

Fall 2004

the

UNIVATION TECHNOLOGIES

Source

Delivering Value to the PE Industry

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in a new market**

*Higher demand —
more efficiency*

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This issue of *SOURCE* wraps up an exciting a productive year for Univation and many of its licensees. Four new licenses became effective in 2004 covering new builds and capacity expansions.

A record 22 patents were granted to Univation in the 3rd Quarter; 3 in the US and 19 in foreign countries. Additionally, an unprecedented number commercialization partner talks and license negotiations continue in numerous regions as the industry upswing begins to take hold globally. Watch for an even more exciting and energetic 2005 as Univation increases its focus on delivering value to customers and industry innovators recognize and reap the value of Univation's modern, direction setting technology.

Univation is pleased to bring you the content of its Customer Value Conference that was held at K'04 in Düsseldorf in October. In case you missed the conference, inside this issue you'll learn how technology today can impact your PE business tomorrow, what it takes to keep pace in the marketplace, where growth in the industry is expected and catalyst innovations that are in the development pipeline.

The entire Univation organization was pleased to introduce PRODIGY™ Bimodal HDPE technology at K'04. The product and financial advantages of this breakthrough accomplishment are detailed on page 2.

On behalf of Univation Technologies, we wish you a prosperous and Happy New Year.



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Clark Brumbaugh
Director

Licensing, Products & Services

KEEPING PACE *in a* New Market

With the onset of higher demand, there's no room for inefficiency

As PE supply and demand comes more into balance, resin producers must get all the productivity they can from their facilities and people. As margins increase and production rates are pushed to meet demand, even the smallest of errors can be very costly. Operations efficiency is more critical than ever to getting the most from production facilities, and use of Univation resources and expertise can be a cost-effective way to do just that.

"Univation's PREMIER™ Products & Services can help UNIPOL™ PE Process operators ramp up and operate efficiently to meet new demand," says Clark Brumbaugh, business director for Univation Licensing, Products & Services. "With increased profitability on the horizon, now is the ideal time to invest in solutions that will rapidly pay for themselves in higher productivity and competitiveness."

Products and services from plant to people

Univation's PREMIER Products & Services comprise a suite of exclusive

APC+ has generated millions of dollars in savings, increasing production rates by as much as 9%, reducing transitional aim-grade volume by 35% and reducing unplanned downtime by as much as 2%.



offerings that enable Univation licensees to extend and enhance the value of their UNIPOL PE assets. These products and services can improve bottom-line performance in two ways: by ensuring optimized and consistent operating performance and by implementing best-practice operating behavior for personnel.

Get more from your plant

PREMIER Products & Services include industry-leading technologies such as Advanced Process Control (APC+), a software tool that maximizes plant efficiency, decreases control variability, increases aim-grade production and achieves maximum production rates. All of these factors become even more critical to PE producers as production limits are pressured by rising demand.

For producers around the world, APC+ has generated millions of dollars in savings, increasing production rates by as much as 9%, reducing transitional aim-grade volume by 35% and reducing unplanned downtime by as much as 2%.

Univation also offers Operations Improvement Services, which provide access to the latest UNIPOL operating techniques and Univation experts for targeted on-site, goal-specific assistance including increased production rates,

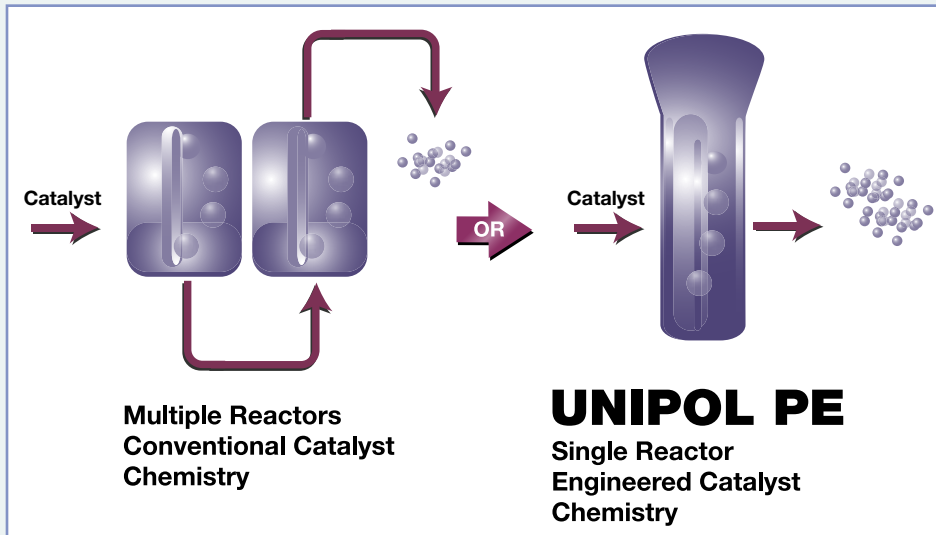
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PREMIER PRODUCTS & SERVICES

