

# Polypropylene Handbook

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Vorwort

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# Foreword

Some 50 years after the discovery of isotactic polypropylene (PP) by Prof. Giulio Natta at Milan Polytechnic the global polyolefins industry has become a very large business, with an installed production capacity of around 100 million tons/year. Polypropylene is one of the largest thermoplastics by volume, ranking second only after polyethylene, and world demand in 2003 has grown to 36 million tons according to Parpinelli Tecnon.



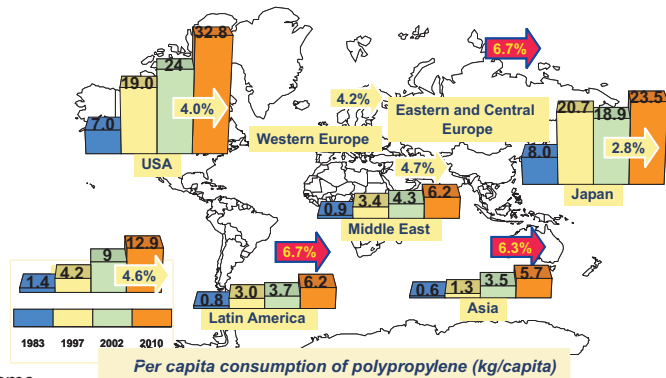
Dr. Just Jansz  
President,  
Basell Technology Business

Growth rates have historically been above GDP and this trend is expected to continue into the near future. Average growth is forecasted at 5–6% until 2010, however, regional differences are expected to be considerable.

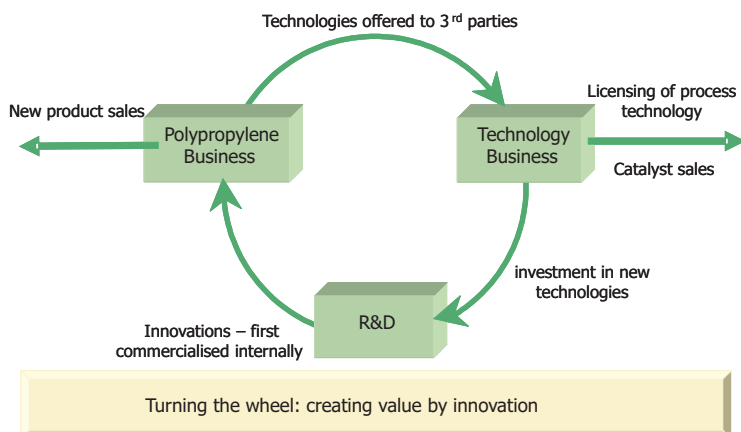
In the more mature markets – Europe, North America, Japan – growth is mainly driven by new applications and by inter-material substitution, whereby PP successfully replaces other polymers and more traditional materials. In the fast-growing emerging markets the current low per-capita consumption and high GDP growth rates provide additional scope for market growth. Highest growth of per-capita consumption is expected in Asia and Latin America. In absolute numbers China provides the highest growth in demand, driven by high consumption in packaging film, textiles and general consumer goods.

While the market for polypropylene has been growing at high rates over the past decades this is also changing the structure of the industry and the related critical success factors. During the initial growth phase the emphasis has been fully on technology leadership, but the balance is changing over time towards market leadership and then to cost leadership while the industry matures. As a result, different types of industry players have emerged that are following different strategies to create value by building on their specific strengths:

- Resource driven – access to low cost feedstock
- Market driven – access to customers/markets
- Technology driven – access to latest process technology and catalyst systems



Source:  
Parpinelli Tecnon and ChemSystems



Cost leadership is particularly important for the volume part of the business and as industry profitability swings dramatically in response to raw material price volatility upward integration and/or access to advantaged feedstock has become mandatory to stay competitive. This is the main driving force behind the strong investment in the Middle East that will contribute a large part of the around 10 million tons/year capacity anticipated to be added by the end of the decade. At the same time, the ability to manage supply-demand on a global scale drives competitiveness. However, it is the local customer focused business environment that drives the innovation of products and applications that allows to capture value in the market with differentiated products. While the economics of the business have changed the ability to continue to invest in technology is expected to remain a major differentiator.

Basell and its predecessor companies have led in the development of leading technology and catalysts for the manufacturing of polypropylene and Basell continues to invest in innovation to come up with cutting-edge technologies and products. These innovations are successfully commercialised not only through captive operations and by bringing new products on the market, but also by licensing of process technologies and selling catalysts to third parties.

A prime example is Basell's *Spheripol*\* process technology that accounts for about 35% of globally installed PP capacity. Now Basell has recently commercialised its new *Spherizone*\* process technology that was first proven at full industrial scale in Brindisi, Italy, and is now being licensed to third parties. Using a patented multi-zone reactor system this new cost effective process can produce bi-modal products in a single reactor stage and offers an extended product portfolio compared to *Spheripol*.

Reflecting the changes in the industry this book quite appropriately not only provides a state-of-the-art update on polypropylene products and technology but also addresses the market and indeed the business and the PP value chain. Learning from recent past and looking ahead strategies are being discussed that are aimed at optimising the value of polypropylene in the market. In a fast changing world polyolefins will remain an exciting industry!

October 2004

Just Jansz

\* Spheripol and Spherizone are trademarks of Basell Polyolefins

# Preface

## *Personal background*

When the Basell Management asked me whether I would be interested to be the editor and co-ordinator of the publication of the second edition of the “PP Handbook”, I felt proud and worried at the same time.

