



Socio-economic contribution of the polyurethane industry to growth and jobs in Europe

AN OVERVIEW

April 2014

Table of Contents

Introduction	3
Who is ISOPA?	4
What are polyurethanes?	4
Executive Summary	5
An overview of the impact of polyurethane on the European economy.....	5
An overview per country.....	7
An overview of the economic and social value of polyurethane for the European economy per sector	9
Adhesive and sealants	9
Appliances.....	10
Automotive.....	11
Binders	12
Coatings.....	13
Construction.....	14
Elastomers	15
Footwear.....	16
Furniture and bedding.....	17

Introduction

This report summarises the value of the polyurethane industry to the European economy. We will look at the value provided by polyurethane and the industries which rely on it in terms of wealth and job creation, highlighting the importance of this sector for a large range of applications and stakeholders. The data contained in this report has been compiled by an independent consultant in 2013, based on the most recent data available.

This report highlights that the polyurethane industry plays a key role in the European economy, involving close to 240,000 companies throughout Europe and

contributing €207 billion annually to the European economy. It also employs, directly and indirectly, more than 1 million people throughout the European Union. Out of those, close to 700,000 jobs generated by the polyurethanes industry and its products are found in the non-polyurethane sector. Polyurethane saves 14,5 million tonnes of CO₂ in Europe each year in building insulation and lightweight automotive components alone (the equivalent of more than four London 2012 Olympic Games), and is increasingly used as a resource-efficient solution by industry and other third-party stakeholders.

Who is ISOPA?

ISOPA is the European trade association for producers of diisocyanates and polyols – the main 'ingredients' of polyurethanes.

ISOPA promotes the highest standards of best practice in the distribution and use of diisocyanates and polyols in Europe, and ensures that all stakeholders can easily access accurate and up-to-date information on these substances. To do so, ISOPA develops guidelines on how to use diisocyanates and polyols correctly and safely, and sponsors initiatives on recovery, recycling and product stewardship of polyurethanes both in Europe and in the rest of the world.

ISOPA is based in Brussels, Belgium, and is a part of the European Chemical Industry Council, Cefic. ISOPA's members include Bayer, BASF, BorsodChem, Dow, Huntsman, Repsol, Shell Chemicals and Vencorex.

What are polyurethanes?

Polyurethanes, like all plastics, are polymers. They are made by reacting diisocyanates¹ with a range of polyols. Different end products can also contain other ingredients such as catalysts, blowing agents or flame retardants. The blowing agent determines the density of the product, and the polyols and diisocyanates make it flexible or rigid. Various combinations of these ingredients can create a wide range of products: rigid and flexible foams, rigid and flexible integral skin foams, elastomers, adhesives, coatings and sealants, amongst others.

Different forms of polyurethanes combined with other materials produce appliances that all Europeans use on a daily basis, including insulated building panels, mattresses, upholstered furniture, car seats, domestic refrigerators, freezers, composite wood panels, truck bodies and footwear.

