European Flexible Polyurethane Slabstock Foam

MARKET REPORT FY 2020

AUGUST 2021

Prepared for members of EUROPUR aisbl by:

Angela Austin
Clint Raine, Director, Belvedere and Partner Ltd.
Michel Baumgartner, Secretary General, EUROPUR aisbl
Patrick de Kort, Regulatory Affairs Manager, EUROPUR aisbl

Reviewed by Silvia Freni Sterrantino, Legal Adviser, Polymer Comply Europe Scrl

METHODOLOGY & ACKNOWLEDGMENTS

The information contained in this report is based upon:

- Production data supplied by EUROPUR members producing flexible polyurethane slabstock foam and aggregated in compliance with competition law;
- Interviews with more than 60 experts from 42 industry organisations;
- Data from public sources including ACEA, EU Market Access database, company annual reports and trade press reports.
- Data from consultants and agencies used with their kind permission including CSIL Milano, Tecnon Orbichem, ICIS and LMC Automotive.

EUROPUR, Angela Austin and Belvedere and Partner Ltd (B&P) thank the many industry experts that participated in the research, including representatives from foam manufacturers and associations: Aramis, AIPEF, Egida+, Flex 2000, Form Sünger, FoamPartner Group, Healthcare Europe, Ikano Industry, Interplasp, Kabelwerk Eupen, Kayfoam, Lusocolchao, Multy Foam, Neveon, Olmo, Orsa Foam, Pelma, Plama PUR, Recticel , Safaş Sünger, TempurPedic, Torres Espic, V-Correct, Ventius, Vita Group, Vitafoam Malta, Xunifoam, Yataş.

Several raw materials and machinery companies also provided comments: Bäumer, Covestro, Evonik, Galanthus, Hennecke, Huntsman, Laader Berg, Möller Chemie, Milliken, PCC Rokita, and Tosoh.

Disclaimer & Copyright

This report was prepared by Belverdere and Partner Ltd (B&P), with support from Angela Austin for EUROPUR members. The compliance with competition law of statements made in the report, as well as the collection and aggregation of the data have been validated by Polymer Comply Europe SCRL.

The information contained in this report was compiled in good faith and to the best of our knowledge for distribution to EUROPUR members. No warranties are made with regard to its completeness, accuracy or reliability and no liability will be accepted for damages of any nature whatsoever resulting from the use of or reliance on the information it contains. This report may not be distributed or reproduced in any form without specific written consent from EUROPUR.

More detailed reports on raw materials markets, the mattresses and furniture markets or the automotive market can be purchased from the companies Tecnon Orbichem, ICIS, CSIL Milano and LMC Automotive.

EXECUTIVE SUMMARY

According to data collated by Belvedere and Partner Ltd and Angela Austin, on behalf of EUROPUR, the total production of flexible polyurethane foam in the 27 EU Member States, UK, Norway, Switzerland, Albania, Belarus, Bosnia, Kazakhstan, Kosovo, Serbia, Macedonia, Ukraine, Russia and Turkey reached nearly 1.7 million tonnes in 2020.

Of this, 279,225 tonnes was moulded foam, down from 373,340 tonnes in the previous year, mainly due to lower automotive production, and 1.41 million tonnes was slabstock foam, an increase of 2.9%, or an absolute increase of 39,400 tonnes compared to 2019. Of the total flexible polyurethane slabstock foam produced, just over 1.346 million tonnes comprised of polyether slabstock foam and 63,872 tonnes was polyester slabstock foam.

Overall, total slabstock production in 2020 increased by 2.9% across the entire region. Production of polyether slabstock increased by 3.4% while production of polyester slabstock fell by 7.8%. Over 40 organisations were interviewed to supplement production data provided by EUROPUR member companies, who now represent ~70% of total EU slabstock production.

In fact, 2020 was one of the most challenging years in living memory for the slabstock industry, due to issues associated with the Covid 19 pandemic, which resulted in significant demand shifts, raw material supply chain issues and very volatile pricing in both the demand and supply side.

The year was one of two distinct halves. The pandemic hit during the first half of the year with collapsing demand and factory closures, some of the effects of these issues were mitigated through government support in some countries. The second half of the year was characterised by sharply increasing demand causing raw material supply chains to struggle to meet the unexpected demand. This resulted in much tighter supplies and rising prices into Q4, 2020.

Although data shows an annual increase in foam production, nearly all of the growth took place in the second half of the year. Growth in foam production varied across Europe with the higher growth seen in South-Eastern Europe and lower or no growth in Western Europe. Within individual countries growth between members and non-members varied sharply.

One explanation of the variation is that foamers integrated into downstream production of mattresses for the e-commerce markets grew much more than foamers supplying customers involved in traditional “bricks and mortar” retail outlets. While the trend towards e-commerce has been slowly increasing over recent years, the pandemic - and closure of stores - has exacerbated the shift to e-commerce. Sales of mattresses and some upholstered furniture through e-commerce platforms are expected to continue growing over the coming years.

Another distorting factor, affecting foam production has been the significant rise in the exports of mattresses from Europe to North America. The main drivers for this has been the implementation of import tariffs on Chinese mattresses, the huge increase in demand for mattresses from the US “bed in a box” market during the pandemic, and insufficient foam

production within the US resulting in a shift in supply contracts to European producers in Spain, Serbia and Turkey.

In addition, some foam production was produced under tolling agreements in countries where raw materials were more readily available. Toll manufacturing may explain some of the high rates of growth in certain countries.

Contents

1. INTRODUCTION AND CONTEXT

Overall, the production of all flexible PU slabstock foam types increased by 2.9% across Europe. In total nearly 1.7 million tonnes of flexible foams (moulded and slabstock) were produced in 2020 of which a total of 1.41 million tonnes were slabstock foams, comprising 1.35 million tonnes of polyether slabstock foam and 63,872 tonnes of polyester foams. In absolute terms, just under 40.000 more tonnes of foam were produced in 2020 compared to 2019. Most members reported that they could have produced significantly more foam, if raw materials had been available.

In fact, 2020 was one of the most challenging years in living memory for the slabstock industry, due to issues associated with the Covid 19 pandemic which resulted in significant demand shifts, tightening raw material supply chain issues and very volatile pricing. This situation was not exclusively confined to chemicals but included the full range of raw materials and logistical services.

General market trends which were not related to Covid 19 were difficult to identify because of the following overriding factors:

a) The extraordinarily strong performance of foam customers with leading e-commerce platforms compared to the traditional “bricks and mortar” retailers, this was mainly visible through the “bed in a box” market.
b) Strong exports to US and Canada driven by US anti-dumping tariffs on Asian suppliers
c) Larger than expected growth in foam production in Turkey, the Balkans and Eurasia

The variability in production between regions reflects the differing supply strategies employed by the foam, furniture and mattress manufacturers.

Overall, there was a contraction in the value of upholstered furniture produced in the EU27+ UK, Norway and Switzerland by 3.5% across all economies, reaching a total of EUR 14,289 million, down from EUR 14,811 million in 2019. In total, exports from the EU27+ decreased by 2.1% from EUR million 9,156 million to EUR 8,963 million according to data collected by CSIL[1]. Data collected for mattress production showed a very slight decrease during 2020, from 49.5 million units in 2019 to 47.8 million units in 2020.

The automotive industry experienced sharp falls in demand and a resulting fall in production due to the closure of factories and retail showrooms during the pandemic lockdown. Recovery has been, as would be expected, more measured because the effects of the pandemic only compounded the problems that were already prevalent in that industry as it moves from the internal combustion engine to hybrid/electrically powered vehicles. In terms of production of passenger vehicles, data from LMC Automotive suggests that there was an overall fall in

[1] Centre for Industrial Studies, The World Upholstered Furniture Industry and The World Mattress Industry, June 2021

production between 2019 and 2020 of 4.5% from 21.5 million to 20.8 million while sales increased by 0.9%.

Raw material supply chains were stretched to the limit. In H2 2020, tightening supplies of isocyanate and polyol were joined by problems in sourcing chemical additives, textiles, wood, metal (springs) as well as serious logistical issues. These issues continued well into 2021.

These supply chain issues have had serious effects resulting in price volatility causing cost pressure in foam manufacturing. This is now having an effect on product quality continuing the trend to lower densities. In addition, foam recycling, sustainability and circular economy topics continue to challenge the foam industry.

There are now 160 foam plants active in the wider European region, up from 159 in 2019.

The trend towards vertical integration continues with new capacities to come online during 2021 in Romania and Ukraine, aligned with mattress and furniture production. In addition, further investment in new foam lines are under consideration in Poland, Spain, Turkey, Russia and Belarus in the next 3-4 years.

The estimated total turnover of the European flexible slabstock industry in 2020 was EUR 5.3 billion. The total number of employees increased slight from 27,539 to 28,622.

2. PRODUCTION, TRADE and CONSUMPTION of FLEXIBLE SLABSTOCK by END-USE

2.1. Upholstered furniture

According to CSIL, the upholstered furniture market accounted for about 16% of total world furniture consumption with total sales estimated to be valued in the region of 67 billion USD in 2020, a 5% drop when compared with 2019. In 2020 the largest markets were China, the United States and Germany, where China and the United States account for 28% each and Germany 6% of world consumption. During 2020 there was a continued shift in the composition of furniture consumption in almost all major markets. In the main consuming countries, the reduction in the demand for upholstered furniture was large; China (-11%), India (-9%) and in Europe, UK (-11%), Italy (-5%), France (-6%) while consumption grew in the United States (+1%), Germany (+4%), Australia (+4%) and South Korea (+8%). The pandemic induced contraction was limited in size due to consumers having reallocated disposable income and savings towards furniture having been forced to decrease expenditure on dining-out, holidays, and other leisure activities. CSIL predicts that consumption will return to pre-pandemic levels during 2021, although the speed of recovery will vary in different countries.

Table 1 UPHOLSTERED FURNITURE CONSUMPTION IN LARGE MARKETS, 2021-2022. FORECASTS OF YEARLY CHANGES IN REAL TERMS

Country	Real Change Forecasts 2021	2022
China	4%	3%
United States	4%	3%
Germany	3%	3%
United Kingdom	5%	5%
India	6%	5%
France	5%	4%
Australia	3%	3%
Canada	4%	3%
South Korea	3%	3%
Italy	5%	4%
Japan	2%	2%

Source: CSIL, used with kind permission

Global production of upholstered furniture continues to be highly concentrated with six countries accounting for around 75% of the total output, these countries are China, United States, Poland, Vietnam, Italy, and India. China and Vietnam increased their exports by USD 1.6 billion and USD 0.9 billion respectively in 2020.

In total, Europe (including Central-Eastern Europe outside EU) is estimated to produce 23% of the world's upholstered furniture and the United States an estimated 16%. The global furniture market continues to focus heavily on price-based advertising, rather than promoting furniture as a durable, long term asset, leading to a shift of the industry to the lowest production cost countries. This is especially visible with the increased exports from Vietnam.

Eastern Europe, now the case for some years, continues to be the focus for Europe's leading upholstered furniture producers. Companies such as IKEA, Polipol Group of Germany and Hong Kong based ManWah, owner of Home Group, all operate facilities in Poland, the Baltic States, Belarus, Romania, and Ukraine and continue to plan expansions during the coming years. However, some projects have been delayed by the pandemic and political situation in some countries.

According to European Furniture Industry Confederation (EFIC), the EU furniture industry employed more than 1.1 million people across 127,500 enterprises making products worth 87 billion EUR in 2019. The industry, despite the low-cost trend, still benefits from high quality and design images. Nevertheless, rising costs both in labour and all raw materials continue to put the sector under pressure. The major manufacturing countries in Europe are Poland, Italy, Germany, the United Kingdom and France, which together provided 85% of total European output. Estimates suggest that around 28% of the production was exported outside of Europe to North America, Russia, and the Middle East. Growth in export – especially from Spain – can explain any market discrepancies.

2020 saw the growing importance of digitalisation, Internet of Things (IoT), Industry 4.0 and End of Life issues all having a major effect on the furniture industry.

In the case of route to market, manufacturers and retailers are being forced to work more closely together in order to optimise the customer experience while providing a rapid and efficient supply chain. Shortening of the supply chain has led to greater integration of key raw materials and furniture manufacturing and a greater move towards e-commerce sales platforms.

CSIL estimates that e-commerce represents 8% of furniture sales in Europe, with the UK and Germany having the highest penetration. This is a trend that will only be enhanced by the challenges of the pandemic.

Digitalisation has also played a major role in cost reduction with manufacturers continuing to optimise all production process and production runs.

Overall, there was a contraction in the value of upholstered furniture produced in the EU27+ UK, Norway and Switzerland by 3.5% across all economies, reaching a total of EUR 14,289 million,

down from EUR 14,811 million in 2019. In total, exports from the EU27+ decreased by 2.1% from EUR million 9,156 million to EUR 8,963 million according to data collected by CSIL.

