



TRANSITIONING FROM HBCD TO ALTERNATIVE FR FOR PS BUILDING AND CONSTRUCTION PRODUCTS

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synthos
chemical innovations



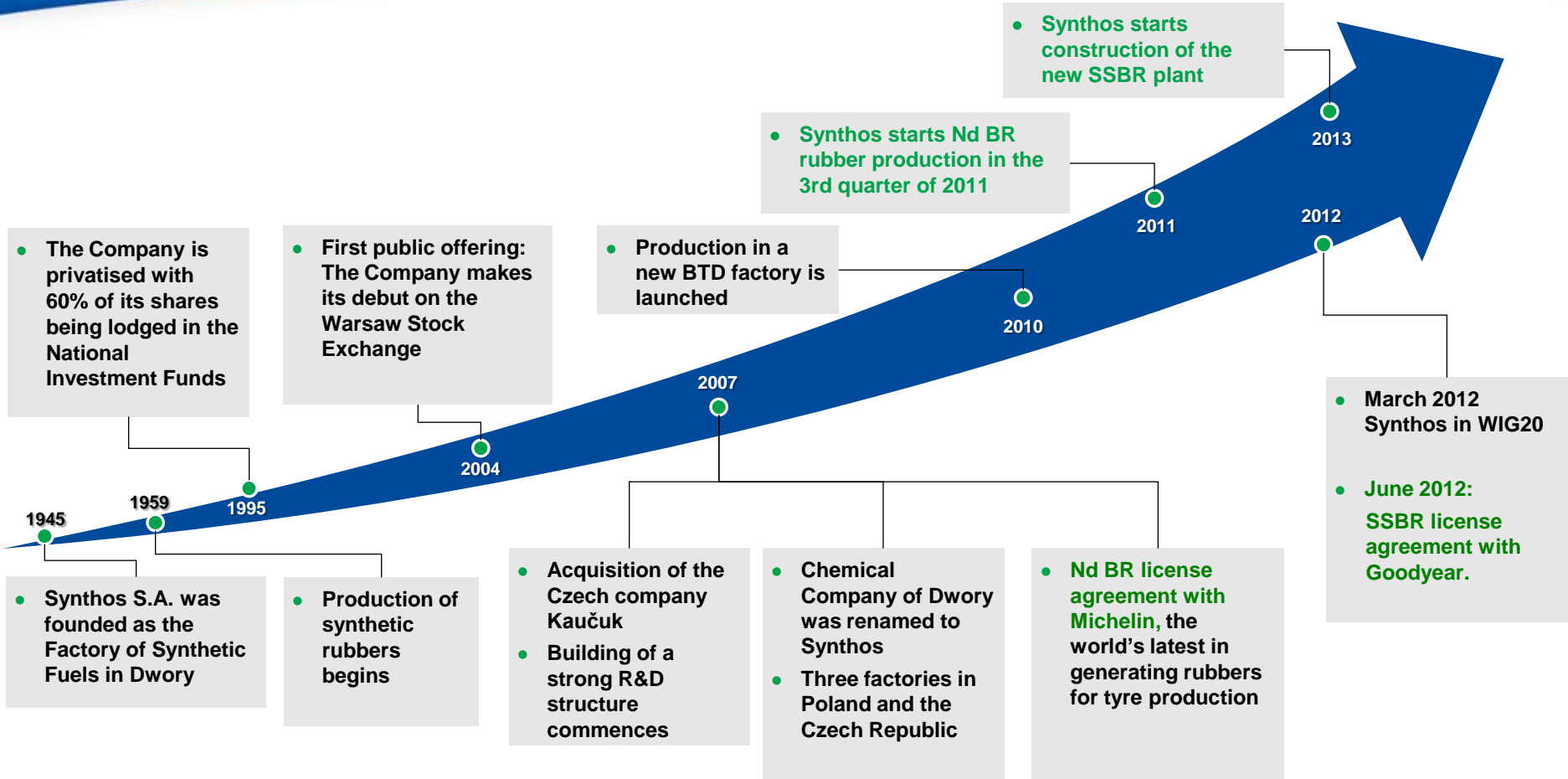
Synthos SA

- Company installations located at the heart of Europe, close to the major clients
- Product groups:
 - Production of synthetic rubbers is 355 000 t/y (this includes advanced rubbers Nd-PBR)
 - Thermal insulation and styrene based products: 335 000 t/y
 - Dispersions, adhesives, latices: 50 000 t/y
- Together with the monomers, there are manufactured almost 1 160 000 t of products per annum
- Employment figures: 2 157 workers, 16 Ph.D.



