Beckers Magazine

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Tailored solutions for shared success

2017 has been a dynamic year for the coatings industry. Ongoing consolidation, already implemented or proposed, is shaping the future of our industry while at the same time most coatings manufacturers have been affected by the rising cost of raw materials during the second half of 2017.

Dedication to customers is at the core of Beckers Group thinking. Our substantial growth in 2017 derives from an ability to combine the flexibility of a medium-sized player with continuous innovation.

SMARTER COATINGS

Our coating solutions are designed to generate new business opportunities for our customers, anticipating end customers' future needs. This latest issue of Beckers Magazine features several exciting examples, such as the waterborne basecoats developed for Beckers' business segment Industrial Coatings, in response to demand from key automotive OEMs.

Examples of our innovative solutions developed for the coil coatings segment include high-coverage and textured topcoats, new polyester and polyurethane based coatings, bio-based paints and multilayer systems that feature alternative chemistries.

This ongoing investment in 'smarter' coatings has resulted in a significant range of new products: more than 27% of the Beckers coil coatings sold in 2016 were newly developed.

We help our customers accelerate time-to-market by developing innovative solutions that add value by making their products more durable, functional and attractive. We are also committed to enhanced sustainability at every level, a field in which we have made great progress over the past twelve months.

COMMITTED TO SUSTAINABILITY

Determined to lead in sustainable coating products and solutions, our commitment is truly holistic. In 2017, for example, we developed the Beckers Sustainability Index App, which demonstrates how our coil coatings can enhance the sustainability of customers' end products. Features include a function that indicates how coatings' specific technical properties directly or indirectly affect LEED and BREEAM ratings – an increasingly important issue, not only for our direct customers but also for architects, building planners and developers.

Highlighting the environmental advantages and multiple commercial benefits offered by the Group's latest sustainable coatings, Beckers launched roadshows in India and China during the year, showcasing a comprehensive portfolio of sustainable coil coatings.

ENHANCED CUSTOMER SERVICE

All our products are developed to anticipate and cater to the specific needs of our customers. We back this commitment by significant investment in customer service. Our global presence and proximity to customers enables rapid access to our markets and has led to further expansion in India and Argentina over the past year. In North America, our recent installation of a Beckry®Mix facility offers customers a faster turn-around on smaller 'made-to-order' batches.

Our innovative product development and ongoing commitment to sustainability focus exclusively on promoting our customers' long-term success – and we mean to be best in this regard. I hope this latest issue of Beckers Magazine provides an intriguing glimpse of what we are doing, where we are going and how we mean to get there – and that you will enjoy reading it as much as I did!

With best wishes for the coming year,

Dr. Boris Gorella
CEO Beckers Group

Front page

Convention Centre Antibes, France. Aluminium coated with Beckry®Tech.

Photo Courtesy of ORY & Associés© & Arconic Architectural Products©

Contents

New brochure!

Major OEMs have strict requirements and some of the more stringent ones relate to the performance of the coatings themselves. Our Beckry®DA range of coatings are designed to provide the optimum properties for each type of White Goods application.

The brochure is available in English, French, Russian and Spanish. You can download it from our website or contact: *coilcoatings@beckers-group.com*

Beckers Sustainability Report 2016

This year's report is our first prepared in accordance with the GRI (Global Reporting Initiative) Standards for global best practice. Implementing these reporting standards ensures a clear presentation of comprehensive data on our environmental and social impact.

The Sustainability Report also provides an insight into the priorities of our sustainability agenda. A key milestone is our first step towards a shift to renewable energy. At Beckers Malaysia, investment in a solar panel project is expected to answer for a considerable share of the site's energy consumption. For more about our sustainability initiatives, download the report from our website.

Extended Group Innovation Organization – new position of Group Technical Director Coil Coatings

Bernd VOGEL

Recent growth dynamics and the increasing volatility of our global industrial coatings markets have inspired a thorough review of the Group's approach to innovation. As well as considering the issue from our own 'inside-out' perspective, we have paid careful attention to customers' expectations and to general feedback on industry trends. It seems that demand for even more highly advanced technical services and support will continue to grow, as well as expectations of game-changing sustainability-driven R&D.

We are therefore very pleased to announce the 2017 establishment of the Beckers Group's new expanded Innovation organization. The new setup assures we are well prepared to meet the major technological challenges posed by global markets in the coming years. Whether talking R&D coordination, technical business development and customer support or strategic product development, we shall now have the focus essential to current and future success.

As a key element of this new organizational structure, we have created the global position of Group Technical Director Coil Coatings, reporting directly to the CTO. This group position is one hundred percent focused on technical business development and local 'on-demand' customer service, across our entire local coil coatings business. This will secure the consistent provision of Beckers' dedicated world-class industry expertise, ensuring all our customers have access to tailored technical solutions.

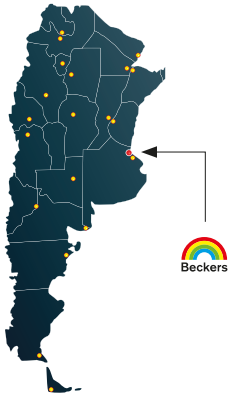
I am therefore very pleased to introduce our readers to Dr. Paul Davies, who agreed to take on this challenging new position. He joined the Beckers Group innovation team as Group Technical Director Coil Coatings in April of this year. With 24-plus years in the international coil coatings business, where he has held numerous senior positions in technical service, R&D and sales, Paul brings Beckers considerable industry expertise in coil coatings. Most recently, Paul headed Technical Service Europe & Africa for BASF's coil coatings business, based in Münster, Germany. ■

Group Technical Director Coil Coatings Paul Davies

Continued expansion in Latin America!

The second largest country in Latin America and the eighth largest country in the world, Argentina offers enormous potential. In recent years, a gradual improvement in the country's economy and political climate has strengthened its industrial sector, encouraging foreign investment and expectations of commanding a leading role in the region.

Frank BEAUREZ



In 2014, alert to the growing market potential, the Beckers Group decided to ramp up its operations in Latin America. This resulted in the establishment of two new sites, one in Monterrey, Mexico, the other in Argentina. Located southwest of Buenos Aires, in Burzaco, Beckers Argentina is strategically situated close to a key customer, steelmaker Ternium Siderar. Operating as a satellite concept, Beckers Argentina features a Beckry®Mix unit. The site also maintains an advanced on-site safety stock supplied by Beckers France. The stock is capable of satisfying three months' demand of high-volume orders for our top-selling products.

2015 was entirely devoted to administrative formalities and setting up the plant. Deliveries of our first locally produced paints, to Ternium Siderar, were made early in 2016, and we are fast becoming a key supplier to the company.

Backed by the Beckers Group's global network of expertise and technical support, we have established contact with Latin America's major coil coating players, companies such as Novelis, Tekno do Brazil and Alucomaxx, also in Brazil, all of whom we now supply. We have also received technical approval from Cintac, in Chile.

“To achieve our targeted market shares in Argentina, Brazil and Chile, we are investing heavily in new equipment”

Local support, global back-up
Our key target is to boost local production capacity to increase our ability to meet demand for high-volume sellers such as white coatings for the construction and domestic appliance markets, as well as primers and backing coats. To achieve our targeted market shares in Argentina, Brazil and Chile, we are investing heavily in new equipment, such as automated dispersion and grinding equipments.

With a total staff of six, that also supplies technical assistance for coil coating lines, we run a lean and effective operation. From the start, for maximum efficiency and to enable us to better focus on customers’ operational requirements, we have outsourced all business administration to BPO-Solver. This ensured we were ready to provide customers with optimal support from day one.

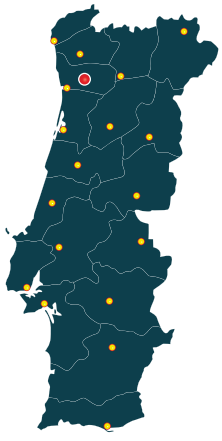
With our strong local relationship and professional cooperation with Ternium Siderar, combined with fully optimized supply-chain management, we are a highly dedicated supplier. Ably backed by Beckers France and confident in the expertise and commitment of our on-site staff, we anticipate a bright future. ■

Entrance Beckers Argentina

First coil coating line in Portugal

The first coil coating line to be installed in Portugal, the 360 Steel Materials (360SM) facility is the result of a joint venture between Portuguese group Metal Rolo, Chinese steelmaker Zhejiang Huadong and a number of private investors.

Jamal ELHANDAZ



Based in Soza in the district of Aveiro, close to the major city of Porto, the company started operations in September 2015 and currently numbers some 80 employees. Initially, most of the company's production of coated coil is earmarked for its major customer, Painel 2000, a sister company based in Braga, focused on the production of sandwich panels for the construction industry. Nevertheless, 360SM plans not only to develop its sales in Portugal but even beyond the country's borders, particularly in Spain.

Partners from the start

The Beckers Group has played a key role from the very beginning. Prior to the operational launch, the 360SM management team held detailed discussions to define the terms of the close partnership that still links both companies.

To ensure optimal conditions for production of the first coated coils, Beckers was commissioned to provide dedicated technical assistance during and after the start-up of the coating line, as had been the case in previous instances. The Beckers team provided several days of on-site support to 360SM's staff over this tricky initial period, helping fine-tune the line to ensure it satisfied all performance parameters.

360 Steel Materials (360SM) in Soza, Portugal

The new line

Since the line has been up and running, Beckers has delivered ongoing support in the form of short delivery times, optimized safety stock, regular technical backup and training in applying the latest paint technology.

Two years on, the strong relationship established between 360SM and Beckers has grown still closer, making Beckers a key supplier.

Promising future

Right from the start, 360SM has consistently focused on ways to improve quality and productivity. As a new player in the market, one of the company's key challenges is to achieve full capacity utilization as soon as possible, while also expanding into new markets. Drawing on its broad experience of the global paint sector, Beckers is able to provide unique market insights and expertise in supporting the 360SM team.

Initially, this has naturally involved concentrating mainly on the paint systems themselves, to ensure production of the finest end products. Looking further ahead, however, this support will evolve into the proposal and development of new coating solutions and paint technologies, designed to expand 360SM's potential product range, as well as to enhance its end-customers' experience.

