



Petrochemicals workshop PKN ORLEN Investors and Analysts Day 2008

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Warsaw, June 18th 2008*



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Agenda

Petrochemicals basics of PKN ORLEN and market perspective

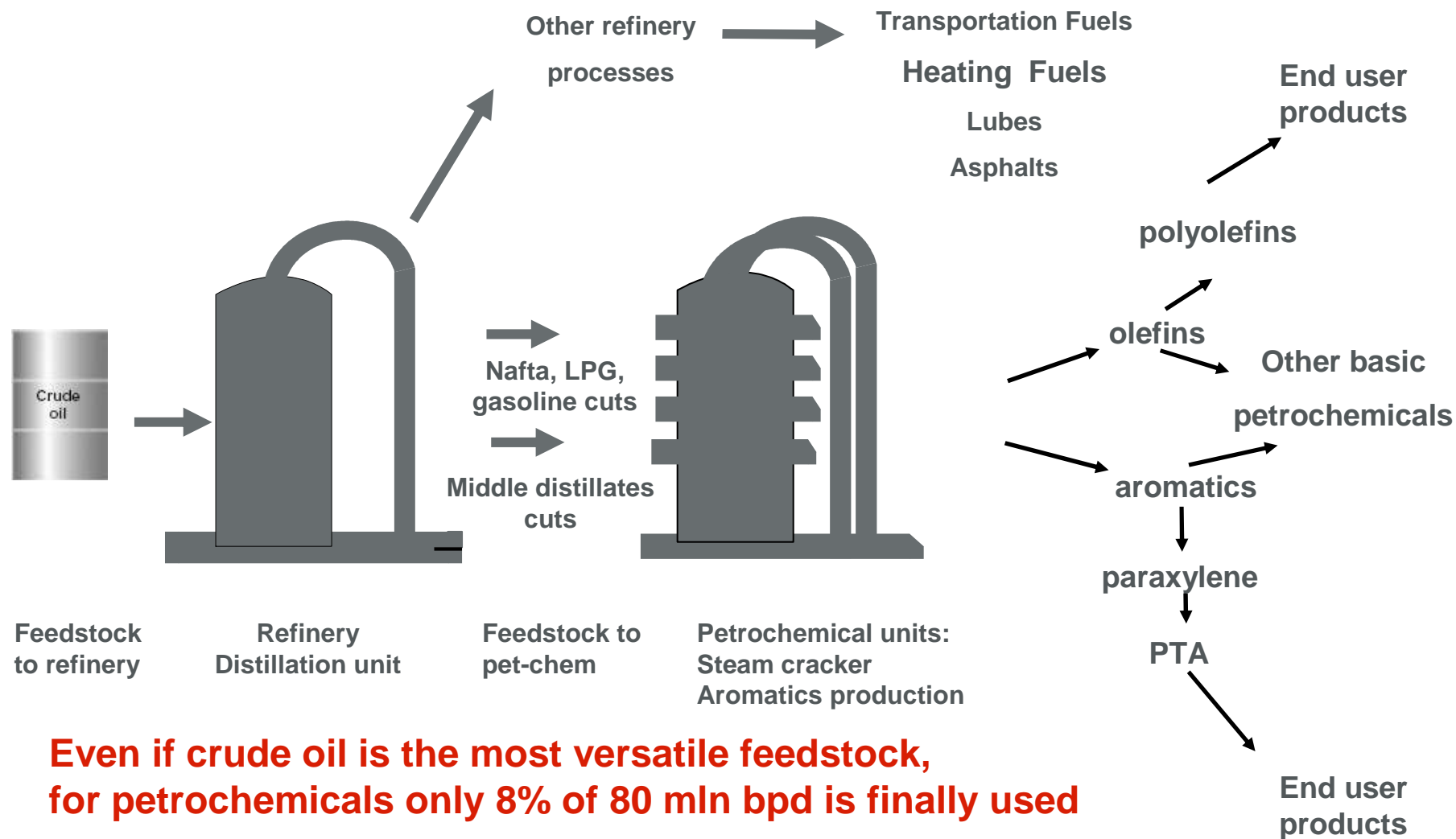
Key production flows in petrochemical

Supporting slides



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Petrochemical basics 1.2



**Even if crude oil is the most versatile feedstock,
for petrochemicals only 8% of 80 mln bpd is finally used**



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Petrochemical basics 2.2

✚ Petrochemicals are made from the entire range of refinery fractions. Most important feedstock's are: lighter hydrocarbon cuts, refinery gases and paraffinic distillates and hydrocrackates.

✚ In PKN ORLEN we have two main units dedicated for petrochemical production of basic products:

✚ **Steam cracker**

✚ **High severity reformer and aromatic extraction unit.**

Key products on the olefin unit are ethylene, propylene, and on the aromatics most important are benzene and xylenes.

- Ethylene and propylene are used mainly as a base for polyolefins. Aromatics are highly valuable products used to produce high quality gasoline. As the consumption of gasoline becomes flat or even decreasing, surplus of aromatics will be placed in the paraxylene production, being a feedstock for PTA.



Steam cracker by night



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CCR Reformer V – 700 th.t/y



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Aromatics Extraction Unit revamped & expanded to 550 th.t/y



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Technical specification, example: Płock site.

Hypothetical breakdown (total input ca. 2 100 th. t)

Gasoline fraction	~80%
Light gases	~10%
Others	~10%

Olefin unit
700 th.t/y ethylene ; 360 th.t/y propylene

Ethylene	~33%
Propylene	~17%
Gasoline fraction	~20%
BT fraction	~8%
Others	~22%



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Technical specification, example: Płock site
Hypothetical breakdown ; (total input ca 550 th.t)

