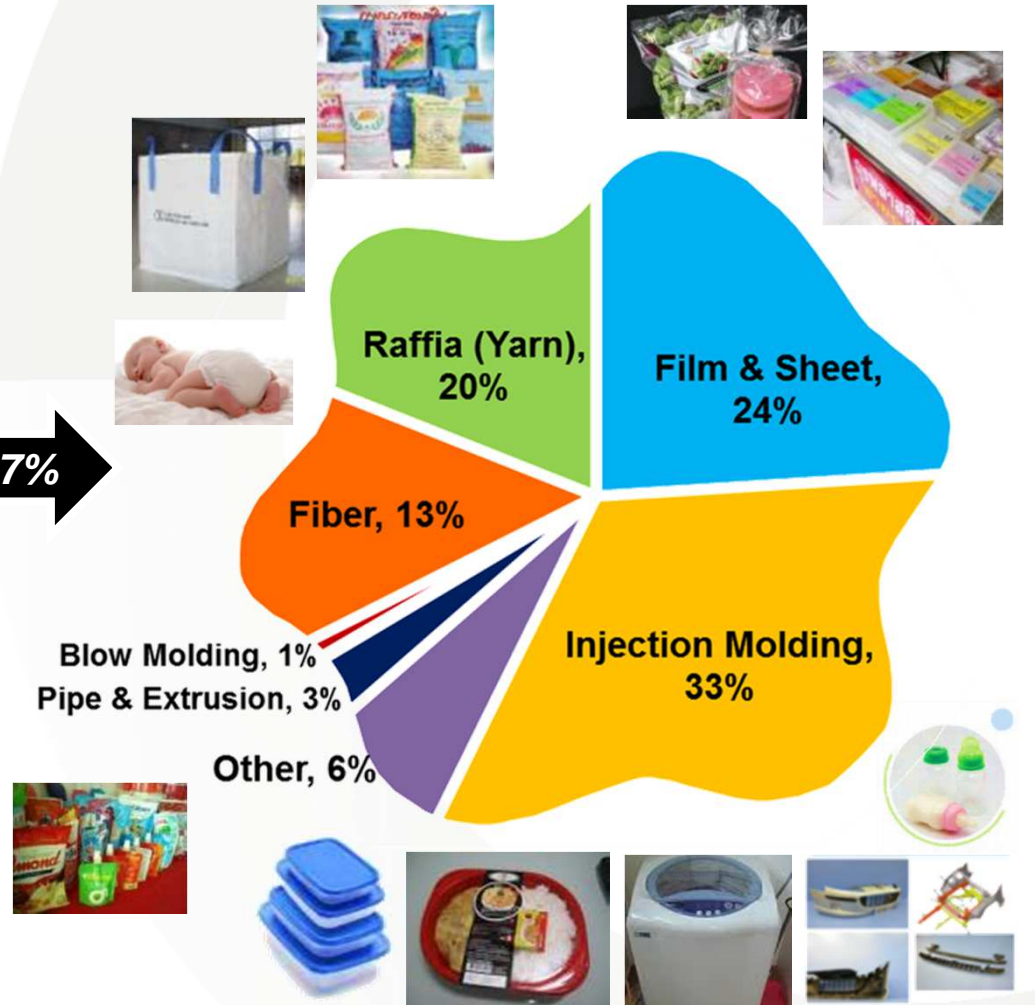
Remark: Bubble size refers to domestic demand

World Polypropylene Demand by Application



Market Size Y2014
59 Million Tons

+27%



Market Size Y2019
75 Million Tons

Polymers play a critical role in all economies

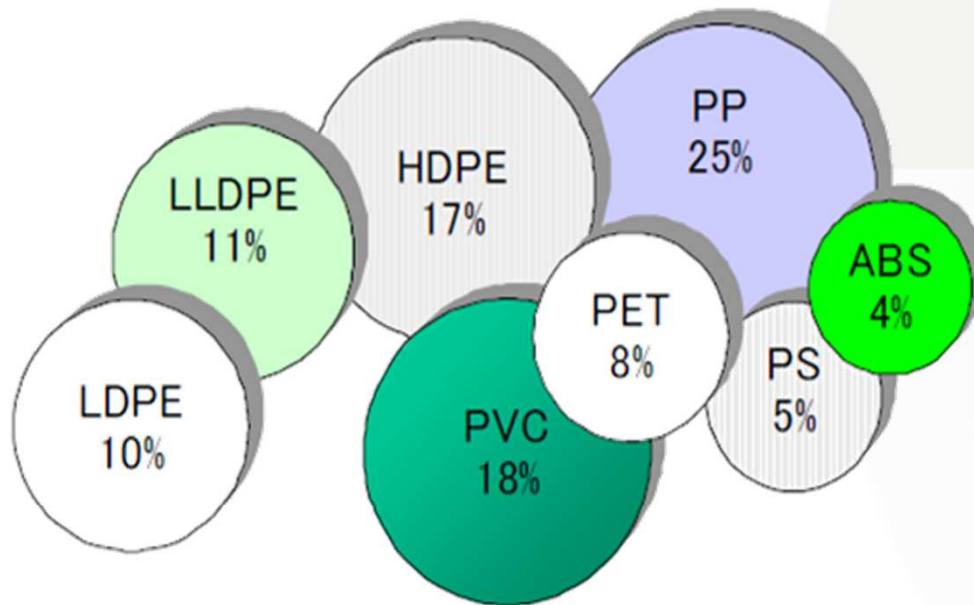


Economic Impact to Demand and Price

Situation	E&E, Autopart, Construction, Luxurious goods	Food packaging
Economic Upturn		
Economic Downturn		

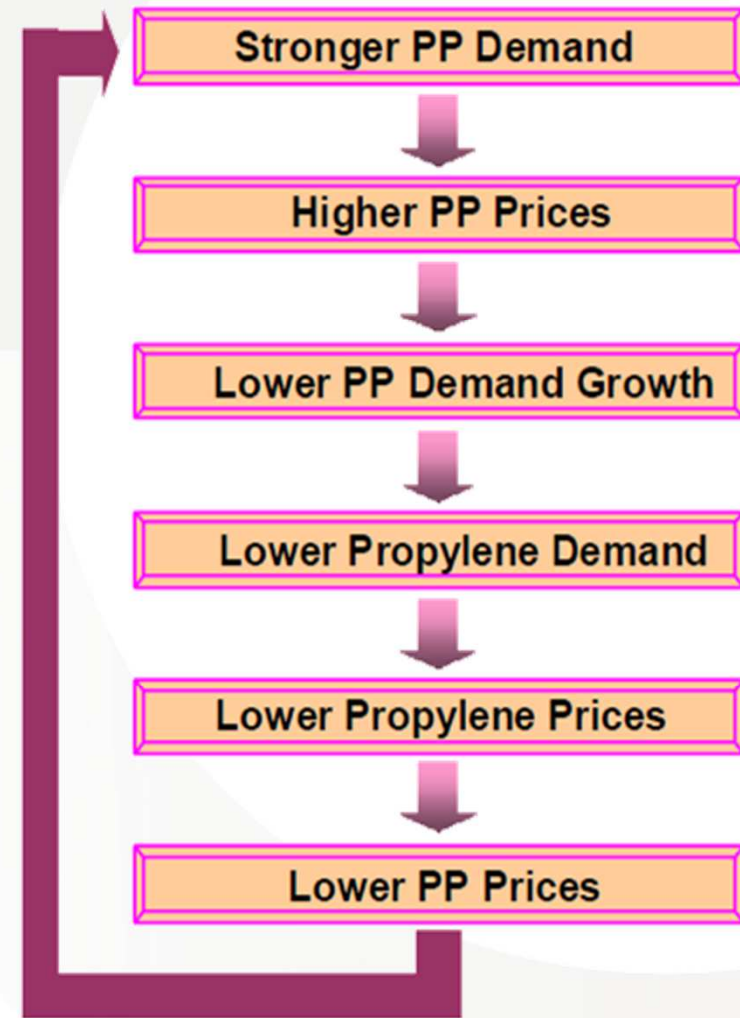
Polymer Price and Demand Cycle

* 10~15% overlap depends upon prices



Total Demand = 190 Mil Ton

(2010)



Outline...

➤ Polypropylene Market Outlook

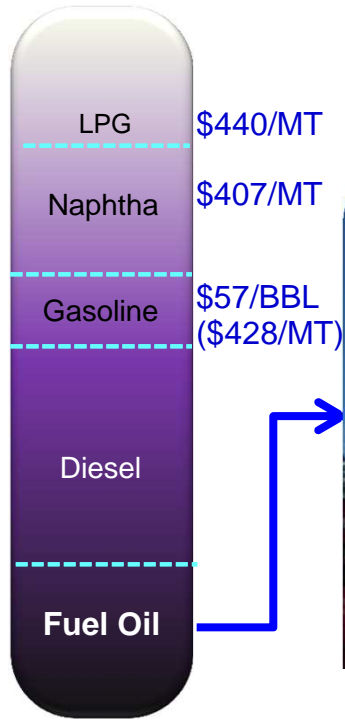
➤ **IRPC Polypropylene
Business Development**



➤ Key Drivers & It's
Opportunity



Value Added Products from UHV Project



- ✓ Increasing Crude Run
- ✓ Variety Properties & Flexible Crude Type
- ✓ More Value Added Products