Table 2 PRODUCTION, TRADE AND SALES OF UPHOLSTERED FURNITURE DATA – EU28, NORWAY & SWITZERLAND, 2019 & 2020 (EUR MILLION)

EUR million	2019	2020	% Change
PRODUCTION			
EU16+NO+CH	12715	12365	-2.8%
EU12 (Newer members)	2096	1964	-6.3%
EU28	**14811**	**14289**	-3.5%
EXPORTS			
EU16+NO+CH	7690	7538	-2.0%
EU12 (Newer members)	1466	1425	-2.8%
EU28+NO+CH	**9156**	**8963**	-2.1%
IMPORTS			
EU16+NO+CH	8662	8581	-0.9%
EU12 (Newer members)	652	646	-0.9%
EU28+NO+CH	**9314**	**9227**	-0.9%
CONSUMPTION			
EU16+NO+CH	13687	13147	-3.9%
EU12 (Newer members)	1282	1187	-7.4%
EU28+NO+CH	**14969**	**14334**	**-4.2%**

EU16 – Austria, Belgium, Luxembourg, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Poland, Portugal, Spain Sweden, UK
Source: CSIL World Upholstered Furniture Report 2020, provisional data, used with kind permission

Table 3 CHANGES IN UPHOLSTERED FURNITURE PRODUCTION IN THE EU16 2019 & 2020 (EUR MILLION)

EU Country	2019	2020	2020/2019 (% Change)
Austria	136	120	-12.3%
Belgium	258	247	-4.1%
Denmark	382	406	6.2%
Finland	102	97	-5.2%
France	478	444	-7.0%
Germany	1753	1751	-0.1%
Greece	16	12	-22.2%
Ireland	62	56	-8.6%
Italy	2268	2370	4.5%
Netherlands	468	540	15.4%
Norway	153	112	-27.0%
Poland	3531	3228	-8.6%
Portugal	231	202	-12.2%
Spain	493	531	7.7%
Sweden	406	390	-3.9%
Switzerland	97	82	-15.5%
United Kingdom	1694	1481	-12.6%
Europe	**12526**	**12069**	**-3.6%**

Source: CSIL World Upholstered Furniture Report 2020, provisional data, including adjustments for previous years used with kind permission

The above table shows the changes in upholstered furniture production 2019 compared to 2020. Whilst a common trend is difficult to see due in part to the various levels of government support, it is worth noting that the increases in Denmark, Italy, Netherlands and Spain support similar trends in foam production.

2.2. Mattresses

Data from CSIL suggests that there was a small decline in the total number of mattresses produced in the EU last year from 49.5 million units in 2019 to 47.8 million units in 2020. Production values were 10.6% higher than in 2019 at EUR 5,420 million.

Analysis of data from CSIL, for 12 EU countries - excluding Poland and Romania - suggests that there was a marginal change in the type of mattress produced between 2019 and 2020. Innerspring mattress accounted for 51% of production, foam mattresses 40%, latex 7% and other type the remaining 4%.

According to the Frost & Sullivan Assessment, supported by CSIL data the global consumer mattress industry grew at a 13.6% CAGR from 2014 to 2020, making global sales of mattresses worth an estimated USD 87 billion in 2020.

Foam manufacturers supplying this market have nearly all reported that the major issue in 2020 was availability but as the year closed and 2021 started, price became the main driver again. The rapid growth in e-commerce during the pandemic has raised the profile of “bed in a box” mattresses and corresponding viscoelastic foam sales. The split between the mattress types has remained relatively stable during the Covid-19 pandemic with a marginal shift to foam mattresses. IKEA continues to promote a range of spring mattresses in 2020 and several manufacturers promote the combination of springs and foam as offering better support. Interest in “Hybrid” mattresses also continues as price pressure from raw materials continues in to 2021.

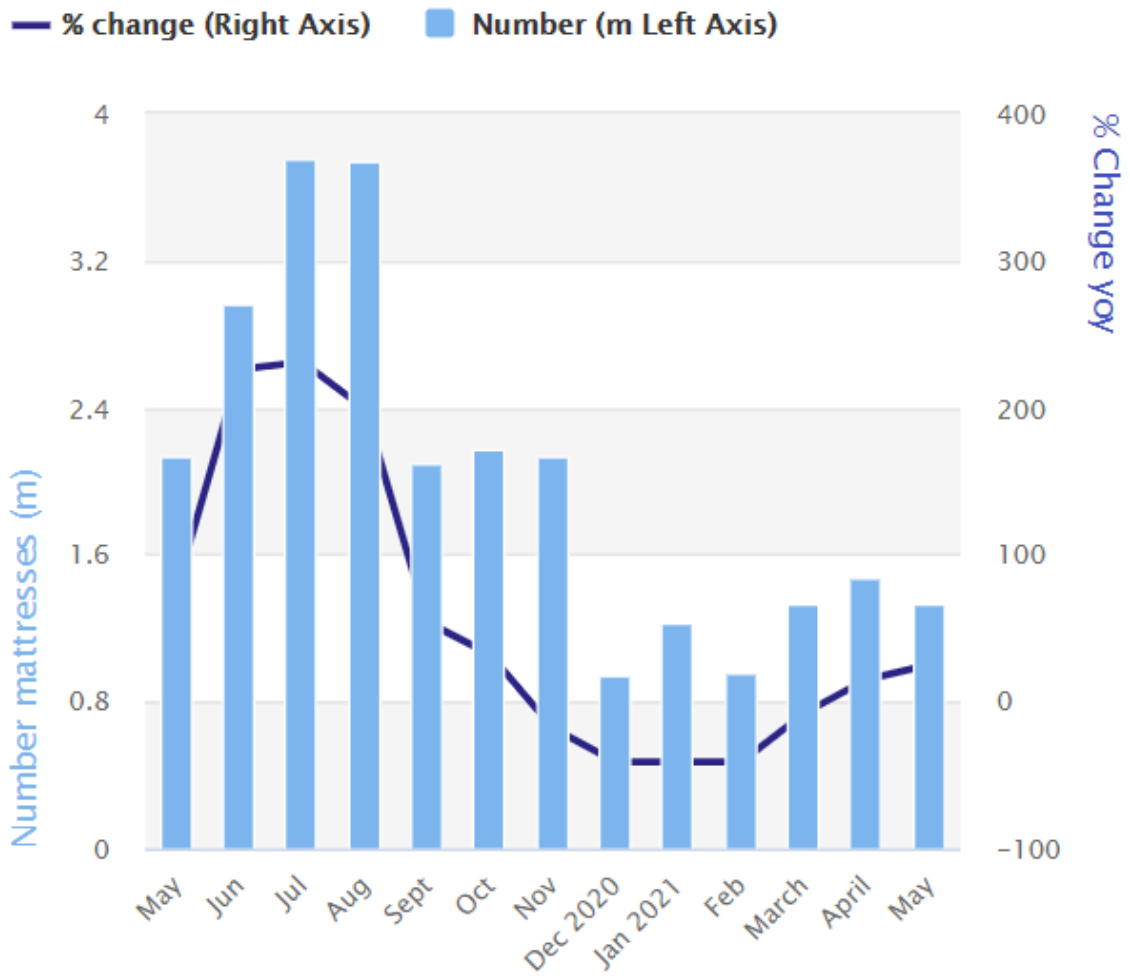
The high-end mattress sector continues to demand high quality foams and customers were reported to be very loyal to brands, but even here some foam has been substituted with natural materials and springs.

The wide range of mattress sizes found in Europe is thought to deter Chinese manufacturers from importing large volumes into the market, as tariffs on imports to the US are implemented.

Some European mattress core manufacturers found strong demand in export markets where the CertiPUR label is valued. There is also renewed interest in using a small, rebonded content in low end mattresses.

2020 saw a huge growth in mattress sales though e-commerce channels in the USA, (as shown in the USITC chart below). The decline in imports from China due to anti-dumping tariffs led e-retailers to source mattresses from Europe. As a result, there was a significant increase in the production and export of mattresses from several European countries, in particular from Serbia, Spain and Turkey. This trend has continued into 2021 with Turkey now the fourth largest exporter of mattresses to the US.

Chart 1 ROLLING US MATTRESS IMPORTS (000) AND % CHANGE



Source: USITC, used with kind permission

Table 4 USA IMPORTS OF MATTRESSES OF CELLULAR PLASTICS, (940421 HS Code) IN 2020 (No of mattresses)

	2018	2019	2020	% Change 2019/2020
China	7,400,000	3,100,000	120	-96%
Serbia	1,932	2,019	8,981	345%
Spain	609	2,000	20,782	939%
Slovenia	1,616	5,010	84,000	1577%
Turkey	520	241,673	981,122	306%
Total	**4,677**	**250,702**	**1,094,885**	**337%**
Other exporters to the USA	2,436,436	3,647,798	11,731,915	222%
Total	**9,843,131**	**10,351,221**	**141,63,705**	**37%**

Source: UNcomtrade.org

The above table shows the large fluctuations between countries generally driven by US tariffs and refugee support actions.

Table 5 PRODUCTION OF MATTRESSES IN EU 28, 2016-2020 (MILLION UNITS)

Millions of units produced	2016	2017	2018	2019	2020	% Change 2019/2020
Belgium & Netherlands	3.5	3.6	3.5	3.4	3.4	0%
Denmark	2.1	2.1	2.2	2.0	2.2	+1.0%
Finland & Norway	1.1	1.0	1.0	1.0	0.9	-11.0%
France	3.9	4.0	3.6	3.6	3.2	-12.5%
Germany & Austria	6.4	6.2	5.7	4.9	5.4	+9.0%
Greece	0.3	0.5	0.6	0.5	0.5	0%
Italy	5.2	4.8	4.8	4.6	4.9	+6.1%
Portugal	1.4	1.5	1.5	1.5	1.4	-7.4%
Spain	3.5	3.7	4.1	4.1	3.7	-10.8%
Sweden	1.5	1.6	1.7	1.6	1.5	-6.6%
Switzerland	1.4	1.4	1.4	1.3	1.2	-8.0%
UK & Ireland	5.2	5.4	5.7	5.7	4.9	-16.2%
Bulgaria & Romania	1.3	1.5	1.7	1.7	1.9	+10.5%
Czech Republic	0.4	0.4	0.4	0.5	0.5	0%
Poland	11.0	12.3	12.9	13.1	12.2	-7.3%
Total	**48.2**	**50.0**	**50.8**	**49.5**	**47.8**	**-3.6%**

Source: CSIL World Mattress Report 2020, including adjustments for previous years, used with kind permission

The mattress market has become increasingly competitive with a growth in suppliers via e-commerce.

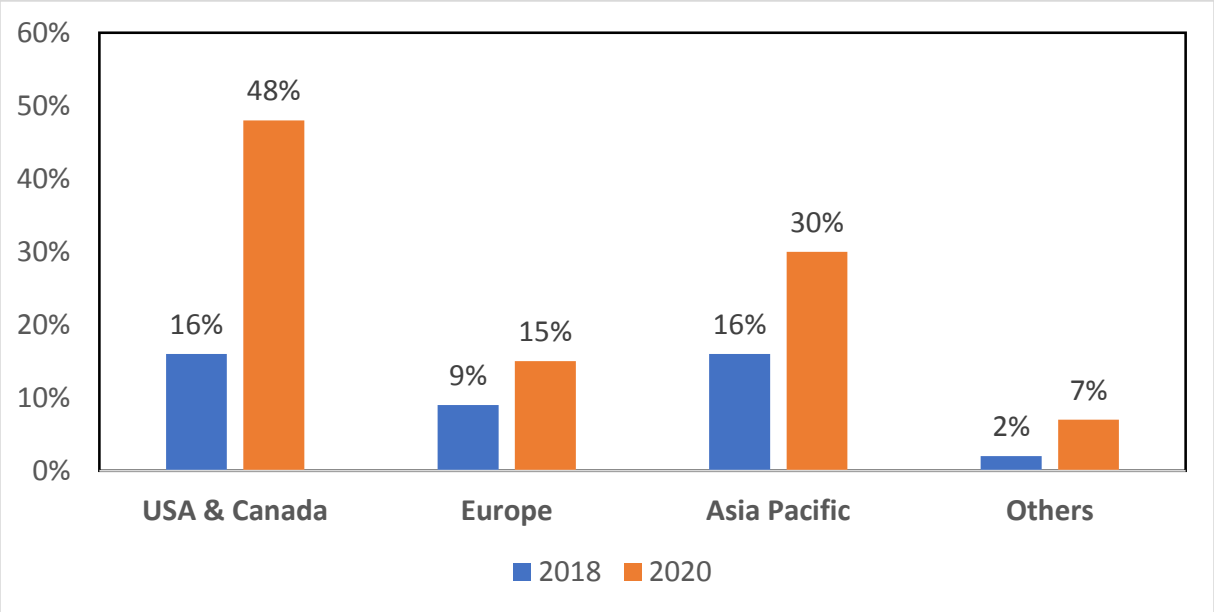
E-commerce

In 2020, reports suggested that there had been a large increase in the trend towards e-commerce for mattress purchases, driven mainly by the closure of standard retail outlets during the pandemic lockdowns. This phenomenon occurred throughout the global mattress industry, with ISPA (International Sleep Products Association) reporting that on-line sales accounted for 46% of all mattress sales in 2020. One of the most impressive examples of this trend has been the increase in sales by Amazon. Having entered the market in 2018, the company became the leading on-line seller exceeding USD 1.2 billion in 2020. As recovery from the pandemic starts to build, some on-line retailers have decided to form partnerships with bricks and mortar retailers or to establish their own stores in order to boost visibility and reduce customer acquisition costs.