- Advanced Process Control (APC+)
- Operations Improvement Services
- UNIPOL Virtual Plant (UVP) Simulator
- Technology and Performance Support
- Operations Training
- Product Enhancement Service

PRODIGY™

Bimodal HDPE Film Technology Launches



The years of intense development, evaluation and testing are finally over, and Univation Technologies is proud to announce the commercialization of PRODIGY™ technology for producing bimodal HDPE film resins in a single reactor. Licensees are already implementing this new technology, and producers around the world are expressing interest in this exciting approach to producing bimodal PE.

This breakthrough builds on the long traditions of Union Carbide, Dow and ExxonMobil in bringing major technology innovations to the PE industry, including UNIPOL Gas-Phase technology, Super-Condensed Mode high reactor capacity technology, and metallocene LLDPE technology.

Now, with bimodal catalyst developed for a single reactor, UNIPOL licensees can produce bimodal high-density film resins equivalent to or better than any made via today's more costly dual-reactor technologies. This remarkable technology enables producers to get more product flexibility with huge savings in investment and fixed costs by avoiding use of cascading multiple reactors in series.

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Keeping Pace — Continued from page 1

higher aim-grade product and reduced downtime.

Especially as production rates peak, PE producers need well trained personnel to keep things running smoothly. The UNIPOL Virtual Plant (UVP) Simulator enables UNIPOL operators to train personnel to handle all aspects of plant behavior, including plant upsets and rare occurrences. It exposes operators and engineers to real-time, realistic plant experience – without disrupting operations.

Getting more from your people

The PREMIER portfolio also includes solutions for helping your personnel be as productive and efficient as possible at a time when all assets may be pushed to the limit.

Our customized Operations Training programs help you keep your people at

their best, resulting in improved operating performance, fewer operator errors and process upsets, and rapid training for new personnel.

In addition, Technology & Performance Support gives licensees a significant competitive advantage by enabling them to stay up-to-date on the latest technological improvements and best practices. Thanks to our close relationships with ExxonMobil, Dow and other UNIPOL PE producers, we're able to give you access to new and improved products, improve your use of UNIPOL PE technology, and help you stay current with the latest industry practices.

And finally, Univation can help ensure that in the coming months and years, you are able to deliver the products your customers want most. Through our Product Enhancement Services, we provide unique perspective, resources and

expertise to help you develop and maintain the best product mix for your market. We can provide end-to-end product assistance, from analysis to launch, plus benchmarking of your existing products against leading products in your region.

As demand for PE rises, producers will need to focus more than ever on the immediate needs of their customers and business operations. By taking Advantage of Univation PREMIER Products & Services, licensees gain access to the latest knowledge and innovations while you keep your costs down and your staff focused. We can help you achieve and sustain technology leadership at a fraction of the cost of maintaining internal R&D, support programs and personnel – so you can make the most of the PE boom ahead.

PRODIGY Bimodal Technology delivers best of both worlds

- Product performance equivalent to or better than multiple-reactor materials
- Capital investments savings of 40% compared to existing staged-process technologies

“The consumption of HDPE around the world is growing at a strong rate,” says Paul Moyer, commercial vice president at Univation. “Bimodal products will be required to support a large portion of the anticipated growth, and PRODIGY Bimodal HDPE will help resin producers cost-effectively compete in HDPE markets that need bimodal performance.”

Single reactor, multiple advantages

The cost savings of PRODIGY technology are dramatic. It offers approximately 40% savings vs. staged technologies for grassroots investments of 300 kta. In addition, a UNIPOL single line has capacity above 450 kta, which increases its advantage vs. other ‘size-limited’ technologies. And while competitive platforms require separate reactors for LLDPE, PRODIGY technology enables production of bimodal (and unimodal) HDPE and LLDPE in a single line, with capacity capabilities of 450+ kta a further advantage.