There is still plenty to be done and many challenges to face but, thanks to this close partnership, the future for 360SM and Beckers in Portugal seems very bright. ■

First coil coatings company to receive the GreenPro Certificate

Beckers Group is the first coil coatings company to receive the GreenPro Certificate, a product certification issued by the Confederation of Indian Industry in recognition of the Beckry®Therm paint systems as sustainable throughout their life cycle. The unique properties of Beckry®Therm save energy and enhance durability which makes it extremely suitable for green building projects. The award ceremony took place in October in Jaipur, India at the annual Green Building Congress.

From left: Senior Executive Sales Pankaj Bansinge, Senior General Manager Sales & Marketing Sanjay Saxena, Managing Director Rajesh Mehrotra, and Marketing Manager Umesh Chandra Vishwakarma

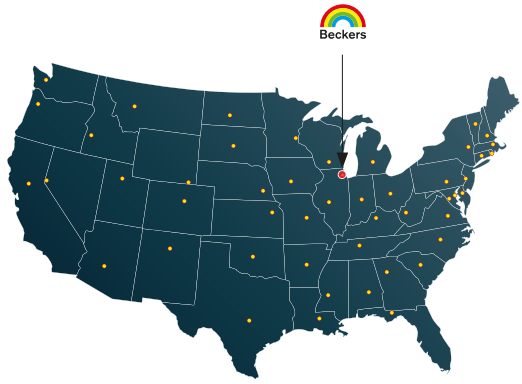
The unit installed in Chicago

Mixing it up in North America!

For customers seeking faster turn-around of smaller make-to-order batches, the recent installation of a Beckry®Mix automated dosing unit at the Beckers North America facility offers major gains in speed and quality of service.

Gavin MILLER

Coil coaters across the North American market can now order smaller quantities of make-to-order coatings for almost immediate delivery from the new on-site unit. Ensuring exact colour shading and short lead-times, this service adds significant value to the downstream market. As an automated on-site production process, the Beckry®Mix system also offers significant gains in terms of sustainability, in line with Beckers Group's global strategy.



Speedy deliveries

The new automated dosing unit, commissioned at the Chicago facility in April, 2017, is dedicated to the production of Beckry®Tech super durable polyester and Beckry®Pol Polyester coatings. The installation of this modern equipment forms part of a global operations strategy focused on consistent improvement of delivery times and service levels.

Utilizing proprietary Beckry®Mix software, the new unit features precision load cells and dosing valves that dispense colorants directly to customer drums with previously unmatched accuracy and consistency. The conventional intermix liquid assembly process has traditionally involved manual dosing of materials into a process tank before mixing, testing and adjustment, prior to transfer to drums for customer shipment.

The Beckry®Mix unit entirely eliminates the filling and subsequent tank-washing process, minimizing process stages and improving ergonomics. The result is a more sustainable process, as no wash solvent is required to clean process tanks. Furthermore, the equipment is engineered with multiple layers of safety and process interlocks, enhancing employees' safety by removing the risk of human error.

With its dedicated tanks, pumps, lines and dosing valves for each material, the new equipment even prevents any trace contamination. Each material is kept under automated recirculation and mixing cycles and the nozzles utilize an automated wash cycle. These features ensure a dramatic reduction in the colour shading and adjustments required to meet customer specifications, when dosing individual batches.

"Coil coaters across the North American market can now order smaller quantities of make-to-order coatings for almost immediate delivery"

Supply chain gain

The customer's order for each batch is transmitted electronically, direct to the production unit, avoiding the requirement for multiple paper-based batch labels. All process data is logged automatically and can be accessed remotely for fine tuning and reporting. This dramatically enhances supply-chain predictability, significantly accelerating the response to urgent customer needs.

The smooth installation and commissioning of the new equipment has provided a fine example of the Chicago team's cross-functional skills – skills that the team continues to hone in its determination to drive ongoing process improvements and further refine service levels. ■

Beckqua®Color: New waterborne basecoat for automotive parts

To cater to the needs of key automotive OEMs, Beckers business segment Industrial Coatings' Liverpool-based Long Term Research (LTR) laboratory, backed by Beckers' business line Automotive Plastics Exterior (APE), have developed a new waterborne basecoat coating technology.

Rumman AHMED

The high-pressure wash unit in the Industrial Coatings lab at Beckers Sweden

Led by LTR Manager Rumman Ahmed, supported by Beckers' Swedish-based APE team, the innovative project is scheduled for completion in late 2018. As well as pioneering new waterborne coating technology, this project is adding considerably to the automotive know-how and technical capabilities of the local team, acting as a centre of excellence for APE-related customer enquiries.

Waterborne benefits

Conceived as a response to the European automotive market's growing demand for waterborne basecoats (especially for bumpers), this LTR project will continue to keep Beckers' Automotive Plastics Exterior business firmly on the automotive coatings map. The project has already seen a number of exciting advances in terms of higher solids content, superior applicability, improved regulatory compliance and so on, offering customers substantially improved sustainability and production benefits.

Investing in the future

To ensure our product satisfies client OEMs' most stringent performance specifications, the APE team has made a number of major equipment investments. These include a high-pressure wash testing unit, a widely utilised piece of technology that features in all OEM's test specifications. This versatile unit enables the team to customize conditions and parameters (pressure, temperature, distance and angles) to meet each customer's highly varied pressure wash test requirements. Another key investment has been flaming equipment – imperative for altering the surface properties of

Panels featuring the four main waterborne colours: white, black, silver and red.

inert plastic substrates – enabling strong adhesion between primer and substrate. Further investments have featured a stone-chip tester and the acclimatization of spray booths (essential for waterborne development, where temperature and consistent humidity are crucial).

The project is focused on specific target areas, such as Technology, Application, Millbases and Weathering. As we probed deeper, it became increasingly clear that these areas are highly inter-dependent, requiring us to address them in parallel, having a dramatic effect on the project's timeline and key milestones.

Tested and tried

To ensure this waterborne technology fully satisfies our customers' challenging specifications, panels coated with a combination of primer, basecoat and clearcoat are exposed to all relevant tests (humidity, environmental cycles, water immersions etc.), followed by the rigorous high-pressure wash tester.

The application process is obviously critical to coating quality and performance. It must deliver optimal quality while accommodating the multiple demands posed by individual coating lines in terms of application timing, specific line conditions and application parameters. This requires coatings technology that offers a robust and broad application window, able to achieve coatings of a high visual standard across a wide spectrum of challenging line conditions. The secret lies in developing a basecoat of exceptional application versatility, offering excellent sag-resistance, hiding, colour and a quality finish, irrespective of variations in coating film thickness. High-speed balls such as shown to the right are employed by 99% of all OEMs.

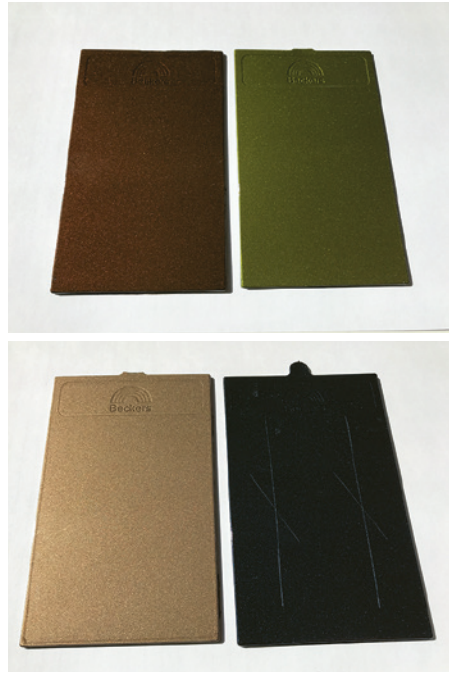
Colourful new options

The team at Beckers Sweden is currently engaged in developing a complete range of pigment pastes, designed to deliver the colour requirements for solids and their metallic counterparts. Developing pastes that are fully compatible with our WBBC recipe is challenging and time-consuming. Nevertheless, each colour range is being developed and tested to ensure stability, compatibility, applicability, technical excellence and advanced weathering properties.

Following the successful completion of the accelerated indoor weathering tests conducted on our waterborne basecoats, we plan to expose this newly developed range to real-time outdoor weathering tests in Florida and the Kalahari.

Parallel to these developments, production is already being coordinated with a view to scaling up in line with established objectives, while new partnerships are being forged to secure future market opportunities. As already noted, this Long Term Research lab project is scheduled for completion by the end of 2018. We can look forward to a waterborne surge of interest in this new range of basecoats! ■

The high-speed bell applicator in action in the Industrial Coatings lab at Beckers Sweden



Some of our new mill-base colours: bronze, green, copper and blue

Video on YouTube introducing the Beckers Sustainability Index App

New Apps for digital convenience

We have made choosing the most sustainable coating option still easier! Two practical Apps from Beckers place comprehensive sustainability data at your fingertips – just download from App Store or Google play. The Beckry®Therm and Beckers Sustainability Index Apps are two powerful digital tools that offer immediate and simple access to everything you need to know about our sustainable coatings solutions.

Nicklas AUGUSTSSON

We have made choosing the most sustainable coating option still easier! Two practical Apps from Beckers place comprehensive sustainability data at your fingertips – just download from App Store or Google play. The Beckry®Therm and Beckers Sustainability Index Apps are two powerful digital tools that offer immediate and simple access to everything you need to know about our sustainable coatings solutions.

Available on the App Store

ANDROID APP ON Google play

Both Apps can be downloaded from App Store or Google play

The Beckry®Therm App

Beckers has based its update of the Beckry®Therm App on a new simulation model developed in association with Oxford Brookes University in England, a model that clearly demonstrates the benefits of Beckry®Therm and Beckry®Low-e. As well as calculating costs savings, the App now also features data on global warming potential, peak energy load, exterior roof temperature and the Solar Reflective Index for the specified colour. Cost calculations can be made in nine different currencies and today the App also includes data for countries such as Argentina, Brazil, India, and the entire Middle East. The new version features upgraded functionality, enabling all calculations to be saved, compared and shared.

indirectly affect ratings assigned by sustainability certification schemes such as the Leadership in Energy and Environmental Design (LEED) and the Building Research Establishment Environmental Assessment Method (BREEAM).

