

Materials technology company TenCate

The year 2015 marks the 311th anniversary of the inception of Royal Ten Cate (TenCate). This year the company will have borne the designation 'royal' for 163 years and TenCate will have been listed on the Amsterdam stock exchange for 61 years. Since 2000 materials technology company TenCate has focused on finding sustainable solutions to protect people in their working and living environment. Worldwide, the 4,800 or so employees of TenCate make a difference by developing and producing protective materials, modules or systems. These advanced solutions can turn undesirable events into a life-saving experience.

Protecting people with materials that make a difference

Societies, communities and organizations across the world have an increasing need to protect people and their working and living environment against countless threats and dangers, whether these are caused by nature or by man himself. In providing such protection, advances in techniques and technologies, materials and solutions, production and processes have opened up ever more possibilities. The TenCate textile technology group has long placed people at its very heart in its search for optimal protection through the use of technical textiles and material science.

Firefighters, police and other emergency services can be deployed more safely, rapidly and flexibly, as advanced fabrics protect them against burns and heat stress. Aircraft and vehicles are becoming ever lighter, stronger and more fuel-efficient, with reduced noise levels. Composites protect crew, passengers and cargo, while military personnel can be more broadly and better deployed during defensive actions and reconstruction operations. Advanced fabrics, armour and protective systems help soldiers to survive. The inhabitants of coastal regions are made safer against super-storms or flooding, while those living in mountainous areas are guarded from the dangers of landslides or subsidence: geotextiles protect them. Athletes can develop the technical aspects of their sport more broadly and perform better: high-grade synthetic turf systems protect them during matches when making sliding tackles or sudden movements or jumping for the ball.

The binding factor between these various markets and solutions is textile technologies and their combination with other techniques. For more than 310 years TenCate has been engaged in increasing knowledge, skill and experience of textile and non-textile materials and processes. In recent decades the focus has shifted entirely towards technical textiles and related advanced materials, modules and systems. Technological knowledge alone, however, is not sufficient; a clear incentive is needed. The indispensable driving force behind the successful and targeted application of technology is the fact that it is being used for people: knowing why and for whom the technology is intended. This understanding

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provides direction and lends weight to daily operations. Excessive attention to detail, such as craftsmanship merely for the sake of knowledge and skills, or an inward-looking focus, results only in improvements to techniques, machines or processes, not in enhanced usefulness to society and individuals. Technology only really makes a difference when it is applied with or derives from a knowledge of the protection that people need and of the threats and opportunities in the world.

TenCate seeks to make that difference and to name the driving force that has for many decades and centuries contributed to the international community: Protecting people with materials that make a difference.

Since 2000: TenCate has been growing, underpinned by its long-term vision of transformation

In the past years TenCate has undergone the following profound changes:

- From a diversified conglomerate into a coherent technology group with leading positions in niche markets worldwide;
- By applying focus a unique company has been created that is distinctive in the functional materials sector (technical textiles);
- From a locally-based company in Twente into a multinational, operating on four continents;
- From an anonymous B2C company in consumer markets into a visible B2B company with leading-edge solutions in the field of protective fabrics, aerospace composites, armour, infrastructure and water management and synthetic turf;
- From a manufacturer of finished and semi-finished products (production-dominant) into a supplier of integrated system solutions with partners (outside-in approach);
- By placing the emphasis on groundbreaking technological renewal and open innovation, both independently and with partners in the value chain;
- By putting sustainability criteria increasingly at the heart of both the production processes and the inherently sustainable solutions that it produces for market participants, such as lightweight, recyclable materials.

I – Where TenCate has come from through perseverance

TenCate has a long history that stretches back as far as 1704. The company received the designation 'Royal' on 11 July 1852 in recognition of its revolutionary industrialization of the textile production of the day. TenCate was at that time already able to absorb technologies that were being used outside the Netherlands, such as British steam technology, which was brought to the attention of TenCate by the Dutch King, Willem III.

A second significant year is 21 May 1954, when TenCate moved from its status of family company to receive a stock market listing in Amsterdam. As a listed company, TenCate set in train a process of internationalization that is still important to the multinational today.