- Investment savings for a single 300 kta UNIPOL PE gas-phase reactor vs. multi-reactor technology are estimated to exceed \$35 million
- Utilizing a single process platform can provide further savings to PE producers who wish to participate in multiple market segments
- A single reaction environment is easier to control. No slurry recovery equipment and no second reactor mean start-ups and shut-downs are simplified
- Univation’s revolutionary PRODIGY Bimodal Catalysts allow production of tailored comonomer composition distribution and bimodal molecular weight distribution

Film performance that makes the grade

PRODIGY Bimodal HDPE film grades offer all the product attributes HDPE producers need to produce highly competitive products. Excellent extrudability simplifies processing. Films offer excellent physical properties (tear, impact, stiffness) and draw-down capability. Good bubble stability limits gauge variation, and heat-seal characteristics are outstanding.

Proven operability

Thanks to years of hard work by Univation’s R&D team, resin producers can take advantage of this innovative

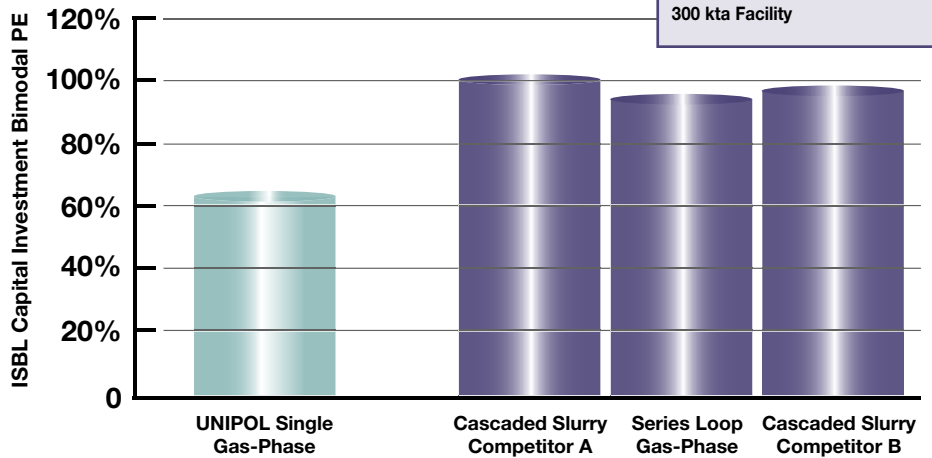
approach to bimodal HDPE with absolute confidence, assured of smooth operation and consistent results.

Operability has been demonstrated in world-scale commercial UNIPOL reactors employing commercially proven catalyst delivery technology. Independent control of the molecular weight of the components (spread) and the weight fraction of the components (split) has also been demonstrated.

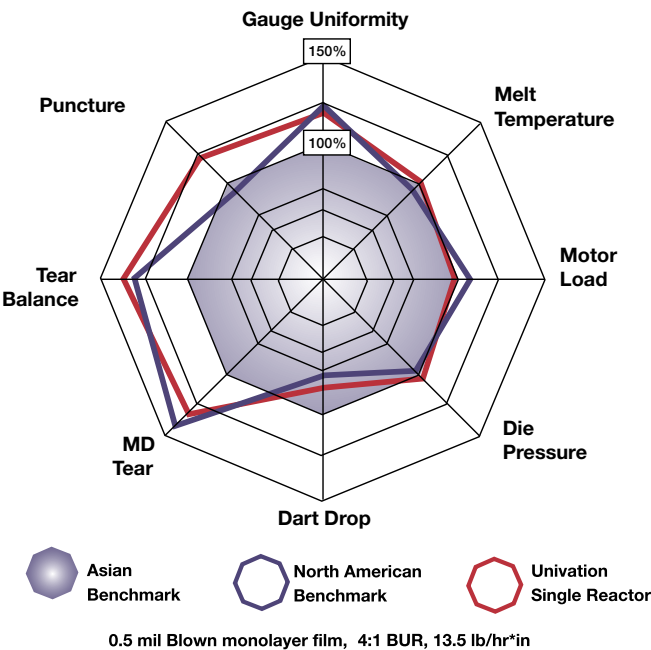
Learn more

For information on PRODIGY HDPE technology, please contact your Regional Commercial Manager.