\$912/MT

PROPYLENE

320 KTA

WORK IN PROGRESS

- PP Expansion 160 KTA
- PP Compounding 140 KTA

> \$1,050/MT

Petrochemical Business

LPG

120 KTA

MIXED AROMATIC

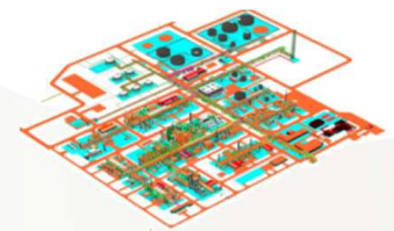


280 KTA

FUEL OIL COMPONENT/
CARBON BLACK
FEEDSTOCK



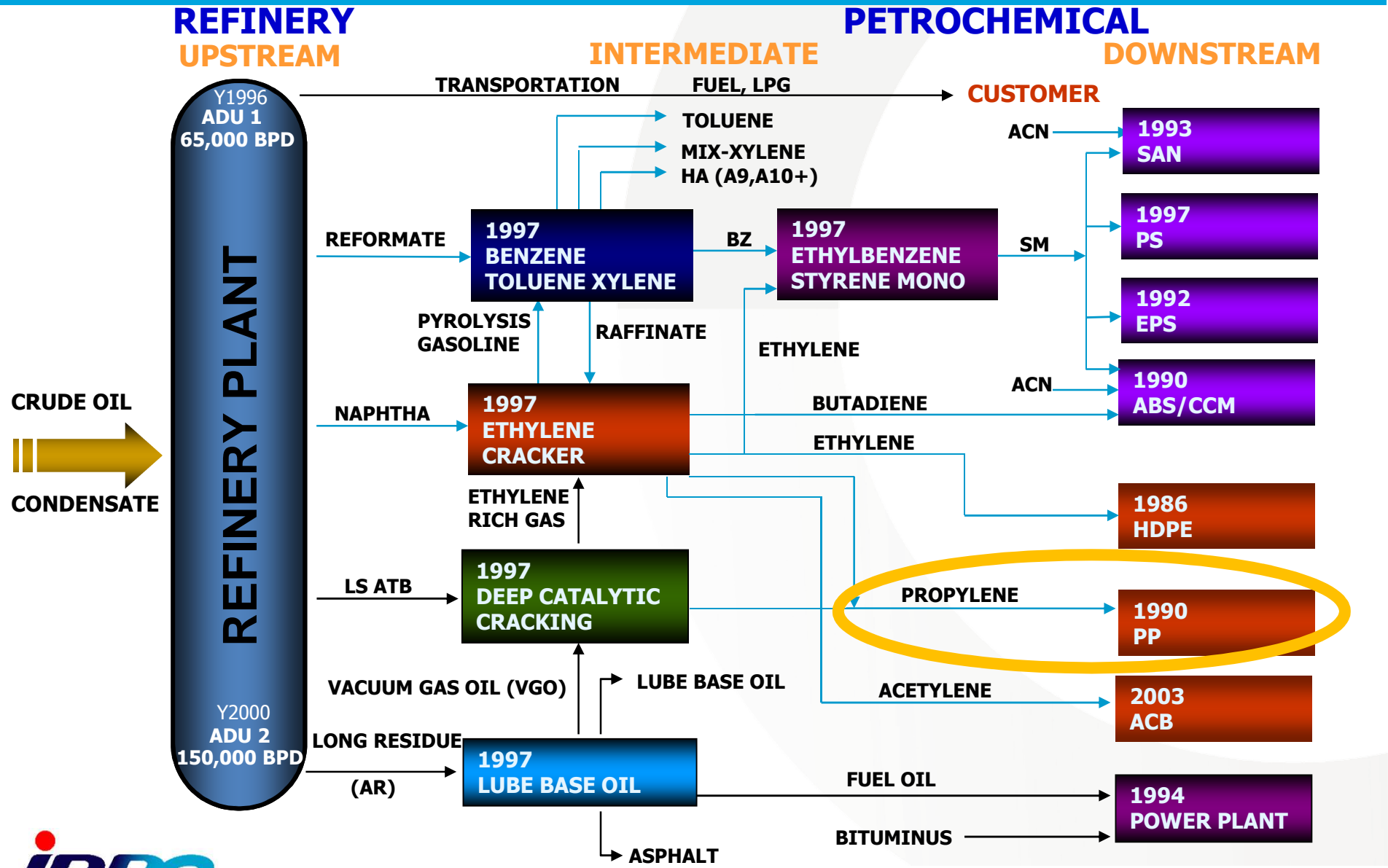
200 KTA



*Production Capacity



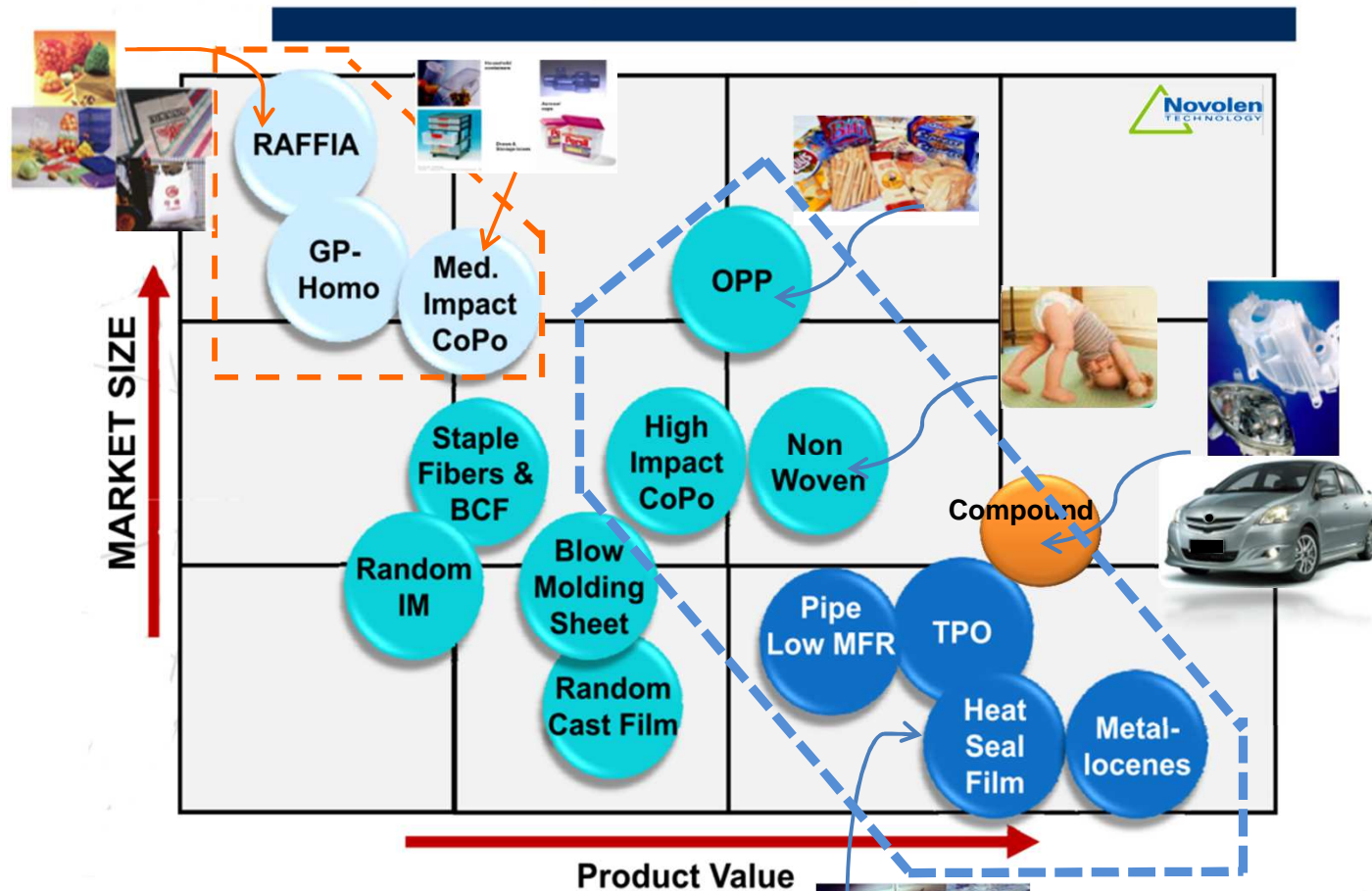
IRPC Overall Process



Shifting of Product Portfolio toward Variety and Premium Product serving Mega Trend

Polypropylene Expansion +160 KTA

Compounding +140 KTA



- Increase Volume : Economy of Scale
- Increase Value Added Products



IRPC PP Compounding Project

Outline Process



Inline Process



Cost Saving

- Packing & Logistic
- 2nd Extruder Production



Outline...

➤ Polypropylene Market Outlook

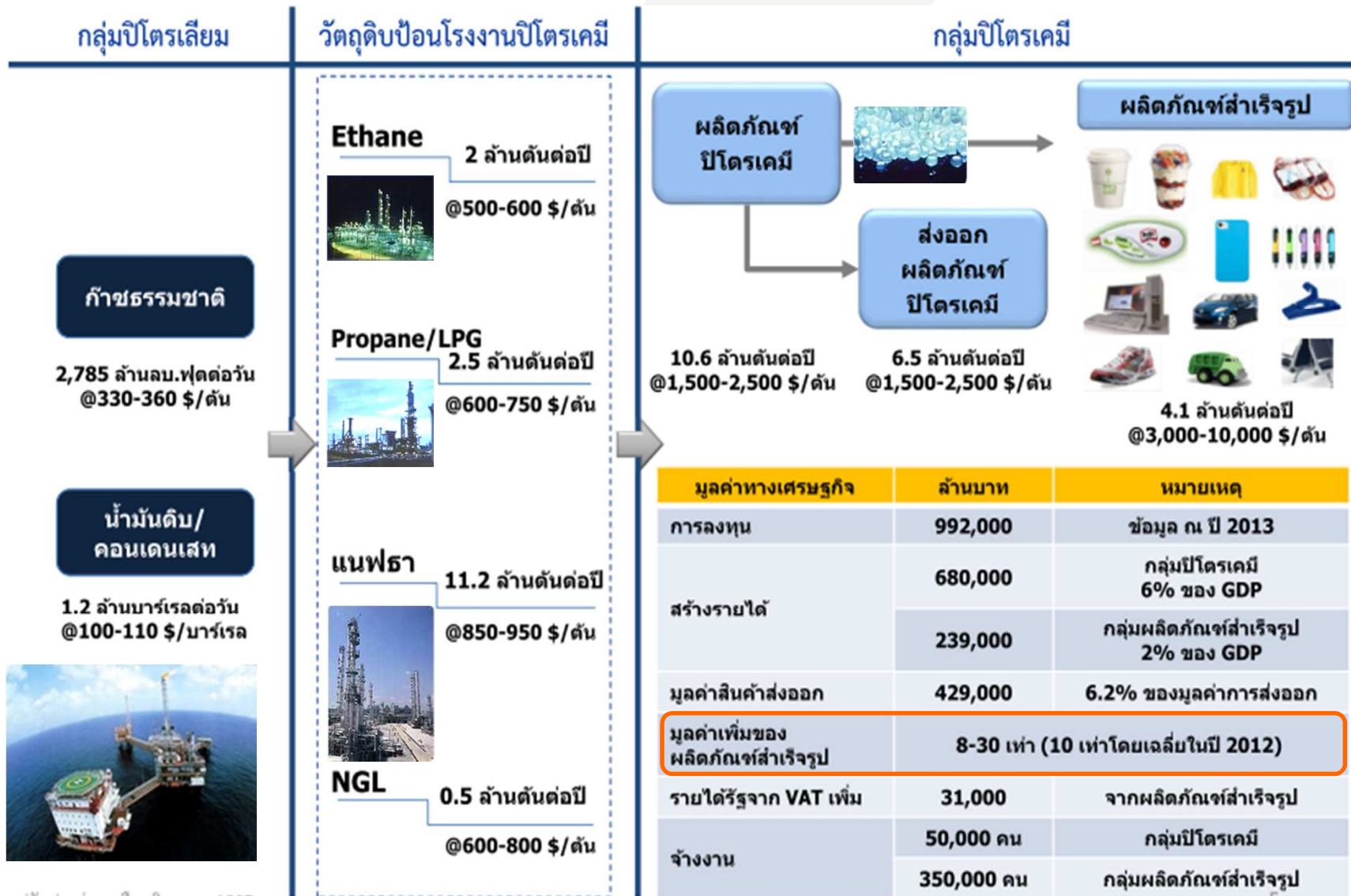
➤ IRPC Polypropylene
Business Development