Globally, CSIL reports that the fastest growing markets for e-commerce mattress sales are the USA, India, Germany and Australia, with the total global B2C market worth in excess of USD 10 billion in 2020.

In Europe, there are in excess of 50 companies involved in selling mattresses on-line mainly in Northern European markets although 2020 and 2021 to date showed the first signs of market consolidation with traditional producers purchasing online mattress companies. The improvement of compression machinery and formulation adjustments that allows spring mattresses to be compressed has also increased competition, in a market that was initially based on full foam mattresses.

Chart 2 CHANGES IN THE E-COMMERCE SHARE OF MATTRESS SALES BY REGION, 2018-2020 (%)

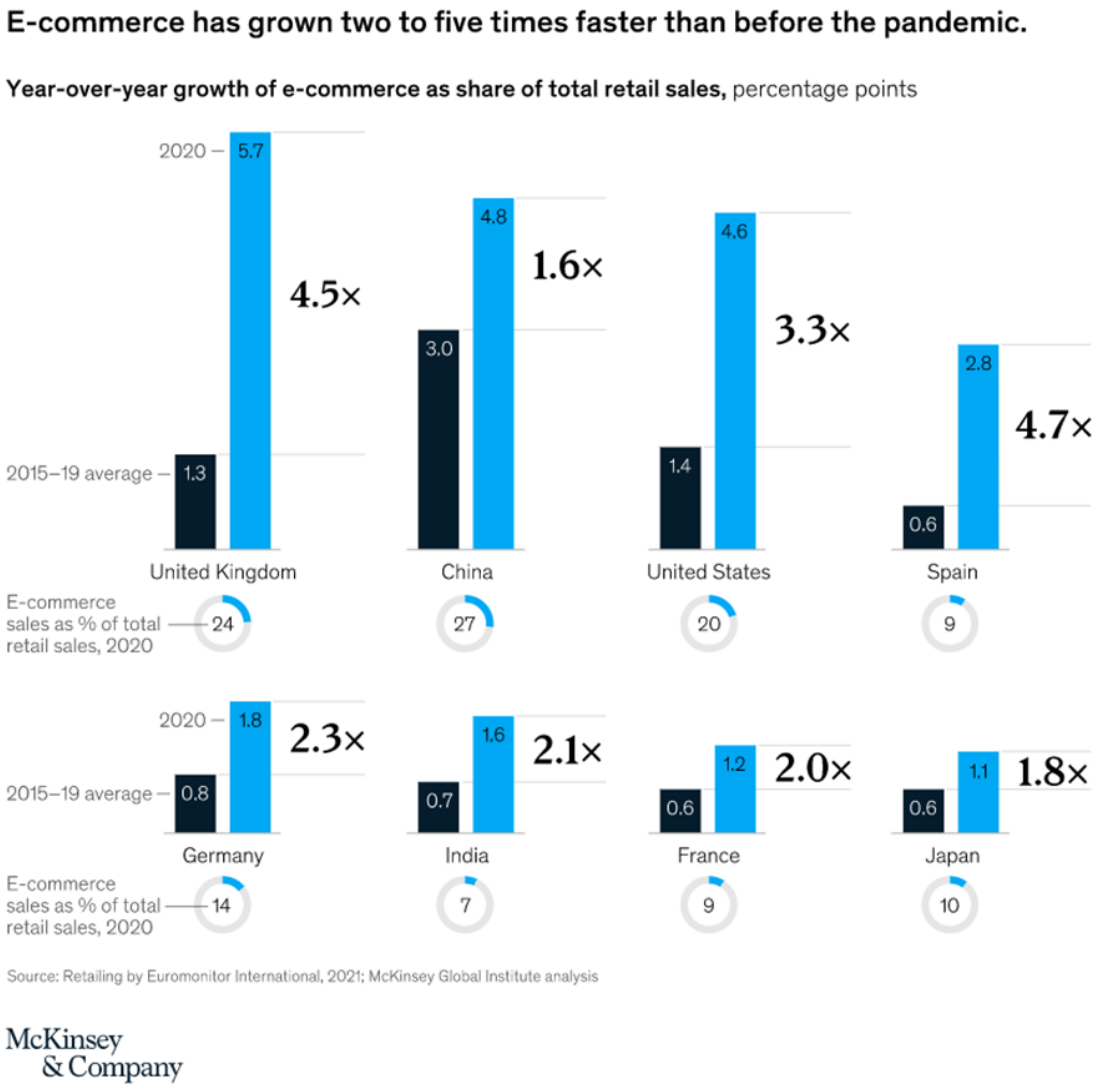


Source: CSIL Global Mattress Market Presentation 2021

It is clear to all that the pandemic has significantly increased e-commerce as a channel to market as can be seen in the chart below. In Europe most significant growth in 2020 was seen in UK and Germany.

The chart below from McKinsey, whilst looking at e-commerce in general, shows how e-commerce has accelerated during the Covid 19 pandemic in the various countries.

Chart 3 GROWTH IN E-COMMERCE ACROSS MAJOR GLOBAL MARKETS 2015-2020 (%)



2.3. The Automotive Industry

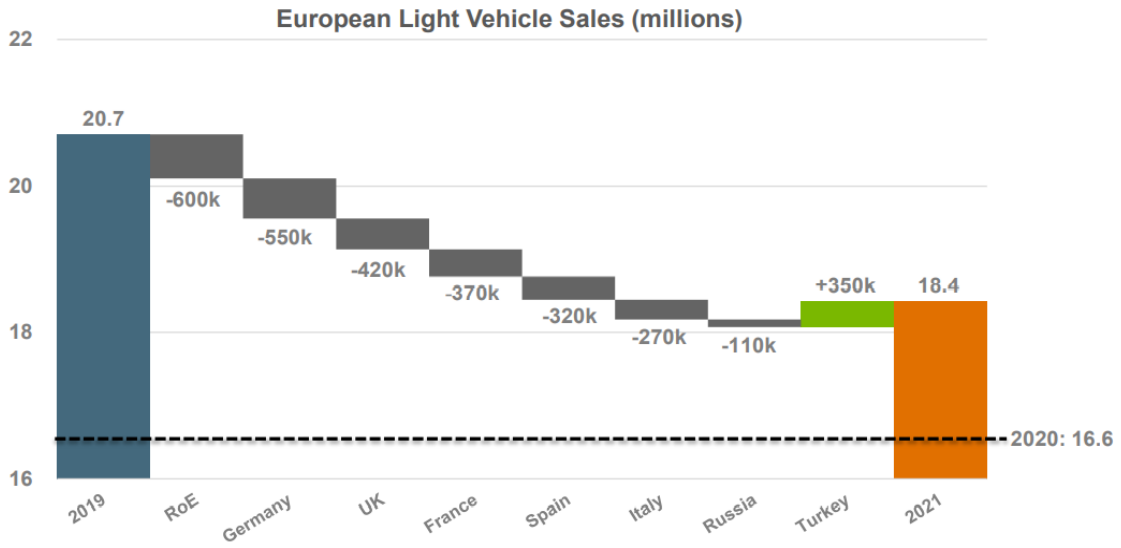
For the global automotive markets, 2020 turned out to be a continuation of 2019's challenges, as the pandemic hit plants began to close around the globe. At the year-end LMC Automotive reported that global light vehicle production fell from 88.9 million units in 2019 to 74.8 in 2020 – a drop of around 19%.

Data from LMC Automotive showed a 4.4% decline in production in China - from 24.3 million units in 2019 to 23.3 million in 2020. Other major producing countries showed declines including: i) the USA where production fell from 10.6 million in 2019 to 8.6 million in 2020, a decline of around 23% and ii) Japan where production fell from 9.2 million in 2019 to 7.7 million in 2020, a decline of around 19%. During 2021 China is expected to exceed 2019 production levels, while the USA & Japan are predicted to reach 2019 levels in 2022.

Growth in Europe for 2021 is projected to be 18.4 million vehicles' showing a growth of 11.3% over 2020. Although interim data from LMC in March 2021 shows that production levels of 19.6 million vehicles could be reached in 2021. Material and component shortages are expected to hamper production levels.

Production in the USA also declined during 2020 by 23% from 10.5 million to 8.6 million. Japanese OEMs also produced 19% less during 2020. However, by the end of 2021, Chinese production is expected to exceed 2019 levels and the USA and Japan are predicted to reach 2019 levels by the end of 2022.

Chart 4 DECLINE IN EUROPEAN LIGHT VEHICLE SALES 2019-2021



Source: LMC Automotive, used with kind permission

The European Automotive Manufacturers Association (ACEA) data shows that European registrations fell by around 20% compared with 2019 with the biggest falls in the EU. Increases in new vehicle sales in Turkey were initially driven by low-cost loans and favourable payment terms. A significant number of the vehicles were imported into the country, leading to a significant outflow of foreign currency; to limit this effect the Turkish government increased the sales tax on all new vehicles during August 2020. Therefore, sales of new vehicles were very much "skewed" to the first 6-7 months of 2020.

Table 6 AUTOMOTIVE SALES IN EUROPE 2019 & 2020 (NO. OF VEHICLES)

Market	2020	2019	% Change
EU	9,942,509	13,028,948	-23.7
EFTA	307,609	465,570	-16.7
United Kingdom	1,631,064	2,311,140	-29.4
Russia	1,505,093	1,638,665	-8.1
Turkey	610,109	387,256	57.4
Ukraine	85,866	90,207	-4.8
Others-Europe	219,469	190,671	15.0
Total Europe	**14,381,719**	**18,112,057**	**-20.6**

Source: ACEA (European Automotive Manufacturers Association), used with kind permission

Table 7 AUTOMOTIVE SALES IN THE LEADING EU COUNTRIES, 2019 & 2020 (NO. OF VEHICLES)

Markets	2019	2020	Change (%)
Germany	3,687,258	2,917,678	-19.1
France	2,214,279	1,650,118	-25.5
Italy	1,916,320	1,382,496	-27.9
Spain	1,258,260	851,211	-32.3
EU Total	**13,128,948**	**9,942,508**	**-23.7**

Source: ACEA (European Automotive Manufacturers Association), used with kind permission

In terms of production of passenger vehicles, data from LMC Automotive suggests that there was an overall fall in production between 2019 and 2020 of 24.0%, with sharp drops in the UK (-28.5%), Benelux (-12.9%), Italy (-17.6%) and Germany (-24.7%). Exports from the EU are reported to have fallen by 17.3% during 2020 according to data from VDA (German Automotive Association). Exports were 4.7 million vehicles less from the EU and imports were also 32% lower at 2.7 million vehicles.

Table 8 PASSENGER VEHICLE PRODUCTION 2019-2020 AND FORECASTS TO 2024 ('000 VEHICLES)

Country	2019	2020	% Change 2019/2020	2021F	2022F	2023F	2024F
Austria	164	116	-29,27	113	118	739	162
Belgium & Netherlands	423	368	-13	439	409	352	352
France	2,154	1,331	-38,21	1,681	1,909	2,008	2,023
Germany	4,870	3,668	-24,68	4,439	5,151	6,467	5,721
Italy	935	770	-17,65	937	1,066	1,058	1,105
Spain & Portugal	3,120	2,479	-20,54	2,946	3,129	3,140	3,209
UK	1,361	972	-28,58	1,263	1,358	1,390	1,437
Czech Republic	1,420	1,150	-19,01	1,281	1,333	1,388	1,424
Hungary	537	435	-18,99	462	513	523	513
Poland	622	428	-31,19	482	541	675	785
Slovakia	1,070	942	-11,96	1,049	1,076	1,014	1,144
Other Europe*	626	573	-8,47	562	511	630	692
TOTAL EUROPE	**17,302**	**13,232**	**-23,52**	**15,624**	**17,114**	**18,784**	**18,567**
Russia	1,632	1,358	-16,75	1,513	1,668	1,819	1,910
Turkey	1,431	1,265	-11,6	1,362	1,490	1,524	1,514
GRAND TOTAL	**20,365**	**15,855**	**-22,15**	**18,529**	**20,272**	**22,127**	**21,991**

*Other Europe - include Belarus, Bulgaria, Finland, Serbia, Slovenia, Sweden and Ukraine
Source: LMC Automotive, used with kind permission

Forecasts form LMC Automotive broadly suggest that passenger light vehicle production will return to pre-pandemic levels in 2022 with corresponding single digit growth to 2024.