In the second half of the 1990s TenCate abandoned its then strategy, which was based on diversification and the scaling down of all its textile activities. The company then embarked on a complete turnaround, in vision, mission, strategy and structure, and in the implementation of this strategy and its operationalization.

At the beginning of the 1990s consumer textiles still played a central role within TenCate. In the preceding years the company had lost its focus as a result of diversification. Moreover, it was being 'squeezed' in the many value chains in which it operated at that time. Both suppliers and customers were also wedging the company in, because TenCate had insufficient added value and only a modest level of distinctive ability.

In the past the company had suffered from a production-dominant approach and operation, which was firmly anchored in craftsmanship. Even though the company had all the required knowledge and expertise in areas such as fibres, yarns, fabrics and finishing, it was not sufficiently aware of how its customers saw TenCate products. This inside-out approach could lead to a customer seeing a product as a specialty for example, whereas TenCate considered it to be a generic product.

Since 2000 the new strategic direction has been based on the one hand on establishing market leadership in niche markets for technical textiles, in which TenCate with its knowledge and experience of textile processes and formulae can offer added value (market focus). And on the other hand, on introducing a management model that is based on global value chain management. This area of activity has been moving since then into the field of material technology, on the basis of which ever more new advanced textile materials are continuously being created. And it is this that gives TenCate its innovative character.

In more than a decade TenCate has developed a new business platform of activities that reflect global trends. Markets follow social themes and developments. TenCate operates exclusively in growth markets that are driven by global growth trends and the TenCate **Buy & Build** strategy reflects this. This strategy was in part financed by the **Fix it – Exit** component of the strategic process. As a result, since the beginning of the 1990s the company has abandoned its non-textile activities in line with the company's new market focus. Since 2000 TenCate has acquired more than twenty companies worldwide, which have been integrated into the group.

This innovative approach secured the Erasmus Innovation Award for the company in 2007, in recognition of the way in which TenCate interweaves technological and social innovation. In the opinion of the jury, the TenCate organization can be characterized by a unique form of entrepreneurship and long-term objectives, in which innovation and efficiency play a central role.

II – Where TenCate is purposefully heading

The context within which TenCate operates can be described as ‘the risk society’. By specifically indicating the global social trends and the market themes derived from these, the company continues to be connected to its environment. At the same time social trends and underlying themes also boost the demand for certain materials. The global trends on which TenCate focuses are: **safety and protection** and **sustainability and the environment**. The related underlying market themes that are important to TenCate include: increased threat, personal safety, fuel efficiency, environmental protection and water management: the protection of people in their working and living environment.

The foundation underpinning the activities of the TenCate technology group is of a distinctive calibre. In the past ten to fifteen years, specialization in the production of functional, technical fabrics with high-grade characteristics has come to occupy a central role. In fact, TenCate began to specialize, at a higher level, in what it had already for centuries been good at: the development, production and finishing of high-grade textiles and extruded materials. New potential applications and new markets have come to take pride of place. Focus, product renewal and technological innovation provided the framework of the company’s long-term vision: the protection of people in their working and living environment. As a result, achieving added value for end-users has become the company’s guiding principle.

Technology clusters (sectors) have been formed within TenCate, in which the purchasing of raw materials (buying power), based on distinctive technologies, has been concentrated. At the same time, market windows (market groups) have also been created with a series of related **product-market-technology** (PMT) combinations, in which the technologies involved play a pivotal role. These basic technologies are complementary.

The market windows were selected to meet the following criteria:

- Market growth is required to be at least 10 per cent;
- Market requirements are based on critical, functional characteristics;
- Specifications of materials are subject to national and international standards, legislation and regulations;
- The markets concerned have relatively high access thresholds.

Through its existing and new series of PMT combinations, TenCate follows global trends and developments. Its solutions and modular system approach predominates. The requirements and expectations of end-users, such as the emergency services, industrial workers, sportspeople or users, play a central role.

By seeking solutions and operating its system approach (single product systems, multi-product systems, integrated systems), TenCate is coming ever more frequently into contact with other technologies, participants and markets. TenCate is operating to an increasing extent in open innovation networks in which its own specific knowledge and experience form part of the solution. This will result in the continuing creation of exciting new PMT combinations and corresponding market windows. Examples include composites for automotive industry and structures such as bridges and buildings.