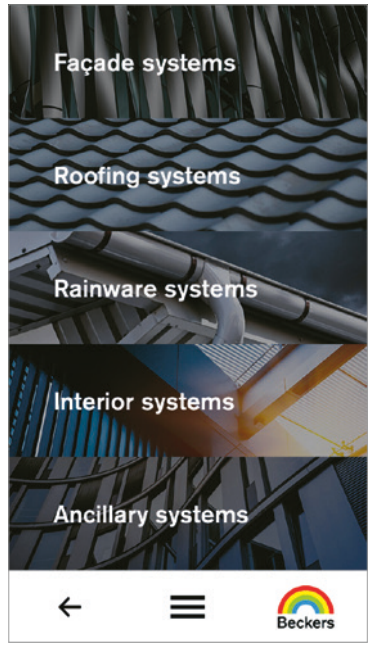
The App generates a clear picture of the overall sustainability of specific Beckers coatings, offering the user a detailed breakdown of each system and its technical characteristics. A brief promotional video introducing the benefits of the App can be found at Beckers Group on YouTube. ■

The Beckers Sustainability Index App

The Beckers Sustainability Index was very well received by the market when launched in 2016. The tool enables comparison between different coating systems and assessment of their relative contribution to sustainability. Making this ground-breaking tool available to a broader range of potential users, Beckers has developed an App to enable not only customers but also architects, designers, building planners and developers to find the most sustainable coating solution.

The sustainability credentials of our coil coatings can easily be compared and contrasted, both in terms of material and functionality. From a functional viewpoint, the App cites the values our sustainable coatings add to a building. When it comes to material constituents, the App rates the sustainability of specific coatings' components. It also indicates which functions directly or

The Beckry®Therm App



The Beckers Sustainability Index App

Beckry®Tech – coating a sustainable future

It is now over 25 years ago since Beckers first introduced the Beckry®Tech superdurable system to the coil coatings market. Since then the Beckry®Tech system has not only established itself as core Beckers technology but has also proven itself to be a highly versatile platform, offering end-users an exciting palette finishes and effects.

James MAXTED

In just a few decades, the Beckers Group has grown to become a world leader in coil coatings – supplying cutting-edge technologies and expertise across the globe. This rapid international expansion has led to the opening up of new and challenging markets, demanding that we constantly adapt our flagship super-durable polyester technology to new cultural and environmental requirements, as we seek to meet customers' needs throughout the coil coating industry.

Now therefore seems the right moment to look at how Beckry®Tech systems are currently being employed and to say something about where this technology may be going in the future.

What makes it such a super-durable technology?

Beckry®Tech performance relies on the intrinsically high photo-stability and excellent formability of its resin binder. This is based on a unique (saturated) polyester polymer that contains none of the aromatic moieties that typically give rise to problems such as degradation, chalking and erosion when exposed for extended periods in harsh environments. Merely omitting these aromatic groups would not suffice, however: the resulting system would be far too soft, with properties similar to flypaper!

What makes the Beckry®Tech coating unique is that it uses specific cycloaliphatic building blocks. These are not only durable but, because of their chain stiffness, impart hardness to the polymer backbone. Paints containing these cycloaliphatic groups absorb less of the damaging UV light affecting polymers that feature aromatic groups, delivering a significant improvement in durability. Our Liverpool-based Long Term Development (LTD) lab has clearly demonstrated Beckry®Tech's benefits with exhaustive tests to determine chemical photo-oxidation and film erosion/weight loss, as well as using normal metrics such as gloss loss and colour change. *See Figure 1* (solid lines).

The durability and mechanical performance of Beckry®Tech is also affected by the crosslinked polymer network. This not only has to be meticulously designed (addressing the hydroxyl functionality of the backbone resin and ensuring the correct cross-linker and catalyst reactivity), it must also be properly executed when cured in

- **Both photo-oxidation and cross link reduction are caused by UV (QUV A) exposure**
- **The more photo-oxidation and loss of X-linking the more the binder deteriorates**
- **Very low photo-oxidation and good cross link stability in Beckry®Tech 2001 binder is due to absence of aromatic groups.**
- **Low level photo-oxidation + stable X-Link = highly durable coating**

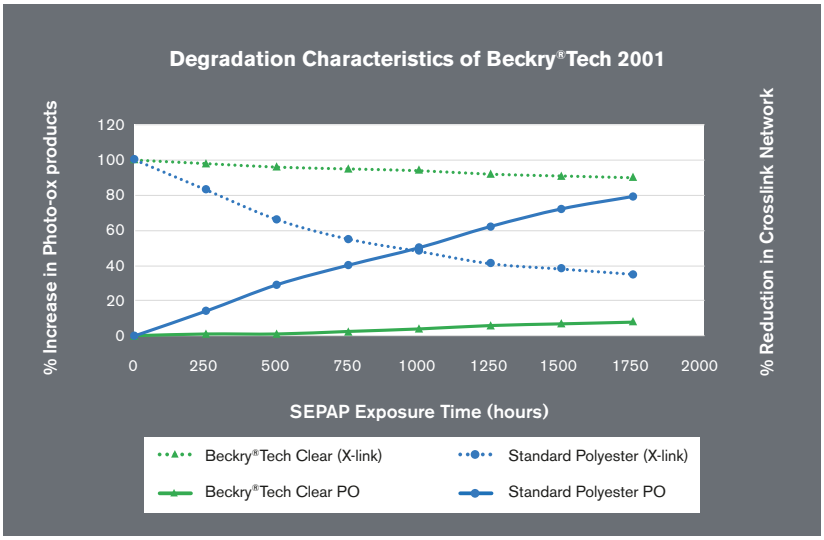


Figure 1: degradation characteristics of Beckry®Tech 2001

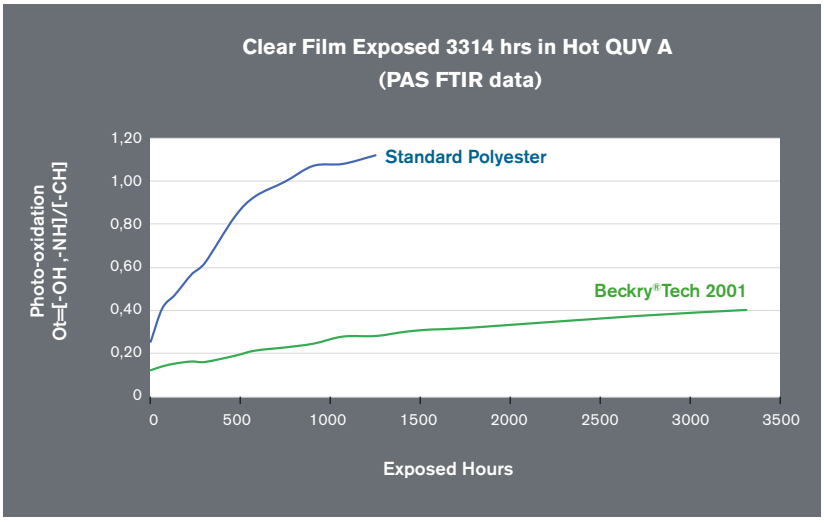


Figure 2: Photo-oxidation and real time exposure

Standard Polyester
16% Gloss retention
Colour Change 1.3 ΔE

Beckry®Tech 2001
81% Beckry®Tech 2001
Colour Change 0.5 ΔE

our customers' ovens. *Figure 1* (dotted lines) also shows the basic degradation differences between a properly crosslinked Beckry®Tech film and a standard polyester.

At the LTD lab, we are convinced that no laboratory weathering test can *per se* take the place of real-time outdoor exposure. Outdoor weathering is always the final arbiter when testing any topcoat for coil coated exteriors. Whenever possible, we test in parallel, especially when making modifications to the Beckry®Tech system. *Figure 2* juxtaposes the photo-oxidation rate determined ▶

- from fast-track Hot (80° C) QUV A 340 testing in the lab with panels from real-time outdoor testing in Queensland, Australia. This underlines the link between photo-oxidation stability and real-time performance as measured by gloss retention or colour change.

Since the system was first developed, we have tested hundreds of Beckry®Tech panels in many different parts of the world. Years of real-time exposure clearly demonstrate how differences in the chemistry and internal structures of Beckry®Tech produce variations in performance.

The results of the below examples of real-time testing of Beckry®Tech, as compared to commercial grade silicone-modified polyester (SMP), speak for themselves. Most importantly, it's not just the numbers: the visual appearance of the Beckry®Tech samples is significantly better – in most cases, the SMP samples are chalking quite heavily.

How is Beckry®Tech being used today?

Well established among the principal brands marketed by many of our customers, the technology is

Beckry®Tech on facades at Intersol Radom, Poland

Beckry®Tech coated aluminium composite panels used on Kameha Grand Bonn

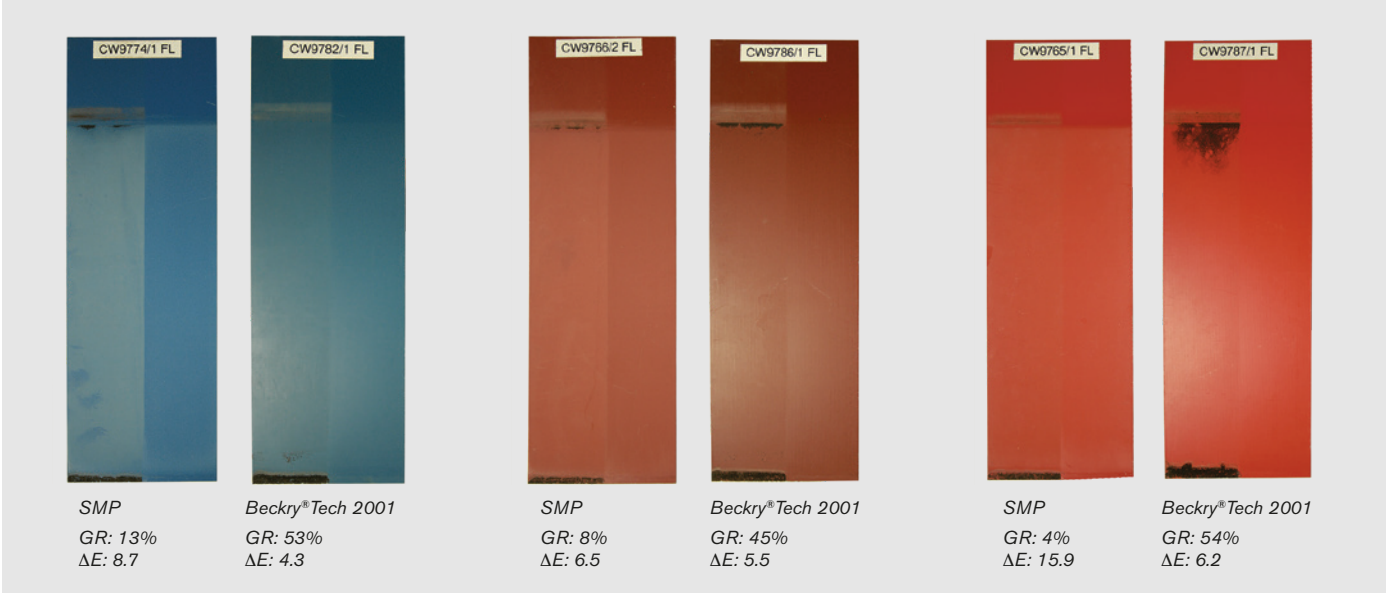


Figure 3: Comparison of commercial silicone-modified polyester with Beckry®Tech 2001, after seven years sub-tropical exposure.
GR = Gloss Retention

widely appreciated for its product differentiation ability.