BT fraction

100%

Aromatic extraction
550 kt /y

Benzene

33%

Toluene

40%

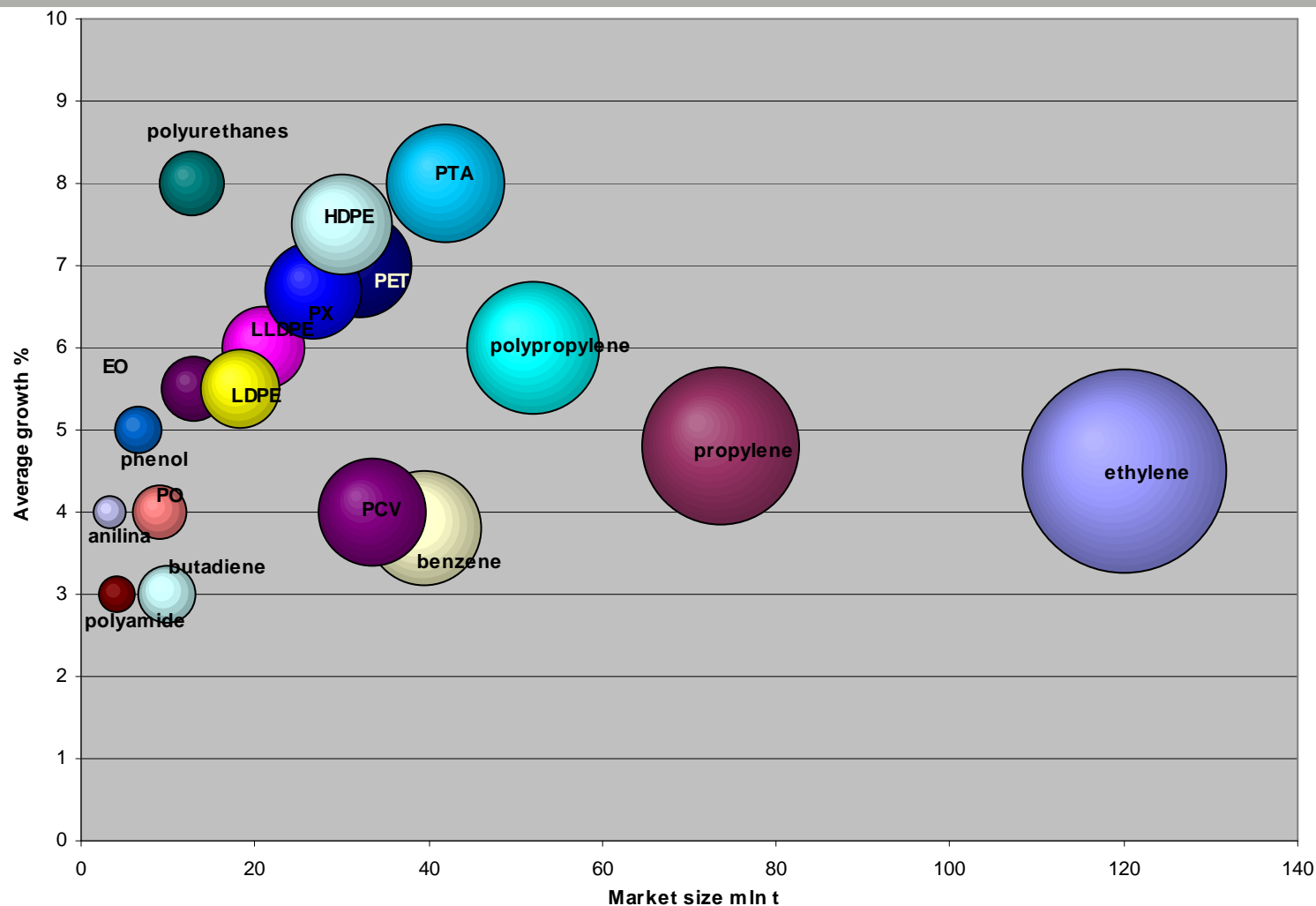
Raffinate

27%



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Market attractiveness



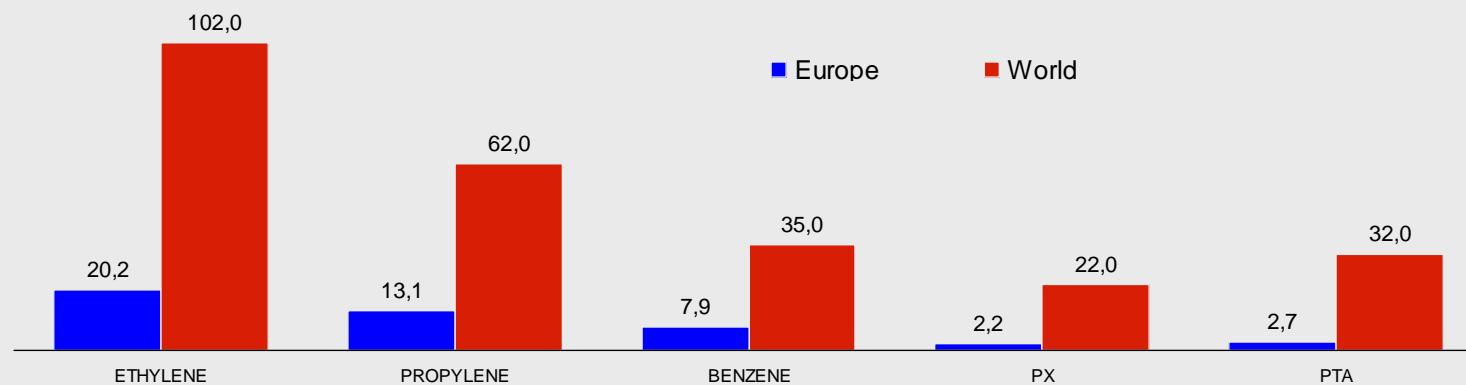
The market attractiveness of particular products depends on market size, expected growth and margin for each product



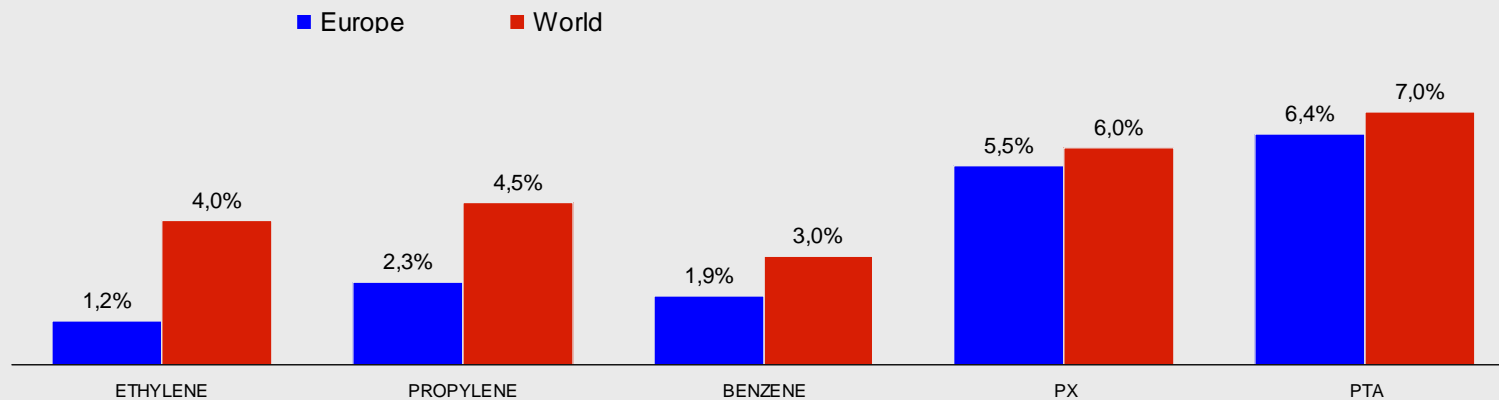
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Market perspective for key PKN ORLEN petrochemicals in Europe and in the world

Petrochemicals consumption 2004



Petrochemicals consumption growth



Source: PKN ORLEN S.A., CMAI,, Nexant



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Polyethylene and Polypropylene Balance in Poland

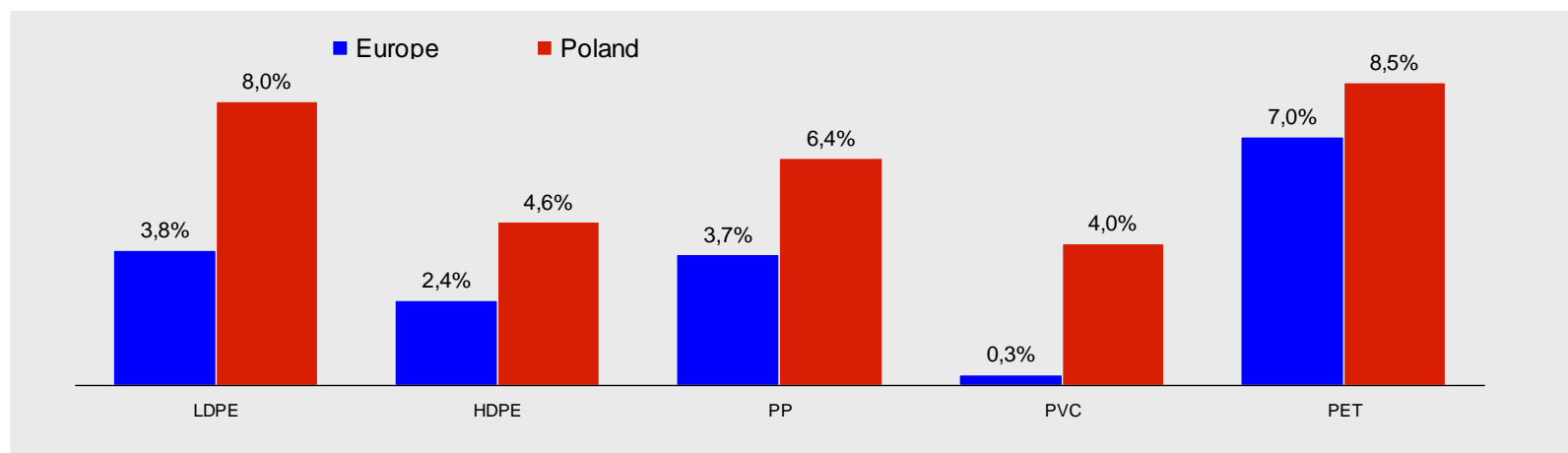
th. t	HDPE	LDPE	LLDPE	PP homo	PP kopo
Production 2005	28	119	0	146	0
Import 2005	231	136	111	169	129
Export 2005	13	22	1	25	3
Consumption 2005	246	233	110	290	126
Consumption 2005	246	343		416	
Capacity BOP	320	110	0	400	
Import H1 2006	121	73	64	90	60
Δimport H1 2006 / 2005	11%	11%	24%	18%	27%
Δimport H1 2006 / 2005	25	15	27	30	35
Increase of consumption y/y	6%	6%	6%	6%	6%
Forecast consumption 2014	416	394	186	490	213
Consumption 2014	416	579		703	
Proposal of increase capacity	350	300	0	450	
Deficit 2014, after increase capacity	66	94	186	253	

In Poland is and will be strong polyolefins deficit. This is the chance to develop domestic industry and improve balance of foreign trade



Positive perspective of dynamic market growth for petrochemicals in Poland and in Europe