¹ MDI and/or TDI

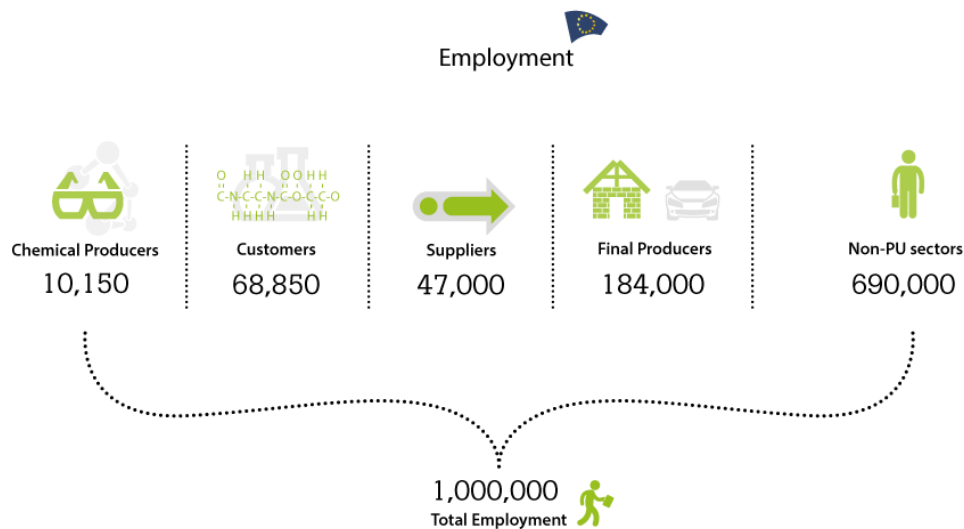
Executive Summary

An overview of the impact of polyurethane on the European economy



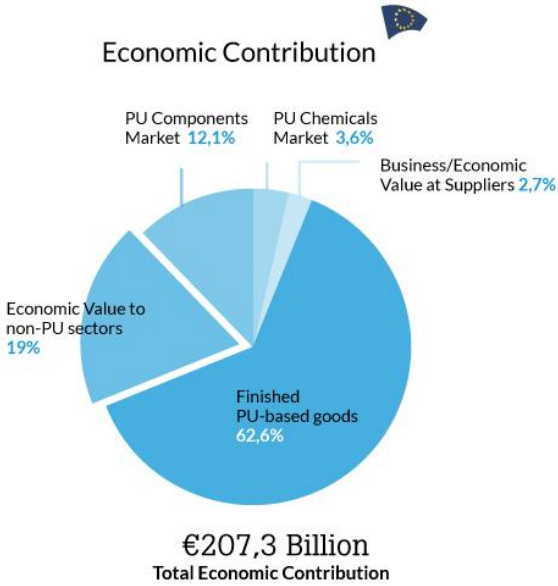
Polyurethanes materials are lightweight, strong, durable and they can resist to abrasion and corrosion: all these properties make polyurethane a key ally to enhance the quality of our lives through the products we use daily.

Considering the global need for enhancing the fight against climate change, it is also interesting to note that polyurethanes contribute both to resource and energy conservation. They are inherently durable and abrasion resistant and guarantee long lives to the products containing them, e.g. tests and practice show that rigid insulating foams retain high insulation performance for 50 years or more.



In this report, we will consider the economic and social contribution of each of the main uses of polyurethane to the European economy: how much does polyurethane contribute to growth and job creation in its various forms as an adhesive or sealant, appliance, automotive element, binder, coating, as a construction material, as an elastomer, footwear or in the form of furniture and bedding? The numbers are clear: more than 1 million European jobs are linked, directly or indirectly to polyurethane, and more than three additional jobs are created for each job in the industry. The majority of these jobs are found in the non-polyurethane sector, clearly showing the wide positive impact that polyurethane has on the European economy. Close to 240,000 European companies are involved in the process of manufacturing, transforming and using polyurethane, 85% of which are SMEs. They contribute to add €207 billion to the European economy each year: polyurethane is a clear ally of a job-rich recovery for the European economy.

As is evident from the variety of its uses, the polyurethane sector is not limited to the sole producers of the chemical compound: their direct customers, the final producers of polyurethane-based products and the producers of the end-product goods, which include the various forms of polyurethane, have to be taken into account too. For instance, without polyurethane, the car industry would have to face higher costs to make its products safer, lighter and more energy efficient. This is why, in this report, we will present an overview of the economic and social value of polyurethane taken as a whole, and we will offer where relevant breakdowns of the value-chain to demonstrate that the value of polyurethane pervades throughout the whole European economy.