➤ **Key Drivers & It's
Opportunity**



Value Creation Through Supply Chain



Global Trend : World Business Opportunities

CLIMATE CHANGE



POPULATION



ECONOMIC



NATURAL RESOURCES



GLOBAL FLOW



HEALTH



EDUCATION



TECHNOLOGY



SECURITY



DEVELOPMENT & POVERTY



Opportunities for Polypropylene



Global production
Global purchasing
Investment shift to ASEAN





PACKAGING

Packaging Market Outlook



Thailand

Total Production of Plastic Conversion

Million Baht: 572,372

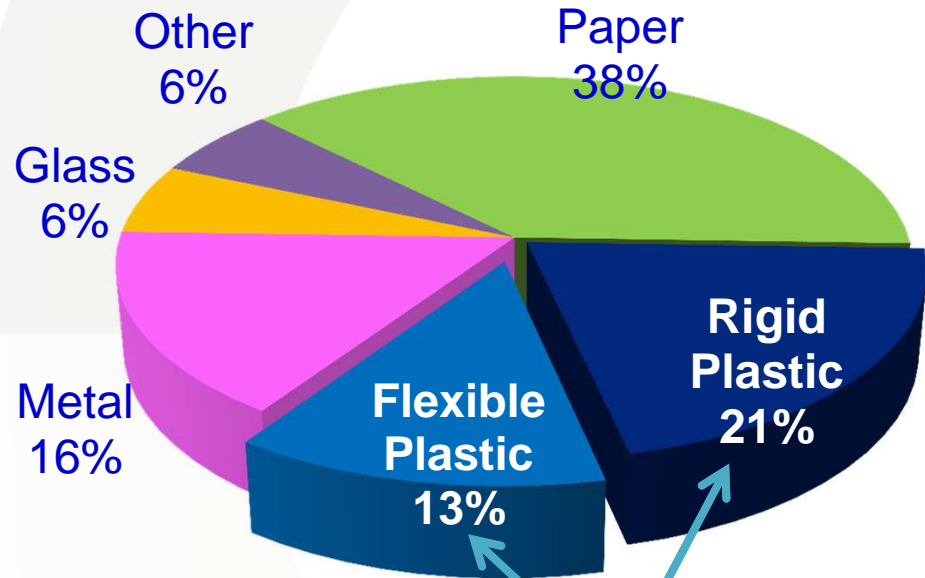
Ktons Volume: 4,679



Plastic Packaging

Million Baht: 187,079 (32.7%)

Ktons: 2,219 (47.4%)



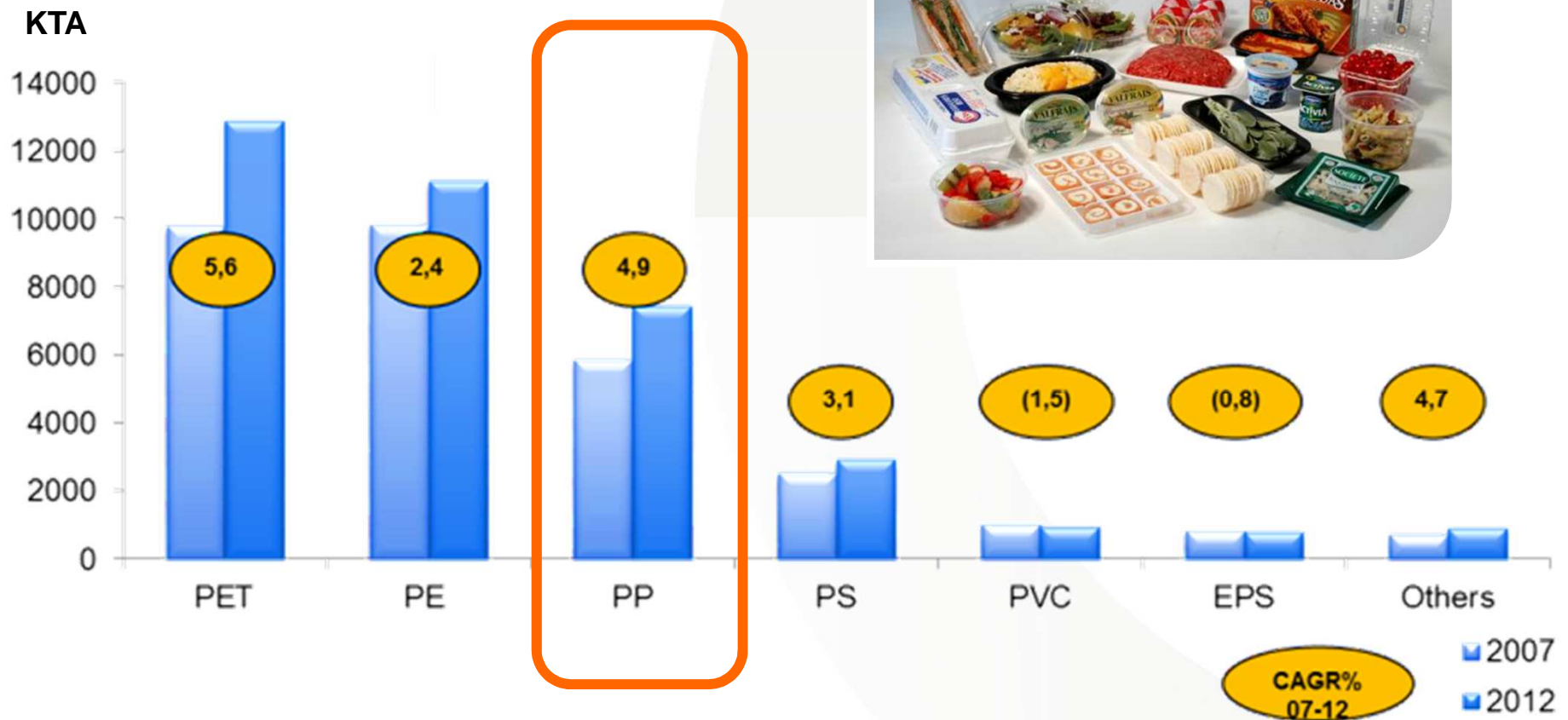
Total Plastic 34%
Global Packaging Consumption

Source: PIRA International, 2009













Source: PTIT Data, Modified by PITH, 2014

World Rigid Plastic Packaging Consumption by Material



Polypropylene in Packaging

	<p>Bag <i>PE, PP, PET, PVC, Nylon</i></p>		<p>Cup/Lid <i>PP, PS</i></p>
	<p>Bottle/Cap <i>PE, PP, PS, PET, PVC</i></p>		<p>Tray <i>PE, PP, PS, PVC, PET</i></p>
	<p>Container/Closure <i>PE, PP, PS, SAN, PET, PVC</i></p>		<p>Film <i>PE, PP, PVC</i></p>
	<p>Box/Pallet/Drum <i>PE, PP, PET</i></p>		<p>Blister/Skin <i>PE, PVC, Ionomer</i></p>
	<p>Sack/Yarn <i>PP</i></p>		<p>Foam <i>PS, EPS, PP</i></p>

