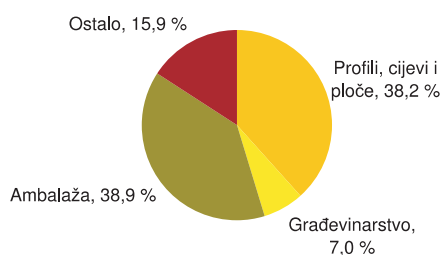


SLIKA 5. Proizvodnja plastičnih i gumenih proizvoda u razdoblju 1990. – 2006.<sup>3,5</sup>



SLIKA 6. Područja primjene plastike prerađene u Hrvatskoj u 2006.<sup>3,5</sup>

## Zaključak

Uočljiv je rastući trend u količini proizvedenih i prerađenih polimernih materijala u Hrvatskoj. Međutim, hrvatska plastičarska i gumarska industrija (zajedno s državnim institucijama) još mora ulagati znatne napore kako bi se područje polimerstva uključilo u rastuće

svjetske trendove. Kako je riječ o radno intenzivnoj industrijskoj grani, ona je jedna od mogućnosti za budući razvoj Hrvatske. Stoga treba uložiti sve moguće napore kako bi se u području proizvodnje i preradbe polimernih materijala i očuvala postojeća i otvorila nova radna mjesta. Brža obnova strojeva i opreme te uvođenje novih preradbenih postupaka nužnost su ako Hrvatska želi uhvatiti korak s razvijenim svijetom te odgovoriti na zahtjeve tržišta koji se postavlja pred proizvođače.

## LITERATURA

1. N. N.: *Plastics Business Data and Charts*, PlasticsEurope Deutschland, June 2007.
2. Šercer, M., Barić, G.: *Production and Processing of Polymers in the Republic of Croatia*, *Plasty a kaučuk*, 40(2003)2, 40-44.
3. Podatci *Državnog zavoda za statistiku*, 1997. – 2006.
4. N. N.: *The European plastics industry*, u *AMI's 2007 European plastics industry report*, Amiplastics, Bristol, 2007.
5. N. N.: *Proizvodnja kemikalija, kemijskih proizvoda i gumenih i plastičnih proizvoda*, Hrvatska gospodarska komora, Sektor za industriju, 1997. – 2006.
6. Podatci sa savjetovanja *Proizvodnja i prerada plastike – strateški oslonac gospodarskoga razvoja Hrvatske*, DIOKI d.d., Društvo za plastiku i gumu, Sekcija za petrokemiju Znanstvenoga vijeća za naftu HAZU, Rijeka, 22. 4. 2005.

# Production and processing of polymers in the Republic of Croatia in the year 2006

Prepared by: Gordana BARIĆ

## Introduction

Our present life could not be imagined without plastics and rubber. *Plastic era*, this popular name for the second half of the 20<sup>th</sup> century has continued into the 21<sup>st</sup> century as well. Plastics and rubber have been for a long time not just cheap alternative materials, but, thanks to them, it is possible to produce a great number of high-tech products. Since polymers, due to their properties are very friendly to the environment, this is also the reason why they can be called the greenest materials of our time. Many fields of human activities would have failed to develop to the present extent without plastics, such as e.g. the packaging industry, civil engineering, textile, electronics industry, space technology, etc. The production and processing of polymers are branches which have seen world-wide

the longest periods of growth in the amount of the produced and processed materials, profits margins and number of employees.

The world production of plastics exceeded 245 million tons in the year 2006.<sup>1</sup> Expressed in volume, this quantity is more than double the quantity of steel produced in the world. Even more fascinating results are expected. The production of polymeric materials, namely, is forecast to reach more than 320 million tons in the year 2010.<sup>1</sup> The consumption of plastics is growing 5% yearly (faster than the world GDP).

It can be said that priority objectives in the field of polymers are cost reduction, waste reduction and improved environmental protection. Therefore, it is necessary to constantly optimize the production chain starting from the design to the disposal of used polymeric products.<sup>2</sup> Optimizing includes improved product design (selection

of material, defining of the necessary properties, dimensioning, and prototyping etc.). But also, optimal production of monomers and additives for the production of polymeric materials, as well as optimal design of parts and transformation. Significant efforts have been invested in the development of improved production procedures for polymeric parts, handling of materials and products, optimizing the production management and quality control, and optimizing of the mounting and packaging procedures.