TenCate has two basic technologies: the first of these, in addition to fibre and fabric technology, is analogue and digital **finishing technology**. The related market windows are: protective fabrics, outdoor fabrics and composites for aerospace, automotive products and armour. The second, in addition to non-woven and grid technology, is **extrusion technology**. The related market windows are: geotextiles, industrial fabrics and synthetic turf.

The creation of maximum added value through value chain management forms the framework of the TenCate strategy. Applying the TenCate business model, the company operates from its own strength. Outside-in thinking has become its guiding principle. System-oriented solutions provide the answer to the ever-changing requirements and expectations of the outside world - the end-users.

Thanks to the expertise that the company has acquired, in-depth, targeted consideration can be given to changing customer requirements. Each new product that TenCate intends to develop must be grafted onto prevailing customer demand or new national and international standards, legislation or regulations. **Pull marketing** is the sales tool that is used to draw up or develop specifications at an early stage together with the customer – the **end-user**. Being able to respond to new and existing specifications is an important competitive tool. The key points here are: brand strategy, time to market (including the R&D process) and the creation of standards relating to specifications that apply in the market.

The standard can constantly be raised by influencing end markets (decision-making units) on standards in a variety of ways or by creating or enforcing new standards with the aid of innovation. This will have the positive effect of encouraging both existing and potential customers to approach TenCate with innovative questions and requirements. Market potential plays a key role in solutions from TenCate.

The core of the TenCate strategy is based on the one hand on its **Buy & Build component** and on the other hand on its **Fix it – Exit component**. This creates a focus on markets for advanced materials, in which smart materials are playing an increasingly important role.

The preconditions for the TenCate strategy are:

1. **Market leadership** (critical mass)
2. **Growth**
3. **Balanced product portfolio** (market share and market growth)

Fix it – Exit. Anything that is not related to high-tech materials (such as technical textiles) – and thus does not form part of the core business of TenCate – comes under the Fix it – Exit component of the company strategy. These business units will first be made healthy and then sold, with the proceeds being used for new acquisitions.

Buy & Build. The Buy-element of this strategy component is driven by the mission to secure market leadership and to achieve growth based on TenCate technologies. This involves complementary products, complementary markets and complementary technologies. This means that an acquisition or interest may no longer be of the same kind, but must always expressly add something, with a view to securing a stronger position in the value chain.

This strategy requires value chain management for greater control of the chains in which TenCate operates. This will entail strengthening purchasing power at the back-end of the value chain by increasing critical mass. And at the front-end of the value chain – towards the customers of TenCate’s customers - better positioning of the brands and making the added value visible through commercial alliances, joint ventures and acquisitions. This last constituent is the Build element within this strategy component, which focuses on investments in advanced materials. In this way step by step technical textiles are gradually being expanded towards smart textiles.

As part of its Buy & Build strategy, TenCate seeks to make horizontal acquisitions within the business model it operates. The company is growing horizontally within the value chain; there is no forward or backward integration. Joint ventures with – or full acquisition of - companies that, above all, have related or complementary technologies help the company to grow. Its position in the value chain is the decisive factor for such a candidate. If this candidate is in approximately the same link in the value chain, then TenCate may well be interested.

Since 2000 TenCate has made a large number of acquisitions, which strengthen the positions of the company on all four cornerstones of the business model. TenCate prefers to buy companies that have a hidden value, especially if the

company involved has a particular technology that TenCate considers to be of crucial importance for implementing its strategy, and which it does not itself yet have in house. By very specifically rationalizing surplus costs and linking hidden qualities (patents, brands, people, machines and manufacturing potential) to existing business units, new profitable revenues can be generated relatively quickly.

When managing its position in the value chain, a company can be assessed on its flow of goods and the added value that this generates. This begins on the input side with the raw materials. By operating globally from a position of leadership, benefits can be gained from regional price differences and economies of scale, thus creating buying power.

In the business model product differentiation and cost leadership are in alignment, as are end-user marketing and technological innovation. The higher the added value, the sooner customers discover how unique the products and solutions are that TenCate offers. In the field of cost control and product differentiation in particular there is complementarity: focusing purely on costs leads to little product differentiation, while focusing entirely on a differentiated product range results in less efficient production (small production runs, changeover costs, additional working capital, etc.).