Packaging Key Drivers and Trends

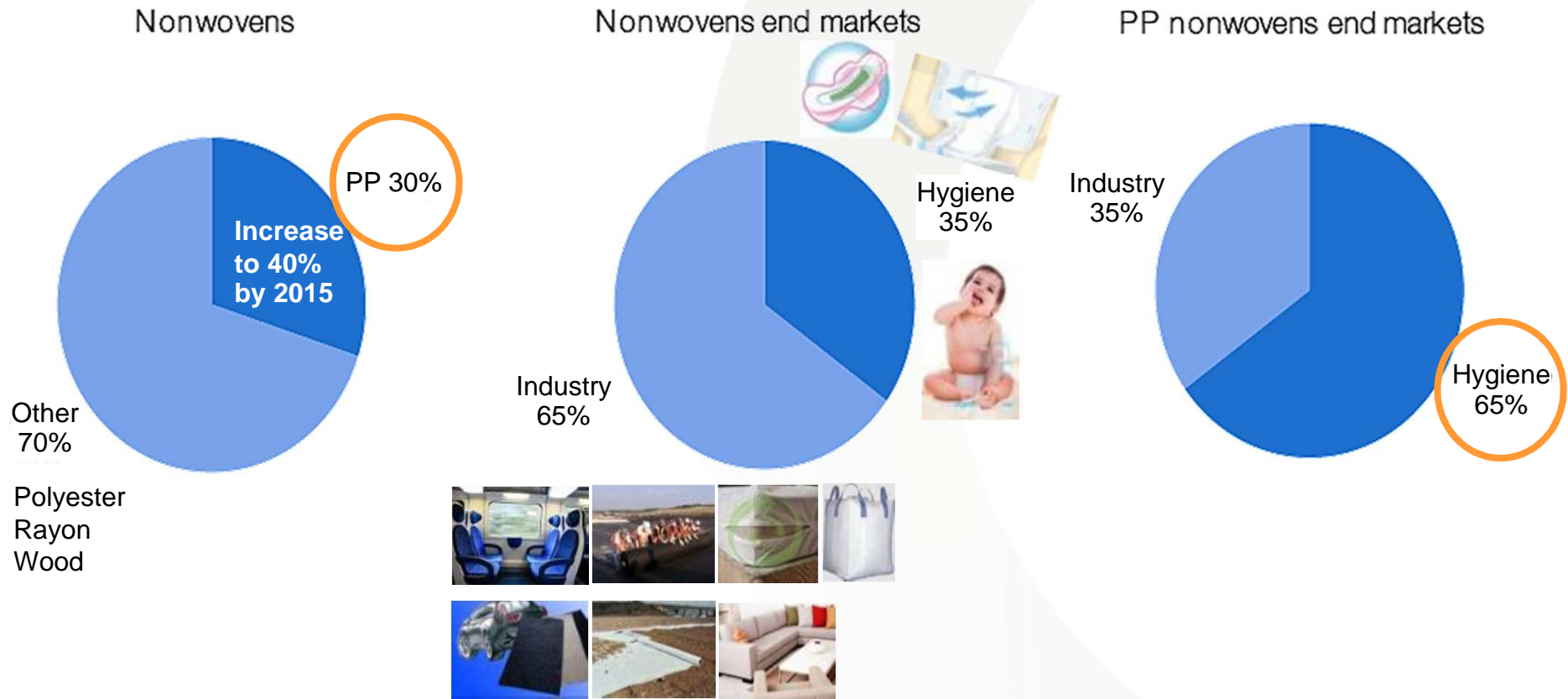


- Multilayer packaging
- Plastic pouches
- Flexible packaging
- Microwaveable packaging
- Frozen / Chilled ready meal
- Convenient closures
- No Carcinogen in baby bottle and food containers



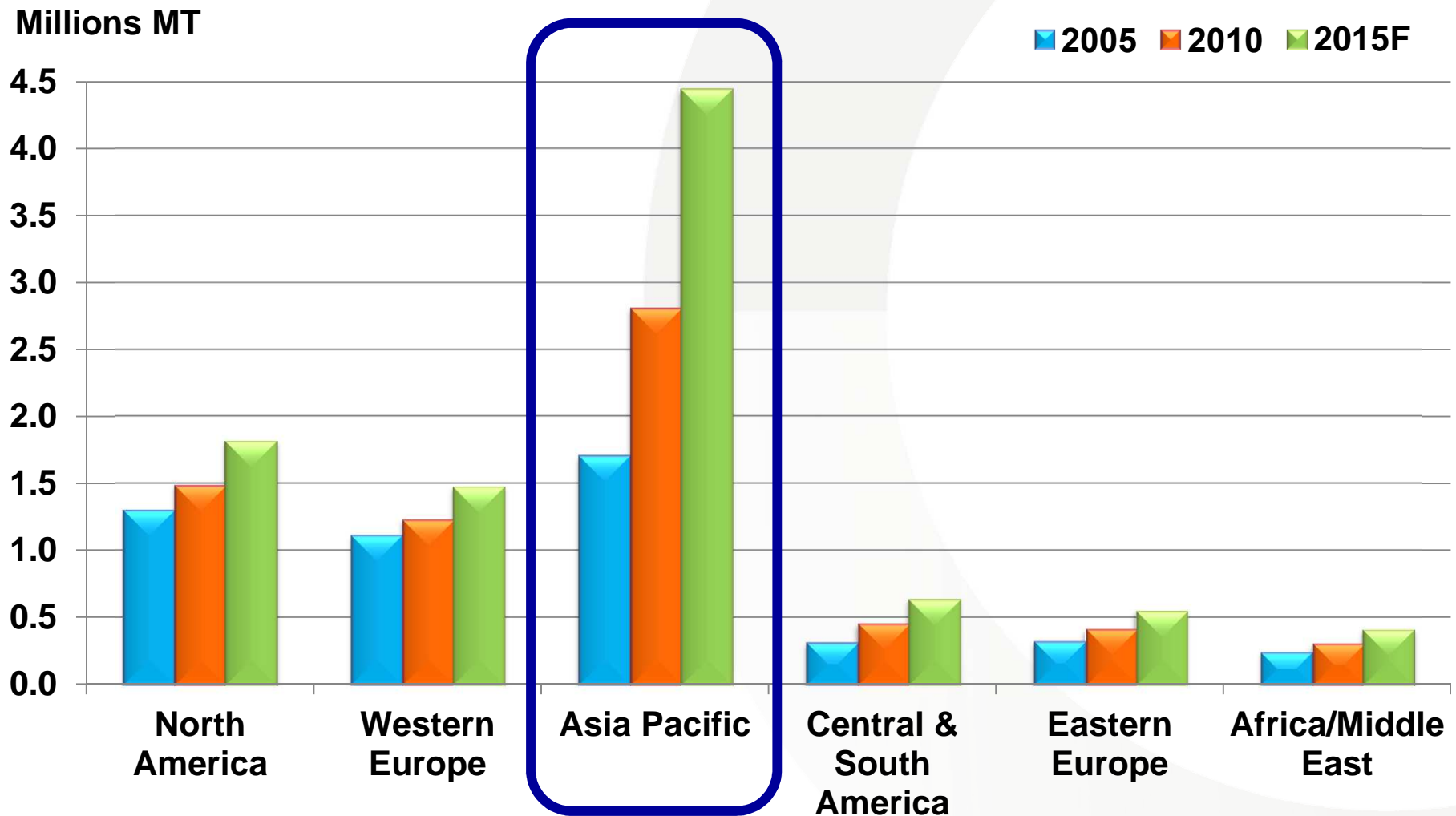
NONWOVENS & YARN

Polypropylene Nonwovens Market

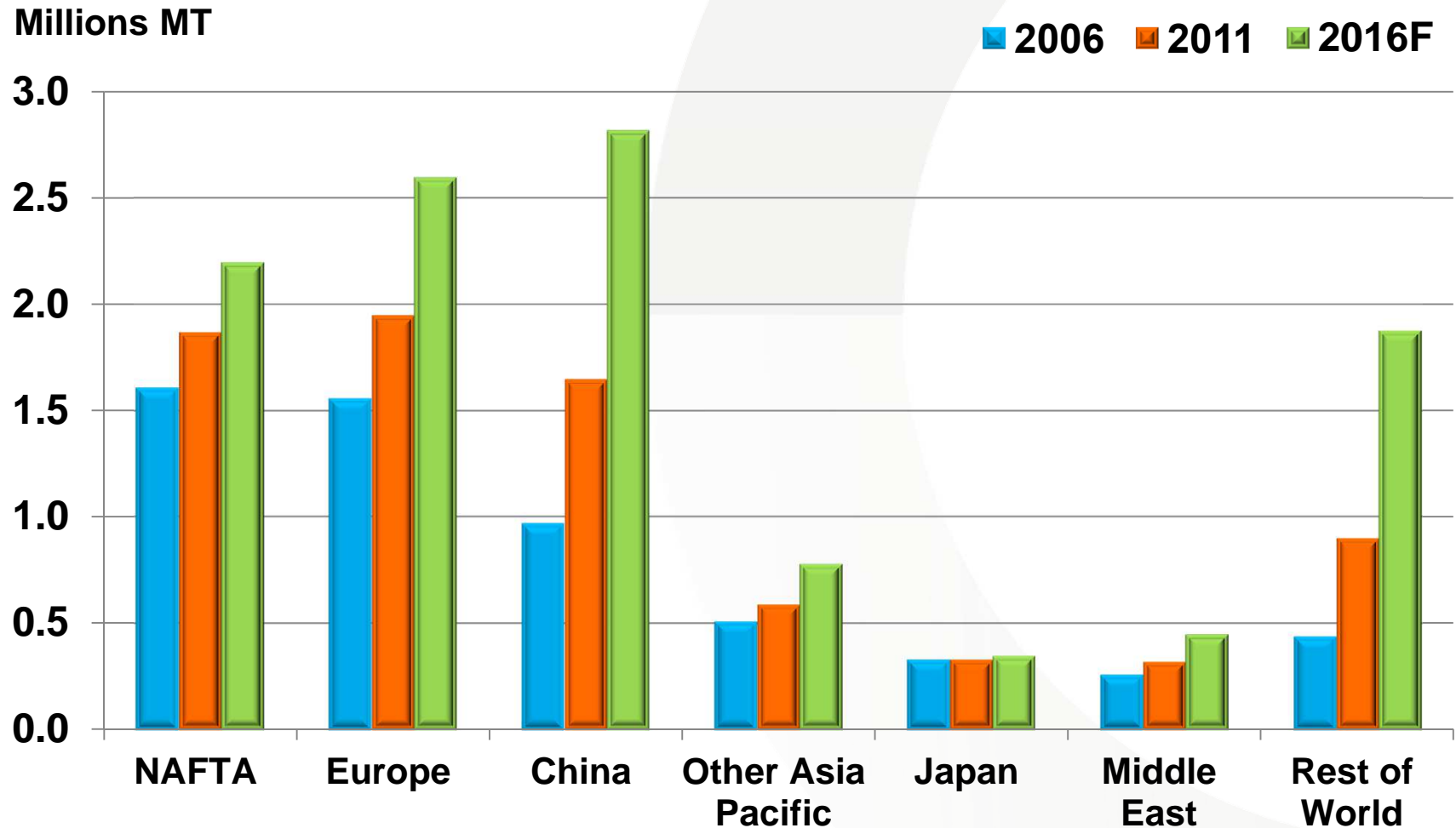


The Global Nonwovens Market is over \$20 Billion by 2011 and US\$30.61 Billion by 2020