■ Domestic markets (styrene products, dispersions, adhesives), synthetic rubber market is global

- **EUROPE'S NUMBER 1** manufacturer of **ESBR** rubbers
- **EUROPE'S NUMBER 2** manufacturer of **Nd BR** rubbers
- **EUROPE'S NUMBER 3** manufacturer of polystyrene for foaming applications (**EPS**)
- **NUMBER 1 IN CENTRAL EUROPE** in manufacturing and sale of **XPS**



SYNTHOS Group

main areas of operation



Synthetic Rubber



- Europe's leading manufacturer of emulsion rubbers
- Offers styrene butadiene rubber (E-SBR), high styrene rubber (HSR) and also neodymium polybutadiene rubber (Nd BR)
- 80% of its products are sold to the tyre industry
- The remaining 20% is used in manufacturing floor linings, cables, toys, and footwear.

Styrene plastics



- # 3 manufacturer of polystyrene for foaming applications (EPS) used mainly in manufacturing thermal insulation panels for the insulation of buildings
- Key manufacturer of general purpose polystyrene (GPPS) and of high impact polystyrene (HIPS) used mainly in the food packaging industry
- 25% market share in the sale of extruded polystyrene (XPS) in Central Europe

Dispersions, adhesives, latex



- Water dispersions manufactured on the basis of octane-vinyl and acrylate dispersions, styrene-acrylate dispersions as well as copolymers of acrylate monomers along with other monomers for construction chemicals producers
- Adhesives for wood used by furniture and woodwork producers
- Paper adhesives used in packaging industry
- Butadiene-styrene latex used for manufacturing elastic latex foams, latex mattresses and for fixing the bottoms of linings and carpets

