LEADING PERFORMANCE
ADVANCED TECHNOLOGY COMPONENTS FOR SPORT SURFACES
Artificial turf is proving to be a real and viable alternative to natural grass for many sports – and it’s growing in popularity. Despite the fact that different sports often demand unique properties from their playing surfaces, sophisticated artificial turf systems have proved well able to adapt, by offering playing characteristics specific to particular requirements, most notably improved player safety and game consistency.

Developing appropriate artificial turf surfaces that meet such tough and varied performance demands has presented the industry with a challenge for many years. The complexity of the systems, the high expectations of athletes and the increasingly stringent quality levels required by different sports’ governing bodies have combined to raise the technology bar ever higher, demanding playing surfaces that deliver Leading Performance.

**Selecting the Right Team**

The ability to predict how an artificial turf system will respond to specific component choices – and to the way in which different materials are combined – is fundamental to the successful development of long lasting, high performance systems that do not harm the environment.

Dow’s specialist turf team is on-hand to support sports surface professionals with system design choices. With access to a remarkable combination of know-how from across Dow’s businesses and integrated, system-wide solutions, the team can help optimize the performance requirements of an artificial turf system, component by component.
Rather than simply developing individual components, Dow’s broad portfolio of technologies, including ENHANCER™ Sport cushioning systems and ENFORCER™ Sport backing technologies, DOWLEX™, ELITE™ and ATTANE™ resins for yarn and INFUSE™, ENGAGE™ and NORDEL™ resins for infill, are carefully calibrated to work together. This distinguished range of exceptional performance resins help to create sport surfaces that allow players and athletes to excel, offer excellent protection from motion-related injuries and demonstrate great durability and resilience.

Environmental performance is also an important aspect to consider. At Dow, we are well positioned to address the growing environmental needs of the flooring industry. From artificial turf to track & field surfaces, we can deliver tailored technologies that help our customers reduce the environmental footprint of their production processes and end products.

Dow has a proven track record of offering an innovative portfolio of high quality resins and technologies for artificial turf system components. With these complementary technologies, sport surface professionals can create tailor-made surfaces that address the specific requirements of each sport.

In recent decades, technology advances driven by Dow have helped to boost the adoption of artificial turf surfaces in rugby, field hockey, lacrosse, soccer, American football, baseball, tennis and golf. This Leading Performance has often significantly changed the way games are played.
Did you know?
The London 2012 Olympic Hockey competition was played on artificial turf surface featuring yarn made with DOWLEX™ Polyethylene Resins from Dow and manufactured by Tapex.
DOW AND THE OLYMPIC GAMES

Worldwide Partner since 2010 Dow has been steadily involved in the Olympic Movement since the Lake Placid 1980 Winter Games, making significant ongoing contributions to the Olympic Games. However, 2010 was a pivotal year for the company when it was named official Chemistry Company of the Olympic Movement.

The exciting development means that Dow will partner with the Olympic Family around the world through to 2020, a move welcomed enthusiastically by the International Olympic Committee president Dr. Jacques Rogge:

"We are delighted to welcome Dow to the TOP* Programme. As a global leader in the chemical industry and an innovator in sustainability, Dow will not only provide critical financial support to the Olympic Movement, but also bring industry-leading expertise and innovation to the Games themselves. Dow will be an important partner in making our vision for sustainability a reality."

*The Olympic Partners Programme
POLYMER YARN TECHNOLOGIES FROM DOW

DOWLEX™ Polyethylene Resins can provide an excellent balance between processability, performance and cost. DOWLEX resins are designed to offer yarn manufacturers excellent haptics and good weatherability characteristics combined with high durability suitable for high-impact sports surfaces.

- **DOWLEX SC 2107G**: Soft touch and durable monofilament yarn for soccer, rugby and American football surfaces.
- **DOWLEX SC 2108G**: For short, stiff hockey and tennis monofilament yarns.

ELITE™ Enhanced Polyethylene Resins are single material solutions tailor made to help maximize yarn toughness, resilience and resistance to outdoor exposure with exceptional processability.