Capital Investment for Bimodal HDPE



Single Reactor Bimodal HDPE in Film





Licensee Activity

Equistar Acquires Metallocene Technology From Univation

Equistar Chemicals entered into a licensing agreement to use Univation's XCAT™ metallocene polyethylene technology for its UNIPOL™ Gas-Phase PE reactors.

Under the agreement, Univation's metallocene catalysts will be used to produce new grades of PE resins. Metallocene-based next-generation resins are renowned for enhanced properties such as impact strength, tensile and heat-seal characteristics, attributes that are valuable to Equistar's customers and their customers in the flexible and rigid packaging market.

"This licensing agreement with Univation is one more step forward in our business strategy to continually provide value-added, cost-effective products and services to our customers," said Edward J. Dineen, Senior vice president, chemicals & polymers, Lyondell Chemical Company.

"Metallocene catalysts are redefining the performance limits of polyethylene and will give Equistar the ability to create precision-tailored resins and open the door to new, differentiated markets," reported Univation president John Verity.



Univation Licenses Keltic Petrochemicals For UNIPOL PE Gas-Phase Process For New PE Lines In Nova Scotia

Keltic Petrochemicals of Halifax, Nova Scotia, Canada has selected the UNIPOL PE Gas-Phase process for its grassroots petrochemical complex to be constructed at Goldbora, Nova Scotia. The nearly \$3 Billion U.S. Dollar petrochemical complex will include two UNIPOL PE lines, each with a design capacity of at least 350,000 tons per annum fed by a world-class gas cracker in excess of 1 million tons design. Start-up of the facilities is planned for second half 2008.

The new UNIPOL PE Lines will be capable of producing both linear-low and high-density polyethylenes using Univation conventional and advanced catalysts. This will include the capability to produce metallocene PEs as well as breakthrough single reactor bimodal HDPE, using Univation's PRODIGY catalysts. In addition, the new lines will be able to operate using Univation's Super Condensed Mode Technology (SCM-T) thus capitalizing on proven high capacity production technology.

"Keltic will be strategically positioned to deliver the full breadth of products needed for the demanding North American PE market, capitalizing on access to the leading gas-phase PE technology," said Wayne Rousch, Keltic's CEO. "The new plant will be well positioned to be highly competitive in a very competitive PE industry. We expect our customers will demand a broader portfolio of products, and the UNIPOL PE technology will insure our competitive advantage. The proven process technology for producing in excess of 500 kta in a single reactor facility was also a very important consideration in our selection."

John Verity, Univation's president, said, "This license further confirms the advantage of Univation's proven high capacity UNIPOL PE technology. In the marketplace, Keltic will benefit from this low cost, high capacity UNIPOL PE process that will be able to deliver a broader portfolio of proven and market leading products to a demanding customer base."



Paul Moyer
Commercial Vice
President

Technology choices today can impact profit margin tomorrow

Capacity Expansion Technology
Super Condensed Mode Technology
XCAT™ Metallocene Technology
PRODIGY™ Bimodal HDPE

How does your business plan to maximize profits in the years to come? New plants? Capacity expansion? New products? By offering licensees a broad range of strategic choices and flexibility to adapt to change, UNIPOL™ Technology helps PE producers flexibly secure their share of market growth.

Lowest investment costs for new plants

Investment costs for UNIPOL technology are estimated to be 50 percent lower than for high-pressure and solution technologies and 25 percent to 45 percent lower than

for slurry and other Gas-Phase processes. UNIPOL technology also offers the lowest operating costs, proven reactor throughput, excellent reactor flexibility and the largest capacity among these technologies. And with proven per-reactor capacity of 450 kta or more, the UNIPOL platform offers the highest capacity per plant of any competitive technology. That means licensees can meet high capacity goals without constructing additional plants.

Retrofit: the fast route to higher capacity and performance

UNIPOL technology offers producers the ability to expand capacity and per-

By taking advantage of UNIPOL technology choices today, polyethylene producers around the world are positioning themselves to compete in a new, healthier business environment.

formance at less than grass roots costs by taking advantage of UNIPOL retrofit technologies. Existing UNIPOL PE reactors can leverage multiple retrofit technologies to increase capacity and/or expand business opportunities.