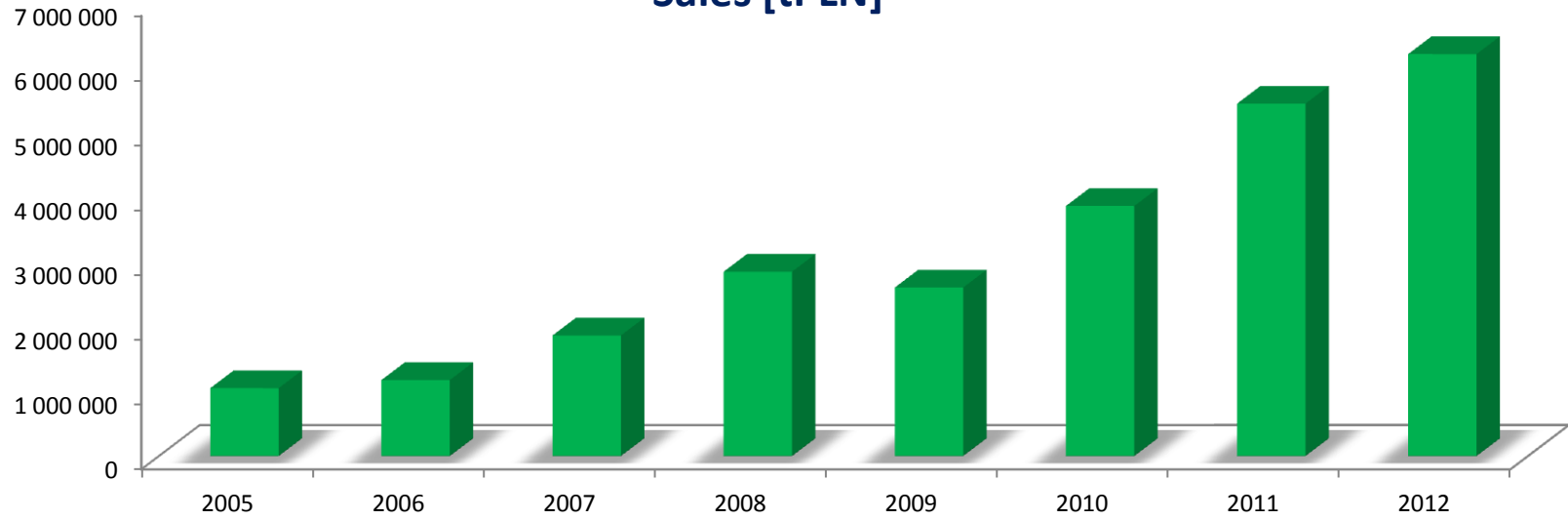
SYNTHOS Group

Financial data



	2005	2006	2007	2008	2009	2010	2011	2012
Sales figures [tPLN]	1 047 119	1 172 238	1 861 266	2 845 691	2 600 952	3 860 697	5 440 709	6 206 544
EBITDA [tPLN]	79 721	149 006	138 654	264 988	323 564	702 619	1 110 787	617 303
%EBITDA	7.61%	12.71%	7.45%	9.31%	12.44%	18.20%	21.70%	15.00%
Net profit [tPLN]	20 861	65 220	477 038	90 910	164 719	476 856	960 817	585 000
CAPEX [tPLN]	40 000	30 000	125 000	169 000	167 000	250 000	303 000	205 000

Sales [tPLN]



Steps to Selecting an alternative FR



Candidate Identification Process:

- Synthos took part in Plastic Europe Program to Identify Alternatives to HBCD as a Flame Retardant in EPS. (2003 – 2012).
- Large amount of own research over last years has been deployed to identify and develop a viable alternative to HBCDD. Synthos checked 12 most promising different Candidate Alternatives (CA) from different suppliers. Synthos spend over 5,7 million EURO for development of alternative FR (costs without investment).
- For Synthos most important during selecting a candidate was:
 - Functionality (polymerization, flammability test, processing, properties),
 - EHS profile,
 - Economic factor,
 - Supply insurance.
- The most promising alternative substances were found to be brominated polymer products proposed by chemicals manufacturers Chemtura, Albemarle and ICL&IP, based on a technology developed by the Dow Chemical Company

Steps to Selecting an alternative FR



Synthos Candidate Assessment Process:

- Manufacturing test:
 - R&D Laboratory tests,
 - Semi technical line tests,
 - Full production scale.
- Performance factor which was considered:
 - Polymerization stability,
 - Processing in internal Testing House and customer tests,
 - Fire performance tests EN & DIN standards,
 - Other product properties (thermal and mechanical properties)

Steps to Selecting an alternative FR



Problems that still have to be solved in coming years:

- Stable Quality of alternative FR product from various supplier. pFR is still under development process (**only one** supplier start full scale production) We have notice that even small changes in recipe can lead to unstable polymerization and dramatic drop in final quality of EPS.
- Big differences in performance among individual supplier. Some pFR product are not viable for EPS production.
- At this stage we have implemented pFR only to one product (InSphere) out of three from our flame retarded grades in Synthos EPS portfolio. It is due to polymerization stability and final performance of our products based on new FR.
- Availability of Alternative FR (pFR and other) for all global EPS market player.
- HSE profile for other than pFR alternatives.
- Commercialization of EPS with new FR (strong resistance on some European markets, downstream education, certification of each EPS construction application on some markets).
- New pFR is still more expensive than HBCD.



Synthos best estimates shows that till 2019 year HBCDD is expected to be progressively replaced by a polymeric flame retardant (pFR) alternative which should then be fully certified for use and hopefully available in sufficient supply. Till this time we hope to finish R&D activities with pFR and other alternatives and give a chance to alternatives supplier to build production line and also finish all quality issues.

Synthos will ask ECHA for **authorization for continued use of HBCD** by 2019, there will be certainty over whether it is possible to replace completely HBCDD with a possible polymeric or other FR alternative for EPS in terms of its technical suitability and availability in sufficient supply.



Thank you for attention.



Back - up.