An overview per country

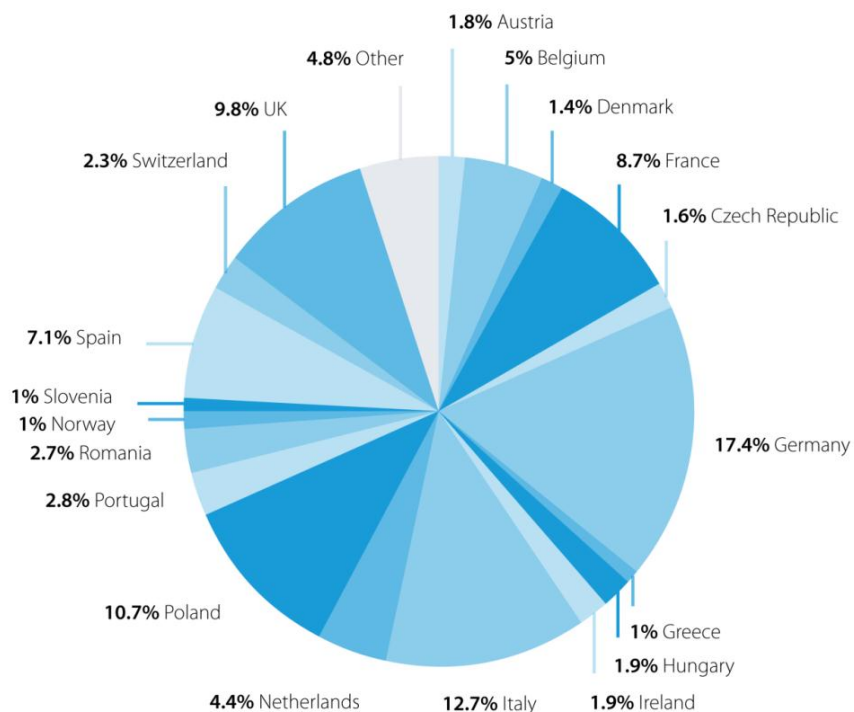
In Europe, there are about 200 companies directly involved in the production of polyurethane, for about 4,600 companies who are their direct customers, and more than 18,300 producers of polyurethane-based finished goods. The highest number of companies involved as direct customers of polyurethane and producers of polyurethane-based products are found in Germany (850 and 3,400 respectively) and Italy (650 and 2,600).

In terms of overall impact on national economies, the highest number of companies impacted are also found in those two countries, with around 44,000 companies impacted in Germany, and around 33,000 in Italy. A large number of companies are also impacted in other major European economies, with close to 18,800 companies impacted both in France and Spain, 16,600 in the UK, 14,500 in Poland and 12,000 in Belgium. Overall, 216,000 non-polyurethane companies are impacted throughout Europe.

These companies are mostly SMEs: SMEs contribute 85% of all job creation in Europe. As a matter of fact, more than 190,000 German jobs and more than 137,000 Italian jobs depend directly and indirectly on the polyurethane industry. In France, Poland and Spain, these numbers oscillate between 60,000 and 75,000 jobs, for an overall total of 1,000,000 jobs in Europe.

This makes for a major economic contribution to European national economies, particularly in Germany and Italy where €41,4 billion and €26,8 billion economic value are added yearly to national GNPs. In France, Poland and the UK, the economic contribution of the sector is around €18 – €19 billion, for an overall European economic value of €207,3 billion.

Total market volume per country (EU 27, Norway and Switzerland)



Total economic and employment contribution

	Employment (units)	Number of companies (units)	Economic contribution (billion euros)
Belgium	43,600	12,060	12,7
France	75,350	18,840	18,3
Germany	190,200	44,410	41,4
Italy	137,720	33,380	26,8
Netherlands	34,560	8,810	14
Poland	62,520	14,505	18,4
Spain	74,200	18,825	14,5
UK	63,840	16,610	18,8
Other (EU 27, Norway, Switzerland)	318,020	72,520	42,4
Total	1,000,010	239,960	207,3

Direct contribution in terms of jobs and number of companies (Polyurethane direct production, including direct and downstream customer and their suppliers/subcontractors)