- **CAPACITY EXPANSION TECHNOLOGY** – Increases capacity quickly and cost-effectively
- **SUPER CONDENSED MODE TECHNOLOGY** – A revolutionary method for dramatically increasing output by increasing heat removal capability
- **XCAT™ METALLOCENE CATALYSTS** – Adds value or reduces costs of film products through down-gauging, performance enhancement or increased recycle content

- **PRODIGY™ BIMODAL HDPE** – Breakthrough PRODIGY Bimodal HDPE can expand business opportunities and enhance profitability through higher-value products, new products, products for new markets and better products for existing markets

Exploit new markets and applications

Finally, product flexibility gives UNIPOL operators the ability to proactively enter new markets/applications and react quickly to changing market demands.

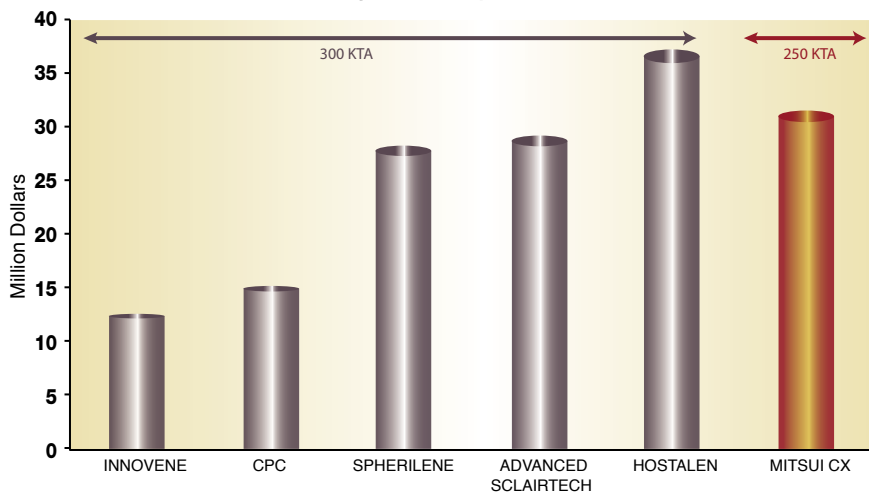
“With UNIPOL technology’s product flexibility, licensees don’t necessarily have to be right today about market conditions years away. It removes a lot of the risks of making long-term predictions,” says Paul Moyer, commercial vice president for Univation. “When a customer breaks ground on a new plant, it’s difficult to know what the market will require at start-up, and virtually impossible to see ten years down the road. But with UNIPOL technology, customers aren’t locked into a grade slate, so they can rapidly and easily adapt to changing market needs.”

Resins can be produced via Ziegler-Natta, chrome, metallocene, and engineered bimodal catalyst families. Compared to any other polyethylene process, the UNIPOL PE Process provides licensees with a greater range of superior quality products at lower cost, for both commodity and specialty markets - wherever they can most effectively compete.

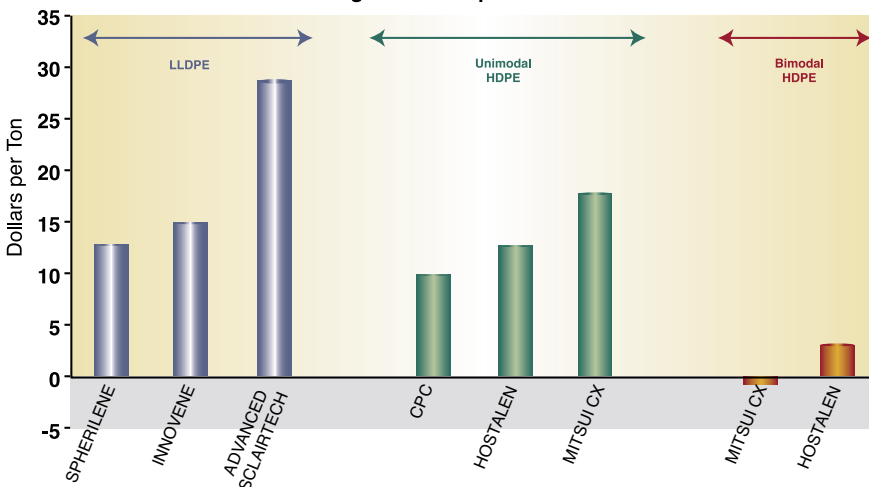
By taking advantage of UNIPOL technology choices today, polyethylene producers around the world are positioning themselves to compete in a new, healthier business environment. Univation Technologies provides proven production technology, capacity expansion opportunities, and innovative catalyst systems they need to stay ahead of their competition.