Petrochemicals consumption growth 2003-2015



Petrochemical market in Poland

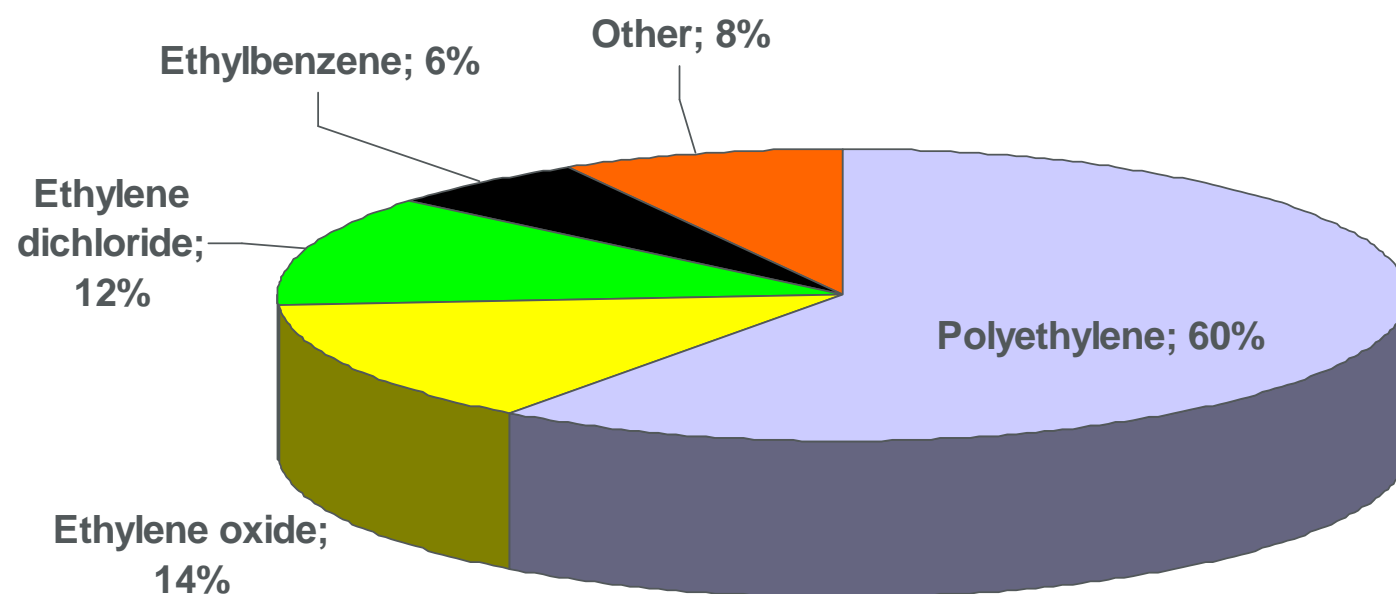
- ✚ PKN ORLEN is the major producer of petrochemicals in Poland and the Czech Republic, where it meets between 40% to 100% of domestic demand (depending on the product).
- ✚ Demand for polyolefins in Poland, at 23 kg per capita per year, is one of the lowest in Europe where consumption averages 50 kg per person



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Source: PKN ORLEN S.A., CMAI,, Nexant

