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Homologacija vozil na Hrvaškem - zasnova sistema in prvi rezultati

Motor Vehicle Approval in Croatia - System Design and First Results

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Jeseni leta 1997 je začela Hrvaška obvezno homologacijo motornih vozil po predpisih ECE, za vsa vozila, uvožena ali izdelana v državi. Delež doma izdelanih vozil, ki je manjši od 100 vozil, izdelanih na Hrvaškem leta 1996, lahko zanemarimo v primerjavi s 110.000 vozili, uvoženimi istega leta. Fizične osebe uvozijo štirikrat več vozil kakor registrirani uvozniki in prodajalci avtomobilov. Prispevek obravnava postavitev sistema za homologacijo vozil. Obravnava pa tudi pričakovane rezultate tega procesa.

(Ključne besede: vozila motorna, homologacija, standardizacija, preskušanje)

In autumn 1997 the Republic of Croatia started compulsory motor vehicle approval scheme through ECE regulations for all vehicles imported to or manufactured in the country. The share of less than 100 vehicles manufactured in Croatia in 1996 can be neglected in comparison to 110,000 units imported in the same year. Of the imported units, private persons imported four times more vehicles than the registered importers or car dealers. This paper deals with the vehicle approval system design. The expected effects of this process are also being considered.

(Keywords: motor vehicle, homologation, standardisation, testing)

0 UVOD

Republika Hrvaška pokriva ozemlje 56.000 km^2 in ima 4.800.000 prebivalcev, ki uporabljajo približno 1.300.000 registriranih vozil (sl. 1). Hrvaška je bila petindvajseta država, ki je podpisala Sporazum o sprejemu enotnih pogojev za homologacijo in vzajemno priznanje ustreznosti motornih vozil in delov. Sporazum je bil pripravljen 20. marca 1958 v Ženevi. Trenutno je v veljavi 54 od skupaj 104 predpisov, vendar pa se v kratkem pričakuje večje povečanje. Leta 1993 je bil ustanovljen Servis za homologacijo vozil, znotraj Oddelka za kakovost, državnega Inštituta za standardizacijo in metrologijo. Zaradi objektivnih težav v obdobju do leta 1995, so se priprave za izvedbo predpisov ECE začele šele leta 1996. Priprave so vključevale naslednje:

- pregled uvedenih homologacijskih predpisov v Evropi v primerjavi s Hrvaško,
- analizo voznega parka na Hrvaškem glede na število in starost,
- definicijo ciljev, ki naj bi jih dosegli z izvajanjem homologacijskih predpisov na Hrvaškem,
- razvoj več modelov izvedb homologacijskih predpisov na Hrvaškem,
- izdelavo sistema homologacije in njegove izvedbe.

0 INTRODUCTION

The Republic of Croatia covers an area of 56,000 km^2, and has 4,800,000 inhabitants who use nowadays approximately 1,300,000 registered vehicles (Fig.1). Croatia was the 25th country to sign the Agreement on adoption of uniform conditions for approval and reciprocal recognition of motor vehicle approval equipment and parts, which was developed in Geneva on March 20, 1958. Presently, only 54 out of the total number of 104 regulations are in force in Croatia, but a considerable increase in their number is expected soon. In 1993, The Vehicle Approval Service was established within the Department for Quality of the State Institute for Standardisation and Metrology. Due to objective difficulties in the period until 1995, preparations for the ECE-regulations implementation started only in 1996. The preparations included the following:

- review of the implementation of the approval regulations in Europe in comparison with Croatia,
- analysis of the car population in Croatia regarding the number and age,
- definition of the aims to be achieved by the implementation of the approval regulations in Croatia,
- development of several models of approval regulations implementation in Croatia,
- approval system design and its implementation.

1 CILJI

Glavna cilja, ki naj bi ju dosegli z izvajanjem registracijskih predpisov ECE, sta:

- zmanjšanje emisije izpušnih plinov,
- povečanje varnosti z zmanjšanjem starosti vozil [1] (sl. 2 in 3).