3. FLEXIBLE PU SLABSTOCK FOAM PRODUCTION DATA

Data reported here has been aggregated according to CEFIC Guidelines for “Handling Confidential Statistics in compliance with competition law”: with at least 3 companies per geographical area and with no company representing over 70% of the reported data in the said area. Preferably, where possible, data has been reported where there are 5 companies per geographical area with no company representing over 70% of the reported data in the said area. All information supplied by EUROPUR members remains confidential and comments are reported anonymously. Due to the growth in EUROPUR membership, the total amount of polyether foam produced by members now represents about 70% of all the foam production in the EU 27, UK, Norway and Switzerland. The raw data supplied by members therefore constitutes a very solid basis for an accurate representation of trends in foam production.

In accordance with the CEFIC guidelines and anti-trust regulations, polyether foam production is presented by regions. Data for polyester foam production cannot be presented by region due to the small number of producers.

The production data reported here was collected from EUROPUR members via a questionnaire that they were asked to complete. As regards non-members, data was collected from foam producers via questionnaires, personal and telephone interviews. Data was also obtained from a range of secondary sources.

In total just over 1.35 million tonnes of polyether foam were produced in 2020, an increase of 3.9% compared to 2019. A total of 63,872 tonnes of polyester foam were produced, a decrease of 7.8% compared to 2019 mainly due to the closures of automotive production due to the pandemic. The industry suffered a severe loss of production in the second quarter but recovered rapidly as plants began to reopen in the 3rd quarter.

Supply chains have been stretched to the limit. In 2020 isocyanate and polyol suppliers have been joined by problems in sourcing additives, textiles, wood, metal (springs) and the serious logistical issues that have challenged every industry and this continues into mid-2021.

These supply chain issues have had serious effects resulting in price volatility causing cost pressure in foam manufacturing. This is now having an effect on product quality continuing the trend to lower densities, etc.

In 2020 foamers who had customers with strong e-commerce platforms benefitted over those who normally delivered to “bricks and mortar” retailers as this sales channels simply closed due to the Covid 19 restrictions.

Data supplied by EUROPUR members showed that volumes of standard foam remained flat while HR and VE showed strong increases. Contrary to 2019 the major focus in 2020 shifted to availability of product and the ability to supply the market. Most members reported that they could have sold more foam if there would have been sufficient raw material supplies.

The shortage of raw materials and a surge in demand increase the amount of "tolling"[2] that was taking place as members struggled to improve supply positions.

Members also reported that innovation and new product development took a lower priority in 2020 as all resources were deployed to maintaining supplies. The exception to this was projects related to sustainability and circular economy.

The following data is a summary of polyether slabstock production in all regions listed in the introduction.

Table 9 POLYETHER SLABSTOCK PRODUCTION EUROPE 2017-2020 (TONNES)

	2017	2018	2019	2020	AAGR (2019/20) %
Austria, Germany, Switzerland	142,176	130,128	129,987	133,748	2.9
Benelux	92,769	88,635	88,392	88,498	0.1
UK and Ireland	83,539	82,542	78,488	74,041	-5.7
Scandinavia & Baltics	79,478	74,928	77,345	78,981	2.1
Poland	211,546	216,974	223,185	218,739	-2.0
Iberia	113,199	110,350	109,716	131,499	19.9
France	41,211	31,842	32,734	30,765	-6.0
Italy and Malta	107,652	105,026	105,916	105,900	0.0
Balkans, Greece & Cyprus	22,555	29,433	42,396	46,825	10.4
Romania and Bulgaria	61,128	59,992	62,728	72,679	15.9
Hungary, Croatia, Czech and Slovak Republics & Slovenia	52,991	49,908	52,192	54,032	3.5
Russia, Kazakhstan, Belarus & Ukraine	134,140	132,670	136,373	141,813	2.1
Turkey	152,650	143,805	162,153	176,985	9.1
Grand Total	**1,295,034**	**1,256,233**	**1,301,605**	**1,354,504**	**3.9**

Data accuracy has increased over the years. Any discrepancy with reports of previous years is due to improvement in knowledge of these years.

[2] "Tolling" is the outsourcing of production

Austria, Germany & Switzerland (DACH) – total foam production in the region grew by 2.9% mainly driven by "bed in a box" sales and the growth of e-commerce in Germany.

The region continues to see large volumes of mattresses imported from its East European neighbours, but the production of high-quality furniture makes the region a leading global exporter of furniture. Production of spring mattresses increased slightly in Germany as some retailers promoted the orthopaedic benefit of springs and foam, rather than just a full foam mattress. In the lower priced segment of the market, full foam mattresses continued to dominate, many millions being imported from Poland and Romania. The largest growth sector within full foam mattress sales has been in the EUR 100-600 range.

Benelux region – here the market once again experienced pressure from imports of competitively priced foams and products from Germany and Eastern Europe as well as China. Total foam production remained stable over the year as a growth in exports compensated for weak domestic demand. Data from the Belgian furniture trade association, Fedustria, stated that production decreased by 2.6% in 2020 compared with 2019. With 57% of production being sold abroad, exports of furniture and mattresses decreased by 4.6%. France, The Netherlands and Germany remained the main export markets. Domestic sales only decreased by 1.1% in 2020 despite the pandemic.

UK & Ireland – production of foam fell by nearly 6% in 2020 due to the pandemic and several "lockdowns". Automotive production fell 28.5% and sales fell 29.4% due to the Covid 19 pandemic although the declines were skewed towards the second quarter. However, adequate raw material supplies would have allowed foamers to produce even more foam in quarters 3 and 4. The "bed in a box" market remains a significant consumer of foam and has grown during the pandemic, nevertheless the sector is highly competitive due to the large number of new players. Both Eve Sleep and Simba, leading suppliers to the UK market, have performed better in 2020 than in 2019. The UK still remains the largest market in Europe for this type of product, although Germany is catching up.

Scandinavia, Lithuania and Estonia – reported a 2.1% increase in production volumes during 2020. Within this region, Lithuania grew the strongest due to exports of foam to the furniture industry in neighbouring Ukraine. Production in Denmark, which is heavily focused on mattress exports, also performed well as the global demand for high-end mattresses was strong.

Poland - foamers reported a decline of 2% in 2020, although the trend was not uniform across the whole country, with some reporting lower sales volumes than in 2019 and others increasing production. This discrepancy was driven by two factors: the conditions of the pandemic and the end-market served by the foam producers' customer (e-commerce or "brick and mortar"). Foamers supplying mostly to brick and mortar retailers logically suffered a decline in production due to store closures. The access to key raw materials also varied wildly amongst companies.

Iberia – the region reported a very strong growth of 19.9%, partly due to the recalculation of estimates for some non-members. Even the readjusted growth figure of 11% showed strong growth. The growth was due to a significant rise in exports to the USA as well as to neighbouring European countries, especially France. The industry has also seen growth due a number of investments in foam production capacity. In response to changes in raw material availability, some foamers actively moved their product portfolios towards higher value products, namely VE & HR Foams. The trend among consumers for the most popular price range for a full foam mattress was still EUR 200-300, but with a view to replace it more frequently.

Some foamers reported a significant increase in interest for tolling on behalf of foam and furniture manufacturers in North Africa and South America as foamers struggled with raw material availability.

The Spanish automotive industry suffered in 2020 with a 20.2% fall in output driven by the pandemic and corresponding plant closures, sales fell by 32.3%.

France – production of foam in France fell by 6% in 2020. All major foamers reported tough conditions driven by the pandemic closures, the market also remains extremely competitive due to imports of foam from Iberia and elsewhere in Europe. E-commerce sales channels have become increasingly popular and have doubled turnover during 2020.

Italy - AIPEF members performed better than expected in 2020 declaring a 2.8% increase in foam production. Non-members performed less well, reducing the change in production of foam down to flat, overall. Manufacturers of high-end furniture have reported good sales, especially in the export markets of both China & USA.

The trend from 2019 towards full foam mattresses stabilised in 2020, although most retailers are still promoting a combination of springs covered in viscoelastic foams, for optimum support. At the lower end of the mattress market foams of 25kg/m3 density are typical. There was a clear shift in 2020 from price and density to availability, almost at any cost.

Compression technology continues to grow in popularity in Italy as a cost effective method for transporting foams and for reducing storage needs at retail outlets. However, at the more expensive end of the market, retailers preferred not to deliver mattresses in compressed rolls because it looked cheap, but, like everywhere else in Europe "bed in a box" market is now growing.

Weakness in the euro against the dollar, helped to increase exports of furniture to the US during 2020. The US remains Italy's third-largest export market, in the EU the leading export markets are Germany and France.

Changes in the Chinese market have also benefitted Italian furniture manufacturers. Chinese consumers have increasing purchasing power and are beginning to demand better quality and design, increasing demand for higher-end products, such as those with "Made in Italy" label. Exports from Italy to China remained relatively strong despite the pandemic.

Greece, Balkans and Cyprus – foam production in this region reached nearly 50,000 tonnes, due to growth in tolling production of foams and the operation of new plants in Kosovo and Serbia. Overall, this region reported a 10.4% increase in production. Production in Serbia increased due to a significant increase in the export of mattresses to the US and elsewhere in Europe. Due to a number of free trade agreements, Serbia can serve as a manufacturing hub for duty-free exports to a market of more than 1 billion people that includes the European Economic Area, the United States of America, the Russian Federation, Kazakhstan, Turkey, Southeast Europe and Belarus.

It was reported that tolling for other foam producers had taken place in the sub region driven by raw material shortages which has somewhat distorted the manufacturing figures when comparing with the previous years.

Another major driver, in the sub region, was the imposition of anti-dumping tariffs by the USA which challenged producers forcing some to redistribute production to other locations.

Price remains the main purchasing decision for both the direct business customers of foamers and final consumers of mattresses, leading to demand for low density foams in many mattresses. Although price is important, product availability became the major issue in 2020.

Production of foam within Greece depends heavily on the tourism industry and was lower in 2020 due to the closure of this sector during the lockdown periods. There was some relief from hotels taking the enforced closure and an opportunity to upgrade facilities.

Foamers in **Hungary, the Slovak and Czech Republics, Croatia and Slovenia** reported an increase of 3.5% in total production, although there remains no production in Croatia. Hungarian foamers benefited from growth in investment in the country's furniture industry from Austrian manufacturers including the Ada Group and Nova Furniture. The geographic position of Hungary also makes it a strategic export base with more than 50% of goods being exported. In addition, Hungarian foamers benefited from tolling in the neighbouring Balkan countries, where they operate conversion units.

Romania & Bulgaria – foam production grew by 15.9% in 2020, with the volumes being driven by tolling and benefitting from investments in the countries furniture industry from other EU states. In absolute terms, production increased by 4429 tonnes. The Romanian Furniture Manufacturers Association (APMR), reported that domestic furniture output stands at 2.5 billion euros per year, and is mainly export-bound, as 80% is sold abroad.

Russia, Kazakhstan, Ukraine, Belarus and Uzbekistan (Eurasia) – experienced an increase of 2.1% in 2020 driven by domestic demand with support from domestically produced chemical raw materials as well as Chinese suppliers.

The use of modern highspeed lines has changed the foam industry in this region, allowing greater volumes to be produced more reliably. Some further consolidation in capacity and modernisation is expected in 2021, as the leading foamers restructure and expand the supply chain.

According to trade journal Furniture World Russia, the Russian home furniture market is expected to register a CAGR of 5% during period to 2026. The main drivers are reported to be:

- Growth in the construction industry over recent years.
- Diversification of sales channels - multi-brand shopping centres, mono-brand stores, and small independent retailers.
- Increased popularity of online shopping.
- Improvements in the logistic services.
- Availability of imported high-quality furniture.

There is still a strong trend to use springs rather than foam in both mattresses and upholstered furniture, although some end-users reported a change towards foam, because it is more modern. Following the high prices and availability of TDI & polyol, many Russian end-users are suspicious about increasing their reliance on the material. However, the majority of mattresses sold in Russia and surrounding countries are spring mattresses. The consumer has been educated to believe that springs are more durable and supportive than foam. Durability and firmness are very important factors for the Russian market.

Vertical integration continues to be a potential threat to the existing foam industry in Russia, with at least two major furniture and mattress manufacturers considering opening their own foam plants.

Furniture manufacturing is dynamically developing in Kazakhstan. In total, more than 1,000 furniture manufacturers are operating in Kazakhstan.

Foam production in Belarus fell in 2020 but remains small in absolute terms. Belarusian furniture is exported to 30+ countries. Among them are many countries in Europe (Italy, Germany, France, Poland, and others) and oversea markets such as the United States, Canada and New Zealand. Currently 70% of the furniture produced in Belarus is sold internationally. It is no surprise that leading furniture manufacturers are investing in foam lines to benefit from integration. A new foam line is due to be commissioned in late 2021, followed by others in 2022, although this could be affected by new EU sector based sanctions on Belarus

Turkey – foam production grew by 9.1% to a total of 176,985 tonnes in 2020. This was mainly due to an ability to obtain key raw materials from far eastern suppliers and official TDI import data showed a 13% increase compared to 2019.

The reduction in VAT on new furniture from 18% to 8% helped to stimulate the domestic market. The housing sector improved too with more houses selling as interest rates were reduced.