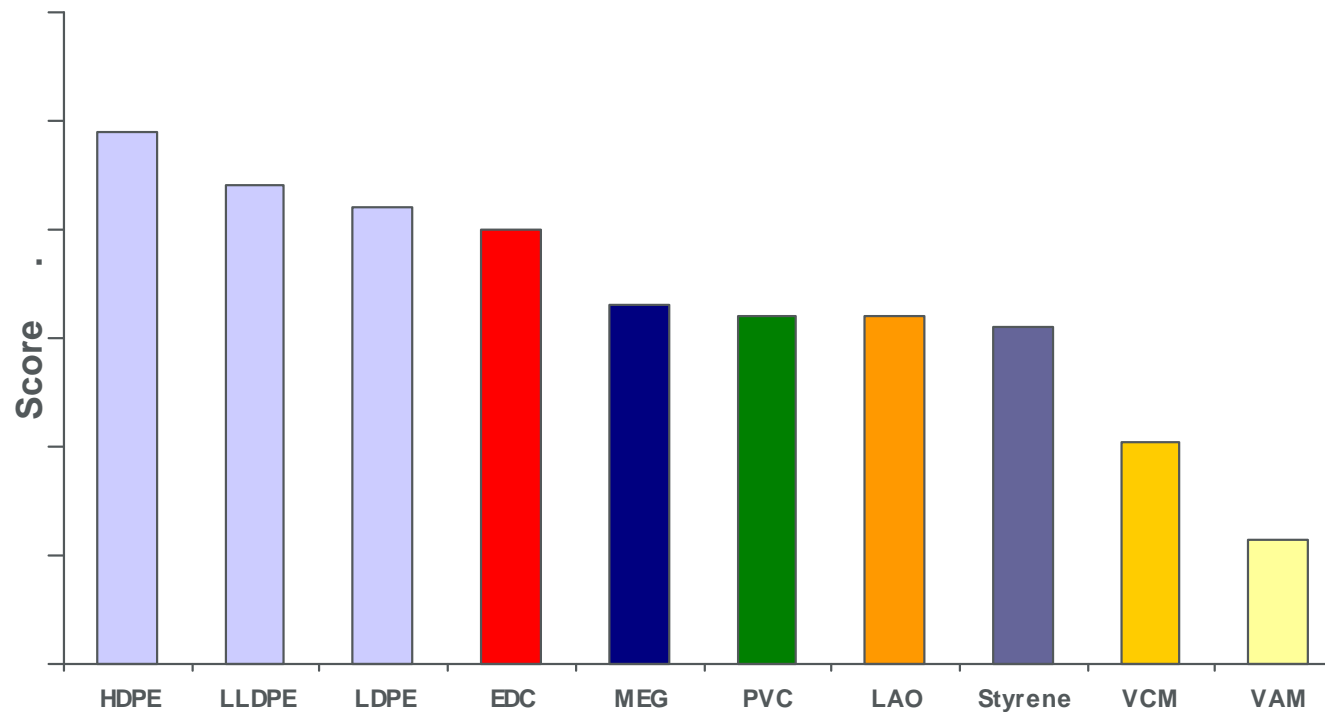
Ethylene derivatives



**Total World ethylene consumption was ca. 111 mln t/y in 2005
CAGR in 2005 - 2010 is expected to be 3,9%/y**



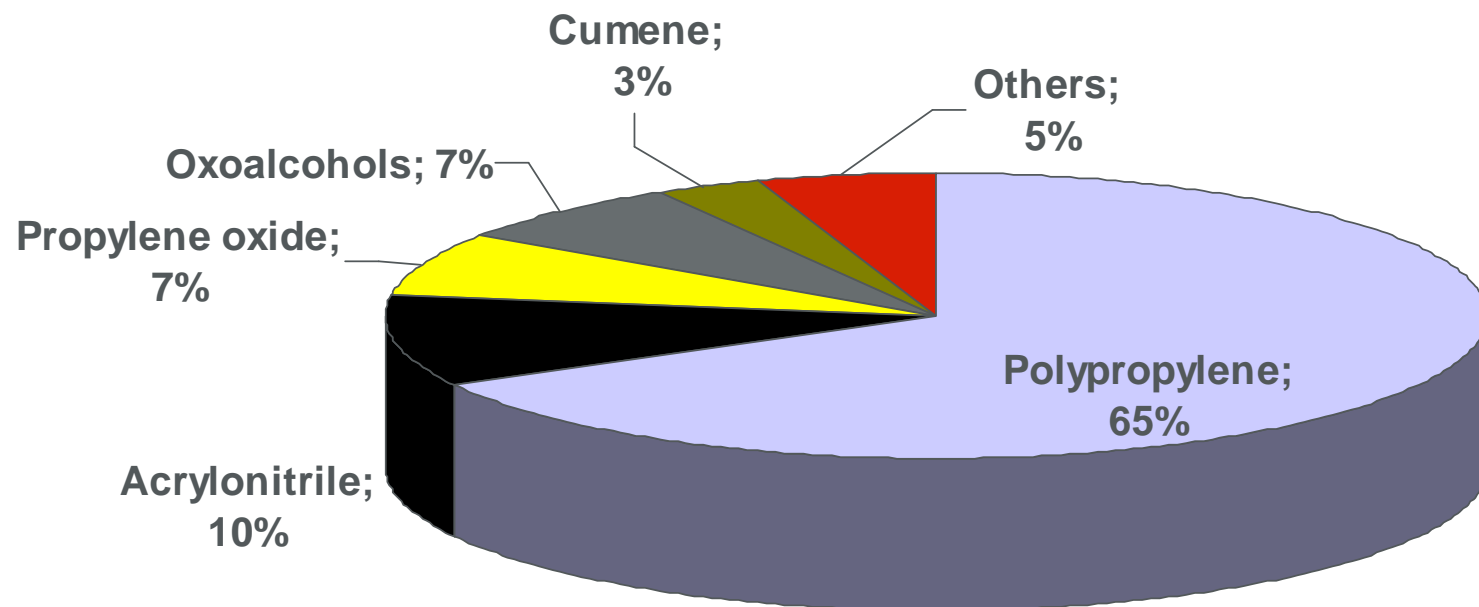
Attractiveness of ethylene derivatives



Amongst ethylene derivatives the most attractive is polyethylene



Propylene derivatives

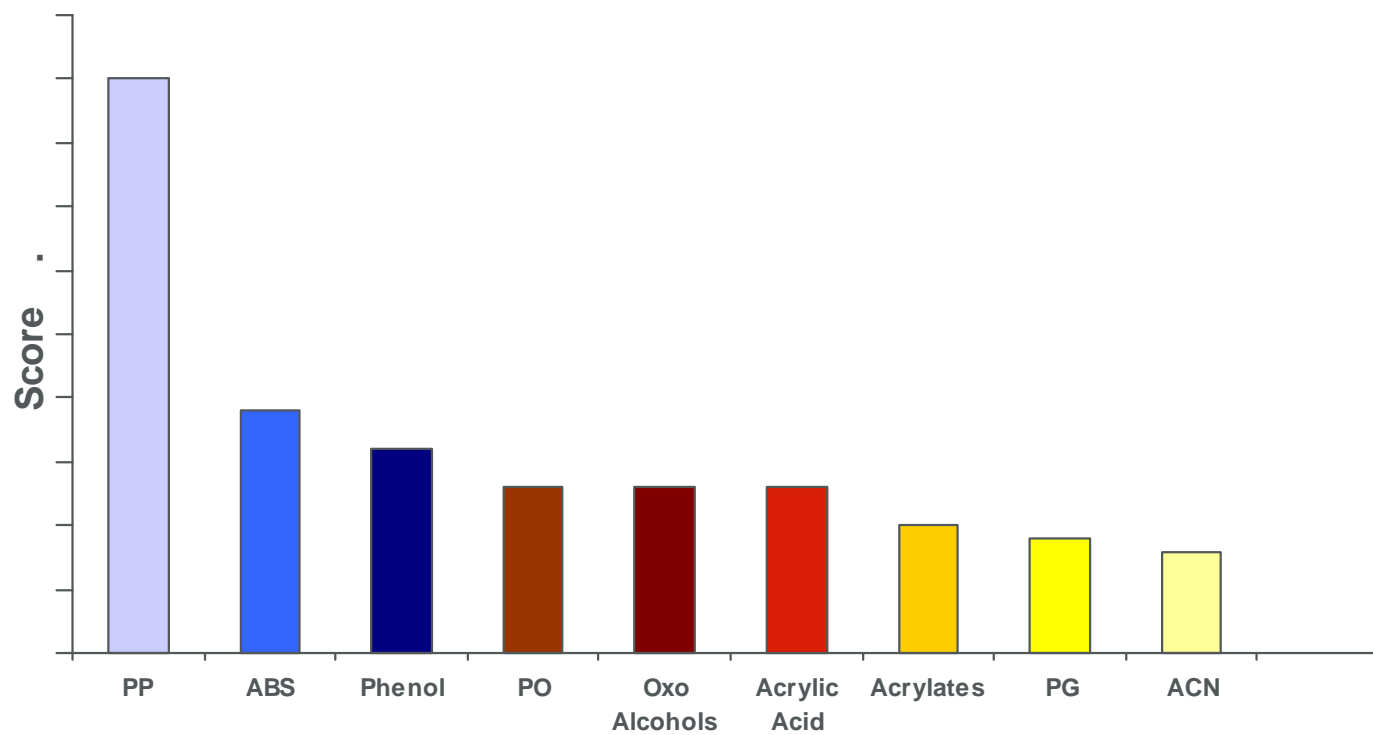


**Total World propylene consumption was ca. 67,1 mln t/y in 2005
CAGR in 2005 - 2010 is expected to be 4,8%/y**



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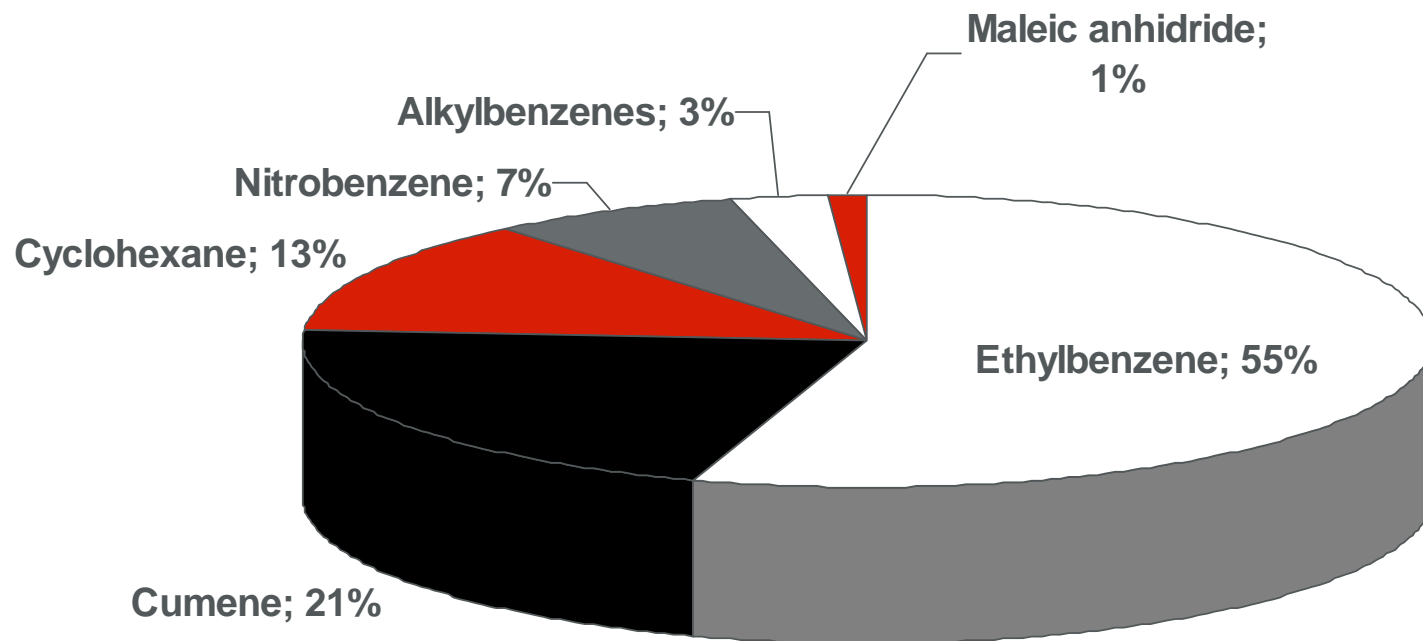
Attractiveness of propylene derivatives



Amongst propylene derivatives the far most attractive is polypropylene



Benzene derivatives



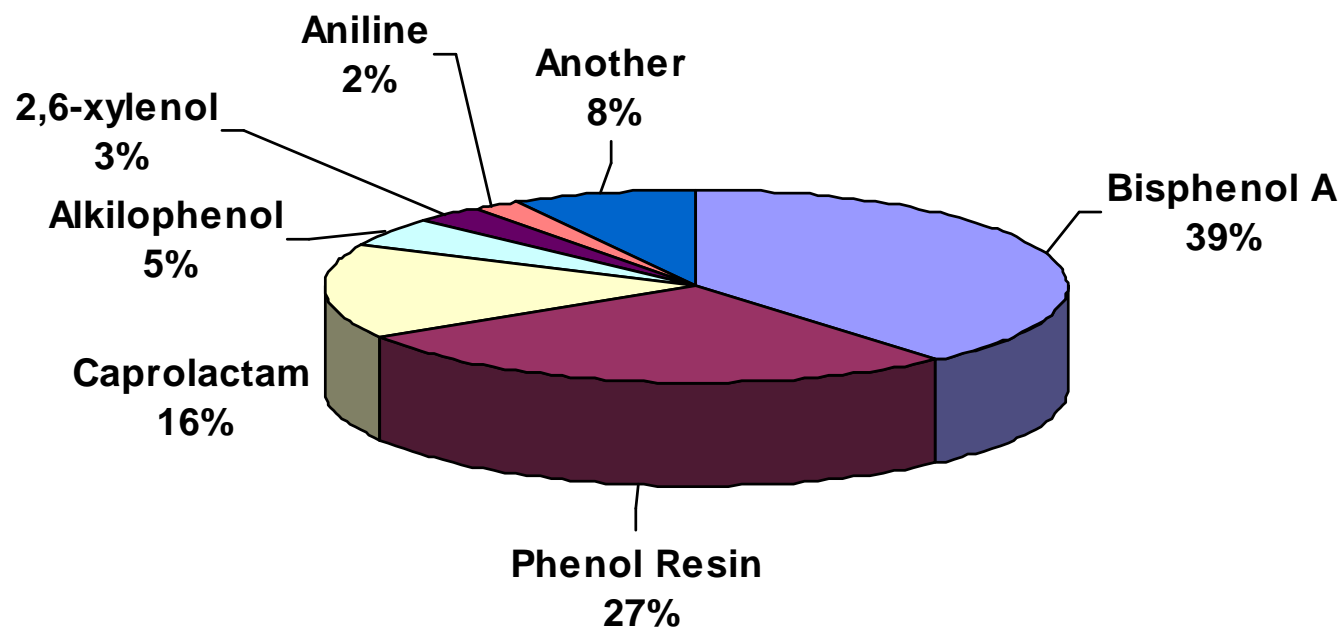
Total World benzene consumption was cca. 36 mln t/y in 2004

Forecasted consumption in 2009 will reach 43 mln t/y.