Many of the set tasks can be accomplished on the basis of the existing knowledge within polymer technology, whereas some influence the society as a whole. No less important is the need for shorter lead-in times and shortening of the marketing time, which requires separation and parallel development of individual phases during manufacture of polymeric products. What is needed is to maximally analyse the possibility of expanding the application of the already existing methods and procedures. Computers can be of great assistance in successful production of polymeric materials and parts in all the phases ranging from the idea to the disposal of the used polymeric part.

Naturally, in order to catch up with the developed world, the area of polymers in Croatia also has to follow the described trends. The history in this area provides sufficient experience and knowledge, but for many companies the present still means fighting for survival, with questionable plans of development.

## Present status of the Croatian plastics and rubber industry

The potential of the field of polymers in Croatia in the year 2006 was about USD 1.3 billion (total revenue – export + import). At the same time the contribution of this field to the deficit of trade balance in the year 2006 was near USD 625 million. The import of plastic materials and plastic products in 2006 was more than USD 1 billion. About USD 176 million were spent on rubber products, out of which more than USD 130 million on rubber tyres.<sup>3</sup>

The processing part of the plastics and rubber industry of Croatia has been significantly fragmented (90% of the enterprises are small-size enterprises, up to 100 employees) and as many as about 52 percent have up to 50 employees.<sup>3</sup> These enterprises are mostly privately owned (and mostly, still domestic property).<sup>3</sup> Big international companies, although present in Croatia, did not consider Croatia to any greater extent as the location of possible investments and organization of operation, but only as a potential market. However, the situation is changing in this area as well. Large part of processing is done in craftsmen workshops that have their specific characteristics.

The number of companies registered in DH 25 category (processing of plastics and rubber) in the year 2006 was about 550.<sup>3</sup> Some of those companies were actually involved in plastic and rubber compound processing, whereas other companies registered in DH 25 category were involved only in the trade or some other activity

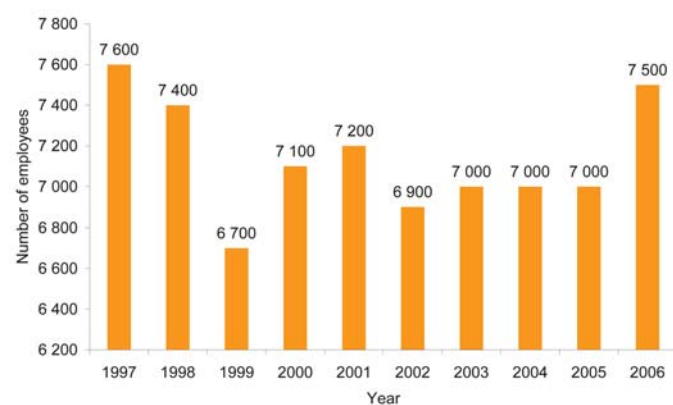


FIGURE 1. Number of employees in the Croatian plastics and rubber industry (1997-2006)<sup>3,5</sup>

or their main source of profit is not the processing of plastic or rubber compounds. However, there are also reverse examples when a company, besides its basic activity is also a big (registered) producer of plastics. There are also companies registered in completely different industrial branches, but with plastic processing as their basic activity. However, according to *AMI Plastics* the same situation is with data collecting in the European Union.<sup>4</sup>

According to the data provided by the *Croatian Central Bureau of Statistics*, just three companies, also registered as DG 24.16 are involved in the manufacture of polymeric materials.<sup>3</sup>

The number of employees at companies that belong to the field of polymers has been continuously falling since 1991. The data say that from 1997 to 1999 the number of employees decreased by 900, then in 2000 increased by 400 and for the next three years stayed around 7,000. Last year, however, the data showed a significant increase in the number of employees (Figure 1). Apart from the mentioned 550 companies, about 1,250 craftsmen are engaged in processing plastics with a total of about 1,700 employees.

Total revenue of the field of polymers in the year 2006 was about USD 700 million.<sup>3,5</sup> Figure 2 shows import, i.e. export in millions of USD in the period from 1997 to 2006. The data show that the import was almost five times greater than export, so that this is one of the areas of industry that certainly requires changes.

