



**Imprel<sup>®</sup>**  
**Polyamide 6**

ITC has become one of the world's main producers of tufted polyamide carpet. The company owes its rapid growth to a vigorous approach and a clear marketing strategy, underpinned by a concern for quality, market-oriented creativity and a perfect service. Being vertically integrated, ITC manages and controls every stage in the production process, from raw material to finished carpet. Our customer-friendly and professional approach ensures that we can present ourselves on an ongoing basis as a reliable partner – as “master in comfort” – to our customers.



# The story of IMPREL®

ITC's branded polyamide yarn, IMPREL®, is produced fully within its vertically integrated extrusion plant, giving entire control of the quality of the yarn from start to finish.

Since ITC started producing polyamide yarn for carpets in 1985, it has built an enviable knowledge base that has seen this manufacturing plant develop high-quality IMPREL® PA6 yarn. Due to continuous technical advancements, the latest generation of IMPREL® PA6 from ITC now offers comparable performance to PA6.6 yarn.



Discover the advantages and characteristics of IMPREL® polyamide 6 with regards to:

**Dye-ability**

**Soiling**

**Staining**

**Tensile Strength**

**Appearance Retention**

**Recycling**

**Pricing**

**DYE-ABILITY** From the six-carbon caprolactam of IMPREL® PA6, a polymer is produced that can be heat set to retain twist and which contains 'dye-sites' of amino groups along the polymer chain. These groups are capable of forming strong chemical bonds with dyestuffs, giving excellent colourfastness.

IMPREL® PA6 has a slightly more open molecular structure that allows dyestuffs to penetrate more easily and provides a greater affinity for acid dyes than PA6.6.

Dyeing PA6.6 is more expensive because obtaining the same colour depth requires more dye-stuff to reach the same level as with IMPREL® PA6.





**SOILING** By experience we can confirm that PA6 doesn't soil faster than PA6.6 because of more dye-sites.

An amino group (or dye-site) is a chemically active point on the polymer chain where a dye molecule attaches. These are inside the fibre, not on the surface, and dye molecules must migrate into the fibre in order to attach.

Carefully controlled tests, where all processes and construction parameters were identical, have clearly demonstrated that the fibre type has no impact on the rate of soiling.



**IMPREL® PA6**  
**Dye-ability**  
**& Soiling**

**STAINING** Permanent staining occurs when a coloured material penetrates into the fibre and cannot be removed. The best example of this is beverage coloured with red food colouring, better known as red dye #40. Comparative testing of identical samples (construction, yarn number, cross-section etc) with topical stain resistance protection shows no difference between IMPREL® PA6 and PA6.6.

In fact, when topical stain resistance treatments are applied, the greater free space between molecules in IMPREL® PA6 means that these chemicals actually last a little longer.

When tested as untreated fibres, without any additional stain protection treatments, there are some small differences between the two nylon types. However, the influence of other manufacturing processes, such as heat setting, result in a bigger difference in stain resistance than that between the two fibre types.

**TENSILE STRENGTH** PA6.6 has a higher tensile strength, but this is irrelevant in carpet fibre. In fact, too high a tensile strength can cause pilling on loop pile carpets because any 'fuzzing' of the pile surface will not break away.

Resilience or pile recovery is a much better gauge of a yarn's suitability as it affects the lifetime of the carpet. The resilience of IMPREL® yarn has been tested in a homologated European testing laboratory and is classified for wear resistance in accordance with EN1307.

IMPREL® PA6 contract fibres easily achieve Class 32 or Class 33 for wear resistance (also see Appearance Retention).



**IMPREL® PA6**  
**Staining**  
**& Tensile Strength**





**IMPREL® PA6**  
**Appearance**  
**Retention**



**APPEARANCE RETENTION** can be defined as the ability of the carpet to retain its original aesthetics, colour and construction integrity.