Consumption increase in 2004 - 2009 will be 7 mln ton, i.e. 19%, i.e. 3,9%/y CAGR



Phenol derivatives



Global Phenol consumption: 6,5 mln t/r

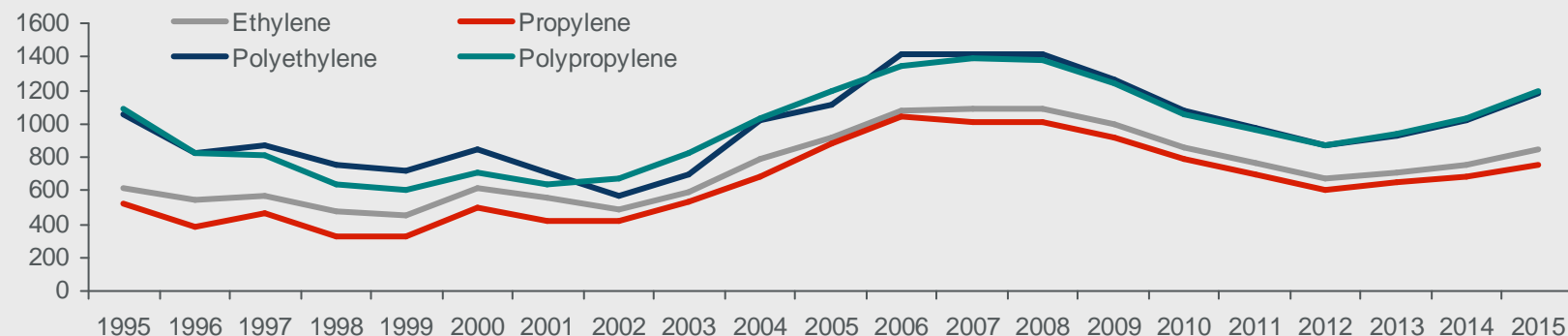
Global demand for Phenol will increase about 4 -5%/y



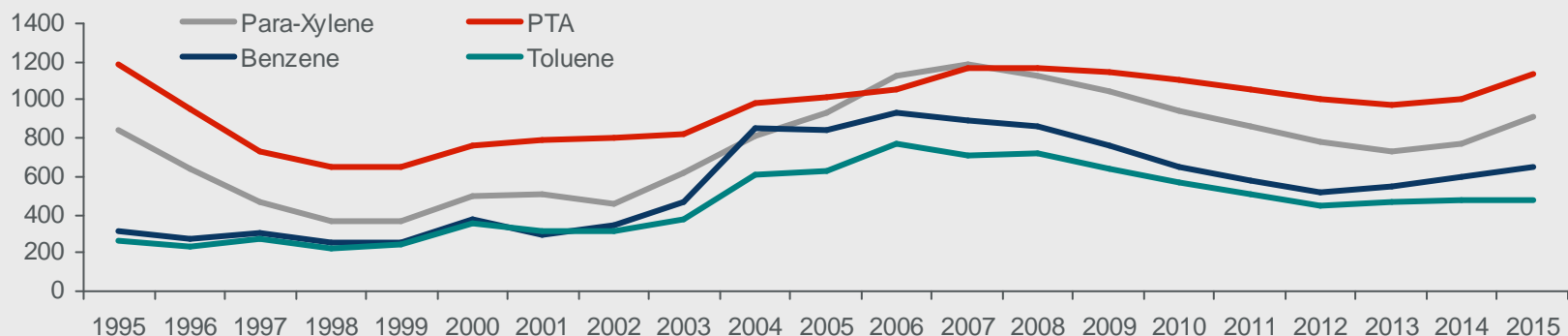
High margin petrochemical products support significantly PKN ORLEN results

Long term perspective of margin development on key petrochemical products

Market forecast price of ethylene and propylene ; benzene and toluene
USD/t



Market forecast price of PX and PTA
USD/t



Source: Nexant 2005. Medium scenario



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Key production flows in petrochemical

Supporting slides



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Leading position on petrochemical market in the region.

Further expansion projects in the region to capture opportunity consumption growth

Petrochemicals as at the end of 2007

▪ Olefin production capacity:

✓ Ethylene	1 160 th.t
✓ Propylene	705 th.t
✓ Benzene	310 th.t
✓ Toluene	120 th.t

▪ Polyolefin production capacity:

✓ PP	605 th.t
✓ PE	740 th.t

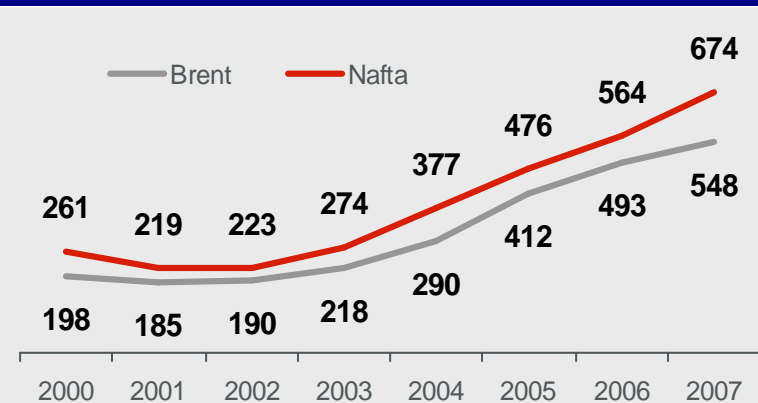
- ✚ The largest plastics producer in Poland and in the region
- ✚ The leading supplier of olefins and polyolefins to the Polish market
- ✚ A significant exporter of polyolefins to other parts of Europe
- ✚ Petrochemical complex integrated with refinery as a source of the feedstock



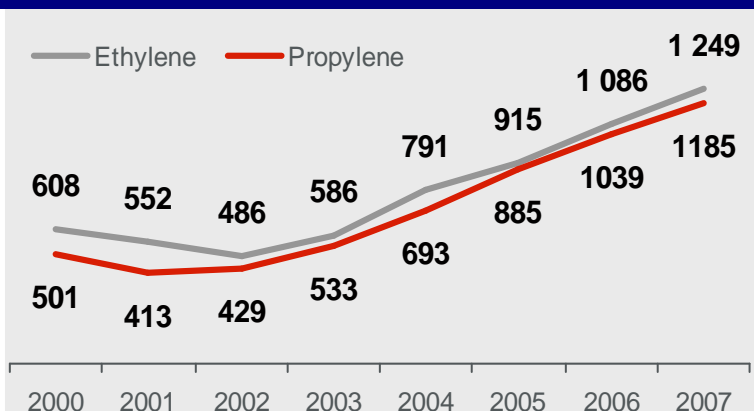
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Historical macroeconomic environment in petrochemicals

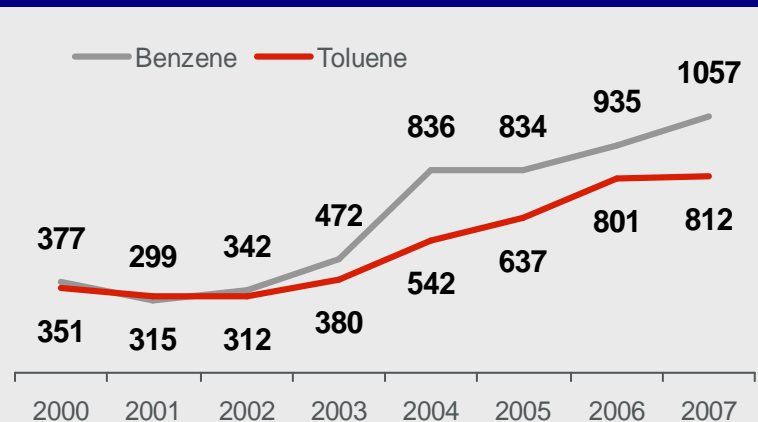
Historical price of BRENT and naphtha
USD/t



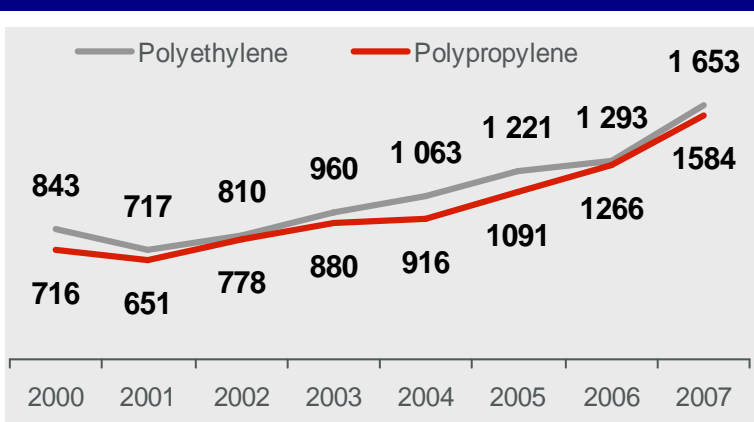
Historical price of ethylene and propylene
USD/t