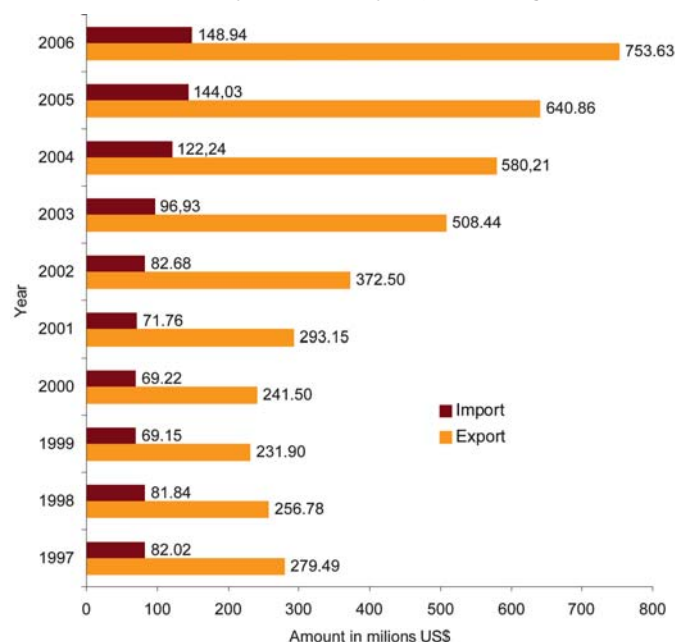


FIGURE 2. Import and export in the Croatian plastics industry in millions USD (1997-2006)<sup>3,5</sup>

## Production of polymeric materials

In Croatia low density polyethylene (PE-LD) and polystyrene (PS) are produced in greater quantities, whereas at the moment the production of vinyl chloride (VC) and poly(vinyl chloride) (PVC) has been closed down. Renewal of production of VC and PVC is expected during the year 2009.

The capacities for the production of polymeric materials in Croatia have been substantially reduced and today *DIOKI* d.d. has the capacity for the production of 150,000t PE-LD, 50,000t PS and 15,000t PS-E, *CHROMOS – Tvornica smola* d.d. has the capacity for the production of about 20,000t unsaturated polyesters (UP), acryl and alkyd resins, polyol and vinyl esters and *ORIOLIK* d.d. has the capacity for the production of 3,500 t rigid and flexible PUR foams.<sup>6</sup>

Therefore, other materials, including PVC, are mainly imported. Figure 3 presents the movement of the total quantities of the produced polymeric materials in Croatia from 1990 to 2006, and Figure 4 shows the production of single types of polymers from 1996 to 2006.