The amino crosslinked Beckry®Tech system is a popular choice for extremely high durability systems such as ArcelorMittal's Granite® HDS. Carrying a warranty of up to 20 years, it is EN 10169 RC4 /RUV4 certified.

Beckry®Tech is also extensively used as a high-durability coating for composite aluminium panels in a wide range of shades, finishes and effects. Beckry®Tech fulfils the requirements of both AAMA 2604-10 and AAMA 2605-11 (colour dependent).

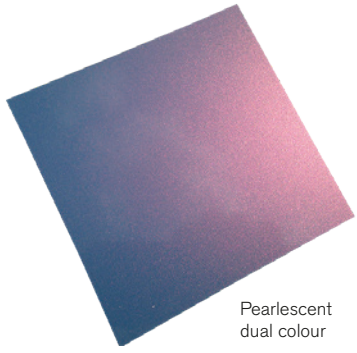
Beckry®Tech has also been used as the basis of multi-layer systems such as Beckry®Shine and the pattern-effect Beckry®Ink range, producing many innovative finishes, ranging from brushed aluminium, metallics and pearlescents to marble, granite, wood and textile effects. Typically, these pattern effects involve a base coat, a printed ink and a clear coat, applied on top of a durable primer. These 'effect' finishes significantly broaden the design palette and, since Beckry®Tech is the core technology on which every layer is based, super-durability is assured.

This core resin technology is also being used very successfully with poly-isocyanate crosslinking in the form of the **Beckry®Duro** high-build system. One example forms the basis for Tata Steel's Colorcoat Prisma® product, which carries up to 40-year guarantees and exceeds RUV4 and RC5 requirement as per EN 10169 ▶

Chatterley Valley, UK. Colorcoat Prisma® pre-finished steel

Wood

Marble



Pearlescent dual colour

Brushed aluminium

Granite

Beckry®Tech is also the basis for a range of high-durability ultra-low-gloss textured finishes, sold under the joint brand name Beckry®Tex. The Beckry®Tex system is formulated to create a surface with a dense anti-reflective/anti-glare 'wrinkled' finish that offers an ultra-low, non-directional gloss.

Careful manipulation of the formulation allows us to offer our customers a range of textures from a very tight, silk feel like **Beckry®Tex Fine** to a ultra-coarse "hammer" finish such as **Beckry®Tex C**. Such products not only offer an interesting range of aesthetics, but have high durability performance meeting the RUV3/RUV 4 / RC3/RC4 demands. ArcelorMittal's Granite® Deep Mat and Granite® Quartz uses such finishes and carries up to 20 year warranties.

Over the years, we have added to the functionality of the Beckry®Tech system by developing a range of solar-reflecting and solar-absorbing technologies. In the US, the **Beckry®Tech Cool** range is marketed as an Energy Star-rated roof product. Initial and aged solar-reflectance values have been independently verified, ensuring that they meet recognized national energy-reduction targets and are certified to offer LEED building sustainability scheme credits. Combining an improved product lifetime (due to the highly durable binder) with effective radiative and thermal control provides the construction industry with intelligent solutions that reduce life-cycle costs and reduce in-service use environmental impacts.

Its multiple applications, attractive design options and functional specifications make the Beckry®Tech family the system of choice for many end users, testifying to our success in optimizing coating performance. But the journey does not stop here.

Where are we headed?

Broader global applications

One key focus has been to modify the Beckry®Tech formulation for a broader range of environments. This has involved monitoring system performance at ten different global locations for more than

Beckers Poland: Beckry®Tex C topcoat on cladding painted at ArcelorMittal Poland

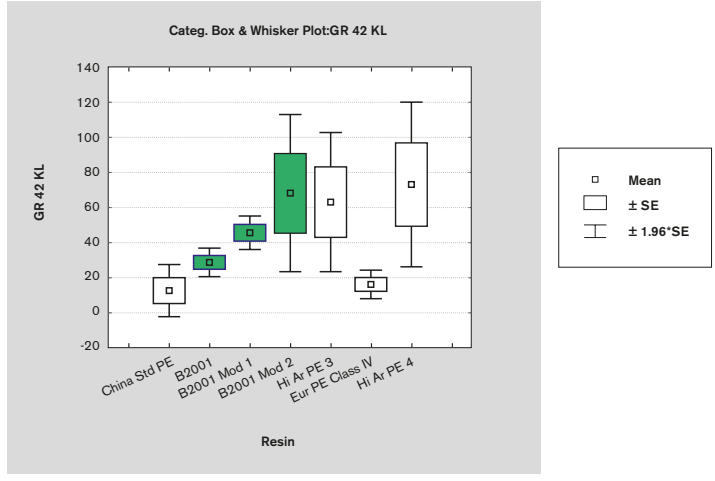


Figure 3: improvements in tropical performance of Beckry®Tech range

The box and whisker plot shows the gloss retention of a range of coatings after 3.5 years exposure in Kuala Lumpur, Malaysia, for a range of different exterior coatings.

Green boxes show the development of the Beckry®Tech system (B2001) through two modifications and how this impacts durability (gloss retention) in this location.

Similar assessments are made of binder photo-oxidation, cross-linker stability and colour change.

a decade. We now routinely conduct tests for all our systems not just in Florida, but Malaysia, South Africa and Australia as well.

In particular, tropical dirt pick-up, when combined with highly humid and hot climates, has resulted in a modification that is specially adapted to address these challenges. Experience in these regions has enabled us to carefully re-balance product properties such as cure response, glass transition temperature and pigmentation, ensuring that we maintain the best possible performance. *Figure 3* illustrates some of the work undertaken in this respect.

Faster application lines

Solvent-blend modifications have also been introduced to meet the demands of very rapid evaporation, while still producing smooth and even surfaces.

Meeting ever more stringent regulations

Some changes in the formulation are of course driven by changes in regulations. All current Beckry®Tech formulations are free from heavy metals such as lead, cadmium and tin. The solvent blends used in the Beckry®Tech range have also been changed to comply with the European Seveso II Directive 96/82/EC and are certified as low-hazard in accordance with the R52/53 standard. We operate an ongoing review of the European Union's REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) regulations to ensure our product remains free from 'Substances of Very High Concern'. We take our environmental stewardship of the range very seriously.

Higher-yield formulations

One current focus of Beckry®Tech development is increasing coverage and applied yield per square metre. In line with changes already brought to market with the Beckry®Pol 3000 family, our target is to achieve improvements of no less than 10–20%, depending on colour and application viscosity. Special attention is being paid to glass transition temperature and micro-hardness, to ensure that the changes in polymer structure required to reduce viscosity do not adversely affect the fundamentals of coating performance.

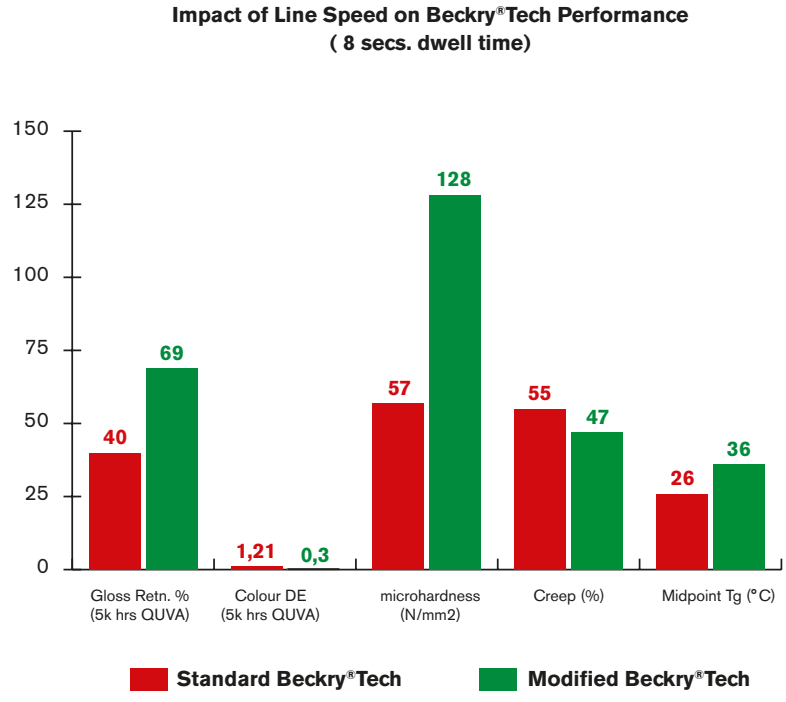


Figure 4: High-speed application

Greater sustainability

Consistent with our determination to be the most sustainable coatings company, we are also working to increase the bio-based content of the backbone resin by employing raw materials derived from biomass – a more sustainable source than petroleum. We have already successfully developed a Beckry®Pol Bio $R_{UV}3$ product and are taking what we have learnt from this into the development of both melamine and polyisocyante-cured systems. Initial laboratory developments show encouraging signs not only of matching existing Beckry®Tech performance but, in some instances, improving it still further.