Our continuing heavy commitment of technical resources, product and process innovations, and after-start-up support assures that the UNIPOL PE Process will continue to define polyethylene manufacturing excellence worldwide, delivering value to your business now and in the future.

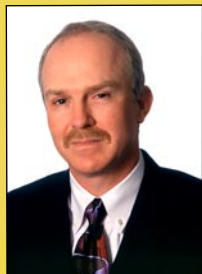
Total Manufacturing Costs Compared to UNIPOL - 2004 USGC



Total Manufacturing Costs Compared to UNIPOL - 2004 USGC



Getting ready for the upswing



John Verity
President

HOW UNIVATION ADDS VALUE TO YOUR PE BUSINESS

- Through UNIPOL process technology which, because of its simplicity, is the lowest cost to build
- With a broad range of catalysts that enable you to target the markets, customers and products that best fit your business
- With products and services designed to help you get the most value from your UNIPOL PE assets
- With continual innovation that gives you world class technology, now and in the future

All signs indicate an upswing ahead, and Univation has the technologies and services PE producers need to maximize profitability as demand rises.

Univation has always been a company focused on adding value to our customers' businesses – in any market environment. We offer a portfolio of technologies that help PE producers adapt to the changing market effectively – whether you need to add new capacity, upgrade your product portfolios to meet changing market demands, or simply operate cost-effectively through market ups and downs.

PE consumption heading upward

Around the world, we see PE growth continuing to stay ahead of GDP growth. PE consumption per capita continues to grow, and PE continues to penetrate the domains of other materials such as paper, glass and metal. We expect a growth rate of 5.3% per annum over the balance of this decade, with around 90% of that

growth being in LLDPE and HDPE.

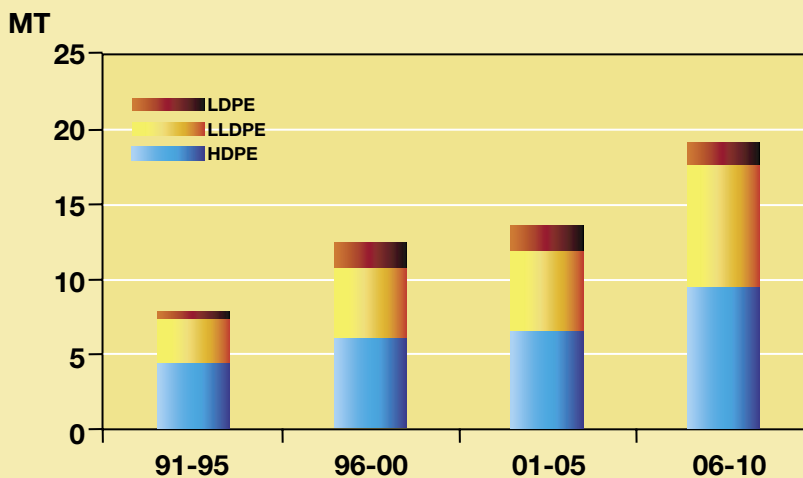
Not surprisingly, we expect that around 60% of that consumption growth will take place in the developing markets of Asia and Central and South America. More than a quarter of the expected consumption growth will come from China.

Capacity growth

In the first half of this decade, capacity growth has been lower than that of the second half of the '90s. Reasons for this include excess capacity growth vs. consumption during the late 90s, the negative impact of the Asian financial crisis and later the SARS epidemic, as well as short periods of recession in North America and Europe.

As a result of the anticipated consumption growth and low number of recent capacity additions we believe that 20 MT of new PE capacity is needed during the second half of this decade. The largest region for capacity growth is expected to be the Middle East, because of its advan-

PE consumption expected to grow at 5.3% p.a. between 2006 and 2010



Source: Nexant ChemSystems

taged feedstock position. This capacity will largely be aimed at meeting consumption growth in Asia.

We also expect significant capacity growth in Asia to support the region's very strong consumption growth; a large portion of this capacity growth will be in China where we currently see many projects being developed.

We see metallocene LLDPE consumption currently in the range of 2.5 to 3 MT per annum and expect that figure to double to more than 6MT by 2010.