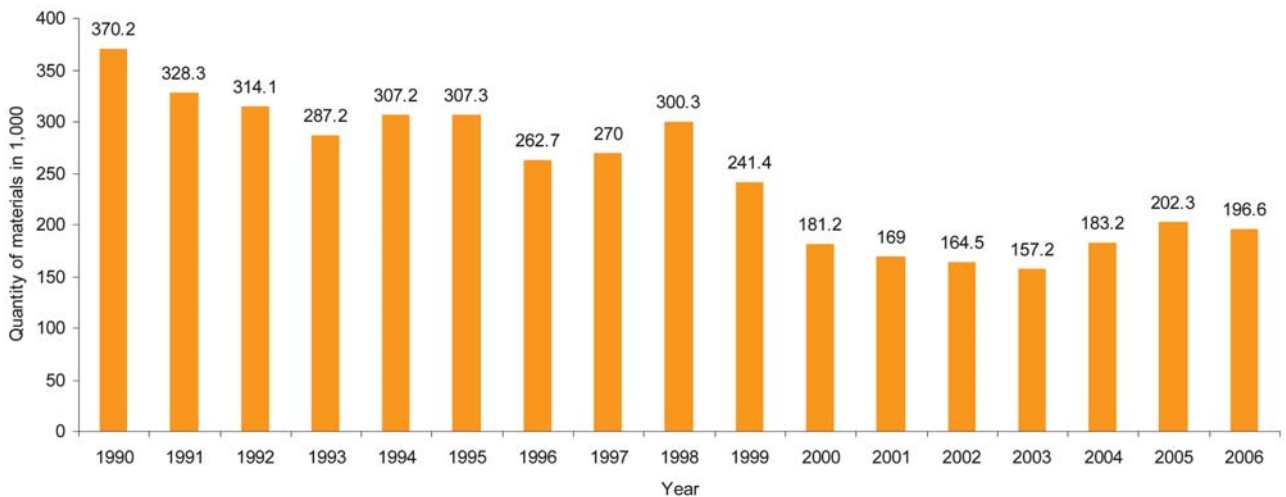


FIGURE 3. Production of polymeric materials in Croatia (1990-2006)<sup>3,5</sup>

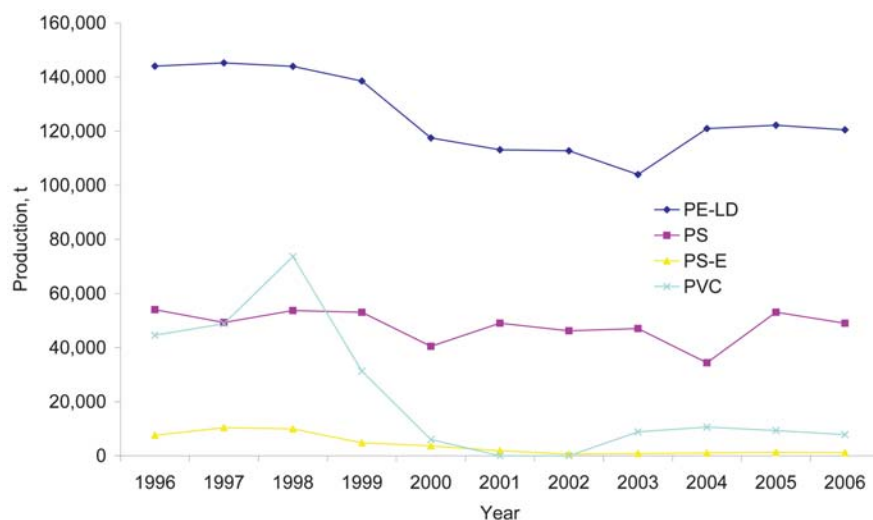


FIGURE 4. Production of plastics (1996-2006)<sup>3,5</sup>

### Processing of plastics and rubber

Figure 5 shows the flow of the quantities of plastic and rubber processed over the period from 1990 to 2006. Today's production of plastic products amounts to about 75% of the one in 1990, and the production of rubber products is negligible. Figure 6 shows the end-use applications for plastics processed in Croatia in the year 2006.

### Conclusion

The increasing trends in material production and plastic and rubber processing in Croatia are obvious. However, the Croatian plastics and rubber industry (together with government institutions) should still invest great efforts in integrating this industry into the increasing world trends. Since this is an operating intensive branch, it represents also one of the great opportunities for Croatia. Therefore,

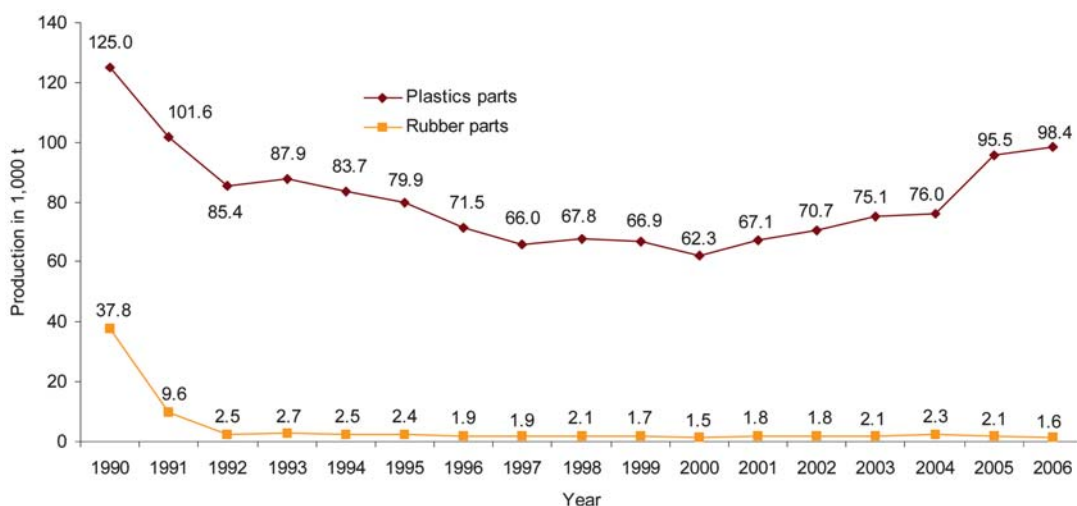


FIGURE 5. Production of plastics and rubber parts (1990-2006)<sup>3,5</sup>

all the possible efforts have to be made in order to preserve the existing and to open up new workplaces. The faster renewal of the machinery and the implementation of new processing procedures is a must if Croatia wants to keep pace with the developed world, and also in complying with the market requirements that have to be met by the producers.