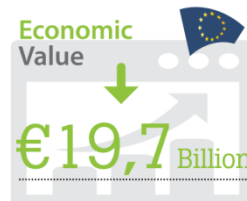
	Employment (units)	Number of companies (units)
Belgium	13,600	1,060
France	23,350	1,840
Germany	59,200	4,410
Italy	42,720	3,380
Netherlands	10,560	810
Poland	19,520	1,505
Spain	23,200	1,825
UK	19,840	1,610
Other (EU 27, Norway, Switzerland)	98,020	7,520
Total	310,010	23,960

Indirect contribution in terms of jobs and number of companies (non-polyurethane sector)

	Employment (units)	Number of companies (units)
Belgium	30,000	11,000
France	52,000	17,000
Germany	131,000	40,000
Italy	95,000	30,000
Netherlands	24,000	8,000
Poland	43,000	13,000
Spain	51,000	17,000
UK	44,000	15,000
Other (EU 27, Norway, Switzerland)	220,000	65,000
Total	690,000	216,000

An overview of the economic and social value of polyurethane for the European economy per sector

Adhesive and sealants



Diisocyanates and polyurethanes are versatile enough to be used as glues for materials like wood, rubber, cardboard or glass. These polyurethane glues are strong and resilient, which makes them the perfect product for construction projects, as well as for packaging and exterior furniture. Polyurethanes adhesives can also help produce new, useful applications from used materials. For instance, end-of-use vehicle tyres can be turned into children's playgrounds, sports tracks or stadia surfaces.

Sealants prevent liquids from entering or escaping through gaps and crevices, which is why polyurethanes are used, for example, in harsh climatic conditions to protect windows. Other sealant applications include for example concrete expansion joints in the construction sector, or pre-formed gasket seals in the automotive sector. In electrical and electronic equipment, sealants prevent moisture from entering the joints and switchgear.

The uses of polyurethanes as adhesive and sealant are so wide and diverse that their impact on the European economy can be numbered in terms of hundreds of thousands jobs. The sectors directly in charge of producing and consuming the direct products of polyurethane account for more than 3,000 European enterprises, mostly SMEs, with a company-to-employee ratio of 1:10 – they employ close to 36,000 people, who all together contribute to creating almost €14 billion worth of economic value for the European economy. The rest of the European economy also benefits from these products: close to 30,000 non-PU companies benefit from the induced impact of production, employing almost 94,000 people and contributing for €5,6 billion to European growth.

Appliances



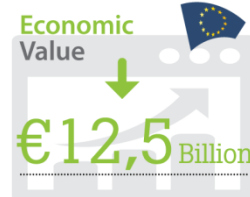
Refrigerators and freezers are two essential domestic appliances used daily by billions of Europeans. While being light and compact, the polyurethane rigid insulating foam preserves food at all stages of conservation and consumption in domestic kitchens. It is also an excellent insulator, which prevents unwanted movement of hot or cold air. Almost all refrigerators and freezers produced in the world are insulated with polyurethane foams.

Today, these appliances are designed to use less energy to help protect the environment and to reduce their cost of use. Polyurethanes help achieve ever stricter energy standards, and have a visible impact on consumers' energy bills. Even if refrigerators are now 60% more efficient than 15 years ago, replacing the old ones would cut CO₂ emissions in Europe by 20 million tonnes.

Producers also benefit: the processing versatility and the strength of polyurethane rigid foam means that it helps produce appliances that are both light and strong, and which can be produced in automated processes.

More than 13,600 Europeans are employed by chemical producers of polyurethane used in appliances, their customers, the producers of polyurethane-based finished appliances, and their suppliers and contractors. Together, they contribute for more than €8 billion to the European economy. With an additional 30,400 jobs generated by companies in the non-polyurethanes sector, a total of 44,000 jobs in Europe can be linked to the polyurethane used in appliances.

Automotive



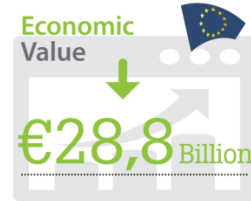
We all drive more safely and comfortably today thanks to polyurethanes. Used in foams in car seats, headrests and other components in the passenger cabin, polyurethanes greatly reduce the risk of injury in case of collision.