Cost leadership is seen as the last line of defence of the business model, whereas product differentiation is considered to be an offensive market approach. Business units will constantly have to assess the comparative merits of these two extremes.

The four cornerstones of the TenCate business model are (clockwise from bottom right):

1: Cost leadership (internal focus, relates to flexibility, last line of defence). The first cornerstone relates to cost leadership, which involves both volume products and specialties. It forces the company always to be extremely conscious not only of costs, but also of its production methods (and the related cost aspects), with its margin policy, the smarter use of processes, organizing logistical streams, reducing environmental costs, etc. At the same time it ensures that a balanced product portfolio is maintained with expansion products, exploitation products and elimination products.

2: Product differentiation (external focus, relates to the value propositions, offensive market approach). This is an offensive element in the TenCate strategy and is closely associated with the product life cycles. It compels the company over and over again to bring new products to market, because in practice every expansion product will eventually become a commodity, with its high quality, unique characteristics, distinctive capacity, low price and large market share slowly or

rapidly petering out. The precondition for a good balance between product differentiation and cost leadership is a flexible organization (through social innovation). It is essential in daily practice to continue to link 'effectiveness' (doing the right things) and 'efficiency' (doing things right). Ultimately, this is all about people's motivation.

3: End-user marketing (external focus, relates to market pull, spec selling and industrial branding). The key principal here is not to 'push' products onto the market, but to allow demand to be created by the end-user. This is spec selling: specifying the product to the right people or agencies. This must be combined with a marketing strategy that increases the visibility of the products in the market. One of the activities involved in this is well-considered industrial branding in accordance with TenCate brand architecture, thus putting both the corporate brand and the aligned product brands clearly on the map.

4: Technological innovation (internal focus, relates to creativity, breakthrough and sustaining). Technological innovation and product innovation are not identical. Breakthrough technological innovations are necessary to safeguard the future. It is essential to develop existing products further, by means of existing (*sustaining*) technological innovations and underpinned by an active intellectual property policy (patents, brands, formulae). Acquisitions will enable the company to obtain technology that will strengthen the position of TenCate in the market or will produce related PMT combinations.

III – What TenCate as an entrepreneurial company stands for

The culture of TenCate can be described as open, enterprising and critical: an environment that leads to creativity and renewal – social innovation. The challenge is to continue to select the right ideas for further development insofar as they are in line with the strategy and provided they have sufficient market potential. Customer demand and market changes play a crucial role in this. The key words are soundness, demanding specifications, reliability of delivery and high quality products for sustainable solutions. Cooperation with numerous partners in both closed and open innovation characterizes the close connection with market developments and social trends.

The Executive Board of TenCate – together with the team of globally responsible group directors at the market groups – plays an active role in directing and guiding the company. Progress in day-to-day practice is constantly being grafted onto the overall company strategy, with the value chain management business model being firmly embedded in the organization and forming part of the management information system. The multinational has a flat organization: lines are short, thus creating a global organization that is flexible and able to respond rapidly to change.

Radical rebranding in 2006 has ensured that the company works from a single overall structure of products and brands. This has strengthened the company's identity, improved its image and safeguarded its good reputation. The market is exposed to this in a positive way, which has a favourable effect on the entire organization (internal branding). Visibility in the market has increased greatly, resulting in recognition of the corporate identity, additional business volume and an enhanced position in the M&A market. The growing regard for the sustainability policy of TenCate is in line with this.

The creation of shareholder value is the underlying driver of the company's long-term policy. By pursuing an active investor relations (IR) policy, the TenCate management keeps in close contact with numerous stakeholders, such as investors, analysts and existing and potential shareholders.

TenCate has a number of product champions which have both a large volume and a relatively high profit margin. There will be an increasing emphasis on these. This means greater focus, deeper market penetration, dedication to functional characteristics and excellence in marketing, customer focus, delivery performance, R&D, business development, technology, etc.