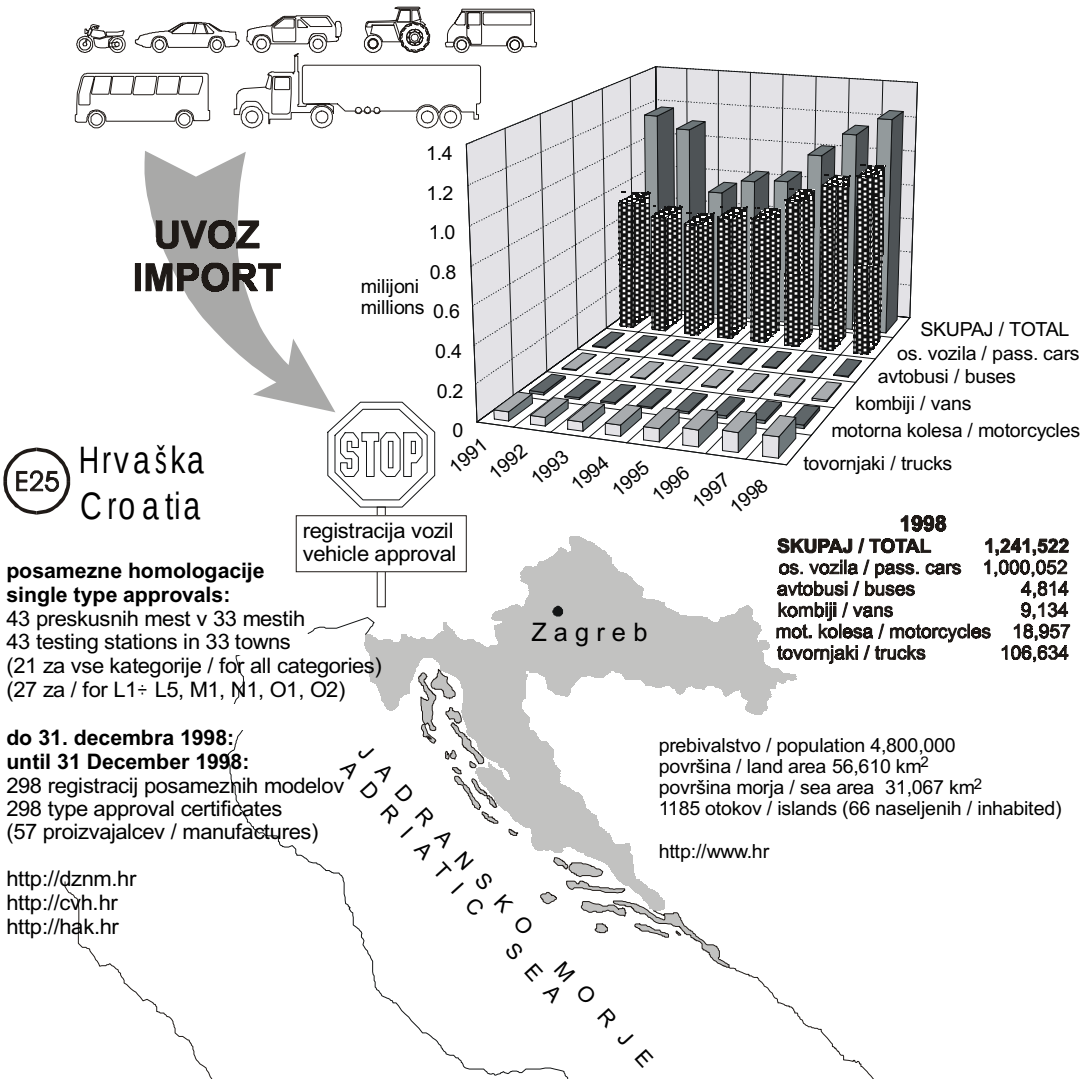
Da bi ta cilja dosegli, je treba uporabljati homologacijski sistem kot sito pri uvozu vozil. Treba je poudariti, da je leta 1996 hrvaška avtomobilska industrija izdelala manj ko 100 avtobusov in tovornjakov. To število lahko zanemarimo v primerjavi s 110.000 uvoženimi vozili. Izpostaviti je treba dejstvo, da so fizične osebe uvozile štirikrat toliko vozil kakor registrirani uvozniki. Prejšnje omejitve homologacijskih predpisov za uvožena vozila so se nanašala le na osebna vozila, ta niso smela biti starejša od 7 let. Zaradi takih ohlapnih predpisov, je bilo uvoženih veliko avtobusov in tovornjakov, starejših od 10 let.