The family of Beckry®Tech finishes occupies a very strong position in our coil coatings portfolio. Committed to a policy of ongoing improvement, Beckers is dedicated to ensuring that the technology is continually updated to satisfy the latest and most challenging application requirements, offering customers and clients the very best in material and functional sustainability. ■

Speedy solutions for a lasting effect

In the US, as elsewhere, time is money. This adage is especially appropriate to the way US coaters act. The supply chain for coil coatings in the US operates very differently from other parts of the world.

Eddie BARON

The US features a proliferation of coater-only companies and service centers, in contrast to the vertically integrated steel mills typical of other markets. These coaters and service centers provide value to the customer through material ordering and organization, making their money by applying material as quickly as possible. Due to this market set-up, it is not unusual for a coater to run lines at 500, 600, or even 700 ft/min (150, 180, or 210 m/min). These faster line speeds mean shorter dwell times, which is of course a concern for long-term durability.

Traditionally, Beckry®Tech products have been limited to a maximum line speed of 500 ft/min (150 m/min), while Beckry®Tex products have been limited to 300 ft/min (90 m/min). These numbers are averages based on oven size and length, but are a common way in the industry of indicating throughput. This speed limitation has put Beckers at a competitive disadvantage. Until now, lower operating speeds have made Becker products more expensive to run than competitive products that permitted higher throughput and generated greater profit for US coaters.

To resolve the disconnect between short dwell times and long-term performance, Beckers North America has spent several years hard at work developing its 'High-Speed' solution. These very rapid speeds significantly reduce curing times. For standard products, this can result in weakened chemical resistance, a softer film that is more prone to damage and reduced UV durability, causing colour loss and fade. Beckers' new High-Speed products ensure that coaters operate at maximum efficiency while maintaining the globally recognized superior performance of Beckry®Tech and Beckry®Tex products.

Throughout the long and challenging development process, Beckers North America had the full support of the Becker Group's Long Term Development (LTD) lab in Liverpool. A baseline was generated on the standard Beckry®Tech and Beckry®Tex lines using a number of tests including Micro-Hardness, Glass Transition Temperature (Tg) and Fourier Transform Infrared (FTIR) spectroscopy. These tests each help analyze the overall cure of the new products and can be helpful in attempting to predict long-term performance. In addition, samples have been exposed to accelerated and long-term weathering tests, including the new 'Hot' QUV test developed by the LTD team. The Beckers LTD team is renowned for its technical knowledge and industry-leading development expertise and its support was critical in developing these advanced systems.

> "With this new High-Speed system, Beckers North America is well equipped to compete with other paint suppliers to the US construction industry"

With its new High-Speed systems, Beckers North America is well equipped to compete with other paint suppliers to the US construction industry. A number of high volume end-users now offer viable opportunities for new business, as well as higher industry recognition for Beckers. With its breakthrough technology and innovative thinking, Beckers is more than up to the challenge. With new products and processes on the horizon, the future looks bright for Beckers North America. ■

Sustainable portfolio showcased in India and China

Highlighting the environmental gains and multiple commercial benefits offered by the Group's latest sustainable coatings, Beckers has staged roadshows in both India and China during the year, showcasing a comprehensive portfolio of sustainable coil coatings products.

Nicklas AUGUSTSSON

Determined to be the leader in sustainable coating products and solutions, Beckers is also committed to sustainability in a broader and more holistic sense. The roadshows held in India and China have naturally been designed to stimulate the perceived market potential for sustainable coatings, but they have also aspired to create a greater general awareness of the critical importance of sustainability as a concept, and to provide customers with an overview of Beckers' achievements in this field in recent decades – as well as insights into what the future holds.

Smart App offers best options

The focus of these roadshows was to demonstrate how our advanced products and technical expertise can enable customers to enhance the sustainable value of their end-products. To assist in navigating the multiple options for enhanced sustainability, the Beckers Sustainability Index App was released in 2017. This App enables not only customers but also architects, planners, designers and developers to find the most sustainable solution for a given application. The App generates a clear picture of the overall sustainability of specific Beckers coatings, offering the user a detailed breakdown of each system and its technical characteristics. The roadshows pro-

On the road: LTD Laboratory Manager Kong Chin Chew, Senior General Manager Sales & Marketing Sanjay Saxena, Business Development Director A&ME Raj Thangavelu, Global Sustainability Director Nicklas Augustsson

Hangzhou P.R.P.T Metal Material Co. Ltd

vided opportunities for presenting the updated Beckry®Therm App, demonstrating how easily customers will be able to check out the benefits of Beckers' solar-reflective coatings.

Sustainable alternatives

Bio-based coatings offer rich potential in terms of sustainable solutions and Beckers already features a number of bio-based products in its portfolio, such as Beckry®Pol Bio. The roadshows introduced several of these bio-based coatings, as well as providing some enticing glimpses of what is planned for launch in the near future.

As the industry seeks more environmentally sustainable solutions, chromate primers are becoming increasingly inappropriate. Beckers enjoys a long and proud track record concerning the development and supply of chromate-free primers and, when it comes to China and India, it seems likely that such coatings will become the natural choice, as these huge and populous countries strive to reduce their dependence on harmful materials.

Improving air quality

Another key environmental concern touched on during the roadshows was the challenge posed by the decline of air quality in urban environments and, specifically, the rise in NO_x emissions. Once again, Beckers has developed a product that can make a positive contribution in terms of greater sustainability, a coating that actually absorbs NO_x from the atmosphere: Beckry®NO_x. Just one more example of how Beckers' latest advances offer the coating industry practical and profitable solutions to more sustainable production.

The roadshows were well-received by our customers and created a lot of interest. Excitingly, it seems that the coating sectors in both India and China are starting to recognize the huge environmental and commercial benefits of sustainable production methods and materials. Beckers means to play a highly active part in this sustainable future. ■

Global Sustainability Director Nicklas Augustsson introducing Beckers at Essar Steel, Pune, India

Beckqua® waterborne coatings meet challenging requirements at SDF's upgraded facility

SDF, formerly SAME DEUTZ-FAHR, is one of the world's leading manufacturers of tractors, diesel engines and agricultural machinery. Headquartered in Northern Italy, SDF operates eight production sites around the world.

Massimo SANTORI

Spray painting by robots

Launched in 2016 and scheduled for completion in 2018, SDF's ambitious upgrade of its Treviglio facility will meet the most stringent quality requirements. Strongly committed to minimizing environmental impact, SDF has employed Beckers' waterborne coatings for more than 15 years, ensuring a significant reduction in CO_2 emissions.

In early 2016, SDF launched a major upgrade of its coating capacity, involving replacement of its two existing lines with a brand-new fully robotized line, which was up and running by the end of the year. Production capacity will rise from the current 65 units a day to 85 units a day. Additional benefits of the upgrade include a dramatic improvement in salt-spray resistance (from 240 to 500 hours), as well as a reduction in particle and solvent emissions.

To meet the new and more challenging paint requirements imposed by the upgrade, Beckers has developed a new coating system, comprising Beckqua®Prim 2K EP Primer and Beckqua®Lac 2K PU Topcoat.

Beckers cooperates closely with SDF personnel at the Treviglio facility to ensure continuous improvement in coating performance. In a spirit of true partnership, Beckers is dedicated to providing a range of products and services that add significant value to the customer's end product. ■

Beckry®Plast

Beckry®Plast – a formula for lasting quality

A unique way of creating coatings that offer very high formability, thermoplastic polymers have played an important role in the development of coil coatings alongside thermosetting paints. ▸

Jean-Pierre GENEVAY & James MAXTED

- **A solid thermoplastic polymer** such as polyvinyl chloride (PVC) can be softened or melted through the application of heat, returning to its original state on cooling. These polymers enable thick, organic coatings to be applied, using either one of two processes: co-lamination on a steel substrate (PVC film) or regular roll-coating and fusion during the heating phase (PVC plastisol coatings). Since it is a fairly rigid polymer, PVC requires plasticizers to ensure optimal flexibility for subsequent formability of the substrate. They also allow the mixture to be liquid enough for roller coating. Beckers has been refining this technology since the late 1970s, providing adhesives for PVC films but, more importantly, formulating plastisols to optimize application parameters and secure superior performance for a range of downstream usages.

"In terms of life expectancy, Beckry®Plast systems are among the most durable coatings"

Improved performance and sustainability

A pioneer of PVC plastisols, Beckers has conducted a comprehensive review of its PVC plastisol formulations over the past 15 years. An extensive R&D program has focused on the consistent improvement of fused-film performance, in line with the company's broader plans for strategic growth, while also ensuring the most sustainable solutions for end customers. Over the past few decades, the need to update plastisol formulations by replacing harmful chemicals with environmentally sustainable alternatives has become increasingly urgent. Beckers' R&D teams have not only replaced these potentially harmful elements with environmentally more benign alternatives: they have simultaneously actually enhanced the durability of these high-build coatings.

Traditionally applied on hot-dip galvanized steel, Beckers' modern plastisol systems are appropriate for well-proven chromate-free surface treatments, featuring primers with chromate-free pigments that offer the best corrosion protection (such as edge corrosion in severe environments) as well as optimal formability (as when bending and forming at low temperature).

Furthermore, Beckers' chromate-free plastisol primers are universal, ensuring full compatibility with most plastisol topcoats commonly available on the coil coating market. The superior cross-linking properties of this Beckers primer eliminate the potential swelling that can be caused by aggressive plasticizers, on which some dramatic delamination problems experienced with roofing and/or cladding have been blamed in the past.

Our PVC plastisol topcoats have also been subject to dramatic advances in recent years. These have derived in part from a major R&D program that has focused on identifying and validating the ideal mix of acid scavengers, heat and UV metal soap stabilizers (to inhibit dehydrochlorination), as well as the use of the latest HALS (Hindered Amine Light Stabilizers) and UV absorbers.

Geared to market needs

The global market for PVC plastisol coated steel is estimated at approximately a half-million tonnes. Apart from a number of interior applications (e.g. cold rooms), PVC plastisol coatings are generally specified when longevity is a key priority, as for especially extreme corrosive environments. The historical success of these products may be attributed to their high corrosion-resistance when used in the coastal regions of Northern Europe, as in Ireland, the UK and the Nordic countries.