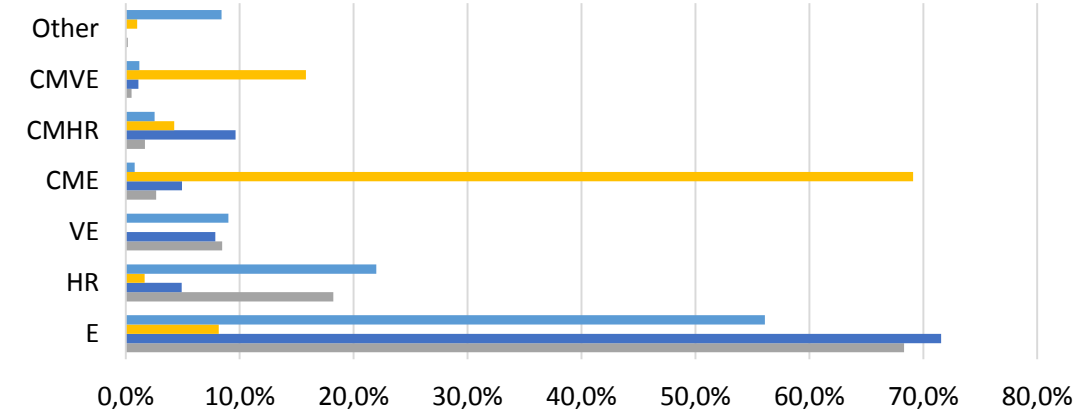
The competitiveness of Turkish foamers and the availability of raw materials enabled them to take advantage over other European suppliers and win some “bed in a box” contracts. This was supported by a weak lira. The weak lira also helped to increase exports of mattresses and upholstery, which showed a double digit increase in 2020, with exports to the United States, Middle East, and North Africa. In total, an estimated 50% of furniture production was exported in 2020.

Exports have played a significant role in demand for foam, with the major domestic mattress manufacturers buying huge quantities of foam for export orders.

3.1. Foam Production by Type

This bar chart shows polyether foam production by region produced in 2020 by EUROPUR Members. In comparison to 2019, there has been a shift in Western Europe towards standard foam with increases to HR and VE foams in Eastern Europe. It must be noted that any long term trends are difficult to draw at the moment as most of the changes were driven by raw material availability as opposed to demand.

Chart 5 POLYETHER PRODUCTION BY TYPE (%), BY REGION IN 2020 (EUROPUR MEMBERS ONLY)

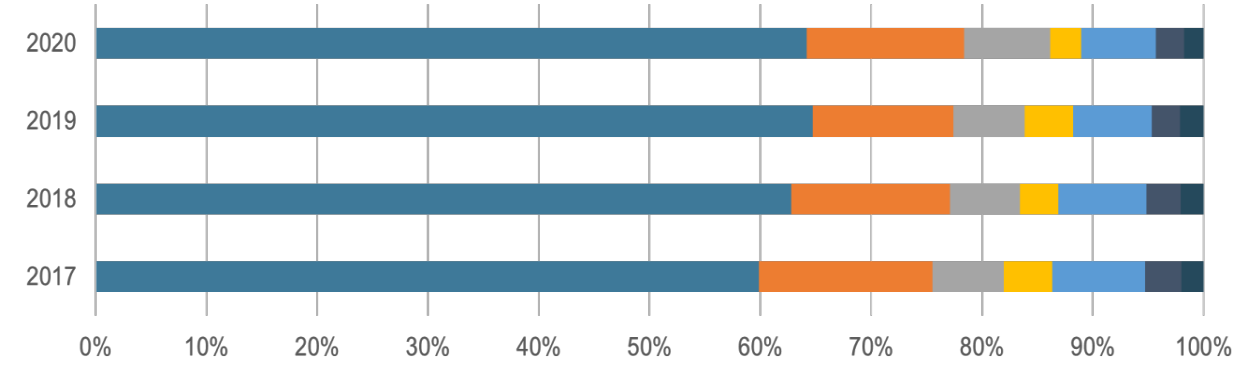


	E	HR	VE	CME	CMHR	CMVE	Other
West Europe	56,1%	22,0%	9,0%	0,8%	2,5%	1,2%	8,4%
UK and Ireland	8,2%	1,6%	0,0%	69,1%	4,3%	15,8%	1,0%
Italy	71,6%	4,9%	7,9%	4,9%	9,6%	1,1%	0,0%
East Europe	68,3%	18,2%	8,5%	2,7%	1,7%	0,5%	0,2%

Chart 6 shows the slabstock production by type (EUROPUR Members only). From the table the effects of the Covid 19 pandemic are clear with a small decrease in standard foam but significant increases in HR and VE foams as members react to the significant move to e-commerce e.g., “bed in a box”, higher demand for medical products and a general trend to move to available but more profitable foams.

Declines in production were seen in all CM (combustion modified) categories mainly driven by the decline in the UK and in automotive.

Chart 6 POLYETHER PRODUCTION BY TYPE (%), BY REGION IN 2017-2019 (EUROPUR MEMBERS ONLY)



	2017	2018	2019	2020
E	59.9%	62.8%	64.7%	64.2%
HR	15.7%	14.3%	12.7%	14.2%
VE	6.5%	6.3%	6.4%	7.8%
Other	4.3%	3.5%	4.4%	2.8%
CME	8.4%	8.0%	7.1%	6.8%
CMHR	3.3%	3.1%	2.5%	2.5%
CMVE	2.0%	2.0%	2.1%	1.8%

3.2. Trade data – Imports & Exports

2020 data from Eurostat showed an 8.2% increase in foam imports into the EU compared to 2019, reaching 17,614 tonnes. Serbia and Russia were again the leading importers of foam into the EU. The value fell by 7.8% to 71.2 million EUR.

Table 10 IMPORTS OF FLEXIBLE FOAM INTO THE EU 28, 2018-2020 (TONNES, EUR MILLION)

Origin of Imports into EU (tonnes)	2018	2019	2020	% Change 2019/20
United States	1,803	2,141	1,432	-33.1%
Russian Federation	2,004	1,443	2,109	46.2%
China, People's Republic of	1,827	3,281	1,955	-40.4%
Switzerland	711	800	926	15.8%
Turkey	1,523	1,551	1,647	6.2%
Serbia	3,455	2,974	6,100	105.1%
Others	5,961	4,090	3,445	-15.8%
TOTAL (tonnes)	**13,829**	**16,280**	**17,614**	**8.2%**
TOTAL VALUE (EUR Million)	**68.6**	**77.2**	**71.2**	**-7.8%**

Source: EU Market Access Data – Code HS 39 21 13 10

The data for 2020 showed an increase of 8.2% over 2019 in volume but a decrease of 7.8% in value.

The data may include volumes of trim and bonded foam in the totals, since this material has no recognised classification. The inclusion of some trim and bonded foam in the numbers, may explain the high volume of foam exported to the US during 2018 as trim foam was in short supply during 2018 and the US is the world's largest manufacturer of rebonded foam.

This seems to have normalised somewhat in 2020 although the construction market in the US is still performing strongly in 2020.

Russia significantly increased imports into the EU despite the pandemic, Turkey in line with expectations and the increase from Serbia and the reduction with China probably has much to do with the US imposed anti-dumping tariffs on Serbian made mattress products.

Exports of foam to Yemen have increased dramatically, and this is assumed to be either due to the inclusion of trim foam or foam slabs for use in refugee camps. Exports of foam to Sri Lanka are thought to be associated with the country's lingerie manufacturing industry.

Exports to Saudi Arabia have begun to normalise after the local mattress and furniture manufacturing sectors were starved of raw materials during 2017 and 2018, or trim foam for the production of rebonded foam.

Table 11 EXPORTS OF FLEXIBLE FOAM OF EU ORIGIN, 2018-2020 (TONNES, EUR MILLION)

Destination of Exports from the EU (tonnes)	2018	2019	2020	% Change 2019/20
Saudi Arabia	5,952	8,170	6,178	-24.4
United States	11,170	5,421	4,513	-16.8
Yemen	2,954	4,501	9,216	104.8
Ukraine	2,914	4,440	5,520	24.3
Serbia	3,435	3,897	4,483	15.0
China	3,384	3,229	2,956	-8.5
South Africa	2,707	2,744	2,215	-19.3
United Arab Emirates	2,519	2,607	1,426	-45.3
Switzerland	2,615	2,557	2,379	-7.0
Russian Federation	2,283	2,007	1,872	-6.7
Morocco	1,703	1,977	1,751	-11.4
Bosnia & Herzogovina	2,197	1,911	1,757	-8.1
Canada	1,189	1,613	1,696	5.2
Mexico	2,000	1,457	1,570	7.8
Australia	812	1042	405	-61.1
Macedonia	957	992	613	-38.2
Turkey	3,405	2,505	2,623	4.7
India	1,196	940	622	-33.8
Sri Lanka	613	823	868	5.5
Other destinations	10,946	10,127	9,277	-8.4
Total Exports (tonnes)	**64,591**	**62,960**	**61,940**	**-1.62**
Value (€ Million)	**221**	**225**	**224**	**-0.44**

Source: EU Market Access Data - Code HS 39 21 13 10

3.3. Structural Changes in the Foam Industry

Whilst the trend in the Covid 19 year was survival, the consolidation and restructuring trend from the past few years continued:

- Recticel – continued the restructuring started in 2019 with the completion of the purchase of Foampartner and the rigid foam panel manufacturer Gor-Stal
- After Greiner took 100% of the joint venture with Recticel “Eurofoam”, Greiner has rebranded their foam activities under the “Neveon” brand.
- Vita acquired IMPE, Naples, which is now VITA Italy. It also made a downstream acquisition of Techical Foam Services from UK.
- Healthcare has expanded into Spain with a plant in Valencia.
- Consolidation in the “bed in a box” segment has continued with Tempur Sealy has announced the acquisition Dreams, a UK bedding retailer.
- The trend towards the recycling of post-industrial mattresses continues, at a pace, with Chemical recycling plants under construction and or planned in
    - The Netherlands (Retour Matras)
    - France (Orion Chemicals/Dow)
    - Belgium (Triple Helix)
    - Germany (2 recycling plants - Covestro AG & BASF SE)
    - Spain (Repsol)

4. RAW MATERIAL SUPPLY AND DEMAND

The following table provides an estimated breakdown of raw materials demand in the production of both moulded and slabstock foam. Data from EUROPUR members provides a breakdown of polyether foams by types, to which a standard formula can be applied to produce a raw material demand estimate.

Automotive moulded foam is estimated using LMC Automotive production data at an average of 15 kg per vehicle; this includes seat foam, head rests, armrests and carpet underlay used for NVH reduction (noise, vibration & hardness). The majority of this foam is assumed to be MDI based.

Using data on foam production by type, some standard formulations and estimates for the share of TDI and MDI technology, the following estimates of raw material demand have been calculated. The figures relate to foam produced and not to foam poured.

Table 12 ESTIMATED RAW MATERIAL DEMAND, (EU28, NO, CH, RUS, EASTERN EUROPE & TR), 2020 AND 2019 (TONNES)

Flexible Foam Type	MDI (t)	TDI (t)	Polyols (t)	Additives (t)	Total (t)
Slabstock					
Conventional + CME	0	288,616	620,727	52,710	962,053
HR & CMHR	10,101	44,730	153,423	18,031	226,286
VSE, CMVSE & Others	43,444	13,222	99,362	10,637	166,665
Polyester	793	16,273	41,301	5,075	63,442
Total Slabstock 2020	**54,338**	**362,841**	**914,814**	**86,453**	**1,418,446**
Total Slabstock 2019	**47,686**	**353,276**	**880,638**	**84,006**	**1,370,879**
Moulded					
Furniture & Bedding	12,000	2,625	29,095	1,680	42,000
Automotive	70,456	15,182	142,098	9,489	237,225
Total Moulded Foam	**83,056**	**17,807**	**167,193**	**11,169**	**279,225**
Total Flexible 2020	**137,394**	**380.649**	**1,082.007**	**97,622**	**1,697,621**
Total Flexible 2019	**161,456**	**375,736**	**1,102,733**	**99,021**	**1,738,945**

Source: LRM & EUROPUR

This section of the report discusses the supply of TDI, MDI and polyether polyols, as well as shifts in their prices from 2013 through to the end of Q1 2021 using data supplied by Tecnon Orbichem.

Like other petrochemicals, prices of isocyanates and polyols have faced significant volatility both in pricing and supply during 2020 & 2021 caused by the Covid 19 pandemic, plant breakdowns and corresponding supply chain problems. Macroeconomic and geopolitical factors have also played significant roles in providing further uncertainly within markets e.g., anti-dumping action

taken by the US mattress producers. As to pricing 2020 has provided both extreme peaks and troughs for all raw materials (TDI, MDI & PET Polyol).

With all three major raw material groups (TDI, MDI & PET Polyol) there have been supply and pricing challenges driven by strongly fluctuating demand complicated by maintenance and restart problems. Logistical issues have also caused short term issues i.e., dedicated container/tank shortages and container availability.

In 2020 there is 3.26 million tonnes/year of TDI capacity, 9.53 million tonnes/year of MDI capacity, and approximately 13.10 million tonnes/year of PET Polyol capacity.