1 AIMS

The basic aims to be achieved by the ECE-regulations implementation can be stated as:

- reduction of the exhaust emissions,
- increase of safety by restricting the age of vehicles [1] (Fig.2 and 3).

In order to achieve these aims, the approval system should be used as an import filter. It should be pointed out that in 1996 Croatian motor industry produced less that 100 buses and lorries. This number can be neglected when compared with the approximate number of 110,000 imported vehicles that year. It should be noted that individual persons at that time imported four times more vehicles than the registered importers. Prior to the implementation of the approval system, the import restrictions in Croatia referred only to passenger cars: they could not be older than 7 years. Consequently, due to these liberal conditions, a great number of buses and lorries older than 10 years were imported.



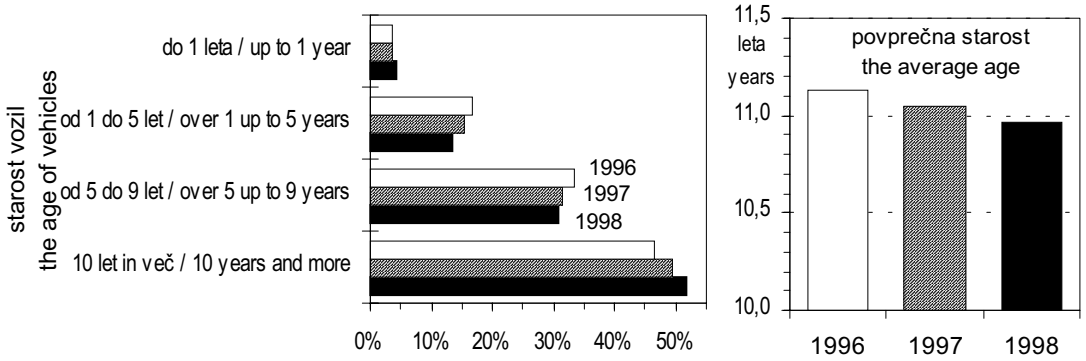
Sl. 1. S*istem homologacije vozil na Hrvaškem (september 1999)*
Fig. 1. *Facts about vehicle approval system in Croatia (September 1999)*

Če želimo, da bi bil sistem homologacije vozil učinkovit glede na zgoraj omenjena cilja, mora upoštevati tudi uvoz posameznih vozil. Ob upoštevanju vsega tega mora homologacijski sistem vsebovati:

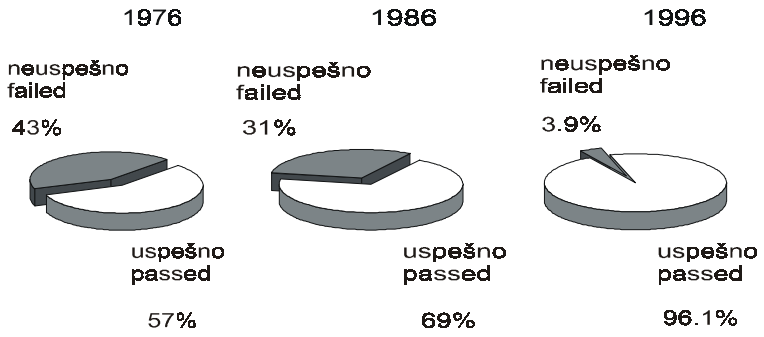
- preskušanje za homologacijo mora biti izvedeno na vseh vozilih, izdelanih v državi in uvoženih (z izjemo diplomatskih vozil in nekaterih drugih vozil),
- homologacijski predpisi morajo biti strogi pri preprečevanju uvoza zastarelih vozil,
- hkrati predpisi ne smejo ovirati proizvodnje na Hrvaškem,
- v prvih letih (največ dveh) se pričakuje večje število vozil za posamezno homologacijo kot za homologacijo določenega tipa.

So, if the vehicle approval system is to be effective with respect to the above quoted aims, it must also incorporate the import of single vehicles. Taking everything into consideration, the vehicle approval system design has to deal with the following:

- testing for approval should be carried out on all the vehicles produced in the country and those imported into it (with the exception of diplomatic cars and few of some other vehicles),
- approval regulations must be strict in order to prevent the import of vehicles of obsolete standards into Croatia,
- at the same time, these regulations must not hinder the production in Croatia,
- in the first couple of years (2 of the most), a larger number of vehicles is expected for single vehicle approval than for the vehicle type approval.