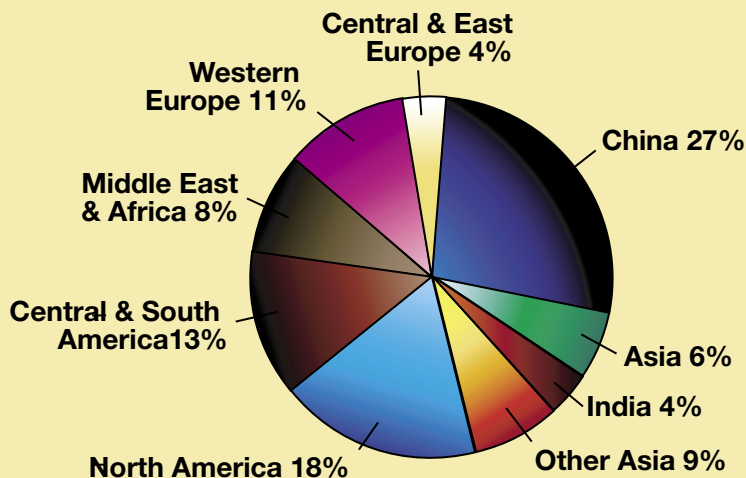
Univation's customers are in a good position to benefit from this trend because Univation has been a pioneer in the development of metallocene technology and is the only licensor able to offer commercially demonstrated metallocene LLDPE technology. Our licensees are finding that adding metallocenes to their product portfolios is a good way to create value for their businesses. We now have ten customers who have licensed our metallocene technology and this technology is currently being practiced in all the major regions of the world.

Bimodal HDPE on the rise

The use of bimodal HDPE technology is also growing around the world. Capacity capable of producing bimodal HDPE represents the largest share of all HDPE capacity under construction. This important trend is one reason Univation has devoted a sizeable portion of its R&D budget to developing the capability to produce bimodal HDPE products in a single UNIPOL reactor.

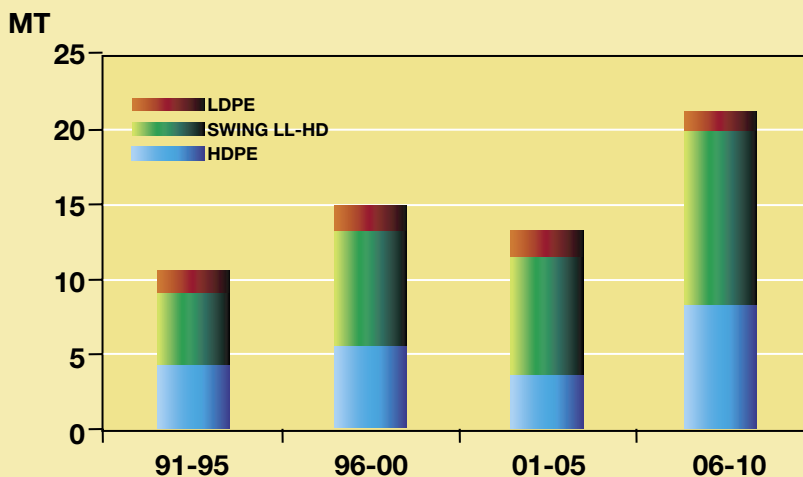
We have recently announced the commercialization of our first catalyst that will enable the production of bimodal HDPE film resin in a single UNIPOL reactor. It is our belief that this technology represents a major breakthrough in the world of polyethylene. For the first time, PE producers will be able to make competitive bimodal HDPE products with the economic advantages of a single-reactor process.

60 percent of consumption growth expected in developing markets of Asia & Latin America



Source: Nexant ChemSystems

Significant PE capacity growth expected in next 5 years



Source: Nexant ChemSystems



Ongoing innovation

Bimodal HDPE is the latest in a long line of innovative Univation technologies that include UNIPOL Gas-Phase technology, Super Condensed Mode high reactor capacity technology, and metallocene LLDPE technology. These and other Univation breakthroughs have helped PE producers stay competitive in the fast changing PE market.

With the lowest-cost PE technology, a broad range of catalysts to produce market-leading products, and products and services designed to help you get the most value out of your UNIPOL assets, Univation is the technology partner best suited to helping you to add value to and improve the profitability of your PE business during the emerging upcycle.





UNIVATION TECHNOLOGIES

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Delivering Value to the PE Industry

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