4.1. TDI (Toluene diisocyanate)

The supply situation showed some improvement in the first few months of 2020 but was then disrupted by the “lockdowns” imposed by various countries. BASF’s Schwarzheide plant was finally closed in March 2020. Most other plants were subsequently run down due to collapsing demand driven by the closure of customers’ plants due to the Covid 19 pandemic. Some suppliers were able to bring forward planned maintenance as the “lockdowns” were slowly eased, with most suppliers struggling to meet the very sudden increase in demand when foaming production restarted.

After the “restart” of TDI production during Q2, the supply situation returned to normal for a short while but in September a number of problems were experienced, two European suppliers experienced production outages, and these issues were not resolved until mid-November. Although new capacity came on stream as planned, the affects were masked by outages at other plants and “restart” problems restricting supplies, especially in Europe.

Overall, the average utilisation rate of the global TDI plants was around 62% of nameplate capacity in 2020 but due to the pandemic may not reach a more typical level of around 85% until 2027/2028. (Assuming a global market growth of 5% - source IHS). All these issues just further demonstrated the difficulties of operating modern world scale TDI plants to produce at a steady rate of output.

Chinese demand for TDI remained weak in Q1/2020 due to the pandemic, but demand returned strongly when downstream furniture and mattress manufacturers in China restarted production during Q2. These manufacturers remained cautious about ramping up production levels, due to concerns about how export markets may be squeezed due to the ongoing trade disputes between China and the US and the EU and US. The strict government controls for the handling and storage of TDI also continued to dampen demand for TDI.

In the US, TDI demand was strong throughout the first half of 2020 driven by high employment levels and a buoyant housing market although this collapsed as the pandemic hit mid-year. Despite the slowdown in automotive production which reduced foam demand, TDI supply remained tight nearly all year.

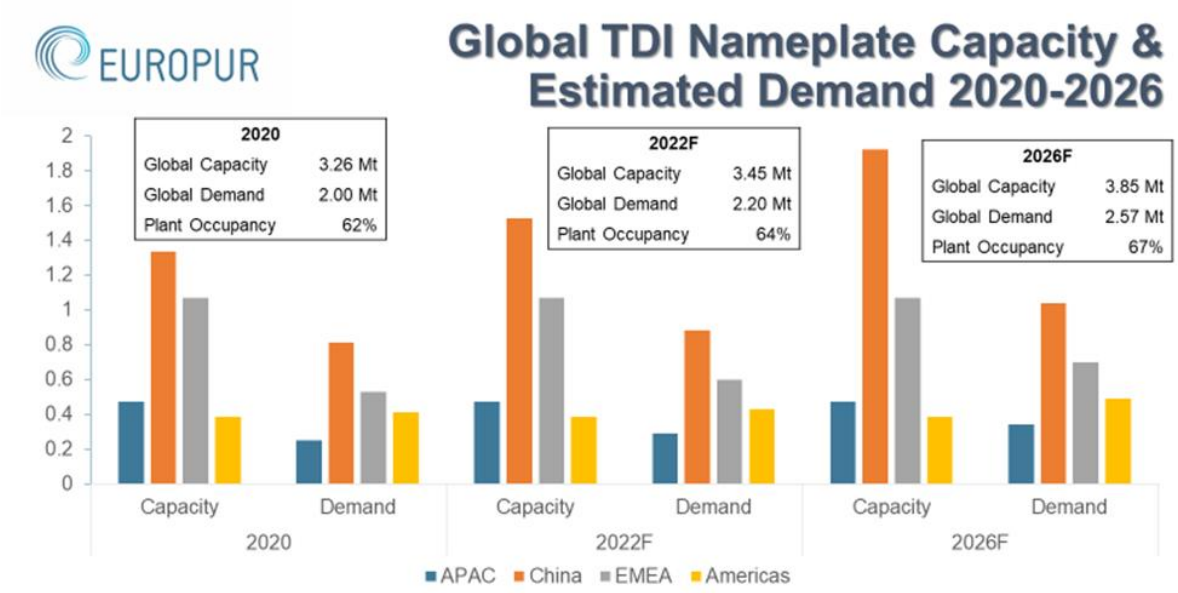
Demand for TDI in Europe was near to normal at the start of 2020 but was then plagued with the severe collapse in demand caused by “lockdowns” followed by an extraordinarily strong rebound upon reopening of the European foaming plants. Force majeure following maintenance and corresponding technical issues also hampered the supply side. Towards the end of 2020 TDI demand was also been affected by the lack of polyether polyol availability.

The unexpected peaks and troughs in demand and supply has created considerable volatility in TDI prices. With “rollercoaster” pricing during Q1 and Q2, followed by stabilising and then increasing prices from August onwards as supply became tighter, by the year end, prices reached levels those previously seen in Q2 2018.

Looking ahead, raw material manufacturers growth forecasts over the next 3-4 years are generally unchanged from an annual rate of 3% in EMEA; but with most of the growth in Africa and the Middle East, 3% in NAFTA, 2% in LATAM, and in 6% in the APAC region, but this growth is now expected to be delayed by about 2 years due to the global pandemic.

In summary, by the end of 2020, global TDI nameplate capacity was in the region of 3.26 million tonnes, with a global demand of around 2 million tonnes. New capacity slated for China could bring the total to 3.45 million tonnes by 2024. Investments into new facilities over the past few years, coupled with the effects of the pandemic has led to isocyanate demand in 2020 in a position of some structural global oversupply.

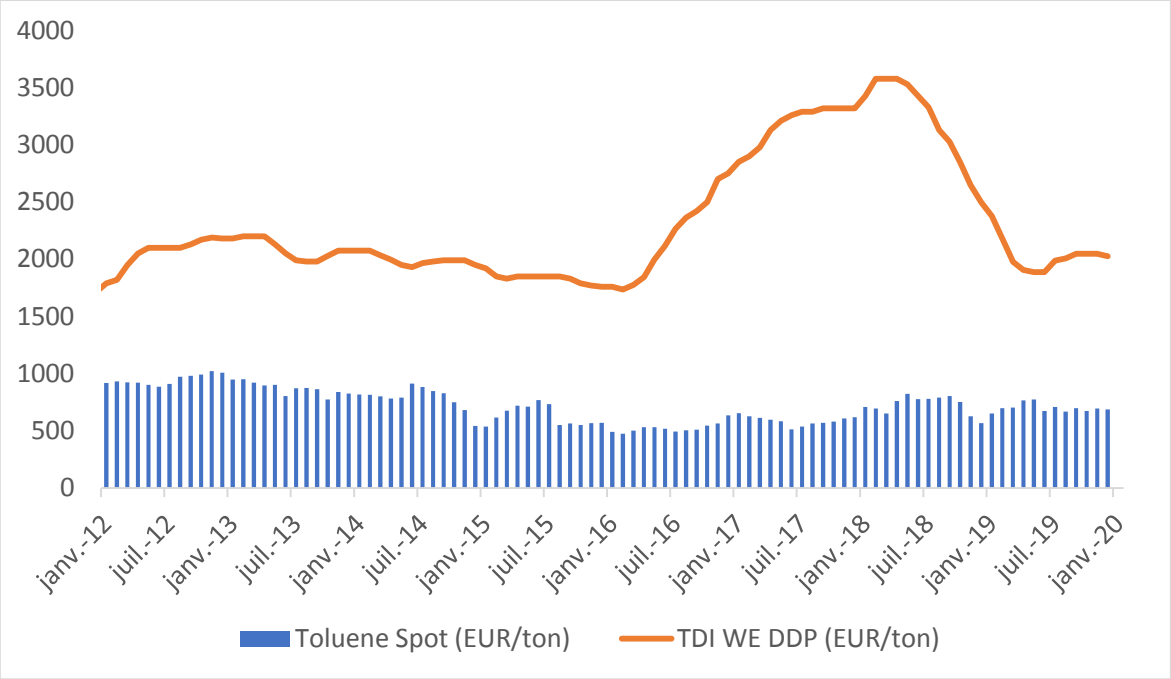
Chart 7 CHANGES IN GLOBAL TDI NAMEPLATE CAPACITY & DEMAND 2020-2026 (MT)



Source: LRM, B&P, Company Announcements

27

Chart 8 TOLUENE AND TDI PRICES IN EUROPE 2012–2020



Source: Tecnon Orbichem, used with kind permission

The following table provides the nameplate capacities for TDI plants across the world, with announced new nameplate capacities through to 2026. The largest increase is expected in Asia, but this may not actually materialise if market conditions change. Implementation of stricter environmental regulations for the chemical industry, in China, and across the Asia region may also impact production levels.

Table 13: GLOBAL NAMEPLATE CAPACITIES FOR TDI PLANTS, 2020-2026 (F) (KTA)

Crude TDI Nameplate capacity	2020	2022	2023	2024	2025	2026
EMEA	**Kta**	**Kta**	**Kta**	**Kta**	**Kta**	**Kta**
BASF, Ludwigshafen (D)	300	300	300	300	300	300
BASF, Schwarzheide (D)	0	0	0	0	0	0
Covestro, Dormagen (D)	300	300	300	300	300	300
Sadara, Jubail (KSA)	200	200	200	200	200	200
Borsodchem, Karincbarika (HUN)	250	250	250	250	250	250
Karoon Petrochemical,Mahshahr,(IRI)	20	20	20	20	20	20
Total	**1070**	**1070**	**1070**	**1070**	**1070**	**1070**

APAC	2020	2022	2023	2024	2025	2026
	Kta	**Kta**	**Kta**	**Kta**	**Kta**	**Kta**
BASF, Shanghai (PRC)	160	200	200	200	200	200
Covestro, Shanghai (PRC)	275	275	275	275	275	275
Gansu Yinguang, Baiyin (PRC)	100	100	100	100	120	120
Cangzhou Dahua, Cangzhou (PRC)	150	150	100	150	450	450
Yantai Juli, (PRC)	150	150	150	150	230	230
Huludao Lianshi Chemical (PRC)	50	50	50	50	50	50
Wanhua, Yantai (PRC)	300	300	300	300	300	300
Wanhua Fujian (PRC)	150	300	300	300	300	300
Total China	**1335**	**1525**	**1475**	**1525**	**1925**	**1925**
BASF,Yeosu (SK)	160	160	160	160	160	160
DC Chemicals, Kunshan, (SK)	50	50	50	50	50	50
Hanwha,Yeochon (SK)	150	150	150	150	150	150
Tosoh,Nanyo (J)	25	25	25	25	25	25
Gujurat Namarda (India)	68	68	68	68	68	68

Total Asia & China	**1788**	**1978**	**1928**	**1978**	**2378**	**2378**

Americas	**Kta**	**Kta**	**Kta**	**Kta**	**Kta**	**Kta**
BASF,Geismar (USA)	160	160	160	160	160	160
Covestro, Baytown (USA)	200	200	200	200	200	200
RioTecero, Cordoba (ARG)	25	25	25	25	25	25
Total	**385**	**385**	**385**	**385**	**385**	**385**
Global Total	**3263**	**3413**	**3413**	**3453**	**3853**	**3853**

Source: Nameplate capacities have been compiled and updated using only publicly available information from a variety of published sources including: A. Austin, D. A. Hicks, A review of the global PU industry 2016 and outlook for 2017, PU Magazine, February 2017, Belvedere & Partner, Investor Reports, PU Magazine, pudaily.com, urethaneblog.com, Urethanes Technology International, ICIS.com.

4.2. MDI (Methylene diisocyanate)

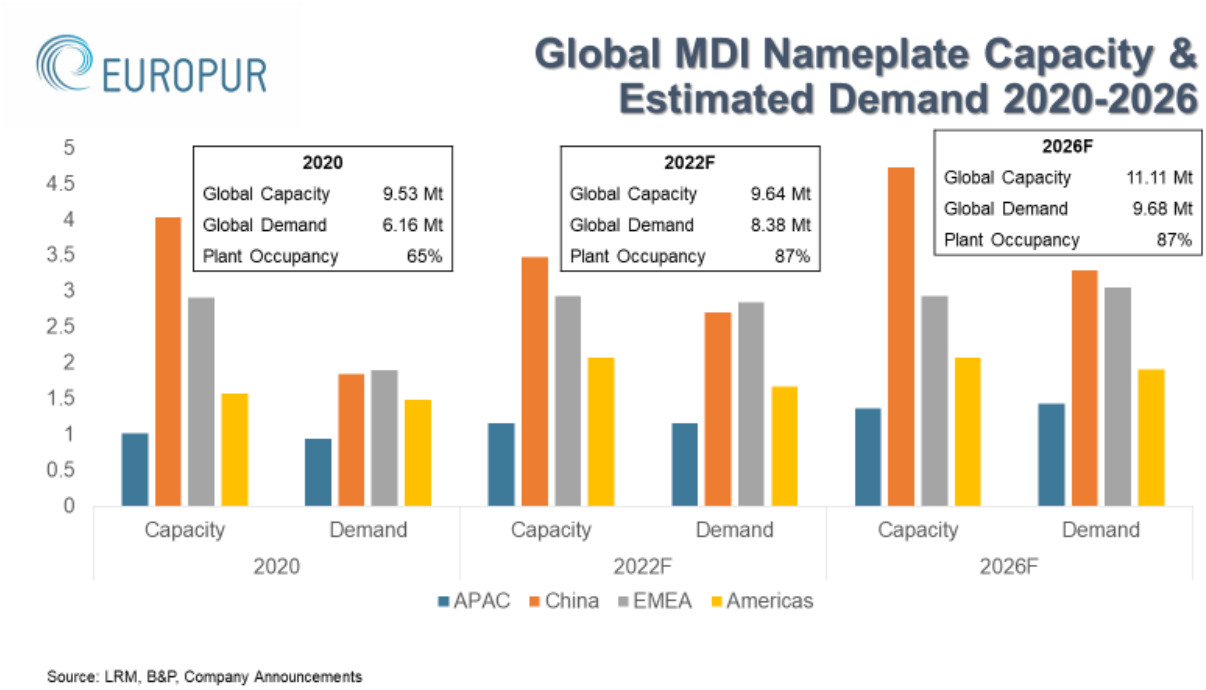
Globally, demand for MDI is forecast to grow annually between 4 - 7% reaching around 11.10 million tonnes a year by 2024, with demand from Europe growing at around 3 - 4% per year.