Sl. 2. *Starost vozil, registriranih na Hrvaškem (glede na podatke Avtomotozveze Hrvaške)*
Fig. 2. The age of vehicles registered in the Republic of Croatia (according to data provided by the Croatian Vehicle Centre)



Sl. 3. *Delež tehnično neustreznih vozil pri tehničnih pregledih, opravljenih na Hrvaškem leta 1997 na vozilih, izdelanih v zgoraj omenjenih letih [1]*
Fig. 3. *The ratio of technically faulty vehicles in technical check-ups carried out in Croatia in 1997 on vehicles produced in the above mentioned years [1]*

2 KAJ JE BILO STORJENO DO SEDAJ

Leta 1995 je bila zbrana dokumetacija za prvo tipsko homologacijo (Peugeot 106), ki je bila izdana 16. oktobra 1995. Od takrat se delo na tipskih homologacijah nadaljuje in od 15. septembra 1997 je, glede na veljavne hrvaške predpise, postal homologacijski certifikat pogoj za carinski postopek in registracijo vozila. Homologacijski certifikat je lahko izdan na podlagi Certifikata primernosti (Cer-

2 WHAT HAS BEEN DONE UP TO NOW

In 1995, documentation on the first type approval (Peugeot 106) issued on October 16, 1995 was gathered. Since then, the work on type approval has continued, and since September 15, 1997, the vehicle approval certificate, according to the valid regulations in Croatia, has become a condition for customs clearance and for registration. A single type approval certificate can be issued on the basis of COC (Certificate of

tificate of Conformity – COC) ali certifikata proizvajalca, ki se nanaša na lastnosti posameznega vozila. Vsi drugi kriteriji so enaki v obeh primerih, pri homologaciji posameznega vozila oz. pri homologaciji določenega tipa vozila. Homologacijo posameznega vozila izda pooblaščena uradna oseba (imenovana od Državnega urada za standardizacijo in meroslovje), homologacijo posameznega tipa vozila pa neposredno Državni urad za standardizacijo in meroslovje.

Stroške za homologacijo posameznega vozila plača uradna oseba ob carinjenju in znašajo do 300 DEM za osebni avtomobil (stroški so odvisni od cene certifikata primernosti). Če je ocenjeno število uvoženih osebnih vozil 50.000 letno, je celoten znesek 15,000.000 DEM letno (300 DEM × 50.000 vozil). Ta vsota je glavni vzrok za pritiske na sistem homologacije vozil. Pregled neprepustnosti sistema je bil zaradi tega zelo otežkočen. Sistem homologacije vozil na Hrvaškem je praktično integriran v sistem tehničnih pregledov.

3 JE BILA IZBRANA PRAVA METODA?

Pri izvajanju homologacijskega sistema v vsakodnevni praksi, se pojavljajo vprašanja, ali se tega postopka ne bi dalo poenostaviti, zakaj ne starostna omejitev vozil namesto zahtevnega homologacijskega postopka, zakaj toliko preskusnih mest? Poskusimo odgovoriti na vsa ta vprašanja.

Res je bil namen homologacijskega postopka, da se standardizira tehnične in tehnološke zahteve za proizvodnjo vozil. Namesto tega se uporablja kot zelo zahteven način omejevanja uvoza. To je v ospredje postavilo administrativno komponento homologacije, ki je popolnoma prevladala tehnično. Nedvomno je morala biti homologacija uvedena zaradi domače industrije, za katero še vedno upamo, da bo preživela. Ali bi se bilo mogoče izogniti uveljavljanju homologacijskih predpisov kot administrativnih prepovedi uvoza in vseeno ustaviti uvoz tehnično zastarelih in ekološko neustreznih vozil? Po našem mnenju je odgovor – ne. V takem primeru bi se takoj pojavila nova vozila, izdelana posebej za Hrvaško, z motorji s preveliko škodljivo emisijo (npr. Euro 0) in premajhno varnostjo (ECE R 13.00).