Historical price of benzene and toluene
USD/t



Historical price of polyethylene and polypropylene
USD/t



Source: market quotations



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ORLEN's Petrochemical production, 2007

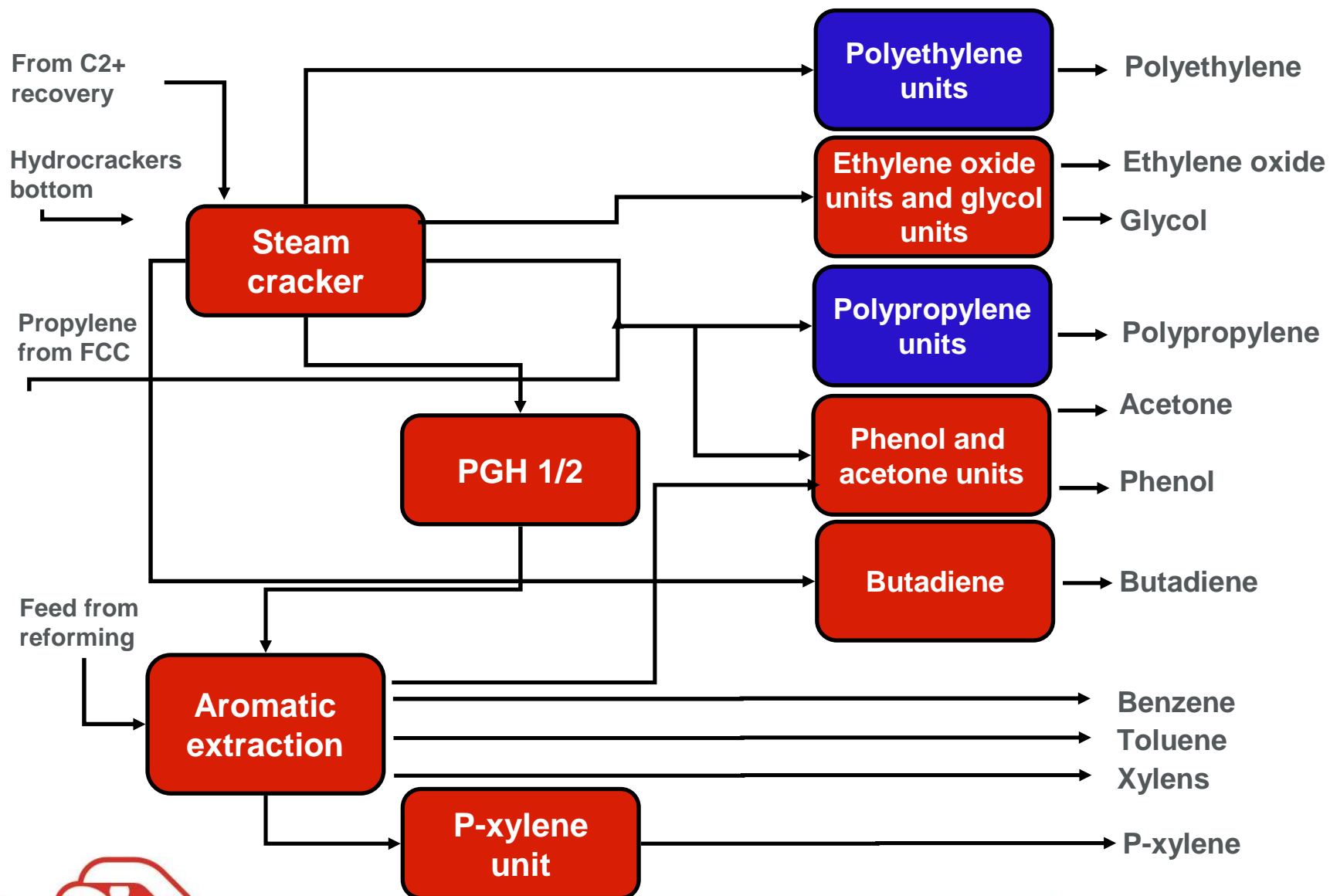
Production 2007 th. t/y	Płock/Basell PKN ORLEN/BOP	Litvinow (+Kralupy) Unipetrol	Włocławek Anwil	Neratovice Spolana	Total
Ethylene	624	409			1 033
Propylene	409	263			672
Butadiene	59				
Benzene	164	163			327
Toluene	140				
p-xylene / o-ksylene	31 / 27				
Phenol / Aceton	50 / 32				
Glycols	116				
Ethylene oxide	17				
Oxo alcohols		55			
Caprolactam				48	
Vinyl chloride			293	124	417
HDPE	275	268			543
LDPE	117				117
Total PE	391	268			659
PP	378	187			565
Total PO	769	455			1 224
Polyvinyl chloride			301	120	421
Total Plastics					1 645



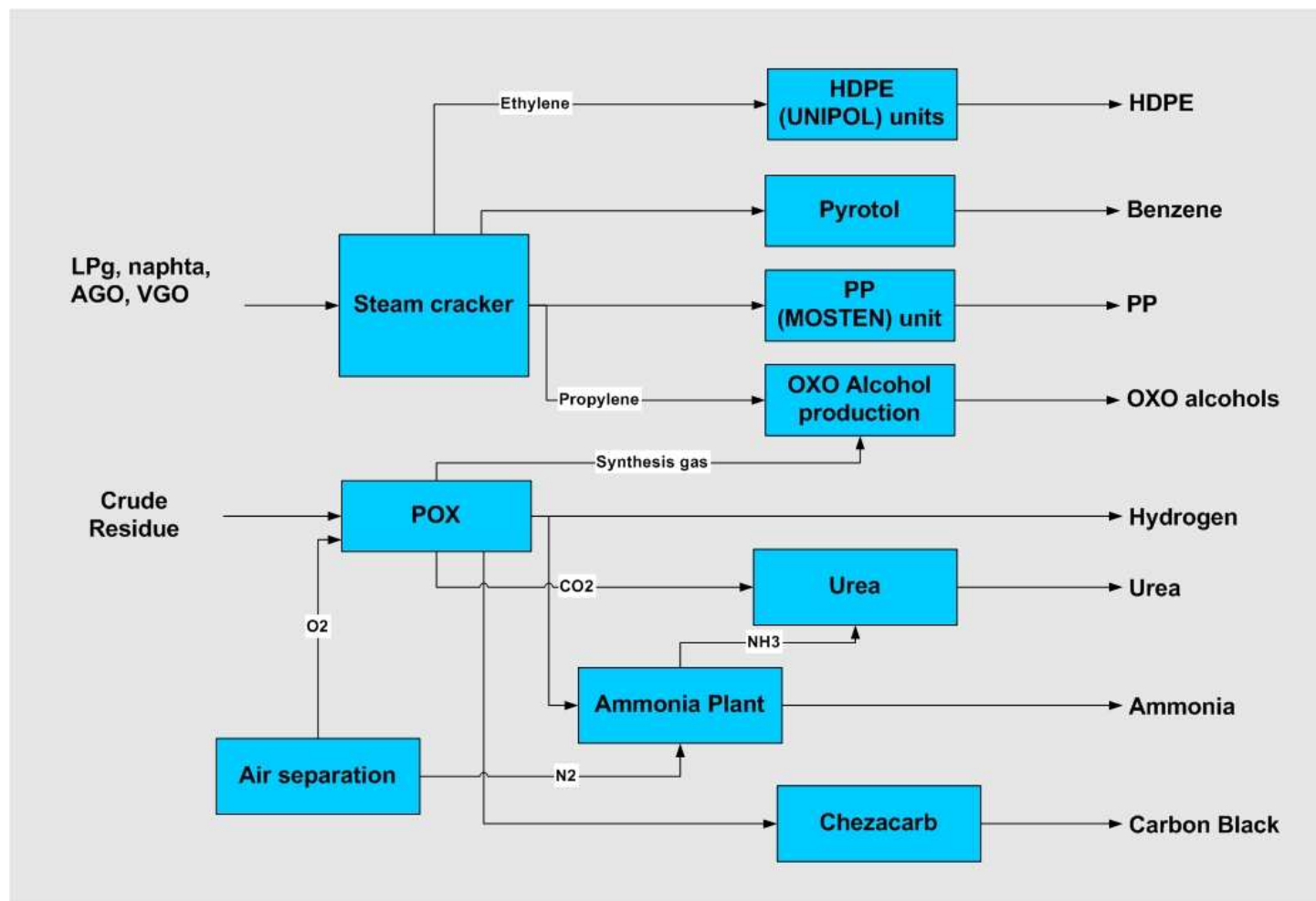
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Petrochemical complex in Płock