Chinese demand has been weak in the first half of 2020 due to the pandemic causing significantly lower demand in appliances and from the construction market.

At the beginning of 2020 all major plants were producing as expected.

The US market for polymeric MDI was generally balanced but the pandemic and supply issues also caused prices to rise. The Americas market is forecast to continue growing, and this has resulted in several announcements of new capacity. BASF will add 300Kt, Covestro have announced a new 500Kt plant and Wanhua have started work on a 400Kt plant, all are in the Gulf of Mexico area, but the weakening demand forecasts caused by the pandemic have led to a delay in the announcement of start-up dates.

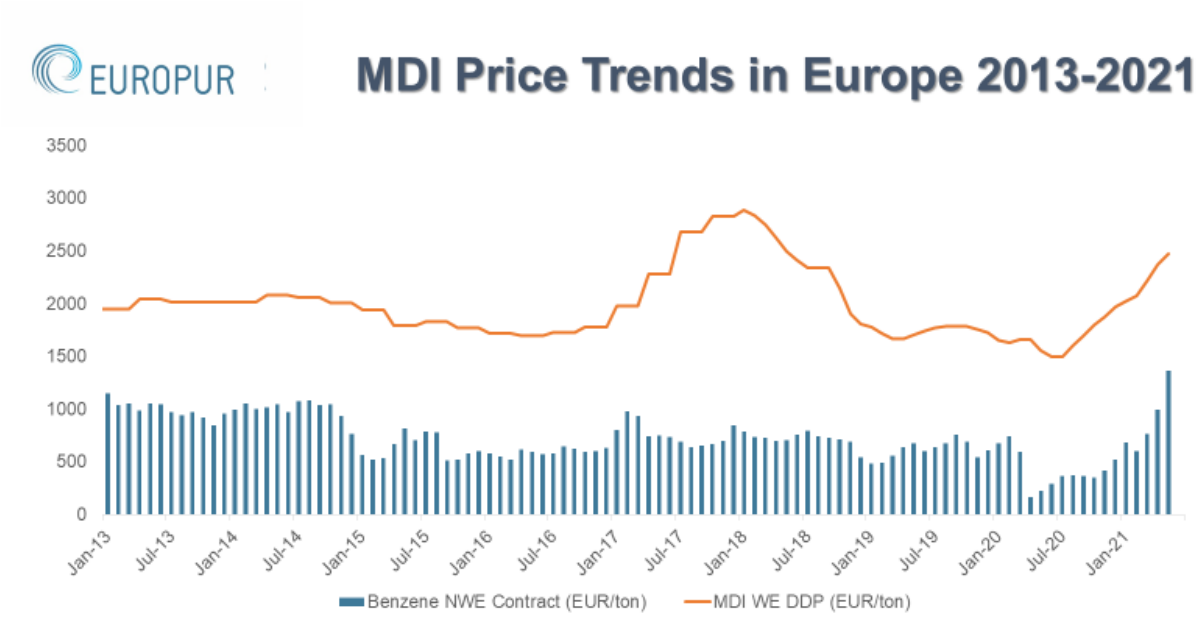
Chart 9 CHANGES IN GLOBAL MDI NAMEPLATE CAPACITY & DEMAND 2020-2026 (MT)



Source: LRM, Company Announcements

European crude MDI prices continued to decline in 2020, mainly driven by weaker demand in the construction sector but the restart after the “lockdowns” and subsequent supply chain issues caused prices to raise and by the year end had reached quarter 1 2018 level. European demand for MDI in flexible foams depends upon production of HR and VE grades and automotive production for moulded foams.

Chart 10 BENZENE AND MDI PRICES IN EUROPE 2013-2021



Source: Tecnon Orbichem, used with kind permission

30

Table 14: GLOBAL NAMEPLATE CAPACITIES FOR MDI PLANTS, 2020-2026 (F) (KTA)

Crude MDI Nameplate capacity	2020	2022	2023	2024	2025	2026
EMEA	Kta	Kta	Kta	Kta	Kta	Kta
BASF, Antwerp (B)	650	650	650	650	650	650
Covestro, Brunsbuettel(D)	400	400	400	400	400	400
Covestro, Krefeld (D)	200	200	200	200	200	200
Covestro,Tarragona (E)	170	220	220	220	220	220
Dow, Stade (D)	335	335	335	335	335	335
Huntsman, Rotterdam (NL)	470	470	470	470	470	470
Wanhua, Karincbarikca (HUN)	260	260	260	260	260	260
Sadara, Jubail (KSA)	400	400	400	400	400	400
Total	**2885**	**2935**	**2935**	**2935**	**2935**	**2935**

APAC	Kta	Kta	Kta	Kta	Kta	Kta
BASF/SLIC 1 (PRC)	120	120	120	120	**120**	**120**
BASF Chongqing (PRC)	400	400	400	400	400	400
Covestro (PRC)	500	600	600	600	600	600
Huntsman/SLIC 1 (PRC)	120	120	120	120	120	120
Huntsman/SLIC No 2 (PRC)	240	240	240	240	240	240
Wanhua, Ningbo (PRC)	1200	1200	1200	1500	1500	1500
Wanhua, Yantai, (PRC)	600	800	800	1100	1100	1100
WanHua Fujian Polyurethane (PRC)	0	0	25	250	400	400
Juli Henshan (PRC)			200	400	400	400
China	**3180**	**3480**	**3705**	**4730**	**4880**	**4880**
Covestro (J)	70	70	70	70	70	70
BASF (SK)	250	250	250	250	250	250
Karoon Petrochemical,Mahshahr, (IRI)	40	40	40	40	40	40
Kumho Mitsui (SK)	300	400	400	610	610	610
Tosoh (J)	400	400	400	400	400	400
Total Asia & China	**4240**	**4640**	**4865**	**6100**	**6250**	**6250**

Americas	Kta	Kta	Kta	Kta	Kta	Kta
BASF	400	450	500	500	550	600
Covestro	330	330	330	330	330	330
Huntsman	500	500	500	500	500	500
Wanhua	0	400	400	400	400	400
Dow	340	340	340	340	340	340
Total	**1570**	**2070**	**2070**	**2070**	**2120**	**2170**
Global Total	**8695**	**9645**	**9645**	**12900**	**13250**	**13300**

Source: Nameplate capacities have been compiled and updated using only publicly available information from a variety of published sources including : A. Austin, D. A. Hicks, A review of the global PU industry 2016 and outlook for 2017, PU Magazine, February 2017, Belvedere & Partner, Investor Reports, PU Magazine, pudaily.com, urethaneblog.com, Urethanes Technology International, ICIS.com.

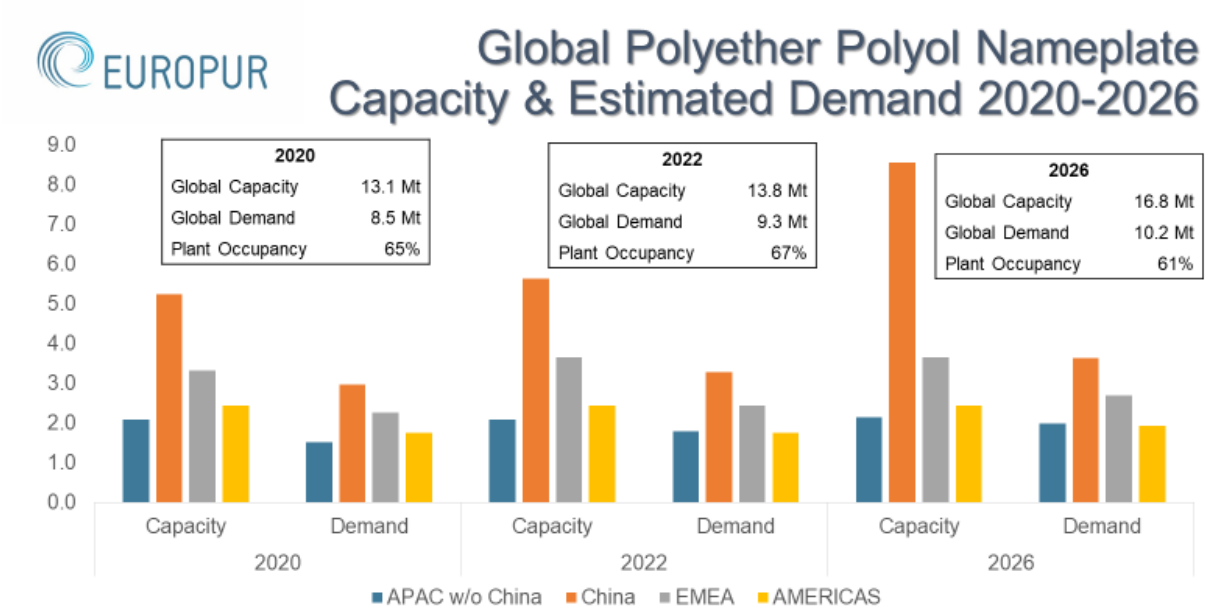
4.3. Polyols

European demand for flexible polyol increased sharply in line with slabstock production after the "lockdowns". Suppliers reported that demand in Europe was significant across the region. The market is structurally long, although, in contrast to isocyanates, plant occupancy is not such a strong indicator of supply.

Propylene Oxide prices have been more volatile, due to the large number of plant turnarounds which forced prices to a 2-year high, making production of some polyols unprofitable at some points during the year. This situation was only made worse towards the end of 2020 when many plants experienced unplanned shutdowns, which was then compounded by the "winter freeze" in Texas, USA. The global supply became very tight with sharply rising prices especially in Q4 2020 and continuing into 2021. The global production capacity for polyether polyols, (flexible and rigid) has continued to expand in recent years with supply keeping well ahead of demand.

The rising price of propylene oxide is expected to create further tension in the raw material supply chain for polyol manufacturers, the declining demand has created extremely challenging conditions.

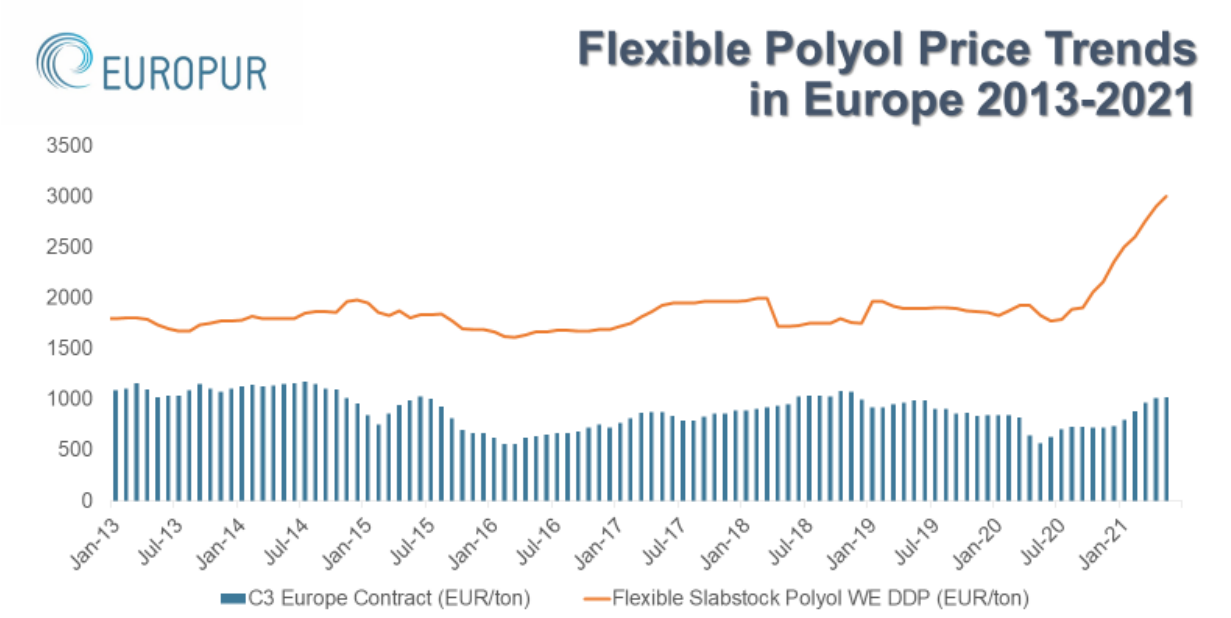
Chart 11 CHANGES IN GLOBAL POLYETHER POLYOL NAMEPLATE CAPACITY & DEMAND 2020-2026 (MT)



Source: LRM, B&P, Company Announcements 31

In a complete turnaround from the 2019 situation flexible polyol demand has increased sharply with the supply situation compounded by unplanned plant outages especially in Q4 of 2020.