ATTANE™ Ultra Low Density Polyethylene Resins (ULDPE) offer enhanced low temperature flexibility. Used as an additive enhancer, it improves softness of yarn without increasing yarn shrinkage while offering excellent mechanical abuse resistance.

- **ATTANE 4607G**: Softness enhancer as component in other resins providing high softness, low shrinkage yarns.
TAKING PLAY PERFORMANCE TO A HIGHER LEVEL

Yarn is a collection of fibers designed to replicate natural grass. Technical advancements in raw materials and the types of yarn now available have helped to create softer, safer and higher quality playing surfaces.

The choice of yarn raw materials has a significant impact on the softness, durability and play performance of a pitch. Making the right yarn selection is therefore vital for designers who want to create appropriate artificial pitches with durable, consistent playing surfaces suitable for play at a professional level and safe for players likely to slide, tackle or fall.

PROFESSIONAL YARN SOLUTIONS
Dow’s linear low density polyethylene (LLDPE) yarn resins are particularly suited to manufacture of monofilament and fibrillated yarn fibers. Such fibers offer an effective combination of exceptional softness, resilience, excellent durability and mechanical toughness, contributing to players’ safety as well as delivering performance appropriate to the highest level of professional sports. Designers can choose from a range of Dow resins designed to offer specific characteristics for different sports surfaces.

DOW TECHNOLOGIES:
DOWLEX™ – ELITE™ – ATTANE™

Main features:
- Softness
- Resiliency
- Durability
- Consistent playing surface
- Increased pitch life
- Enhanced player safety
INFUSE™ Olefin Block Copolymers (OBCs) are versatile polymers with a molecular architecture designed to offer very high levels of performance in flooring applications that require excellent temperature and abrasion resistance. Given its olefin backbone, OBCs can provide ease of processing and added value to applications ranging from polymer modification to compounding. Exhibiting high flexibility and elasticity, the resin can improve resilience, softness and toughness of the structure, with excellent colorability properties.

ENGAGE™ Polyolefin Elastomers are designed to bridge the performance gap between rubber and plastic, inspiring new design possibilities. The polymers offer an excellent combination of the flexibility and toughness of synthetic rubber with the processability of plastics, yielding properties such as low density, softness and enhanced coloring options. Moreover, the resin can also be used to modify other materials such as polypropylene for impact resistance or improved low temperature performance.

NORDEL™ IP Hydrocarbon Rubbers use Dow’s proprietary INSITE™ Technology to control molecular architecture and help deliver improved performance, processability and manufacturing efficiencies that offer advantages to compounders and processors alike, setting new and higher benchmark in EPDM performance.
The infill granules in an artificial turf system not only provide stability for the yarn but also contribute to energy absorption and have an effect on how the ball interacts with the playing surface. Effective infill is therefore fundamental in terms of achieving performance levels similar to natural turf.

Material choice also needs to take into account environmental performance – meaning considerations such as recycling potential and providing an odorless and dust-free atmosphere are important. Performance characteristics such as good energy absorption, excellent ultraviolet (UV) stability, wear resistance and cost-effectiveness are also important when selecting infill for an artificial turf system.

**A NATURAL CHOICE**

Dow’s polyolefin elastomer materials are a natural choice for infill in an artificial grass system that needs to mimic real turf. The materials offer a good alternative to ground styrene-butadiene rubber (SBR) and provide a sustainable solution, using prime raw materials that are recyclable and striking a balance between price and performance.

Dow’s products are also designed to complement each other, meaning they can be combined with other materials as part of the infill material formulation to achieve the required characteristics for the desired application.
BACKING TECHNOLOGIES FROM DOW

ENHANCER™ Sport cushioning systems technology softens the impact by providing cushioning for running or falling athletes. Plus, it aims at the right amount of give for both players and balls. A backing made with ENHANCER Sport is a suitable solution for applications where performance, durability and player safety are important requirements.