The key question here is where end-user marketing ends and forward integration begins. The company must avoid bringing or keeping too many of its own brands on the B2B market and this requires its constant focus of attention. TenCate and its market groups must endeavour to be and remain **unique**.

IV – Where TenCate distinguishes itself in innovation in the markets

Technological innovations are the drivers of everything within TenCate; they are the motor of the company. The knack is to link existing or new TenCate materials, modules or systems to other technologies and techniques, thus creating integrated high-tech solutions that ensure sustainable markets. Several of the innovative successes achieved by TenCate include:

- **3D woven synthetic turf** (sustaining technology). The three-dimensional weaving technology developed by TenCate makes it possible to integrally weave synthetic turf systems (and no longer only to tuft them). Since a single sustainable material type (TenCate XP Blade™) can be used in the production of the fibres, backing and fixation (formerly with Latex), it is possible simply to separate the synthetic turf carpet at the end of its service life and reuse it in the production process of fibres and backing. It is fully recyclable and is being installed under the brand name GreenFields® MX in the first division in Dutch professional football. This supporting technology makes it possible not only to

produce synthetic turf clumps that resemble natural grass and which remain upright, but other characteristics can also be woven into it in the near future, for example for synthetic turf without infill or with integrated sports sub-layers;

- **GreenSource. Sports for Water** (open innovation, the combination of three technologies from different companies). A recyclable synthetic turf system with a recycled synthetic sub-layer that locally collects, stores and treats water that is often polluted. For the development of this product in open innovation, TenCate combined its knowledge of synthetic turf systems with the membrane filtration technology from Pentair and the pipe and storage systems from Wavin;
- **Vertical sand-tight geotextile** (sustaining technique, Water Innovation Award in 2013). This innovative technique is based on the fact that the woven geotextile filter will allow water to pass through, but not sand. A pipe which develops on the polder side of a dyke is stopped by the geotextile, thus ensuring that the sand remains trapped under the dyke, and that piping cannot occur. Linking this to TenCate GeoDetect™ measuring equipment is standard practice, a technique derived from TenCate Geotube® technology. These are environment-friendly and sustainable alternatives to traditional solutions used for example for dyke improvement;
- **TenCate Geotube® textile containers** (existing weaving technique). The use of woven TenCate Geotube® containers for coastal protection, land reclamation and the treatment of sludge results in a greatly reduced CO2 footprint (a difference of up to approximately 50 per cent). Consequently, far less sand extraction, destruction of the natural environment, transport and time were required. Work is currently being carried out on introducing a bio-based variant. A link with TenCate GeoDetect™ measuring equipment is possible;
- **TenCate Cetex® thermoplastic composite** (sustaining technology, existing market, plus open and closed innovation, JEC Innovation Award, 2013). Cloth is woven from carbon, aramid or glass fibres, which is pressed into laminate in multi-layered structures under pressure, time and heat. TenCate Cetex® can be reused, remoulded and recycled. The thermoplastic composite substantially reduces the weight of aircraft and helicopters, consistently lowers fuel consumption or increases the range of the aircraft or its payload capacity. In addition, this composite contributes to noise reduction in aircraft engines. It is used to manufacture the interior parts and secondary structural parts of passenger aircraft. A helicopter tailpiece is a prize-winning primary structural part. Work is being carried out on an increasing number of primary structural parts in open innovation (including with Airbus in TAPAS and Boeing in TPRC). TenCate is also currently developing thermoplastic composite for application in cars, including electric ones: an existing technology for a new market;

- **TenCate ABDS™**. This anti-roadside bomb (IED) system is a part of the complete protection of military vehicles by means of passive armour and active armour. The TenCate ABDS™ active blast countermeasure system protects the vehicle and its occupants against the devastating effects of exploding IEDs, thus defeating the upward acceleration of the vehicle, while the structure remains intact. This provides passengers with maximum protection. In addition to this system, a wide range of fabric and ceramic-based laminates is available for bullet- and fragment-proof applications on and in vehicles and for the protection of people;
- **TenCate Tecasafe® protective fabrics**. The protection of industrial employees is enjoying growing interest worldwide, since the risks they face are great (explosions caused by static electricity and flashovers). The inherently flame-retardant fabric TenCate Tecasafe® provides optimal protection against heat, fire, electric arcs and chemical splashes. At the same time it provides maximum comfort and freedom of movement.
- **Digital printing and finishing** (breakthrough technology). TenCate developed process technology based on digital inkjet, which allows fluids to be applied with great precision and speed to a specific or extremely small surface. This represents an important step in the development towards **smart textiles** and, in fact, the transition from analogue to digital textile finishing. The drop-on-demand and continuous-flow techniques can also be used on other surfaces than textile substrates, for example, composite materials and synthetic turf.