Število preskusnih mest bi lahko in moralo biti manjše. V takem primeru bi bil nadzor nad sistemom homologacije preprostejši. Zmanjšale bi se tudi možnosti napak. Po drugi strani pa bi, zato ker je število preskusnih mest tako veliko, zadoščali le nekateri ključni predpisi ECE, ki vključujejo celoten razvoj vozila (škodljive emisije, zavore, itn.). To bi poenostavilo postopek in med pregledom samim bi lahko več časa posvetili pregledu pomembnejših sestavnih delov, namesto da se izgublja čas, npr. z odbiranjem simbolov na opremi za opozorilne lučke.

Conformity) document, or producer's certificate pertaining to the features of the particular vehicle. All the other criteria are the same in both cases, i. e. single vehicle approval and vehicle type approval. A single vehicle approval certificate is issued by an authorised legal person (appointed by the State Office for Standardisation and Metrology), and a type certificate directly by the State Office for Standardisation and Metrology.

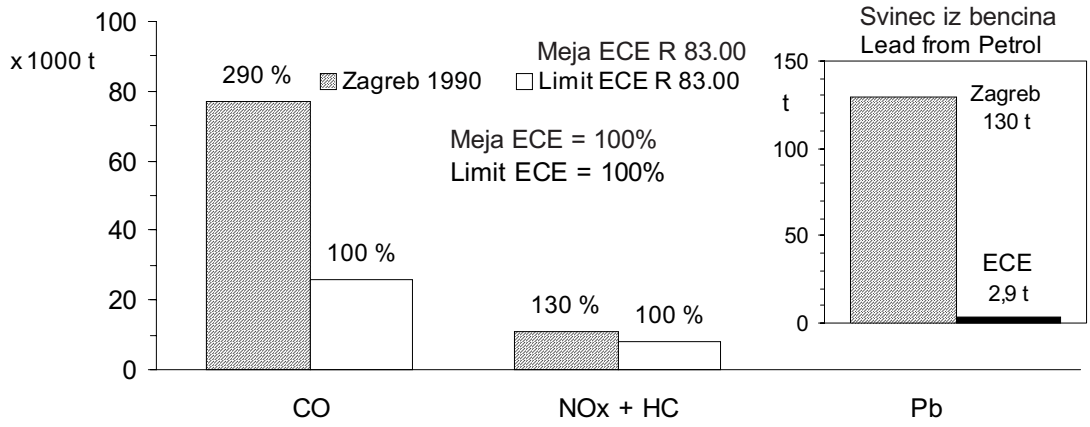
The costs for single vehicle approval, paid by the legal person at the customs clearance, amount to 300 German marks for a passenger car (the costs vary depending on the price of the certificate of conformity). If the estimated number of imported single vehicles is only 50,000 per year, then the total sum amounts to 15,000,000 German marks per year (300 German marks per vehicle × 50,000 vehicles). This sum was the main cause of pressures exerted on the vehicle approval system design (Fig.1). These pressures resulted in the appearance of a great number of testing stations. Inspection on the impermeability of the system has been made difficult because of this. The vehicle approval system in Croatia is practically integrated in the technical check-up service.

3 HAS THE RIGHT METHOD BEEN CHOSEN?

After having implemented the approval system in everyday practice, the question is asked whether this could have been done in a simpler way, why not the vehicle age limit instead of the complicated approval system, why so many testing stations? So let us try and answer all these questions.

It is true that the idea of approval system has been to standardise the technical criteria and technological criteria for the production of vehicles. Instead, it is used as a very complicated instrument of restricting import. This has pushed the administrative component of approval to the fore, and it fully dominates over the technical one. No doubt, the approval should have also been introduced because of the domestic industry, for which we still hope that it will survive. Could it have been possible to avoid the application of approval regulations as administrative ban on import, and yet stop the import of technologically obsolete and ecologically adverse vehicles? In our opinion, the answer is - no. In that case, namely, new vehicles would have appeared immediately, produced especially for Croatia, with engines of high harmful emissions (e.g. Euro 0), and reduced safety (ECE R 13.00).

The number of testing stations could and should be smaller. The approval system control would be much simpler in that case, and the possibility of making mistakes would be much reduced. On the other hand, while the number of testing stations for individually imported vehicles is so great, it would be quite sufficient to control only a few key ECE regulations that include the whole development of the vehicle (harmful emission, brakes, etc.). This would simplify the procedure and during the vehicle check more time could be spent on checking the important assemblies, instead of wasting time, e.g. to read the symbols on the equipment for light indicators.