World Nonwovens Demand



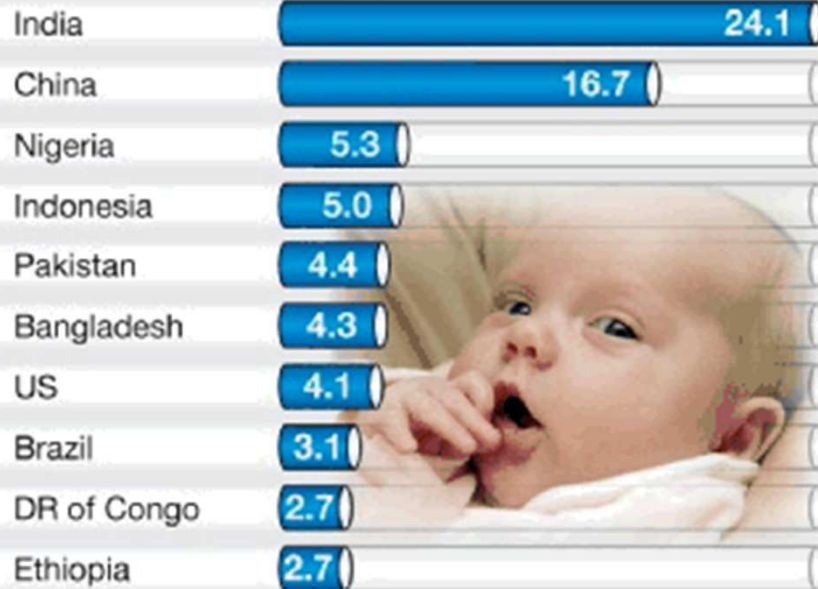
Worldwide Nonwovens Production



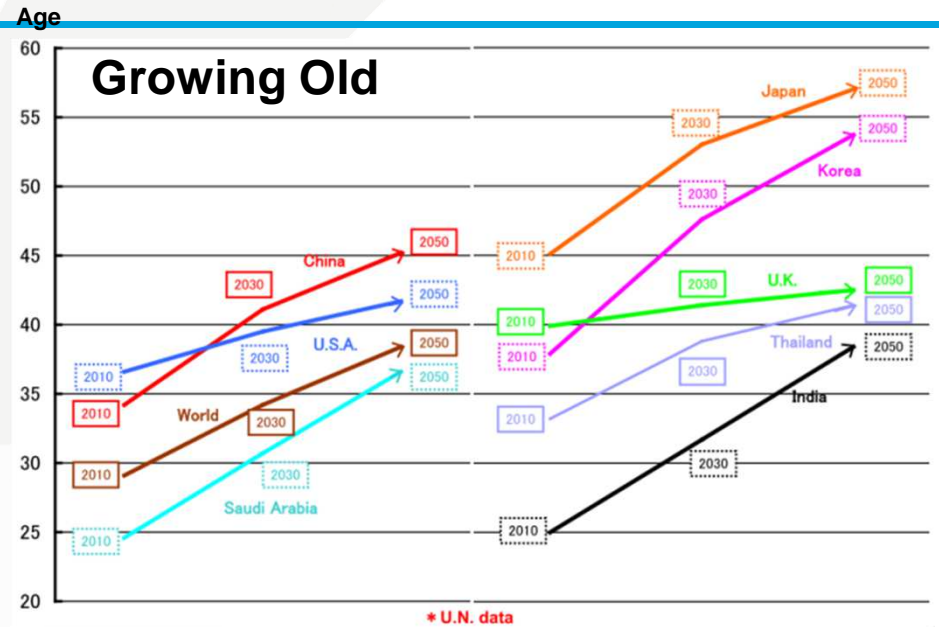
High Birth Rate and Longer Living Drive Demand

Countries with the Most Births Per Year

million births in 2005



Source: www.watchmojo.com
 according to US Census Bureau, International Database
 Photo: © bilderbox.com © grafikdienst.com



Source: Mitsubishi Corporation, 2013



Nonwovens & Yarn Key Drivers and Trends



- **PP Nonwoven growth in hygiene market.**
- **Industrial and agricultural sectors growth in developing countries.**
- **Consumption increasing in Asia-Pacific, Latin American and other emerging markets.**
- **Older traditional products substitution and consumer behavior change**



ELECTRONIC - ELECTRICAL & APPLIANCES





ประเภทพลาสติก	ชิ้นส่วนที่นำมาผลิต
Acrylonitrile Butadiene Styrene (ABS)	โครงของอุปกรณ์ไฟฟ้า เช่น จอเครื่องพิมพ์, แป้นพิมพ์คอมพิวเตอร์, เครื่องโทรศัพท์, คีย์บอร์ดคอมพิวเตอร์
Acrylate Styrene Acrylonitrile (ASA)	อุปกรณ์และสัญญาณไฟจราจร, มือจับโทรศัพท์, โครงโทรทัศน์แบบหัว
Cellulose acetate butyrate (CAB)	เลนส์กล้องถ่ายรูป, ฝาครอบสัญญาณไฟจราจร
Cresol-formaldehyde (CF)	ปลั๊กไฟฟ้า
Ethylene Vinyl Acetate (EVA)	สายไฟ, สายเคเบิล
High impact polystyrene (HIPS)	ชิ้นส่วนประกอบตู้เย็น, โครงโทรทัศน์, วิทยุ, เฟอร์นิเจอร์
Methacrylate Butadiene Styrene (MBS)	ชิ้นส่วนโปร่งใสในตู้เย็น
Polyamide (PA)	สายไฟ, ปลั๊กไฟฟ้า
Polybutylene Terephthalate (PBT)	เปลือกหุ้มวงจรรไฟฟ้าอิเล็กทรอนิกส์
Polycarbonate (PC)	เลนส์กล้องถ่ายภาพ
Polyethylene (PE)	ชิ้นส่วนอุปกรณ์ไฟฟ้า, สายเคเบิล
Polyether Ether Ketone (PEEK)	ปลอกหุ้มสายไฟฟ้า
Polymethyl Methacrylate (PMMA)	ส่วนประกอบของเครื่องใช้ไฟฟ้า, ส่วนประกอบของไฟฟลูออเรสเซนต์
Polycetals (POM)	อุปกรณ์ไฟฟ้า
Polypropylene (PP)	เครื่องใช้ไฟฟ้า
Polyphenylene Oxide (PPO)	ฝาปิดอุปกรณ์ไฟฟ้า, โครงเครื่องพิมพ์ดีดไฟฟ้า, ปลั๊กไฟฟ้า, ปลอกหุ้มสายไฟฟ้าแรงสูง
Polystyrene (PS)	ฝาครอบหลอดไฟ, ส่วนประกอบของเครื่องใช้ไฟฟ้า, ดับวิตโอ
Polysulphone, Polysulfone (PSO/PSU)	แผงวงจรรไฟฟ้า
Polytetrafluoroethylene (PTFE)	ปลอกหุ้มสายไฟฟ้า, สายเคเบิล, ฉนวนสำหรับมอเตอร์หม้อแปลงไฟฟ้า, ขดลวดไฟฟ้า, ฉนวนกันความร้อน
Polyurthane (PU)	ฉนวนความร้อน
Polyvinyl Chloride (PVC)	ฉนวนหุ้มสายไฟ, สายเคเบิล
Polyvinylidene uoride (PVDF/PVF)	ปลอกหุ้มสายไฟฟ้า
Polyvinyl formal (PVFM)	กรอบเครื่องถ่ายภาพเอกสาร, เครื่องพิมพ์ดีด
Styrene-acrylonitrile (SAN)	ชิ้นส่วนเครื่องใช้ไฟฟ้า, เครื่องใช้ในบ้าน

EE & Appliances Market Outlook



Thailand

Total Production of Plastic Conversion

Million Baht: 572,372
Ktons Volume: 4,679

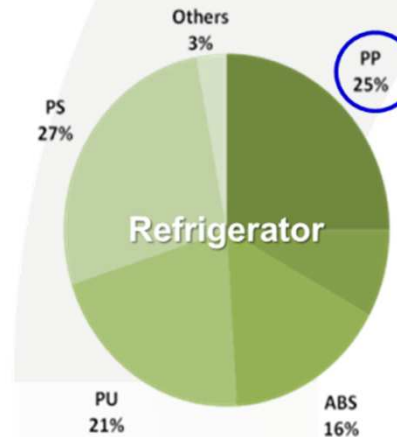


EE & Appliances

Million Baht: 118,240 (20.7%)
Ktons: 739 (15.8%)

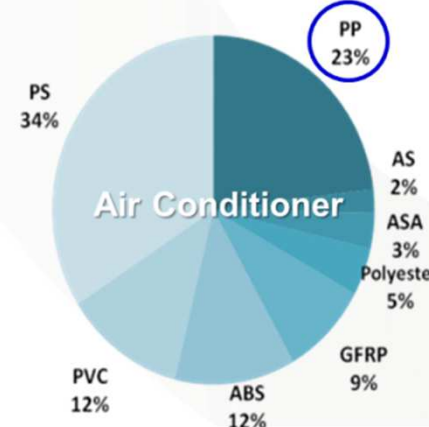
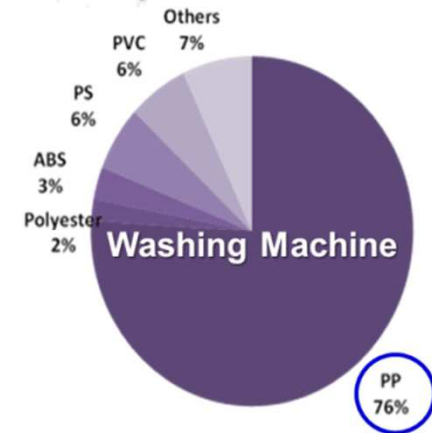