Used for sound insulation, polyurethanes dampen vehicle noise by more than 50 per cent compared to traditional materials like bitumen sheet or felt fibre. Polyurethanes also cut down vibration, providing for a more pleasant and less tiring drive.

Polyurethanes also reduce vehicle weight and, as a result, fuel consumption and emissions into the atmosphere: lightweight components reduce vehicle weight by up to 30 per cent, meaning 15 per cent less fuel consumption. This will be even more important with the uptake of lightweight electric cars. At the end of their life-cycle, polyurethane components can be recycled to help conserve resources.

Polyurethane is an ally of the European automotive industry, generating almost 50,000 additional jobs in the automotive sector in almost 15,000 companies. €10 billion of the value added from these components is found within their direct producers and users, for a total economic contribution of €12,5 billion in the European economy.

Binders

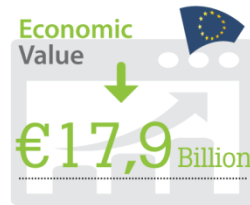


The binding qualities of polyurethanes have opened up new opportunities to use different types of materials together. Used as glue, polyurethanes can bind together wood, rubber and recycled materials in easy, safe and creative ways.

Applications include high-quality boards to make kitchen floorings, work surfaces and cupboards. Similarly, diisocyanates can bind together recycled foam crumbs to make carpet underlays and, in the steel industry, they are the basis for casting moulds.

The variety of uses as binders allows polyurethane to contribute 45,000 jobs to the European economy. Out of those, one third are found within producers, direct users, and their suppliers and contractors; the rest are spread throughout other sectors of the economy. The main value is created at the middle of the value chain: the producers of polyurethane-based finished goods account for €24 billion of the total €28,8 billion market value, thus generating the lion's share of wealth creation for this particular use of polyurethane.

Coatings

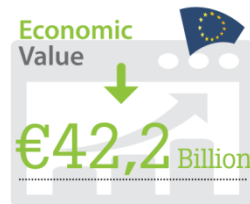


Modern coatings protect the exposed surfaces of many different products, making them last longer and look better.

The durability, corrosion and weather resistance of polyurethanes make them suitable for coatings on surfaces ranging from steel and concrete to wood and other cellulose materials. Their applications include infrastructure projects, such as bridges and motorway structures, steel railway carriages, wagons and wooden furniture.

A large number of jobs depend on this particular use of polyurethane: 105,000 employees spread across more than 25,000 companies work daily with polyurethane coating products. Out of those, 22,700 are not directly involved in the production of polyurethane; this means that polyurethane used as coatings has large ripple effects in terms of wealth creation and job creation throughout the European economy. Out of the €17,9 billion that polyurethanes as coatings contribute yearly to the European economy, €14 billion are found directly within the producers and direct users of polyurethane coatings, and their suppliers and contractors.

Construction



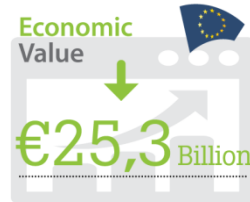
Polyurethane is widely used for construction in all types of infrastructure projects. Its most important application, however, is building insulation: polyurethane foams have excellent insulation qualities. In buildings, they reduce fuel costs and help conserve energy. Buildings consume 40 per cent of global energy, and create more than one third of greenhouse gas emissions. Experts estimate that worldwide insulation of buildings to optimal standards could reduce global CO₂ emissions by 20 per cent.

Foam made of polyurethane provides high insulation value, and helps cut down on space requirements for walls and roofs; this helps maximise building volume. This is especially important when an existing building is being renovated to comply with better energy efficiency standards: rigid polyurethane spray foam is a particularly versatile and cost-effective tool to upgrade buildings' insulation performance.

Polyurethane is also appreciated by the construction industry for its durability: thanks to polyurethane, buildings last longer and require less maintenance. Using rigid composite panels made from polyurethane means using components that are light yet strong, moisture-resistant and easy to install.