Sl. 4. *Emisije izpušnih plinov vozil z bencinskimi motorji na področju Zagreba leta 1990 v primerjavi s emisijami, predpostavljenimi za primer, če bi bila vsa vozila v skladu s predpisi ECE, veljavnimi v tem času ([2] in [3])*
Fig. 4. *Exhaust emissions of vehicles propelled by Otto-engines in the region of Zagreb in 1990 compared to emissions in a hypothetical case with all the vehicles being in accordance with the ECE regulations valid at the time ([2] and [3])*

Kateri so najpomembnejši pričakovani učinki uvedbe homologacijskega sistema. Nedvomno so to povečana varnost in zmanjšano onesnaževanje okolja in v določeni meri tudi relativno zmanjšanje porabe goriva. Ne tako dolgo tega, leta 1990, so bile škodljive emisije in delež svinca v izpušnih plinih vozil na področju glavnega mesta Zagreba nekajkrat večje kakor so današnje meje, ki jih določajo predpisi ECE (sl. 4).

Analiza rezultatov kaže, da se stanje že izboljšuje, vendar pa bo treba vložiti še veliko truda v prenovo voznega parka, da bi začeli zmanjševati škodljive emisije, podobno kakor v razviti Evropi [4].

4 REZULTATI IN NJIHOVA ANALIZA

4.1 Homologacija tipov vozil

Na podlagi certifikatov primernosti za posamezne tipe vozil, je bilo ugotovljeno, da je bilo leta 1998 v promet vključenih 61.000 vozil (carinski postopek in prva registracija).

4.2 Homologacija posameznih vozil

Od začetka uvajanja homologacijskega sistema za posamezna vozila je bilo od 15. septembra 1997 do 27. julija 1998 izdanih 39.860 certifikatov primernosti posameznih vozil (v samo treh in pol mesecih leta 1997 za 22.930 vozil in v sedmih mesecih leta 1998 za 16.930 vozil). Do konca leta 1998 je bilo v promet vključenih 54.000 vozil (carinski postopek in prva registracija). Zaradi prednosti homologacijskega postopka so bila uvožena štiri posamezna vozila na eno vozilo, prodano pri uradnih prodajalcih. Analiza rezultatov je pokazala, da se je to razmerje spremenilo na 1,9:1 leta 1997 in približno 0,9:1 leta 1998.

Which are the most important effects expected from the introduction of the approval system? No doubt, these are improved safety and reduced pollution of the environment, and to a certain extent also the relative reduction of fuel consumption. Not so long ago, in 1990, the harmful emission and the content of lead in exhaust gases of the vehicles within the area of the capital, Zagreb, were multiply higher than the today's levels defined by ECE regulations (Fig. 4)

The analysis of the results shows that the situation is already improving, but great efforts will certainly have to be made in renewing the motor fleet so as to start cutting the harmful emissions, similar to the developed Europe [4].

4 PRESENT RESULTS AND THEIR ANALYSIS

4.1 Vehicle type approval

Based on these certificates of conformity to the vehicle type, it is estimated that about 61,000 vehicles have been included in traffic (customs clearing and first registration) in 1998.

4.2 Single vehicle approval

Since the beginning of the implementation of the single vehicle approval system, on September 15, 1997 until July 27, 1998, a total of 39,860 *certificates of conformity of single tested vehicles* were issued, (in only 3.5 months in 1997, for as many as 22,930 vehicles, and in 7 months in 1998, for 16,930 vehicles). By the end of the year 1998, 54,000 vehicles were included in traffic (customs clearings and first registration). While prior to approval system there were four single vehicles imported per one vehicle sold through a dealer, the analysis of the results shows that this ratio has been changed to 1.9:1 in 1997 and to approximately 0.9:1 in 1998.