Source: Mitsubishi Corporation and Journal of Cleaner Production, 2014



Plastics component average weight about 7 kg/unit

Plastics component average weight about 8 kg/unit



Plastics component average weight about 3 kg/unit



Source: PTIT Data, Modified by PITH, 2014

EE & Appliances Key Drivers and Trends



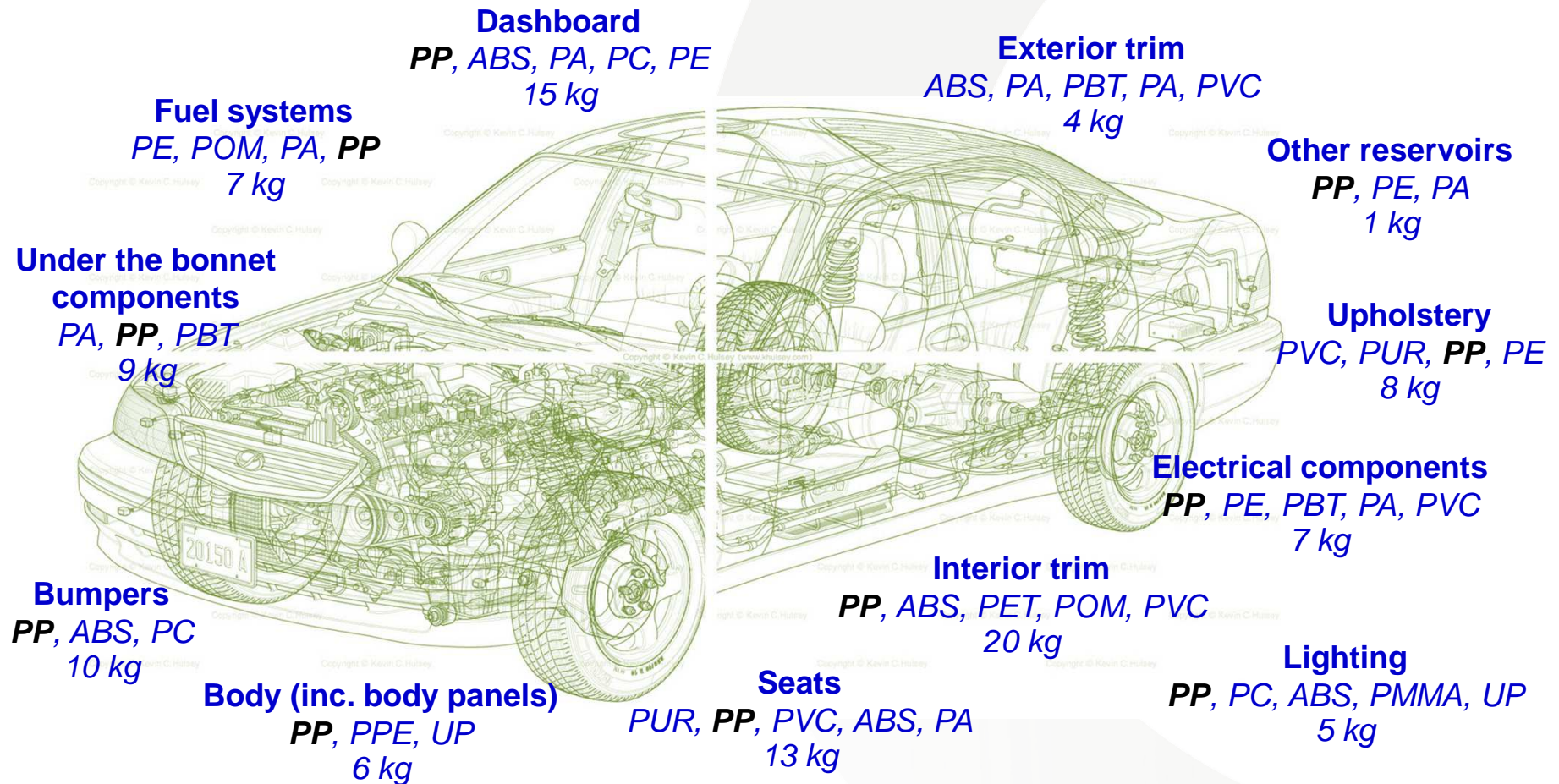
- **Functionality**
- **Easy to use – and connected**
- **Aesthetics and Design**
- **Energy efficiency**



AUTOMOTIVE



Polypropylene in Automobile



About 105 kg of petrochemical-derived plastics

Automotive Market Outlook



Thailand

Total Production of Plastic Conversion

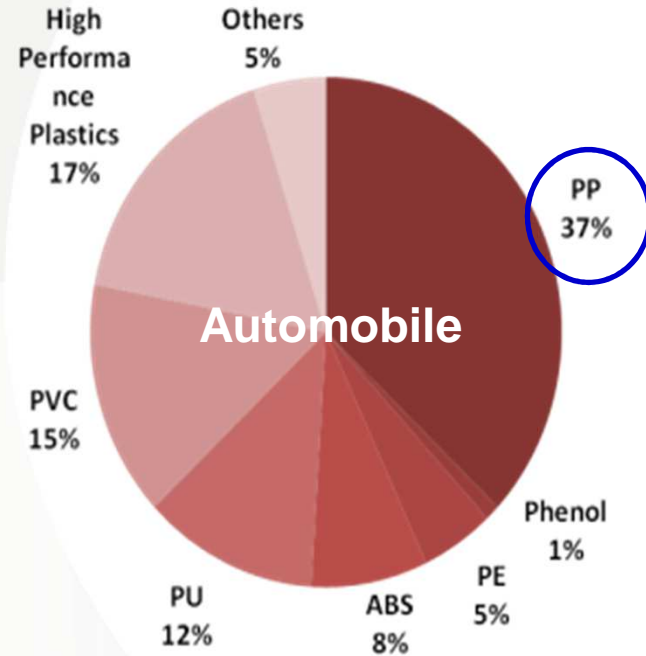
Million Baht: 572,372
Ktons Volume: 4,679



Vehicles

Million Baht: 81,638 (14.3%)
Ktons: 363 (7.7%)

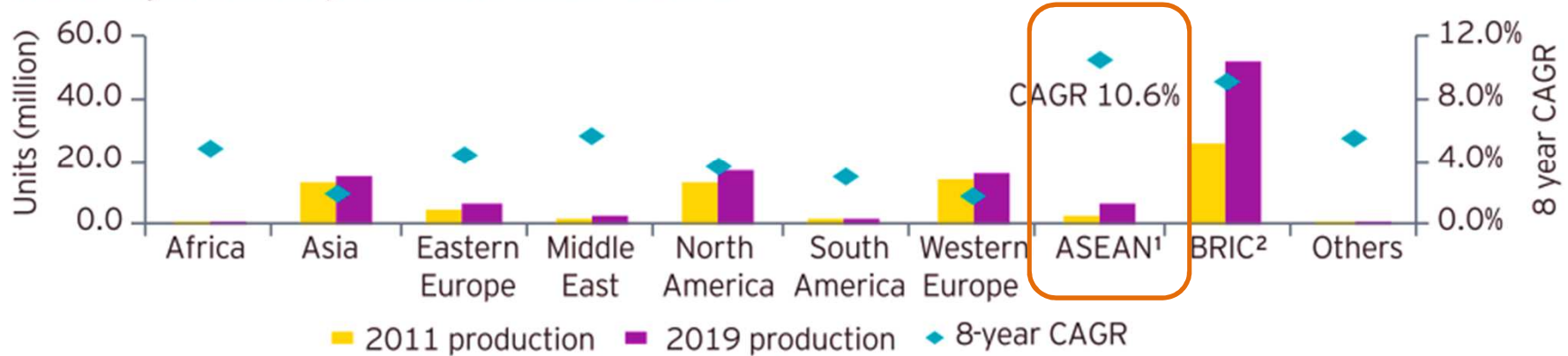
Source: Mitsubishi Corporation



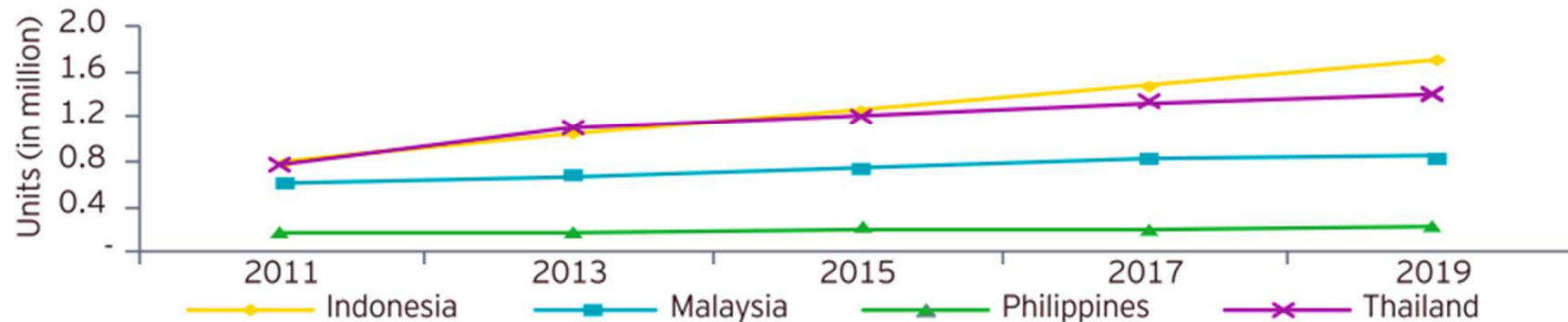
Source: PTIT Data, Modified by PITH, 2014

Significant Transition in the Region

Global light vehicle production: 2011-2019E



ASEAN light vehicle sales: 2011-2019E



Automotive Key Drivers and Trends



- High growth of automotive production in Asia
- Further growth of PP demand in China and Southeast Asia
- Low cost / Light weight PP supports city car production
- Developing bio-plastic based on PP of Japanese car maker