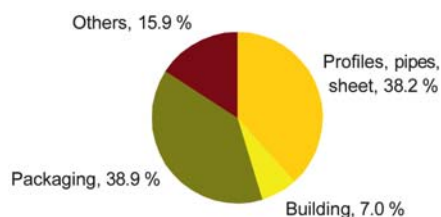


FIGURE 6. End-use applications for plastics processed in Croatia in the year 2006<sup>3,5</sup>

#### REFERENCES

1. N. N.: *Plastics Business Data and Charts*, PlasticsEurope Deutschland, June, 2007.
2. Šerčer, M., Barić, G.: *Production and Processing of Polymers in the Republic of Croatia*, *Plasty a kaučuk*, 40(2003)2, 40-44.
3. Data from the Croatian Central Bureau of Statistics, 1997 – 2006.
4. N. N.: *The European plastics industry*, in *AMI's 2007 European plastics industry report*, Amiplastics, Bristol, 2007.
5. N. N.: *Manufacture of Chemicals, Chemical Product and Rubber and Plastics products*, Croatian Chamber of Economy, Industry and Technology Department, 1997 - 2006.
6. Data from conference presentations *Proizvodnja i prerada plastike – strateški oslonac gospodarskoga razvoja Hrvatske*, DIOKI d.d., Društvo za plastiku i gumu, Sekcija za petrokemiju Znanstvenoga vijeća za naftu HAZU, Rijeka, 22 April 2005.

## Posljednje vijesti

**Privedila: Gordana BARIĆ**

### Nedostatak stručnih radnika

U Hrvatskoj gospodarskoj komori – Županijska komora Pula 14. ožujka 2008. osnovana je *Strukovna grupa prerađivača plastike*. Za predsjednika te strukovne grupe izabran je Božo Lerga, direktor bužetskoga *Drvoplasta*, a za njegova zamjenika Valter Ladavac, direktor tvrtke *Plastik Marko* iz Pazina. Kao jedan od prvih zadataka postavljena je izrada kataloga proizvoda i usluga koje članice grupe nude tržištu.

Istodobno, naglašeno je kako u području preradbe plastike i popratnim uslugama na području Istarske županije nedostaje stručnih radnika.

### Autorska prava, norme i internet

Velik broj korisnika norma bilo namjerno ili zbog neznanja krši zakone o autorskim pravima umnožavanjem i/ili daljnjom distribucijom norma.

Potrebno je naglasiti da *Međunarodna organizacija za normizaciju (ISO)* i *Međunarodno elektrotehničko povjerenstvo (IEC)* prodaju međunarodne norme te time financiraju i njihov razvoj. Članovi *ISO*-a i *IEC*-a iz pojedinih zemalja prihvaćaju međunarodne norme kao nacionalne te ih prodaju kako bi financirali vlastite djelatnosti povezane s nacionalnom normizacijom. Stoga kršenje autorskih prava dovodi do gubitka prihoda organizacija koje razvijaju i distribuiraju norme, dakle *ISO*-a i *IEC*-a, ali i njihovih članova i ovlaštenih distributera. Osim toga, time su i same norme izložene riziku krivotvorenja i/ili nenamjernog preinačavanja. Zbog toga je zaštita autorskih prava na više razina bitna za održivost sustava normizacije.

Kako bi se pomoglo korisnicima i kupcima *ISO*-vih i *IEC*-ovih međunarodnih i nacio-

nalno prihvaćenih norma da iskoriste nove prilike koje nudi raspoloživost norma na internetu bez upadanja u zamke oko povrede autorskih prava i zlorabe intelektualnog vlasništva, *ISO* i *IEC* zajednički su izdali letak pod nazivom *Autorska prava, norme i internet* (e. *Copyright, standards and the Internet*). U letku je opisan smisao i važnost zaštite autorskih prava na norme te što u ovom slučaju znači povreda autorskih prava i načini na koje se povreda autorskih prava nastoji spriječiti. Dodatno se u letku mogu naći pojedinosti o zaštiti autorskih prava na norme i stjecanju prava na njihovu uporabu pri kupnji bilo u papirnatome bilo u elektroničkome obliku.

Letak je na hrvatskom jeziku priredio *Hrvatski zavod za norme* i može se naći na internetskim stranicama Zavoda ([www.hzn.hr](http://www.hzn.hr)).