Bohus-Malmön, Sweden

For exterior usages such as cladding and roofing, the standard recommended thickness is 200 µm (nominal), even though some countries may often accept 175 µm. Some applications were also developed for particularly challenging environments such as the French West Indies, featuring a limited range of colours due to high UV levels and an unusually corrosive environment.

Different grades of PVC resin (selected to achieve required gloss levels) are dispersed in a carefully balanced mix of plasticizers, resulting in plastisols that are formulated by Beckers to fulfil the latest and most stringent coil coating requirements. They combine advanced rheological properties and good processability (e.g. for high speed coating lines), quick and homogeneous film building and excellent mechanical properties with impressive outdoor durability.

The Beckry®Plast formulation platform allows us to offer a range of hardness values tailored to suit almost every end use, while continuing to provide the same excellent resistance to acids, bases, detergents, chlorinated solvents and other corrosive materials. This outstanding chemical stability, together with the barrier effect obtained by applying a very thick coating (200 µm), ensures optimal corrosion resistance in the most severe industrial and marine environments, as well as a high level of resistance to abrasion and mechanical damage.

The aesthetics of PVC plastisols

The Beckry®Plast range of PVC plastisols offers a multitude of exciting finishes and colours that can be applied in film thicknesses of between 100 µm (interior only) to 200 µm. Finishes can be entirely smooth or embossed, featuring light graining effects or a 'leather look', achieved by embossing a texture to the hot, fused film, immediately prior to exit from the line ovens. A characteristic striated effect can also be achieved by manipulating rheological properties and careful adjustment of roller speeds during application. Of course, Beckry®Plast plastisols are available in the full range of traditional RAL building colours. Bespoke colours can also be produced to match specific requests.

Great care is taken to ensure that every pigment chosen in creating a specific colour possesses the appropriate chemical stability and durability. We also make sure pigment content is properly optimized, since this not only affects coating rheology in the wet film, but also, in the dry film, it affects UV opacity. Beckers has developed special software that accurately predicts the UV opacity and delamination resistance of any formulation. Both considerations can in some instances limit the availability of certain colours. ▶

Enhanced corrosion protection

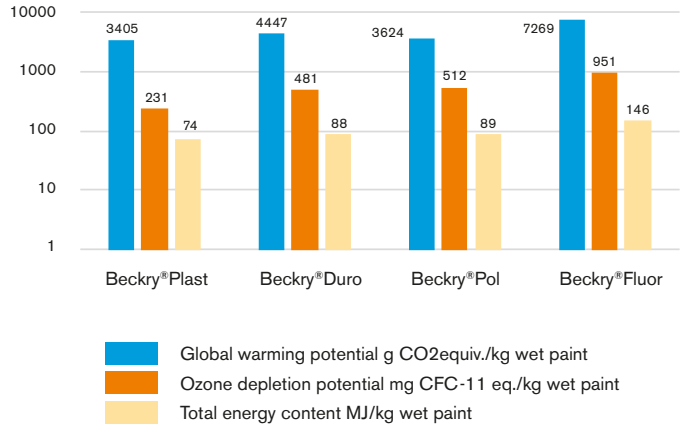
The Beckers database of accelerated corrosion testing of Beckry®Plast systems is extremely comprehensive. With years of experience of outdoor weathering on Sweden's west coast, Brittany in France and at numerous industrial sites, as well as the carrying out of countless building surveys, Beckers has gained a thorough understanding of how Beckry®Plast systems perform in severe corrosive environments. This makes us confident in claiming the excellent durability of these products.

Over the past ten years, the data accumulated from these severe corrosion tests has demonstrated dramatic improvements in the latest formulations. Excellent resistance has not only been demonstrated by conventional salt spray testing (1 000 hours) and Prohesion testing (1 000 hours), but also by the Sakaï test (demineralized water, one week at 90 °C) and by the Cataplasm test (stacking and cycling test over 42 days in a tropical cabinet). These latter two tests are among the most discriminating currently in use.

Increased UV resistance

As noted above, formulations have been successfully optimized to significantly reduce the photo-oxidation and migration of plasticizers.

Environmental Impacts of Common Coil Systems



Adopting the latest UV protection and UV absorption science has also significantly reduced all photodegradation phenomena typically encountered in PVC plastisol systems, enabling very high levels of UV durability. Conventional QUV A and QUV B UV/condensation tests have been employed, involving up to 6 000 hours of exposure , as well as the more recent method of hot QUV A (irradiance 0.89, UV cycle 8 hours at 80 °C, humidity cycle 4 hours at 50 °C). Xenotest exposures of up to 3 000 hours have also been conducted, together with SEPAP testing (up to 2 000 hours). This last test involves chemical analysis following exposure, to check for any degradation of the PVC resins and plasticizers' mix, at the surface as well as at depth in the 200 µm film.

Furthermore, Beckers has used a QUV B 4000-hour test as part of its routine testing, to check for perfect resistance to delamination of the components in a sandwich panel. In addition to these accelerated laboratory tests, Beckers conducts extensive outdoor weathering tests in Florida, Arizona (EMMAQUA), Australia (Allunga open and hot racks for two years), Bandol (in the south of France) and South Africa.

Greater sustainability

In contrast to 'conventional' coil coating paints, Beckry®Plast topcoats offer the great benefit of a high solids content (i.e. > 90 %). Lines can apply high thickness layers, offering economical coverage and almost zero solvent content. Whilst most coil lines capture 98 %+ of all VOCs in the ovens, such high solids significantly reduce the problem of fugitive emissions and improve working conditions in less well-ventilated coil coating areas.

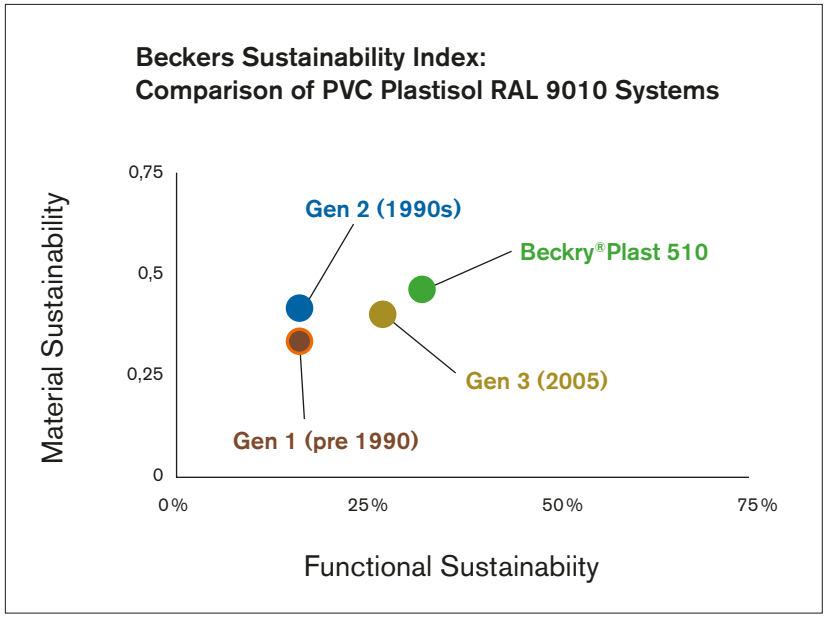
This is not the place to debate the sustainability of PVC, but it is worth recalling that it is the only polymer that is derived from more than 50 % mineral raw material – i.e. sodium chloride/salt (NaCl), which is an almost unlimited global resource! This partially explains the reduced environmental impact of PVC plastisols compared to other common coil coating systems. The diagram shows Life Cycle Analysis (LCA) results for three impacts: global warming, ozone depletion and embodied energy for a 'Cradle to Gate' LCA conducted on 1 kg of finished paint (excluding in-service and end of life impacts). In every

respect, the Beckry®Plast PVC plastisols score low on environmental impact.

In terms of life expectancy, Beckry®Plast systems are among the most durable coatings. They offer the highest longevity of functional sustainability for the building envelope. Moreover, the elimination of heavy metal stabilisers such as cadmium or tin, the use of phthalate-free plasticizers and chromate-free primers have all contributed significantly to improvements in the formulation's material sustainability.

Both aspects of sustainability (material and functional) result in Beckers' PVC Plastisol having a high level of overall sustainability. This is clearly demonstrated by the Beckers Sustainability Index.

The graph to the right shows how our R&D efforts are delivering benefits in material sustainability (i.e. the sustainability of the materials and processes employed in the manufacture of our plastisols) and functional sustainability (i.e. the sustainable value our plastisols impart to the coated product, such as roofing or cladding).



1. Generation 1 *containing heavy metal stabilisers over chromated primer (pre 1990)*
2. Generation 2 *containing tin and phthalates over chromated primer (1990)*
3. Generation 3 *heavy metal-free, phthalated-based over chromated primer (2005)*
4. Beckry®Plast 510 *phthalate-free, metal-free stabilisers over chromated-free (2017)*

The way ahead

Precoated metals are widely used for building construction, both for roofing and cladding. Plastisol coatings, including Beckry®Plast, are used extensively in the coastal regions such as those of Northern Europe, where high corrosion resistance is an absolute requirement.

As already noted, Beckers' research has generated steady advances in plastisol formulations over the years, offering greater sustainability while enhancing anti-corrosion properties and UV resistance. The strong mechanical resistance and 'self-healing' properties of thermoplastic plastisol coatings appeal to the construction industry, which tends to equate high film thickness with high quality. Given the demonstrable material and functional sustainability of these plastisols, we are convinced the technology will continue to deliver quality to coil coaters for decades, enabling the ongoing production of sustainable and durable building products.

Looking ahead, determined to develop our well-proven plastisol concept, we have set new targets for performance and sustainability based on a chemistry that will allow us to develop tough, thick-film coatings, featuring corrosion resistance similar to PVC plastisols, including the same or better scratch resistance and 'self-healing' properties, yet offering improved UV durability for hot tropical and subtropical climates – where PVC plastisols have certain limitations.

The time has come to introduce the benefits of elastomer chemistry to the coil coating world! Our R&D chemists are writing a new chapter of Beckers' history. Polyurethane chemistry offers the exciting possibility of formulating thick film, elastomeric systems that can satisfy the most advanced and demanding specifications in terms of abrasion resistance, chemical resistance, reduced thermal absorption and increased UV durability. ■

Innovative anodized effect

Thanks to the latest advances in paint technology, plastic substrates can now be finished in a range of anodized effects that closely replicate the appearance of anodized metal. The 'glimmer' and 'grain' effect is seen from every angle. The grain size and colours of the metallic effect can be adjusted as required.