COMPOUNDING

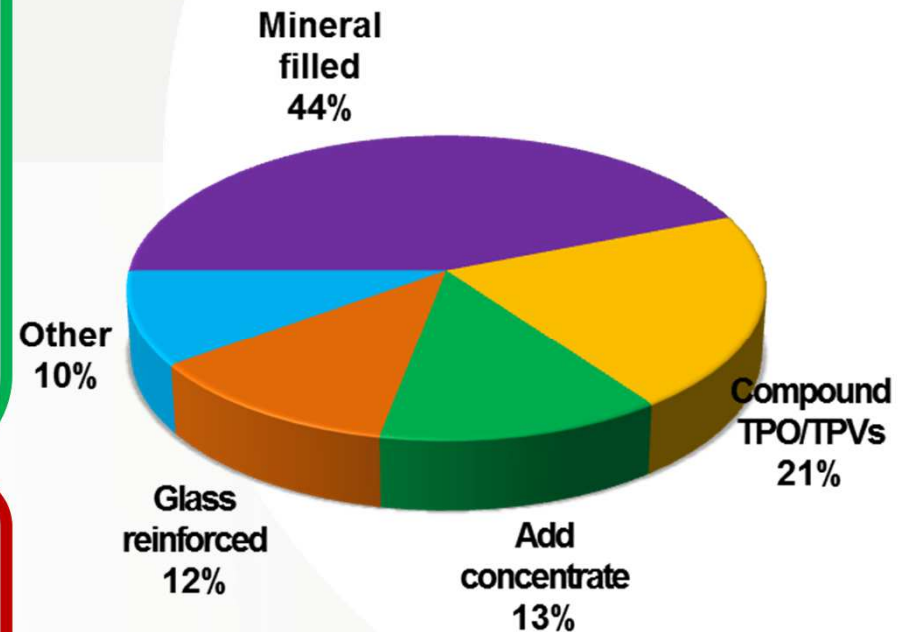
Where is Used Compounded Plastics?

Industries Served:

- Construction
- Auto
- Wire and Cable
- Durables
- Consumer Products
- Industrial Applications
- Aerospace
- Electrical & Electronics
- Health Care

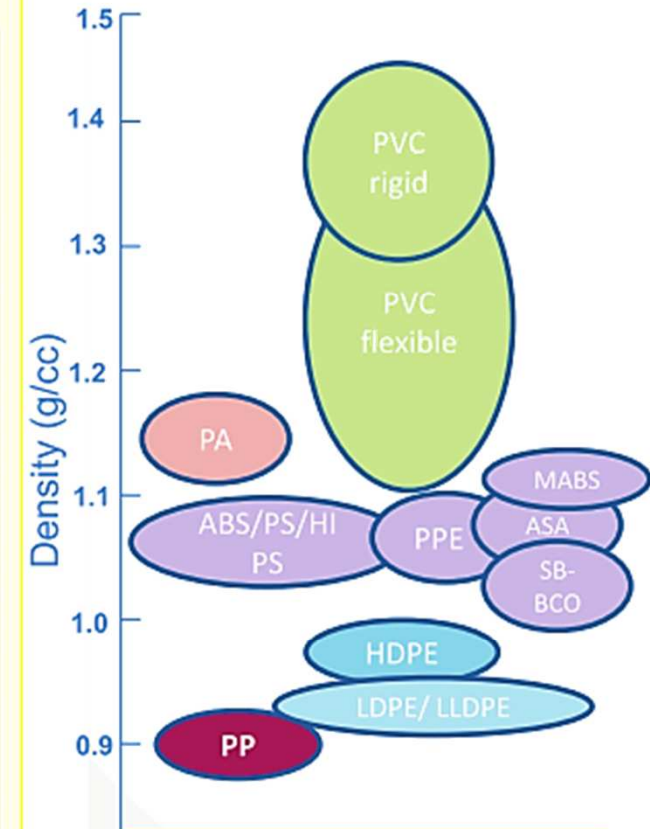
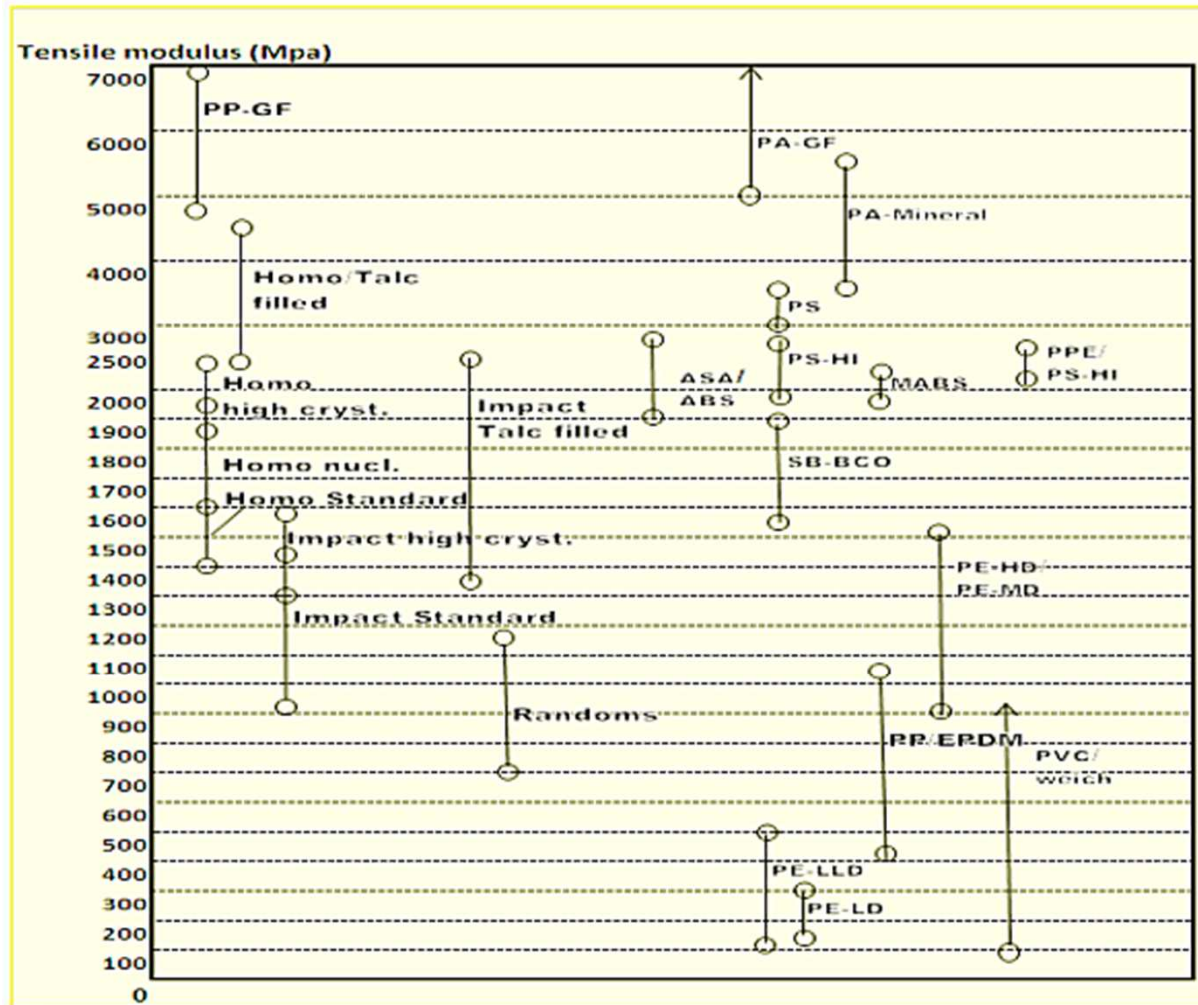
Replacing:

- Metals
- Wood
- Natural Rubber
- Expensive Engineered Plastics

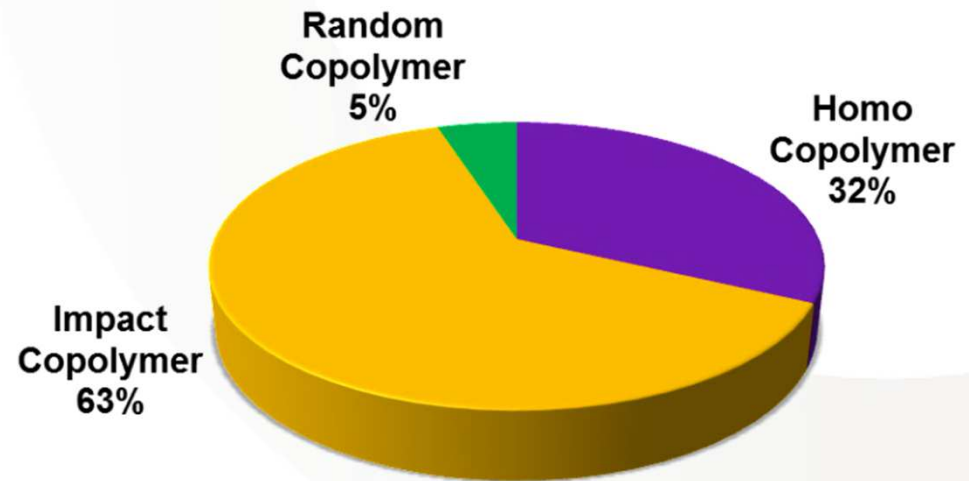
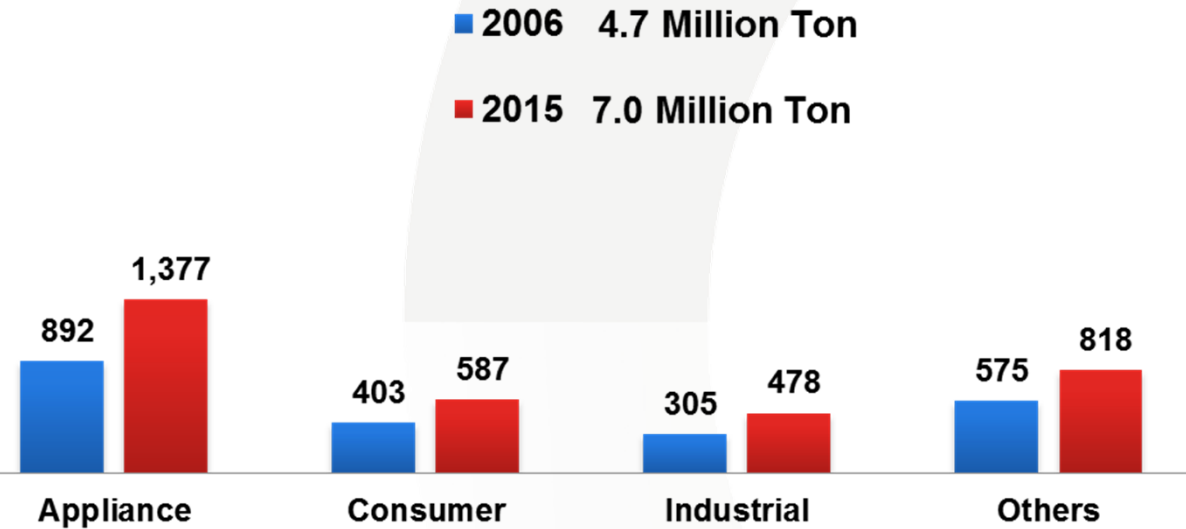
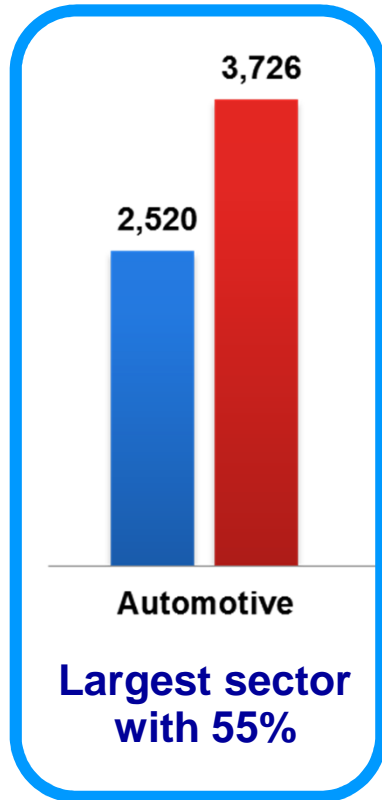