This can be tested in many ways, for example by the Vetterman Drum Test. Here, the carpet is fixed inside a revolving metal drum with a heavy 7.5kg ball covered in hard rubber protrusions allowed to move around freely to simulate the effects of traffic. The carpet is subjected to two test cycles, one of 5,000 rotations and one of 22,000 rotations, and is visually inspected alongside master wear samples to be given a rating for how well it has withstood the effects.

Various attributes have been cited as being important to the appearance retention of a carpet including fibre hardness, the complexity of the polymer molecule (number of carbon atoms) in IMPREL® PA6 and PA6.6, resilience and more. The truth is that even if differences did exist between the two fibre types, the impact of design and manufacturing processes such as heat setting, would overshadow them to the point of being non-discernible.

In appearance retention, different factors in the way yarn is incorporated into the carpet (such as the twist, fibre mix, pile weight, pile height, gauge and stitch count) play a more important role than the difference between fibres themselves. As long as the parameters of design and construction are right, one can produce a Class 33 commercial carpet in IMPREL® PA6 that's just as good as a product made with PA6.6.



**RECYCLING** Unlike PA6.6 that cannot be recycled, IMPREL® PA6 can be 100% recycled back into caprolactam without loss of properties, e.g. through the Falling-Film Crystallization process, developed by Sulzer Chemtech, Switzerland.

On delivery to the recycling plant, the PA6 fibre is separated from the carpet backing before being depolymerized to caprolactam. This is then followed by the most important step in the recycling process; the resulting caprolactam-water mixture is subjected to three-stage distillation and downstream falling-film crystallization. The end product is a high-purity caprolactam that can again be polymerized into PA6.

This recycling process is financially worthwhile and there are various factors that contribute to this. The energy balance is more favourable than the production of virgin polyamide, because the incineration of the remaining materials and substances provides the energy for the recycling processes (steam for the depolymerisation with excess steam converted into electric energy).

In addition, no by-products such as solvents and sulphur compounds have to be disposed of.

The recycling process is conducted in a closed circuit and is in line with the most recent environmental protection regulations – there is no danger of air or water pollution.



**PRICING** Because the synthesis of caprolactam is easier than that of hexamethylene diamine and adipic acid, IMPREL® PA6 generally has a price benefit. The melting point of IMPREL® PA6 is about 30 to 40°C lower than that of PA6.6. This leads to lower energy costs during extrusion and a better comparative carbon footprint.



**IMPREL® PA6**  
**Recycling**  
**& Pricing**


**QUALITY STANDARDS – PRODIS** ITC is a member of the ECRA (European Carpet and Rug Association) that has created the PRODIS quality label. PRODIS is a unified European product information system integrating the environment, consumer health and safety as well as the usage class and the additional characteristics of textile flooring.

PRODIS provides reliable comparative information for consumers and businesses and is based on two elements; the GUT test system for VOC emissions and chemicals and the Floor Covering Standard Symbols (FCSS).





- A** The FCSS symbols were created for easy recognition and understanding. They show the use and wear classes as well as many additional product characteristics, such as fire resistance, static properties, thermal conductivity and colourfastness. The symbols also indicate that the product meets the requirements of relevant EU product standards.
- B** Products simultaneously registered with national symbols like PIT, ETG or ICC and having the GUT license may, as an option feature the logo of the national system.
- C** The registration number indicates that the product is registered in the PRODIS system and meets all its requirements.
- D** By inputting the unique registration number on the PRODIS website ([www.pro-dis.info](http://www.pro-dis.info)), consumers can access up-to-date basic information about the product.



**IMPREL® PA6**  
**Quality Standards**  
**of IMPREL®**

**QUALITY STANDARDS – GUT** The continuous aim of Gemeinschaft Umweltfreundlicher Teppichboden (GUT) is to improve all environmental and consumer protection aspects throughout the life cycle of a textile floor covering from production through use and eventual recycling. The intensive product testing on chemicals and emissions is the basis for ensuring consumer safety. By adopting GUT and its policy of continually upgrading environmental goals, the European carpet industry has revolutionized environmental standards for the flooring sector.



**IMPREL® PA6**

**What is GUT?**



# The story of IMPREL®



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