TenCate is a member of various innovation networks and plays a prominent, often initiatory and leading, role in them. For digital finishing it collaborates in the European Textiles Technology Platform, Digitex and Trex. TenCate operates in open innovation centres such as OICAM (Open Innovation Centre Advanced Materials), TPRC (ThermoPlastic composite Research Centre, with Boeing) and eTAC (European Thermoplastic Automotive Composites consortium). In greater privacy the company engages in innovation work with among others Airbus and Fokker Aerostructures in TAPAS (Thermoplastic Affordable Primary Aircraft Structures consortium). Within AMMON (Advanced Materials Manufacturing Oost-Nederland) TenCate and numerous market participants from the manufacturing industry work jointly on collective demonstrators, including the GreenStadium, the SmartRoad, SmartBridge and SmartLevee. TenCate also collaborates with many universities, colleges and institutions, both nationally and internationally.

On the basis of its international development TenCate has been able to secure a global position that is unique among the industries in which it operates.

V –The social commitment shown by TenCate

The sustainability policy of TenCate forms an integral part of this age-old company's pursuit of continuity. It is based on the forward-looking vision, mission and strategy of the Executive Board. At the same it gives expression to the long-term philosophy and operation of the TenCate group managements and employees, and of its subsidiaries and other interests worldwide.

As a multinational company, TenCate is aware of the impact of its actions on the social environment. By maintaining the company with the aid of its long-term policy and sustainable profitability, TenCate seeks to play a part in ensuring that the social and natural environment will remain available for future generations.

TenCate is increasingly integrating sustainability into its operating processes and partnerships with the aid of Corporate Social Responsibility (CSR). As a result, collective awareness is being created among both internal and external stakeholders. This makes it increasingly possible, together with buyers, customers and partners, to establish constructive initiatives that are focused on the responsible deployment of people and use of commodities and materials.

Based on the global trends on which TenCate focuses, many underlying themes have emerged that touch upon the protection that TenCate offers people and their living environment. Numerous sustainability aspects arise to a greater or lesser degree in the management of the value chain. The 'technological innovations' cornerstone is the most striking of these. It is only by continuing to deliver (breakthrough) technical and technological innovations that TenCate will be able to secure its pursuit of continuity and safeguard its sustainable development.

In its business operations and production processes TenCate operates certification and other systems relating to quality, working conditions and the environment (KAM). Ecotools are currently being used to determine the CO2 footprint of all its processes and virtually all its products worldwide (CSR Performance Ladders, GRI Indicators).

During the past few years TenCate has recorded impressive economic achievements and profitability (Profit) with respect for the social side (People) within an ecological framework (Planet). The TenCate product portfolio is ideal for this purpose, in view of the fact that many materials, modules and systems make an inherent contribution to sustainability, such as fuel efficiency and recyclable composites, recyclable synthetic turf, various light materials and sustainable geotextiles.

TenCate has a strong commitment to society. Numerous projects are being sponsored with materials, knowledge or resources. Various student teams at

universities and colleges in the Netherlands gain experience of TenCate materials and technologies. These teams have built vehicles (including a number of solar cars from the Delft University of Technology and the University of Twente, the Go4Dakar off-road vehicle, DUT racing cars, the Novabike motorcycles, the Antarctica off-road vehicle, the Anemo wind-powered car), vessels (including Windesheim solar-powered boats), an aircraft (Kanja) and a hydrogen driven car (Green Team Twente). Furthermore, TenCate supported numerous sporting events (Military Boekelo, Almelose Ruiterdagen, Triathlon Holten, Heracles Almelo, TenCate Sportboulevards), World Cup Hockey, Dutch Jupiler League, and international sports projects (Cruyff Courts).