Simplified product flow in petrochemical

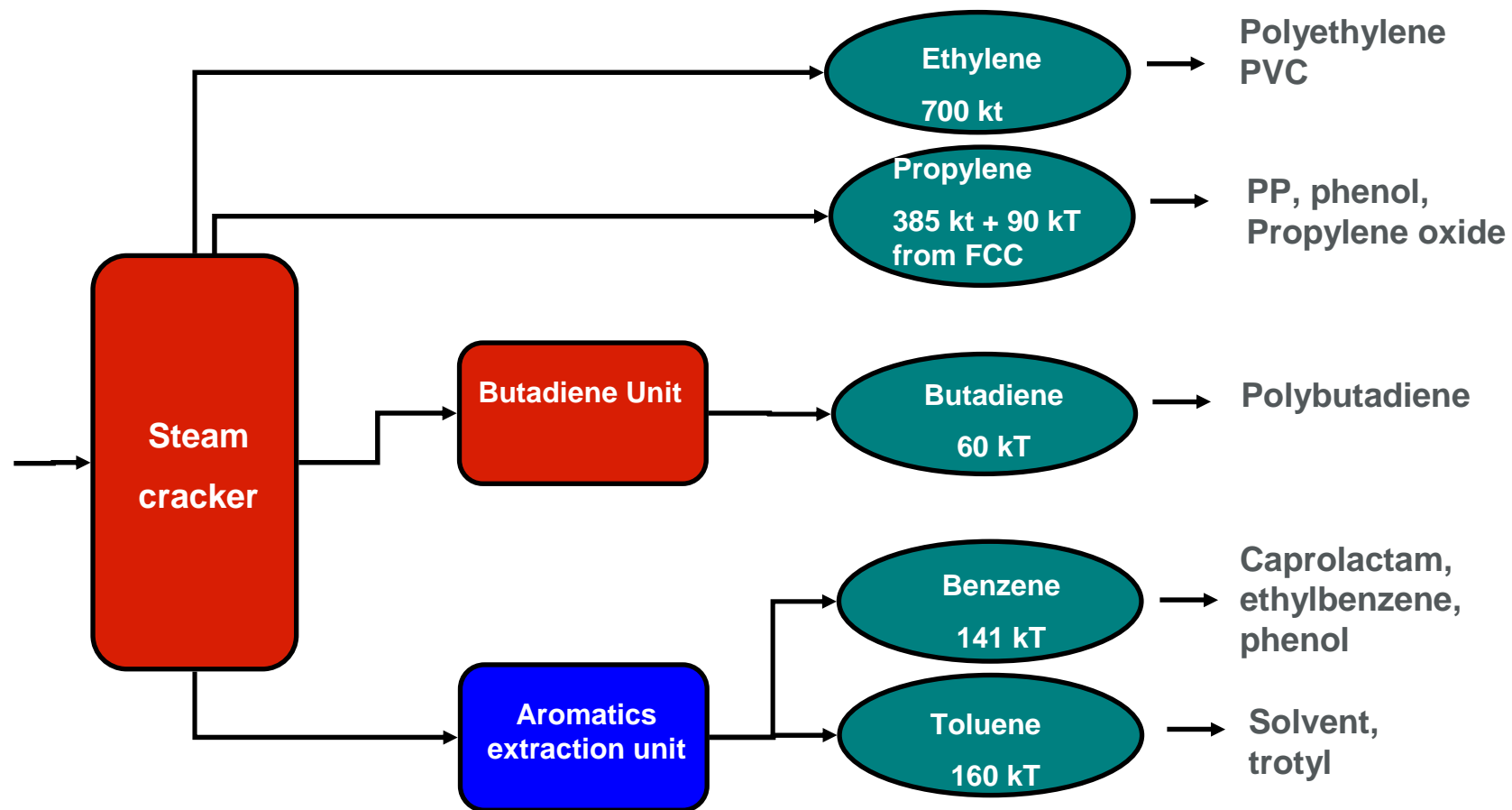


Petrochemical complex in Litvinov



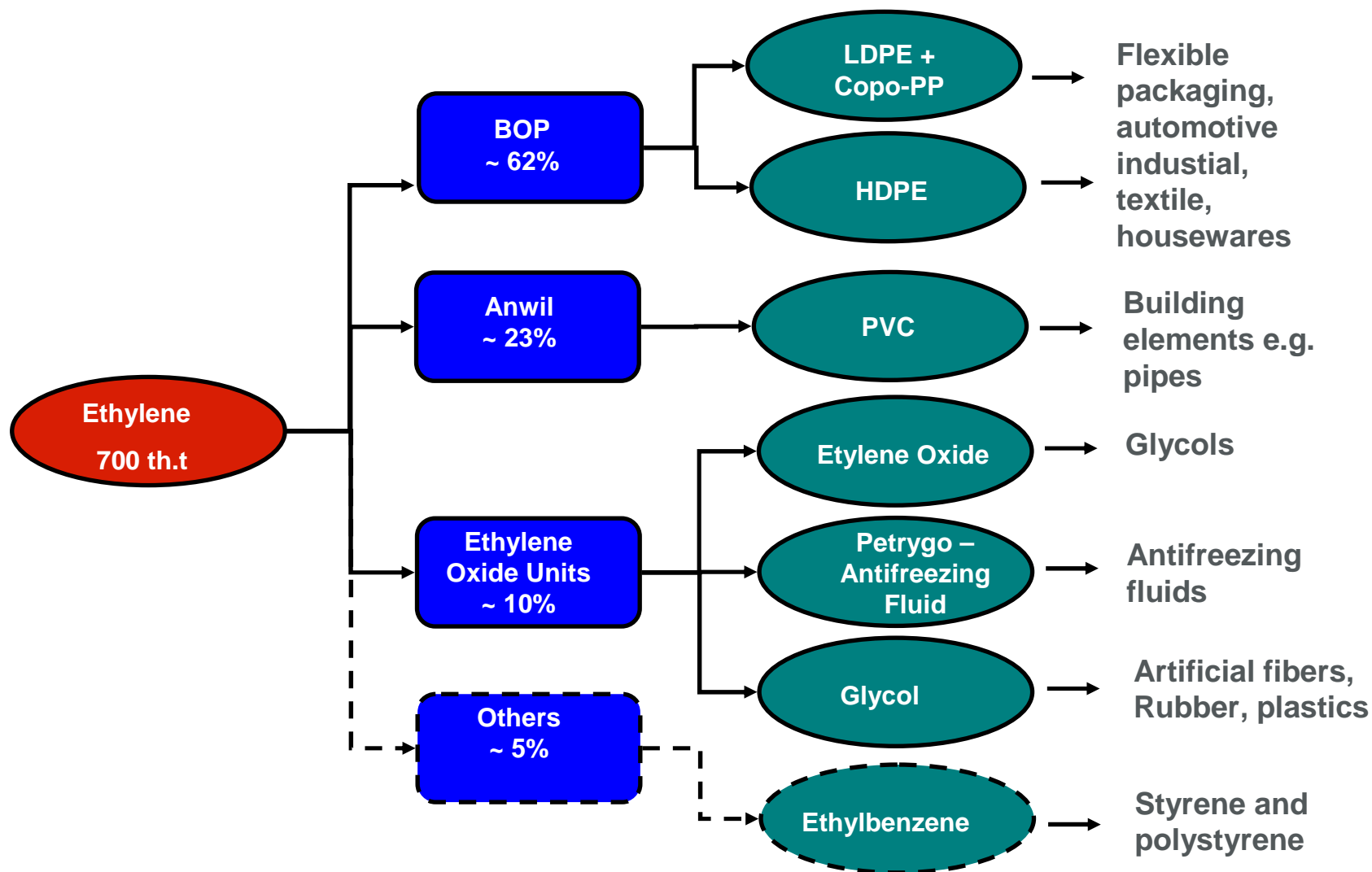
Olefins as a feed base of petrochemical synthesis