Preglednica 1. *Struktura certifikatov primernosti za posamezne tipe vozil, vključno s podaljšanji na dan 31. decembra 1998 (različni proizvajalci, tipi in uvozniki)*
Table 1. *The structure of certificates of conformity of the vehicle type, including extensions, issued up to 31 Dec. 1998 (various manufacturers, types and importers)*

tip vozila type of the vehicle	do 31.12.1997 up to Dec. 31, 1997	leta 1998 in 1998	skupaj total
osebni avtomobili in avtobusi passenger car and bus	155	171	326
tovorna vozila cargo vehicle	28	34	62
mopedi in motorna kolesa moped and motorcycle	31	83	114
prikolice trailer vehicle	45	9	54
SKUPAJ TOTAL	259	297	556

4.3 Ocena povprečne starosti voznega parka za leto 1998 in vpliv na prometno varnost

Rezultati kažejo, da je bilo leta 1998 prvič registriranih približno 61.000 novih in 54.000 rabljenih vozil in da je bila njihova povprečna starost približno 1,6 let. Od leta 1997 je bilo 1.142.000 vozil povprečne starosti 11,05 let. Povprečna starost voznega parka se je leta 1998 zmanjšala na 10,97 let ali za 0,7%.

Ker se je začel sistem homologacije vozil na Hrvaškem uvajati šele pred kratkim, je težko napovedati, kako učinkovit bo pri zmanjšanju povprečne starosti vozil (glej tudi sl. 2). Vseeno pa lahko pričakujemo, da se bo zmanjševanje nadaljevalo tudi v prihodnosti. Napovedi, da bo to imelo pozitiven vpliv na prometno varnost, so upravičene, čeprav bodo rezultati vidni šele čez nekaj let.

4.4 Ocena vpliva na škodljive emisije in hrup

Podatek o skupnem številu registriranih in na novo uvoženih vozil (pregl. 3) kaže, da lahko največji učinek izvajanja homologacije pričakujemo pri osebnih vozilih (110.204 prvih registracij leta 1997) in tovornih vozilih (15.721 prvih registracij).

Komercialna vozila

Škodljivo emisijo komercialnih vozil uravnava predpis ECE št. 49. Od leta 1995 (49.02B) je bila zmanjšana na 1/3 v primerjavi z letom 1993 (49.00). Med komercialna vozila štejemo v večini tovorna vozila (96%) in avtobuse (4%). Pred uvedbo homologacijskega sistema, ni bilo nobenih omejitev starosti pri uvozu teh vozil. Posledica tega je bila, tudi glede na okoliščine na Hrvaškem, da je bila večina tovornih vozil pri uvozu starejših od 15 let. Zaradi slabega tehničnega stanja, je bila njihova

4.3 Estimation of the average age of the motor fleet for 1998 and the influence on the traffic safety

The results show that in 1998, about 61,000 new and 54,000 used vehicles have been registered for the first time, their average age being about 1.6 years. Since in 1997 there were 1,142,000 vehicles of the average age of 11.05 years, the average age of the motor fleet in 1998 was reduced to 10.97 years or by 0.7%.

Since the vehicle approval system started being applied in Croatia quite recently, it is hard to say how efficient its contribution to the decrease of the average age of vehicles is (see also Fig. 2). Still, it can be expected that this positive tendency will continue in the future. The assumption that this will have a positive effect on traffic safety is justified, although the results will be seen only in a few years.

4.4 The evaluation of impact on harmful emission and noise

The data on the total number of registered and newly imported vehicles (Table 3) show that the greatest effects of implementing approval can be expected in passenger cars (110,204 first registrations in 1997) and cargo vehicles (15,721 first registrations).

Commercial vehicles

The harmful emission by commercial vehicles has been regulated by ECE regulation No. 49, and since 1995 (49.02B) it has been reduced to 1/3 in relation to the period of 1983 (49.00). Commercial vehicles include mostly trucks (96%) and only minor parts are buses (4%). Before the approval was implemented, there had been no import restrictions regarding their age. As a result, and due to the circumstances in the Republic of Croatia at that time, mostly trucks even more than 15 years old had been imported. Due to the bad technical

dejanska emisija več ko trikrat večja od tiste, veljavne za nova vozila v Evropski zvezi (Euro 2)[1]. Po uveljavitvi sistema homologacije so se razmere popolnoma spremenile, tovornih vozil, izdelanih pred letom 1993, se ne sme več uvažati. Na žalost to ne velja za uvožene avtobuse, ki so po večini zelo stari (posebej mestni avtobusi, ki so povprečno stari več ko 10 let) in zato v slabem tehničnem stanju. Poudariti je treba, da je negativni vpliv uvoza zastarelih avtobusov na skupno škodljivo emisijo komercialnih vozil opazen kljub temu, da je število uvoženih tovornih vozil več ko 30 krat večje od števila avtobusov. Škodljiva emisija enega tako starega avtobusa je večja od emisije vsaj treh novih težkih tovornih vozil.