Monica WANG & Linda SNIS

Anodic oxidation is an electrochemical method of producing an oxide film on a metallic substrate, such as aluminium. The resulting metal oxide film alters the surface state and properties, changing its appearance, increasing corrosion-and-wear resistance and contributing to greater hardness.

The conventional anodic oxidation process employs an acidic liquid as medium, a process that generates greenhouse emissions in the form of perfluorinated chemicals (PFCs). By adopting the new coating application to create an anodized effect on plastic substrates, this process is completely avoided.

Cooperating closely with Beckers, VIVO, a popular domestic brand of mobile phone on the Chinese market, has decided to introduce a range of anodized effect finishes on its products. Following a dedicated programme of research and development, the Beckers team has successfully introduced a number of anodized effect coating concepts at VIVO. Available in several colours, the new anodized effect coatings are helping transform mobile design.

Compared to the anodic oxidation process, anodized effect coatings are more cost-efficient and environmentally sustainable. Unsurprisingly, growing numbers of OEMs are expressing interest in cooperating with Beckers to exploit this new application. ■

New fast curing non-isocyanate coatings

One of the key projects on which Beckers' Industrial Coating's Long Term Research (LTR) laboratory is currently focused is fast curing coatings technology. Initiated in 2014, the project has led to the development of a robust and fully functioning two-layered coatings system, the result of active and ongoing joint development between the LTR laboratory and a polymer manufacturer. ▸

Rumman AHMED

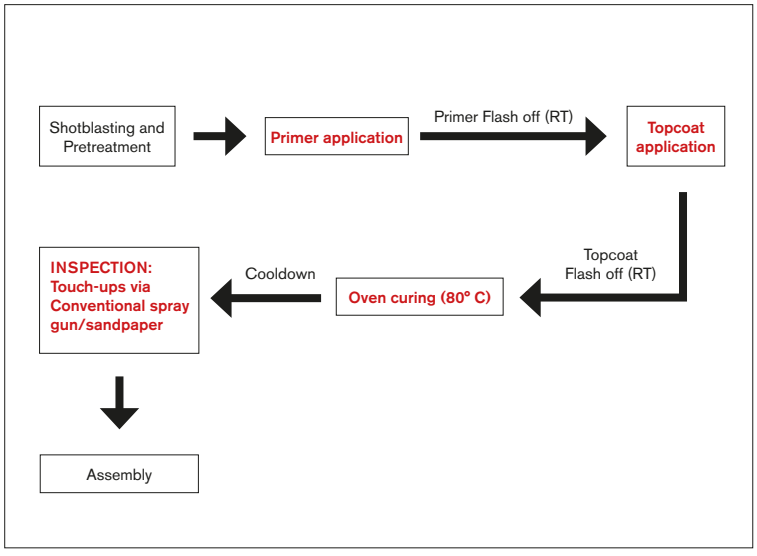


Figure 1: Line application sequence and process in a typical ACE line

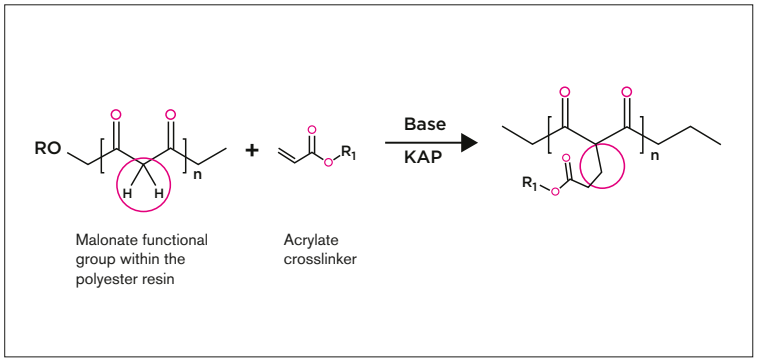


Figure 2: The curing schematic

This coatings system is targeted specifically for applications in the Agricultural, Construction and Earth moving (ACE) sector. The ACE market currently utilises a two-layered approach where, in most cases, the primer consists of a two-component (2K) epoxy coating, the topcoat frequently being a 2K polyurethane layer. The setup and nature of the paint application process adopted by customers' OEM lines necessitates a *wet-on-wet* process. Consequently, any newly developed coatings technology must be compatible with these requirements. By definition, the *wet-on-wet* process entails application of the primer with no subsequent curing, a brief room temperature (RT) flash-off period and direct application of the topcoat. This combined coatings system is then cured at elevated temperatures (e.g. 80° C) – see *Figure 1*.

As noted above, due to the application specificity of ACE application lines, the much higher curing rate of this fast curing product (compared to existing epoxy primers) – resulting in poor appearance and, in particular, excessive wrinkling – could not be leveraged across and utilised for the ACE coating sector. Over the course of two years, a fundamental review of *structure-property-function* relationships was conducted, leading subsequently to the design, development, formulation and testing of custom-made primers and specific topcoat resins for *wet-on-wet* applications, offering comparable or superior coatings performance than the current market technology.

The many attractive and game-changing features of these non-isocyanate (NISO) coatings include fast curing speeds, low-temperature curing, high solids/low VOC and superior chemical resistance. In terms of the chemistry involved, this technology utilises the well-known Michael Addition concept, resulting in a carbon-carbon crosslinked bond in conjunction with a blocked catalyst *(Figure 2)*. The primary components feature:

- a polyester resin (containing malonate functional groups)
- a multifunctional acrylate crosslinker
- a blocked (latent) base catalyst
- a Kinetic Additive Package (KAP).

In this form of 2K paint technology, the A component contains the resin, crosslinker (1:1 stoichiometry) and KAP, while the B component comprises the base catalyst alone.

The mechanism sequence is as follows: a standard free hydroxyl base would deprotonate the C-H groups of the malonate immediately – rendering immediate reactivity (between deprotonated malonate carbanions and acrylic crosslinkers) with a non-existent pot life, leaving the technology impractical for real-life OEM line applications.

However, the real advantage of this new process derives from the blocked catalyst, which allows the extremely fast crosslinking to take place post-application (as desired), whilst simultaneously maintaining the longevity of the paint's pot life. *Figure 3* shows the difference between using a blocked catalyst and a free catalyst, on mixing both A and B components for 45 seconds.

Once the catalyst deprotonates the malonate groups, the resulting carbanions readily react with the acrylate functional groups, forming the new carbon-carbon bonds – the primary basis of the curing process. However, before this happens, the KAP is consumed prior to the resin/crosslinker reaction – enabling the formulator to tune the open time of coatings (for paint levelling, solvent elimination and early hardness build-up).

Moving to the layer beneath, the primer developed in conjunction with the new topcoat technology is based on a modified 2K technology, in which a blocked polyamine reacts with an acrylic resin. The overall formulation and individual components have been significantly modified to match the kinetics of the topcoat reaction speeds, to enable application on ACE lines. Consequently, both topcoat and primer cure at comparable rates, yielding two-layered NISO coatings offering exceptional performance and an excellent finish (on a par with the current technology – see *Figure 4*). It is worth adding that this primer offers excellent corrosion resistance, comparable to that offered by epoxy resins.

The next step of the project entails further optimizations involving scheduled line trials at a customer's site. ■

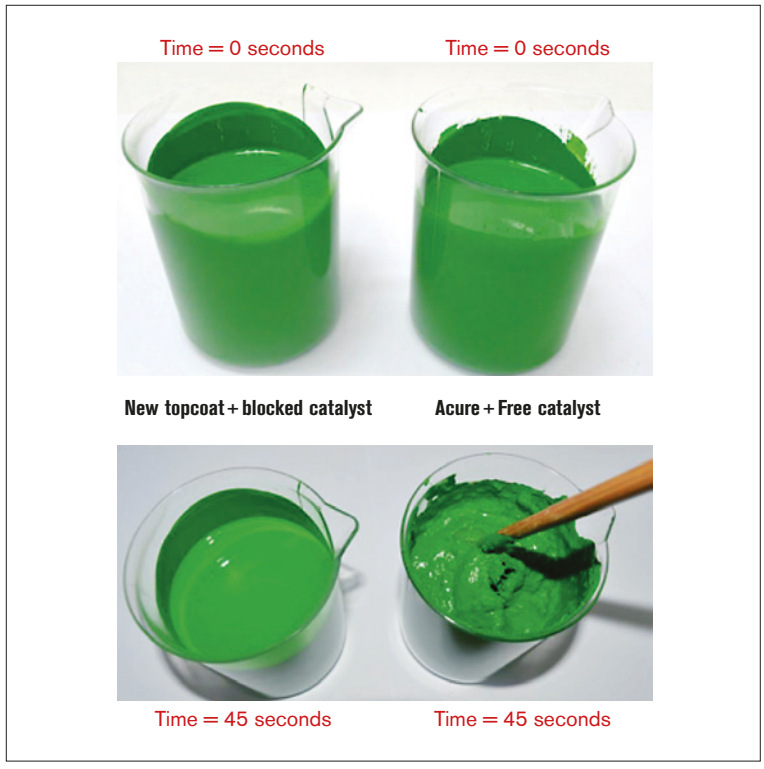


Figure 3: The effects on the paint's pot life: blocked catalyst versus unblocked conventional catalyst