Benchmark main product split



Ethylene utilization in Plock

Simplified product flow on ethylene



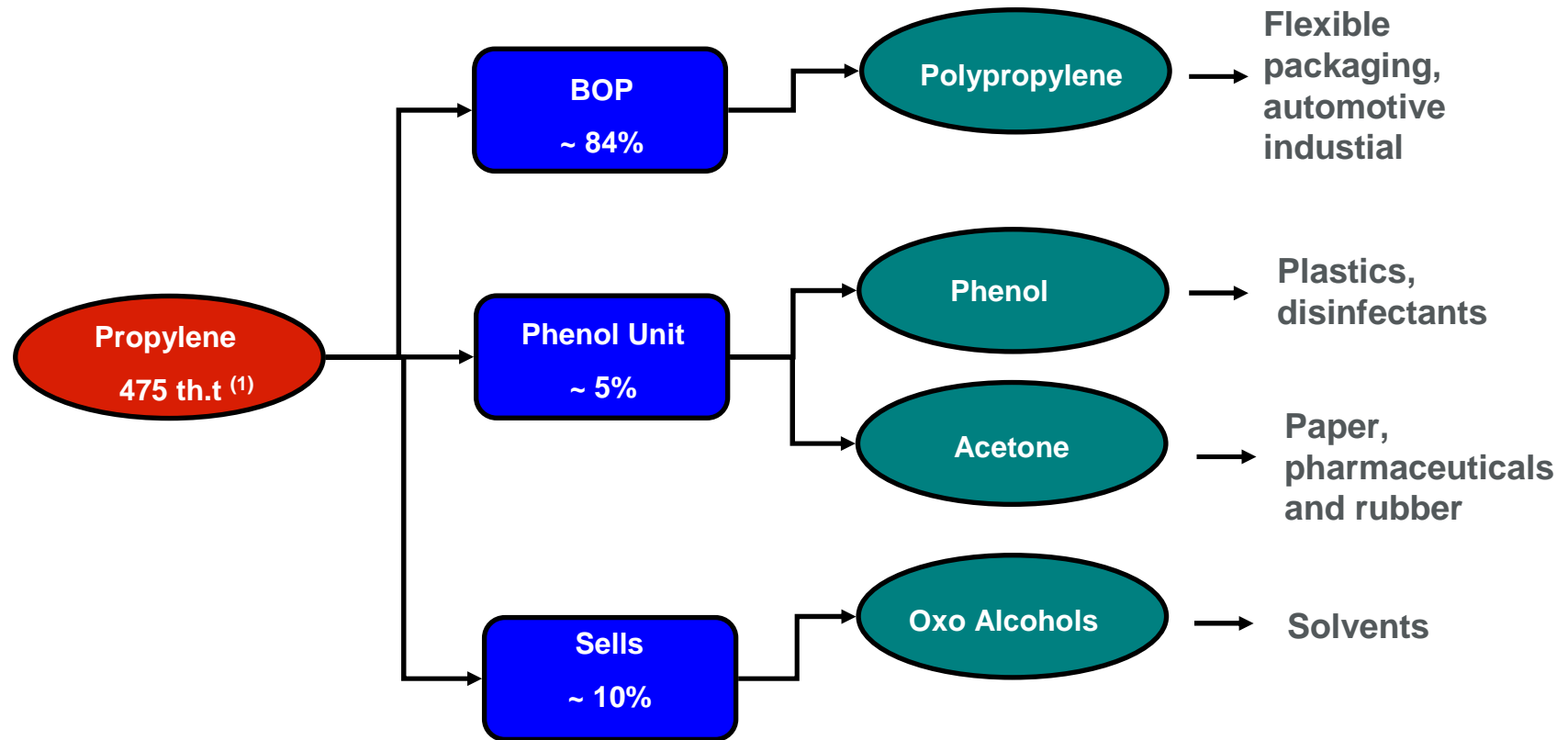
Polyethylene Hostalen 320 th. t/y



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Propylene utilization in Plock

Simplified product flow on propylene



1) 385 kt output from Olefins II and 90 kt from FCC



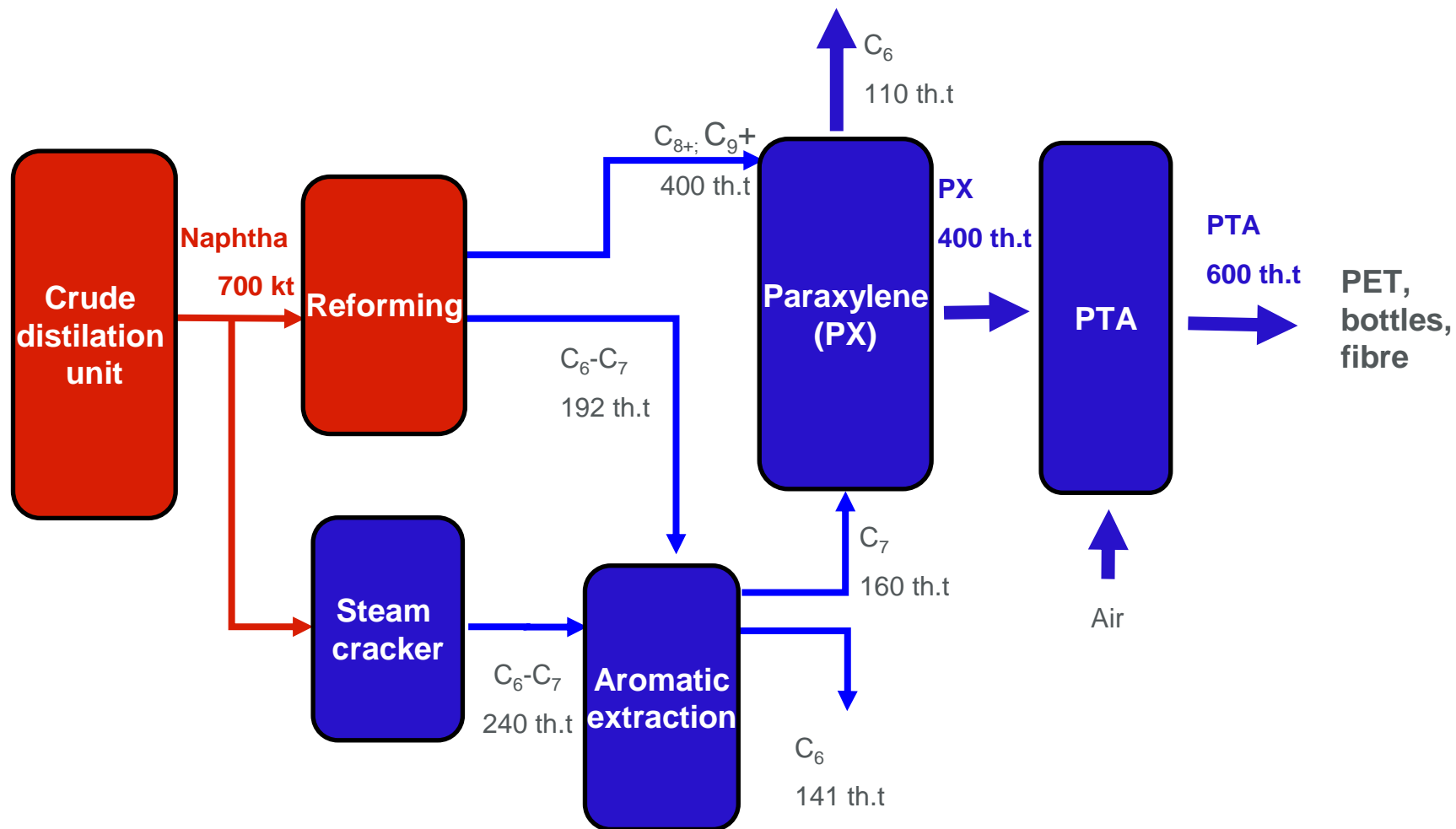
Polypropylene – Spheripol – 400 th.t /y



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Expansion of petrochemical production value chain

Simplified product flow on PX - PTA



Aromatics: C₆ – benzene; C₇ – toluene; C₈ – xylenes



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Polyester fibers



Bases for PKN ORLEN petrochemicals development

Summary of petrochemical developments

- PKN ORLEN manage world scale petrochemical plants.
- Petrochemical business in PKN ORLEN provide to the market large, well-diversified product range.
- Petrochemical segment plays a key role as a risk mitigator for the whole downstream value chain (refinery and petrochemical)
- Petrochemical development allow us to capture market opportunity of:
 - Consumption growth well above GDP growth in the region
 - High margin product
 - Value production chain extension
 - Further integration with refinery and synergy extraction

Thank You for Your attention



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Major end uses of petrochemicals

🔧 **Ethylene** - Industry building block used in the production of polyethylene, and indirectly in PVC, polystyrene and MEG

🔧 **Propylene** - Industry building block used in the production of polypropylene, propylene oxide, acrylonitrile, oxo-alcohols, cumene/phenol

🔧 **Butadiene** - Butadiene rubbers and latices, ABS

🔧 **Benzene** - Modest growth prospects with demand focused in production of aniline, styrene, cyclohexane, linear alkylbenzene, cumene/phenol. Aniline represents strong growth prospects due to its use in MDI for the production of polyurethane foams

🔧 **Toluene** – polyurethane foam applications, solvent, aromatics (benzene and xylenes)



Major end uses of petrochemicals

- ✚ **Ethylbenzene** - Styrene and subsequent end uses such as polystyrene, ABS.
- ✚ **Ethylene Oxide** - detergent manufacturers
- ✚ **Para-xylene** – Finally for polyethylene terephthalate production
- ✚ **PTA** - linked to PET manufacturing
- ✚ **PET** – bottles, packaging, films, fibres.
- ✚ **Phenol** – resins, bisphenol-A for polycarbonates
- ✚ **Acetone** - Bisphenol-A and methylmethacrylate; solvents



Polyolefins wide and diverse applications