In the following days, I began to think that this could be a very gratifying project. Therefore, I started to work with enthusiasm on a proposal, outlining how I intended to carry out this initiative. It was essentially the updating of a book on the history of polypropylene, reporting on the developments of the last ten years.

The first phase went fast and smoothly: most of the previous authors agreed to collaborate and the publisher Hanser appreciated my approach. This greatly encouraged me and the writing process started. At the same time, however, I faced with a very personal issue. As editor, I would have to take over the role of an old friend of mine, E. P. Moore, Jr., whom I had met during the Himont set-up in 1983, when I was an expatriate in Wilmington DE, US, responsible for the “New Business ww”. Together with Ned, we had realized the so-called “Blue Book”, a study that analyzed the segments in which the PP was utilized, dividing them into sub-segments, according to a series of features in order to represent the corresponding customer business units. The Himont management considered the Blue Book a milestone in the company’s life. It helped to highlight the huge potential of the new *Spheripol* technology (later on the *Catalloy* technology) in a wide range of markets – automotive, packaging, fibers, consumer, according to the respective features. This project was the starting point of the Marketing era in the field of the big volume plastics.

Hence, I undertook the project of preparing the second edition of the PP Handbook seeing it as a challenge to continue what my friend Ned had initiated.

My career in the Polyolefins world, the PP in particular, has followed a path more related to the Business, Strategic Marketing, and Innovation aspects than the technical ones.

Innovation in the PP sector was the key driver during my entire career. I always saw innovation as the process responsible for translating an invention, mainly a technical/scientific one, into a commercial success (Business). PP is a perfect case in point. The process obviously entailed a continuous dialogue and a strong collaboration with R&D people, both receiving from them and inspiring them a “technology push” approach to innovation.

The first important development I was involved with was the introduction of PP in the automotive sector, in the mid 1970s, when Montedison created the business, which would later be called Advanced Materials.

The segmentation of the market in line with the criteria mentioned above, represents the second, significant step in my career. It was in the mid 1980s. This was followed by the creation of a marketing organization for Europe, which was made for each of the applicative segments, on my return to Milan, in the latest 1980s. The next assignment was the management of the products coming from the *Catalloy* technology, which in the 1990s allowed the growth in the market of specialized and highly diversified products. The company was then called Montell and I was based in Brussels.

I came back to Ferrara after 28 years, at the end of the 1990s, first as leader of the “Product Application Development”, and afterward as coordinator of the innovation to be implemented at the Basell Joint Ventures, in the International regions. Now I work as consultant for Basell, on specific projects.

### *Acknowledgement*

This book is an attempt to present the new state of the PP industry, to record and explain those fast moving technological and business events that have resulted from that recent revolution, all in the light of five decades of PP experience.

Although all the authors are from Basell and its predecessor’s backgrounds, I have tried to present an industry-wide view of PP, while referring in many cases to Basell developments that are, I believe, pertinent examples of more general perspective of the PP industry.

Sincere thanks to the Basell Management team, in particular to Volker Trautz and Anton De Vries, for accepting the proposal from Hanser’s Dr. Glenz to update the first successful edition and giving me this opportunity.

I would like to continue by thanking the authors who made it possible to publish this book. In fact, with the contribution of all their expertise we have been able to cover all the dimensions of the PP business: product, technology, market. None of us alone, because of lack of time and lack of expertise in all areas, could have written the book:

Antonio Adoleo, Ronald Becker, Daniele Bigiavi, Emanuele Burgin, Patrizia Busi, Giuliano Cecchin, John C. Chadwick, Massimo Covezzi, Dario Del Duca, Maurizio Dorini, Cornelia Fritze, Richard T. LeNoir, Decio Malucelli, Gabriele Mei, Giampiero Morini, George J. Ouellette, Giampaolo Pellegatti, Giuseppe Penzo, Roger A. Phillips, Luigi Resconi, Daniele Romanini, Paola Sgarzi, Michael Wolkowicz, Theo Zwygers.

I also wish to acknowledge by name the authors of the first edition, whose contributions not only led to the success of that work, but also have had an important effect on this second edition:

*Enrico Albizzati, Stephen E. Amos, Ronald F. Becker, Omar M. Boutni, Lester P. J. Burton, Gianni Collina, Dario Del Duca, Stephen M. Dwyer, Umberto Giannini, Gregory A. Larson, Richard T. LeNoir, Richard T. Lieberman, Edward P. Moore, Luciano Noristi, Charles G. Oertel, Roger A. Phillips, Luigi Resconi, Catherine E. Ruiz, Chichang Shu, Michael Wolkowicz.*

Particular appreciation is again expressed to Edward P. Moore Jr., for his professional job as editor of the first edition.

Several individuals deserve a special recognition for their detail reviews of the manuscript.

Craig Blizzard, Yves Bonte, Michael Brekner, Giuseppe Colucci, Gaetano Gaverini, Stefano Giberti, Fiorella Pradella, Aurelio Savadori, Stefan Seelert, Robert Sperati, and Burkhard Wehefritz.

I had the tremendous advantage of having Paola Sgarzi, she performed as an excellent editor assistant through the preparation of the manuscript. She turned out to be exceedingly helpful in assembling all the chapters of the book.

Last, but certainly not least, I’m sincerely grateful to my wife Yvonne for her continuous encouragement and support.

*Ferrara, October 2004*

*Nello Pasquini*