Chart 12 PROPYLENE AND FLEXIBLE SLABSTOCK POLYOL PRICES IN EUROPE 2013-2021



Source: Tecnon Orbichem, used with kind permission 32

Volatility in propylene (C3) prices has driven prices in the polyether polyol markets along with increased logistical costs. The traditional metric for polyol profitability margins in Polyether polyols is the margin over C3 which as shown in the above chart has now been exceeded over the past years average.

Table 15 GLOBAL POLYETHER POLYOL NAMEPLATE CAPACITY BY LEADING PRODUCER 2018-2026 (F), KTA

Global polyether polyol capacity by leading producer 2017-2022 (F), kta							
Company	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Europe, Middle East & Africa							
SAIC/ Rabigh (KSA)	120	200	200	200	200	200	200
Sadara (KSA)	390	390	390	390	390	390	390
BASF, Antwerp(B)	300	350	350	350	350	350	350
BASF, Schwarzheide (D)	150	150	150	150	150	150	150
Covestro, Antwerp(B)	260	260	260	260	260	260	260
Covestro, Dormagen(D)	260	260	260	260	260	260	260
Covestro Fos sur Mer (F)	140	140	140	140	140	140	140
Dow, Tarragona(E)	60	60	60	60	60	60	60
Dow Terneuzen (NL)	570	570	570	570	570	570	570

Dow Tetre(B)	94	94	94	94	94	94	94
Oltchim (ROM)	120	120	120	120	120	120	120
PCC Rokita, Brezg Dolny (POL)	130	130	130	130	130	130	130
Huntsman (NL)	54	54	54	54	54	54	54
Repsol, Tarragona (E)	130	130	130	130	130	130	130
Repsol Puertollano €	70	70	70	70	70	70	70
Shell, Pernis (NL)	255	255	255	255	255	255	255
Nizhnekamsamskneftekhim & other Russian producers	65	65	65	65	65	65	65
MOL (HUN)	0	200	200	200	200	200	200
Others (independent system houses)	150	150	150	150	150	150	150
Total EMEA	**3318**	**3648**	**3648**	**3648**	**3648**	**3648**	**3648**

Company	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Americas							
BASF (MX)	60	60	60	60	60	60	60
BASF(US)	400	400	400	400	400	400	400
Dow (US)	515	515	515	515	515	515	515
Covestro (US) 3 plants (NMV, Channelview & South Charleston)	660	660	660	660	660	660	660
Monument (US)	150	150	150	150	150	150	150
Carpenter (US)	320	320	320	320	320	320	320
Huntsman (US)	45	45	45	45	45	45	45
Others	50	50	50	50	50	50	50
Total NAFTA	**2200**	**2200**	**2200**	**2200**	**2200**	**2200**	**2200**
South America							
Dow (BR)	120	120	120	120	120	120	120
Dow (Others)	60	60	60	60	60	60	60
Others	50	60	60	60	60	60	60
Total South America	**230**	**240**	**240**	**240**	**240**	**240**	**240**
Total AMERICAS	**2430**	**2440**	**2440**	**2440**	**2440**	**2440**	**2440**

Company	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Asia Pacific							
Sanyo (J)	110	110	110	110	110	110	110
Asahi Glass, Kashima (J)	100	100	100	100	100	100	100
MCNS(J)	90	90	90	90	90	90	90
Dow (TW)	35	35	35	35	35	35	35
Covestro (TW)	30	30	30	30	30	30	30
BASF(SK)	170	170	170	170	170	170	170
KPX (SK)	230	230	230	230	230	230	230
MCNS (SK)	180	180	180	180	180	180	180

Kukdo (SK)	65	65	65	65	65	65	65
Shell (SG)	360	360	360	360	360	360	360
Dow/SCG (Thailand)	279	279	279	279	279	279	279
Dow (Aus)	45	45	45	45	45	45	45
Huntsman (AUS)	35	35	35	35	35	35	35
Manali (IND)	150	150	150	150	150	150	150
PTT/Sanyo (Thailand)	130	130	130	130	130	130	130
Others (small Japanese manufacturers)	140	140	140	140	140	140	140
Total Asia Pacific	**2149**	**2149**	**2149**	**2149**	**2149**	**2149**	**2149**

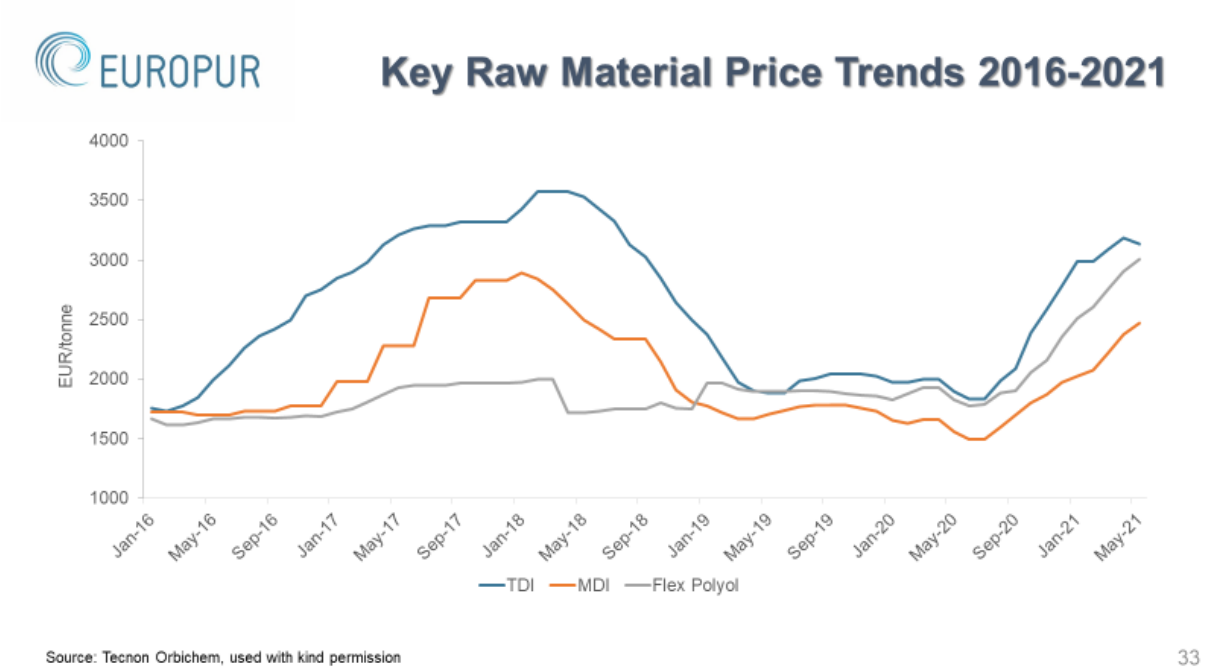
Company	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
China							
Shell/CNOOC, Nanhai, Huizhou (PRC)	270	270	600	600	600	600	600
Sinopec Shanghai Gaoqiao	220	220	220	220	220	220	220
Hangjin Technology Co, Ltd (Fangda Jinhua)	170	170	170	170	170	170	170
Blue Star Dongda, Zibo (PRC)	330	330	330	330	330	330	330
Ningwu Jurong, Juraon (PRC)	300	300	300	300	300	300	300
HongBao Li, Nanjing (PRC)	180	180	180	180	180	180	180
Tianjin Degu, Tianjin (PRC)	150	150	150	150	150	150	150
Dow/Zhiang Pacific, Zhangjiagang, (PRC)	50	50	50	50	50	50	50
Nanjing Kumho, Nanjing (PRC)	130	130	130	130	130	130	130
Fushan Jiahua	550	550	550	550	550	550	550
Wanhua, Yantai & Ningbo	605	800	800	800	800	800	800
Tianjin Petrochemical Co. Tianjin (PRC)	80	80	80	80	80	80	80
Guangzhou YutianChemicals (PRC)	200	200	200	200	200	200	200
Meizhouwan, Fujan (PRC)	50	50	50	50	50	50	50
Korea Polyol, Nanjing	100	100	100	100	100	100	100
Shandong, Longhua, Zibo (PRC)	380	380	380	380	380	380	380
Dexin Lianbang Zibo, Shandong (PRC)	330	330	330	330	330	330	330
Dexin Wudi, Zibo, Shandong (PRC)	300	300	300	300	300	300	300
Jiahua Chemicals, Shanghai Shangdong (PRC)	500	500	500	500	500	500	500
Juyuan Chemical Co Ltd, Jilin	235	235	235	235	235	235	235
HongBao Li, Nanjing (PRC)							

Befar Chemical Co Ltd, Binzhou, Shandong.	120	120	120	120	120	120	120
INOV Chemical Co Ltd, Zibo, Shandong	100	100	100	100	100	100	100
12 Others	2100	2200	2100	2100	2100	2100	2100
Total China	**7450**	**7745**	**7975**	**7975**	**7975**	**7975**	**7975**
Total Asia Pacific & China	**9599**	**9894**	**10124**	**10124**	**10124**	**10124**	**10124**
Global Total Polyether Polyol Capacity	**15347**	**15982**	**16212**	**16212**	**16212**	**16212**	**16212**

Sources: Nameplate capacities have been compliled and updated using only publically available information from a variety of published sources including, A. Austin, D.A Hicks, A review of the global PU industry 2016 and outlook for 2017, PU Magazine, Febuary 2017, investor reports, PU Magazine, pudaily.com, urethane blog.com, Urethane Technology International, ICS.com, CPUIA.

The chart below is a summary of changes in European raw material prices throughout the last 5 years. It illustrates the volatility which has created downstream challenges for the entire supply chain.

Chart 13 KEY RAW MATERIAL PRICE TRENDS IN THE EUROPEAN FLEXIBLE FOAM INDUSTRY (% CHANGE JANUARY 2016 - DECEMBER 2019 IN EUROPE)



From the above chart we see that raw material prices climbed significantly in the Q4 of 2020 and this continued into 2021.

5. SUMMARY & CONCLUSIONS

The year 2020 was the "year of Covid 19" where the industry was subjected to probably the most challenging year in its history.

To summarise, the research and subsequent member interviews confirm:

- 2020 whilst challenging was an unexpectedly good year for the industry, especially in the second half of the year.
- Those members with customers who have strong e-commerce platforms benefitted over the traditional "bricks and mortar" customers.
- The trend of the last few years has continued, as end-use industries continue to demand lower density foams, and no return to higher density foams was observed during 2020. This continues to remain a concern for the quality image of polyurethane. EUROPUR members produced a higher percentage VE & HR foams driven by the Covid-19 market and growth of e-commerce and "bed in a box" markets.
- The replacement of foams with other materials such as fibres and springs has continued as a discussion topic, but the overall volumes do not show a large shift. Due to the rising costs of all raw materials, foam and mattress manufacturers are looking at all possibilities to improve supply chains and reduce costs. Some upholstery manufacturers are increasing their use of rebonded foams at the expense of comfort to maintain a given price point in the finished product dictated to them by end retailers. Also, some mattress manufacturers were reported to be reducing the density and weight of the foam core and sometimes replacing it with fibres and textiles to also reduce costs.
- Growth in production, and investment in new capacity continues to be focused on Eastern Europe.
- Growth in Eastern Europe, Eurasia, Turkey, and the emerging economies of the Balkans were stronger than in Western Europe due to growing exports to USA, Northern Africa and Middle East. Growth was also driven by reaction to the US anti-dumping tariffs.
- Foam manufacturers supplying the European market experienced a severe contraction in demand as OEM production units were closed down due to the pandemic with data for the full year from LMS in March 2021 shows that the European light vehicle market (including CIS) fell by 20%, producing 16.6 million units in 2020. The steepest falls were in Q2 when many of the plants were closed due to "lockdowns" with reopening delayed due to shortages of raw materials and the refilling of supply chains.
- It is believed that the shift to e-commerce, already growing in the last few years will continue after the pandemic, but also as demand returns to "the new normal" there will be more stability both in supply and demand.

- The challenges of 2020 have continued into 2021 with high demand for foam products and continuing raw material shortages and price volatility, especially with polyether polyols. Logistic issues have also continued to challenge foam producers. Some members are now reporting a slight decline in demand as supply chains start to become more stable.

6. LIST OF FIGURES