ENFORCER™ Sport polyurethane backing technology helps artificial turf systems provide strong tuft bind and dimensional stability – even when wet. It effectively locks the fibers in place.

Together, these factors extend the durability and appearance of the pitch while creating a highly stable and predictable playing surface. The end result is an artificial turf surface that retains appearance and performance while giving players the necessary safety, even during the most intense gameplay.
Today’s athletes demand an artificial turf solution that can deliver leading performance. Dow’s polyurethane backing solutions for artificial turf not only offer excellent processability, but safety, durability and overall performance.

A big portion of this performance is provided by the shock absorbency components integrated into turf systems – granular infill or shock pads/underlayment.

The selection of such components is a key factor for success. Dow recently conducted work to develop performance models for different foam systems. Various foam compositions were screened in stress response, elastic recovery and creep resistance as shockpads using lab tests in compression along with FQC (FIFA Quality Concept), which tests both on foams and the artificial turf system.

The results of this study provide evidence that shockpads highly influence the energy absorption property of an artificial surface. We now know that absorbent sports surfaces can be designed purposely without shock absorbing infill. Desired performance characteristics can be predicted based on raw material selection and foam characteristics.

**SOPHISTICATED TECHNOLOGY AND INCREASED OPERATING EFFICIENCY**

Dow sells fully formulated polyurethane systems to artificial turf producers. While the technology is advanced, our polyurethane systems are easy to use and provide benefits over alternative backing systems. Some of the benefits include lower backing weights, reduced yarn shrinkage and the possibility to tailor the product to meet individual customer needs. The fully formulated systems mean consistent performance of the product from our delivery to your delivery. Plus, Dow offers fast, local technical support and on site demonstrations.

To experience all the advantages of artificial turf made with Dow polyurethane backing, coaters can test Dow products on their own coating line using a demonstration multi-component mixing machine. The polyurethane coating process not only provides major advantages in the end-product, but also offers producers savings in energy consumption, waste generation and improvements in operating capacity. The bottom line is increased operating efficiency and an excellent artificial turf.

**DOW TECHNOLOGIES:**

**ENHANCER™ SPORT cushioning systems**

**ENFORCER™ SPORT backing technologies**

**Main features:**
- Enhanced durability and improved performance
- Strong tuft bind, even when wet
- Stable, uniform playing field
- Excellent processability
- Environmental friendly solution
**ENHANCING PLAYING QUALITY FOR OLYMPIC HOCKEY TOURNAMENT**

Every four years the Olympic Summer Games gathers the world’s finest athletes to participate in one of the most viewed sporting events. The field hockey tournament at the London 2012 Olympic Games featured over 76 games, with 380 competitors vying for gold. To help players safely slide, tackle and fall without nasty abrasions and enhance the playing quality, a high performance artificial turf system was specially developed for the Olympic Hockey Centre.

**Artificial turf dream team**

One of the most visible features of the system was the artificial grass, daringly colored blue and pink to match the London 2012 Olympic logo. Resulting from a great multi-party technical collaboration, the grass yarn was produced by Australian yarn manufacturer Tapex, based on high performance linear low density polyethylene (LLDPE) DOWLEX™ Polyethylene Resin from Dow.

In combination with other components, the Tapex yarn was converted into rolls of POLIGRAS™ Olympia hockey turf by Advanced Polymer Technology Australasia. The design, installation and maintenance of the turf at the Olympic Hockey Centre was provided by Sports Technology International (STI), appointed to do so by the London 2012 Organizing Committee (LOCOG).

**Achieving a resilient, safe, world-class playing surface**

A resilient artificial turf surface is a field hockey player’s best friend. In addition to minimizing abrasions resilient and soft turf affords greater playing mobility and can help prevent serious injury.

Modern hockey fields need the right combination of stiffness resiliency and softness to perform perfectly. This delicate balance is determined by the density of the polyethylene used in the artificial yarn: the right density level will determine resiliency and softness requirements and provide yarn durability. Octene-based DOWLEX LLDPE resin from Dow provide this challenging combination of properties, offering exceptional levels of durability helping meet today’s exigent requirements.
on softness, durability and play performance.