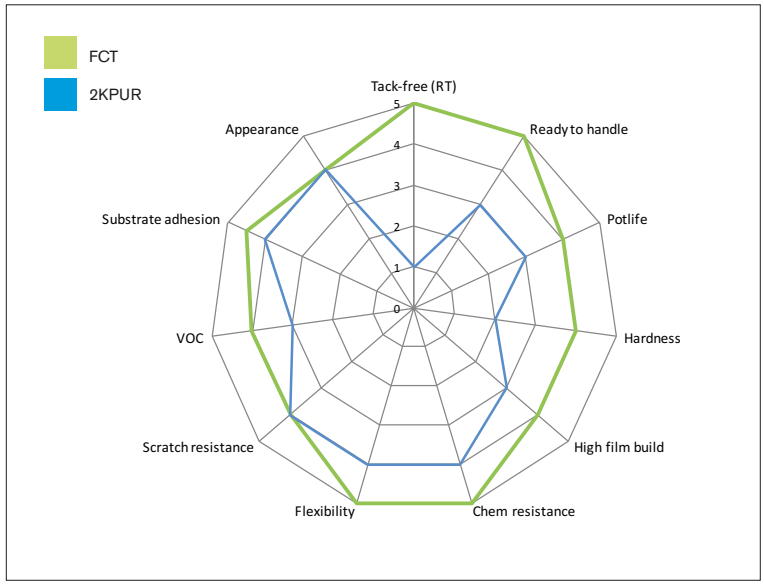
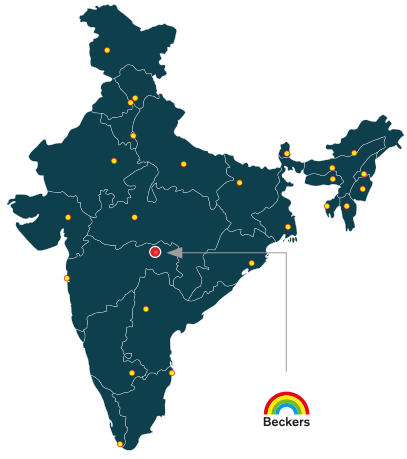


Figure 4: Performance of fast-curing coatings versus standard 2K PUR

Feeding the Indian tiger



According to the Central Statistics Organisation (CSO) and International Monetary Fund (IMF), the Indian Economy is the fastest growing major economy in the world, with gross domestic product (GDP) for fiscal 2017–2018 forecast at 7.7 %. This makes India the strongest economy among the G20 nations.

Morisetty SRINIVAS

This burgeoning economic growth is fuelling dramatic industrial development and ambitious investment in numerous infrastructure projects. One consequence is India's fast-growing demand for steel and steel products.

In light of this huge expanding market potential, the Beckers India* management team recognized the need to establish an additional manufacturing site in India, dedicated to servicing customers in central, northern and eastern parts of the country.

Ideally located

The choice fell on Nagpur. Ideally located in the centre of the country, with excellent road, rail and air connections, Nagpur is the fastest growing Tier-II city in India, featuring a good range of industrial and higher educational institutes. An additional attraction was that one of our key customers, JSW Steel Coated Product Ltd, is also based in Nagpur, with many other customers in relatively close proximity (500 – 600km).

The 28 000 m^2 site was acquired in 2013 and, by September 2015, the plant was ready for commissioning.

Space to expand

Operating at an initial capacity of supplying paints for 6 000 tonnes of coil coatings per annum, the plant's state-of-the-art production equipment and laboratory facilities have been designed to enable an increase in capacity for supplying up to 24 000 tonnes per annum.

With this in mind, the factory building has been generously dimensioned, covering an area of no less than 10 000 m^2.

Although 2015 proved challenging, with a decline in demand for coil coatings across the Indian market during the latter half of the year, import restrictions introduced by the Indian Government in early 2016 helped stimulate demand for domestically-produced materials, including coated sheet.

The new plant was brought on line in July 2016, with some experienced staff from our Goa Factory moving to Nagpur to help their new colleagues achieve a smooth start-up. As with any new project, it took a few months to resolve a number of teething problems, but the plant is now operating at full capacity.

As noted above, demand for precoated steel sheet is on the rise again, and we are already considering plans to further expand existing capacity. India seems hungry for precoated sheet – and we, like our customers, are determined to satisfy the nation's appetite. ■

QC Officer Kunal Kherde at the colour computer

Process tanks

* Beckers India is a joint venture between Beckers and Berger Paints.

Innovation – we create and deliver value

Beckers innovative trend-setting coating solutions create new business opportunities by catering to tomorrow's design and legislative priorities. By anticipating future demands, we help customers accelerate their products 'time-to-market'.

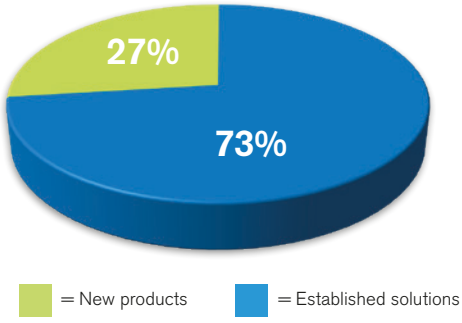
Michal STASIAK

Sustainability and process improvements are key

We focus on development and innovation:
20% of staff working in technical functions
3% of annual sales are invested in R&D

New products developed over the last years are:
High coverage topcoats, primers and backcoats
NIR and induction cured systems
New textured topcoats polyester and polyurethane based
Multilayer systems with different chemistry
Bio-based paints

Coil Coatings: Volumes sold 2016



Greetings from the CTO

Dear Readers,

In this latest issue of Beckers Magazine, we would like once more to underline our firm commitment to drive a technology leadership aspiration across our markets. Featuring a number of highly promising technological developments, this issue will clearly demonstrate how we mean to continue to contribute to our customers' success, while at the same time fuelling the industry agenda for more environmentally viable coatings solutions.

In the past twelve months, based on our 2016 practice and innovation portfolio review, we have addressed two key areas of development. We further adapted our group innovation organization to better meet perceived future needs with regard to coil coatings and we have succeeded in several strategically important product development projects entering the final development and line-trial phase.

In the light of current industry trends and a broad customer feedback, we have determined a clear need to focus on even more technically advanced customer services and support across all markets. This led to an expansion of the Beckers Group innovation organization in 2017, through the establishment of a new key global function in the form of a dedicated Group Technical Director Coil Coatings, reporting to the CTO. The position focuses strictly on customers' joint technical business-development needs, anytime and anywhere, in close cooperation with our local Beckers entities and customers. We believe this step-changing organizational change will ensure the consistent provision of Beckers' dedicated world-class industry expertise, assuring our customers' ongoing access to tailored technical solutions. In this context, allow me to welcome our first Group Technical Director Coil Coatings, Dr. Paul Davies, a highly respected member of the coil coatings technology community, to the Beckers family.

Addressing the theme 'new sustainable products in the pipeline', I'd like to draw your attention to two articles featuring the introduction of superior new industrial coatings solutions for our Automotive Exterior Plastic and ACE business segments. Our new waterborne base coat for exterior plastic applications in the automotive sector has just successfully completed its first line trials and is scheduled for market introduction in 2018. We are also pleased to report the development of a new fast curing technology for the global ACE markets, enabling significantly reduced curing times and temperatures in our customers' coatings processes.

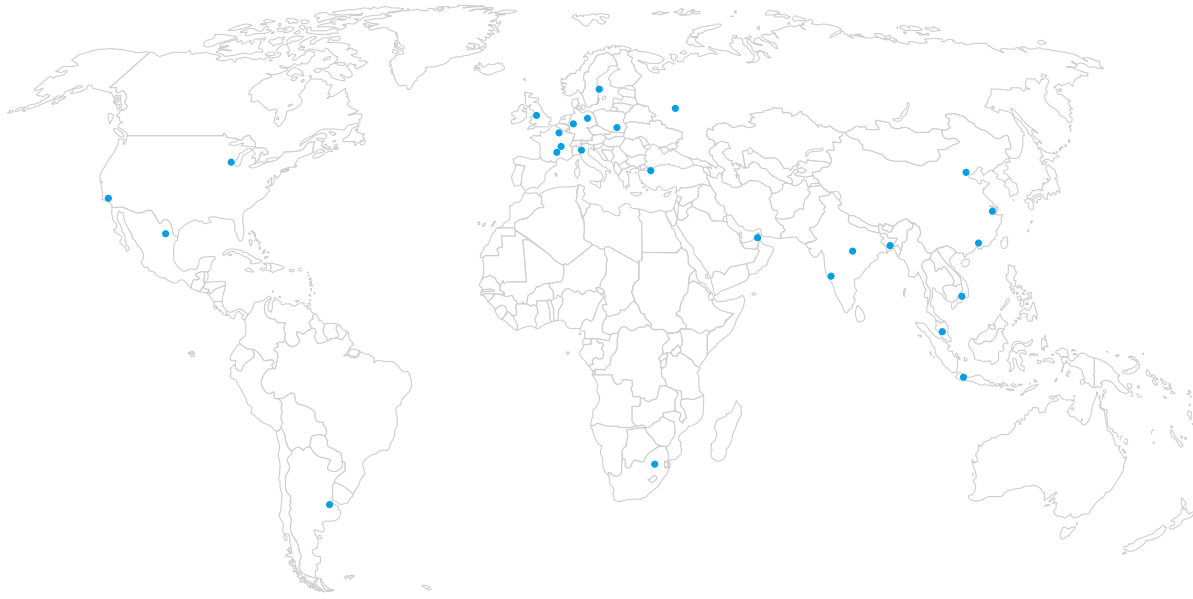
A highlight of our 2017 product development programme was the transition to the final development phase of the first high-solids elastomeric coating of its kind. This product family offers a global alternative to more conventional plastisol applications. The past year has also seen significant progress on new next-generation high-coverage systems, textured topcoats and bio-based paints, as well as new multilayer systems based on alternative chemistries.

As a first, I should also like to provide a truly transparent assessment of our innovation performance and continued investment in new products. We have for the first time quantified the number of available new solutions for our customers, demonstrating that 27% of our coil coatings sales in 2016 involved newly developed products. We are determined to maintain this pace of development, with a view to accelerating product innovation and time-to-market.

As for sustainability, our commitment is unrelenting. We mean to lead in sustainable industrial coatings solutions in the broadest and most holistic sense. In 2017, we further raised the bar to the next level, making our Beckers Sustainability Index tool more broadly and instantly available by going digital. By accessing the Beckers Sustainability Index App and video clip, customers learn how coil coating systems can enhance the sustainable value of their end products, while end-users gain new perspectives on forward-looking and more sustainable building solutions. The App has generated highly favourable market and stakeholder feedback, attracting considerable attention at the ECCA (European Coil Coaters Association) autumn congress, as well as being nominated for the British Coatings Federation Innovation Award.

I hope you will enjoy this latest issue of Beckers Magazine and find our consistent commitment to the development of innovative and sustainable coating solutions stimulating and informative. Good reading!

Dr. Bernd Vogel
CTO



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