Many of the companies in the construction industry are SMEs with specific skills and experience in using polyurethane-based construction products. In Europe, there are more than 6,000 companies involved directly in the production and use of polyurethane elements and finished goods used in the construction sector. If you add this to the complete chain of value for these products and their final market uses, the number of companies impacted increases tenfold, for a total of 61,800 companies. In addition to the polyurethane construction-related sector, which accounts for 80,000 jobs and a wealth creation of €31,8 billion, these products create close to 260,000 jobs in the European economy.

Elastomers



Polyurethane elastomers are used in a wide range of applications. Most of these are found in the engineering field, thanks to their properties of durability, abrasion resistance and chemical and oil resistance.

These applications include rollers and belts for carrying minerals in quarrying operations, wheels for roller-blades and hospital trolleys, the rollers for printing processes and hoses and other components in automotive, under-the bonnet, applications.

More than 4,000 companies employing more than 52,000 people in Europe are involved in the making and direct use of these products, for a contribution to the European economy of €18,35 billion. Their overall impact on the European economy concerns an additional 36,200 companies creating close to 116,000 jobs, and adding €7 billion to European growth.

Footwear



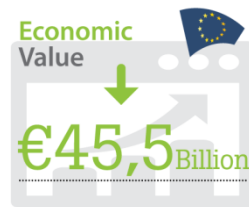
Good footwear is comfortable, long-lasting, appropriate for usage – and sold at the right price. Polyurethanes let designers meet all these objectives.

Polyurethanes are perfect for hard-wearing shoe soles, which last longer than traditional materials, because they are light but highly abrasion resistant. Polyurethane soles are practical and keep water out but do not constrict the imagination of designers, enhancing innovation.

As a result, they are used for a wide range of footwear types. Even if they are best known for sports / athletics shoes and boots, polyurethanes are also widely used for business and fashion shoes, as well as for durable footwear for work safety applications.

Out of the 53,000 European jobs involved in the use of polyurethanes in footwear, close to 70 per cent is found outside of the sole polyurethane industry (i.e. chemical producers, polyurethane customers and producers of polyurethane-based finished products) by way of 11,500 companies providing employment to more than 36,600 Europeans.

Furniture and bedding



Modern homes, offices and communal buildings would be much duller and far less comfortable without polyurethanes. Polyurethane flexible foams are soft yet provide support, are durable and keep their shape. They are an excellent filling material for seating cushions and mattresses, and can be produced to the density the manufacturer requires. Their versatility allows designers to use the full scope of their imagination.

Polyurethane foams adapt to and support the body. This is why we feel better for longer and experience less fatigue when chairs and beds use polyurethane foams. When asleep, the human body loses water through perspiration. Combined with heat, this can stimulate micro-organisms to grow. Polyurethane foams help prevent such problems because their open cellular structure allows good absorption of humidity, ventilation and heat transfer. This is the reason why hospitals recommend the use of polyurethane mattresses. More rigid, but nevertheless pliant, polyurethane elastomers are also used for making the armrests of office chairs.

A large number of European companies are involved in this sector: outside of producers and direct customers, more than 26,000 companies are impacted by the use of polyurethane in furniture and beddings; these companies provide close to 83,900 jobs.

ISOPA - European Diisocyanate and Polyol Producers Association

Av. E. Van Nieuwenhuyse Laan 4, Box 9

B-1160 Brussels

Tel: ++32 2 676 74 75

Fax: ++ 32 2 676 74 79

Email: main@isopa.org

ISOPA is an affiliated organisation within the European Chemical Industry Council (Cefic)

The information contained in this publication has been gathered by de Walque & Associates SPRL (<http://www.etienne-de-walque.com>) based on data from 2011-2012. It is, to the best of our knowledge, true and accurate, but any recommendation or suggestions which may be made are without guarantee, since the conditions of use and the composition of source materials are beyond our control. Furthermore, nothing contained herein shall be construed as a recommendation to use any product in conflict with existing patents covering any material or its use.