Resilience and mechanical toughness are also of the essence. Field hockey players, like their colleagues in sports such as football and rugby, are constantly driving their studded boots into artificial turf surfaces, imposing multi-dimensional mechanical stresses on the surface yarn. One of the most trusted industrial tests for measuring artificial turf durability and resilience is the Lisport test, in which heavy rolls equipped with numerous studs are rolled back and forth over turf samples to offer a visual indication of how they might age over time as a result of typical usage.

**Better yarn, longer play**
To demonstrate the performance of DOWLEX™ LLDPE resin for artificial grass applications, Dow recently commissioned a Lisport test at Ghent University in Belgium. The university conducted a Lisport test on a variety of artificial turf carpet samples, including a sample featuring DOWLEX LLDPE resin. After 20,000 cycles of the studded rollers, the artificial grass made with DOWLEX LLDPE resin did not have any visible trace of aging -- an excellent result, and testimony to its suitability for yarn in high performance playing surfaces.
NEW TURF MEANS MORE FOOTBALL FOR AHLEN’S SPORTPARK NORD

In the heart of the picturesque German town of Ahlen is a new playing field at Sportpark Nord that’s home to non-stop football action. Thanks to the ENFORCER™ Sport polyurethane backing technology from Dow, the performance artificial turf system installed in September 2010 allows the field to keep up with the frequent use and high demand placed on it – even during inclement weather conditions.

By increasing tuft bind ENFORCER Sport helps artificial turf better withstand tough wear and tear and improves dimensional stability, even in wet conditions. It effectively locks the fibers in place to the backing, allowing for enhanced durability and longer life. Plus, the dimensional stability of the polyurethane backing allows for exceptional adhesion at the seams and helps prevent delamination. The resulting stable and predictable playing surface gives players the necessary safety and support and helps ensure the field is built to last.

The advantages of the addition of a polyurethane backing were apparent right from the start at Sportpark Nord: the installation of the turf, by J&E Sports, went quickly and easily. According to the installer, polyurethane backing is preferred because of the easy unrolling, which is due to the lower weight of the rolls compared with latex backed alternatives. Now that the turf is installed, it just requires simple maintenance and cleaning once or twice a week.

According to Manfred Milczarek, who is responsible for coordination and scheduling for the local area football league and cup games, “This new artificial turf pitch in Ahlen allows for up to three games per day on the same ground, which makes planning much easier. Artificial turf will become the most used playing surface for football in the future due to the possibility for high frequent use, and it will be used more and more in the professional soccer league.”

The innovative technology that goes into an artificial turf system is what makes such a high performance, durable playing field possible. In the case of the football pitch at Sportpark Nord, the artificial turf system was designed to meet a set of very specific standards. “The polyurethane backing, together with the yarn and infill selection, provides the best playing characteristics,” explains Frank Buntrock, engineer for Sportpark Nord. “And the turf can be used more often in bad weather conditions, including heavy rain, frost and light snowfall.”
PROJECT NAME:  Sportpark Nord
PROJECT LOCATION:  Ahlen, Germany
BACKING TECHNOLOGY:  ENFORCER™ Sport
TOTAL AMOUNT :  7,169 m2
TURF MANUFACTURER:  Mondo
Dow combines the power of science and technology with the "Human Element" to passionately innovate what is essential to human progress. The Company connects chemistry and innovation with the principles of sustainability to help address many of the world’s most challenging problems. Dow’s diversified industry-leading portfolio of specialty chemical, advanced materials, agrosciences and plastics businesses deliver a broad range of technology-based products and solutions to customers in approximately 160 countries and in high growth sectors. In 2010, Dow had annual sales of $53.7 billion and employed approximately 50,000 people worldwide. The Company’s more than 5,000 products are manufactured at 188 sites in 35 countries across the globe. References to “Dow” or the “Company” mean The Dow Chemical Company and its consolidated subsidiaries unless otherwise expressly noted. More information about Dow can be found at www.dow.com.