Note: TPO, Thermoplastic Polyolefin
TPV, Thermoplastic Vulcanizates
Add concentrate ex: Carbon black, Pigment, Masterbatch

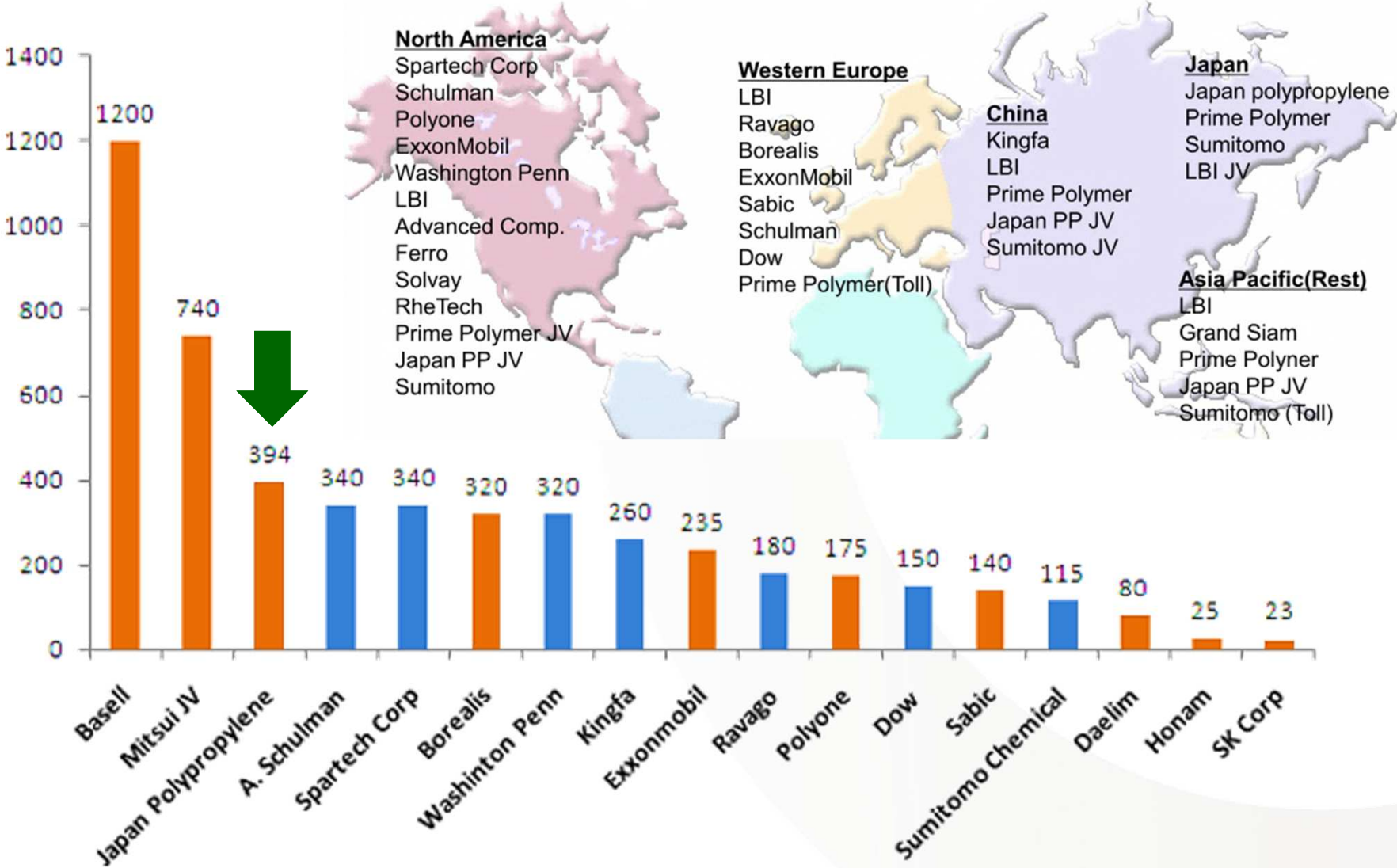
PP Categories/ Stiffness vs. Other Polymers



Global Demand of Polypropylene Compound



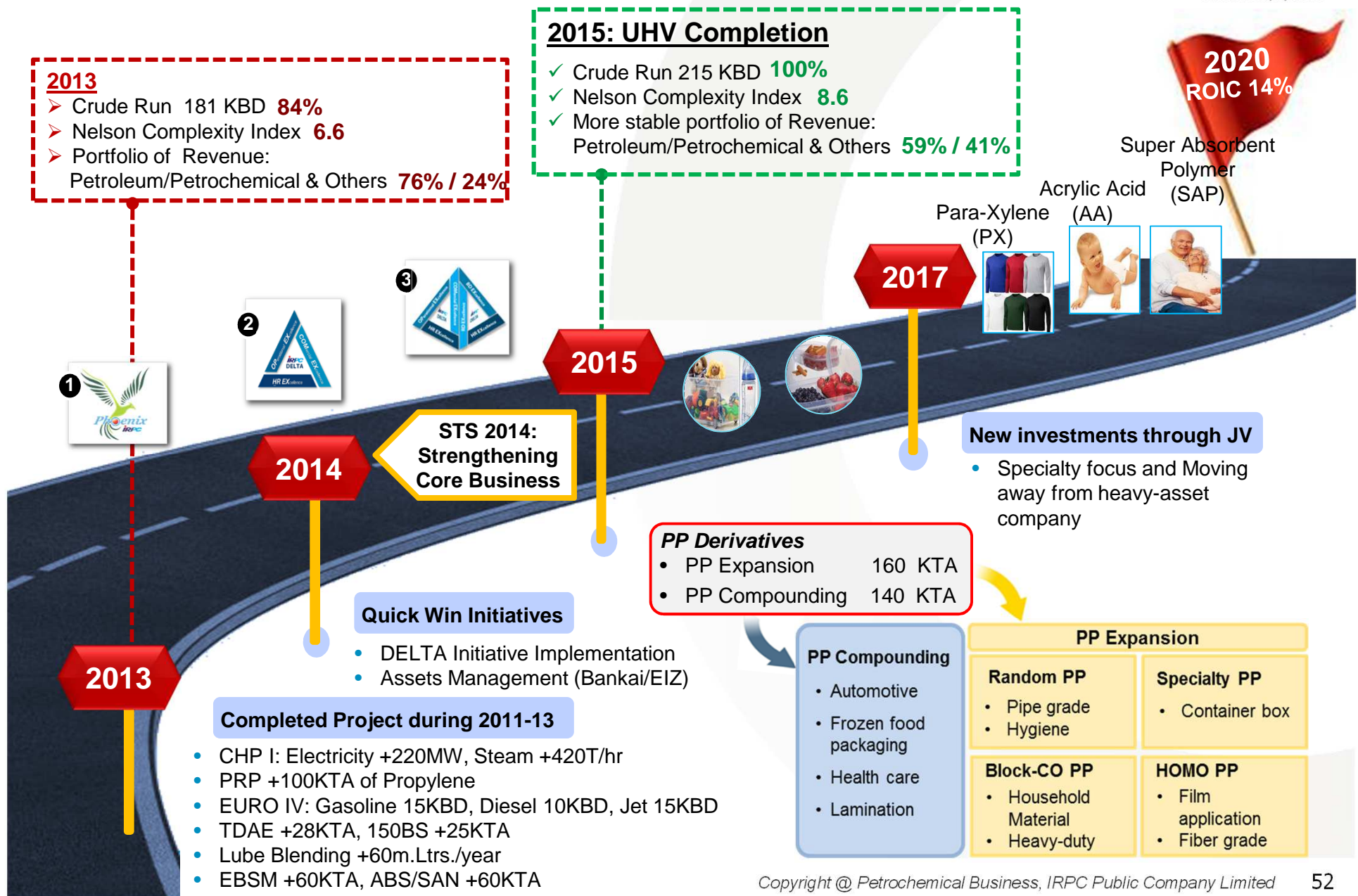
Major Global PP Compound Producers



Source: TASNEE (Saudi Arabia), 2nd GPCA, Plastics Summit

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Strategic Initiatives: Roadmap to Success



Question



THANK YOU

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