condition, their actual emission was over three times higher than the one valid for new vehicles in the European Union (Euro 2)[1]. After the implementation of the approval system, the situation has changed completely, and trucks manufactured prior to 1993 cannot be imported any more. Unfortunately, this does not apply to the imported buses that are mainly very old (especially city buses: on the average over 10 years), and therefore, in bad technical condition as well. It should be noted that in spite of the fact that the number of newly registered trucks is more than 30 times greater than the number of buses, the negative influence of import of more than obsolete buses, on the total harmful emissions of commercial vehicles is significant. Harmful emission of one such old bus is greater than the emission of at least three new heavy trucks, i.e. buses.

Preglednica 2. *Število vozil, prvič registriranih na Hrvaškem leta 1997 (31. december 1997, vir: Republika Hrvaška – Zavod za statistiko)*
Table 2. *Number of vehicles and first registrations in the Republic of Croatia in 1997(on December 31, 1997, source: Republic of Croatia - Central Bureau of Statistics)*

	registrirana vozila - skupaj registered vehicles - total	število prvih registracij (%) number of first registrations (%)	
motorno kolo motorcycle	17.401	3.052	(17,5%)
osebni avtomobil passenger car	932.278	109.144	(11,7%)
avtobus bus	4.771	455	(9,5%)
tovorno vozilo cargo vehicle	101.051	15.608	(15,4%)
kombi van	8.683	851	(9,8%)
ostalo other	78.017	12.583	(16,1%)
SKUPAJ TOTAL	**1.142.201**	**141.693**	**(12,4%)**
SKUPAJ 1998 TOTAL 1998	1.241.522	114.789	(9,2%)

Dovoljeno raven hrupa določa predpis ECE št. 51 od 1.oktobra 1997, za nova vozila je v veljavi predpis ECE št. 51.02 (za rabljena: začetek leta 2000), ki je znatno zmanjšal dovoljeno raven hrupa (s 74 na 77 dBA, kar je tehnični napredek), tako da je zadoščeno tudi trenutnim strožjim predpisom evropske skupnosti iz skupine zahtev, znanih pod imenom "zeleni kamion".

Če bo letni uvoz vozil v nekaj prihodnih letih enak kakor v obdobju od 1996 do 1998[2] in bodo predpisi o škodljivih emisijah za komercialna vozila

The allowed noise level has been regulated by the ECE regulation No. 51. Since October 1, 1997, the ECE regulation No. 51.02 has been applied to the new vehicles (for the used vehicles: beginning of 2000). This has significantly reduced the allowed level of noise (from 74 to 77 dBA, which is a technological leap) so that the currently even most strict conditions of the European Union have been fulfilled, from the group of requirements known under the name of "green lorry".

If the yearly import of vehicles over the next few years is the same as in the period from 1996 to 1998[2], and if the present level of requirements

[1] Predpis ECE 49.02 (Euro 2) je v Evropski zvezi v veljavi od 1. oktobra 1996 za izdelana in prvič registrirana vozil. Dovoljena škodljiva emisija je bila tako zmanjšana na 1/3 v primerjavi z osnovni predpisom 49.00, ki je bil v veljavi od 1. oktobra 1990.

[2] Letni uvoz tovornih vozil 1996/1997/1998: 13.700/15.600/7.600; približno 12.000 vozil letno.

[1] Since October 1, 1996, the ECE regulation 49.02B (euro 2) is applied to manufacture and first registration of vehicles in the European Union. The allowed harmful emission has been thus reduced to 1/3 compared to the basic regulation 49.00, which had been valid until October 1, 1990.

[2] Yearly import of trucks 1996/1997/1998: 13,700/15,600/7,600; approximately 12,000 vehicles per year.

ostali nespremenjeni, lahko v približno 8 letih pričakujemo popolno izginotje zastarelih komercialnih vozil[3] in njihovo zamenjavo z vozili nove generacije, pri katerih je škodljiva emisija zmanjšana na manj kot 1/3. Že sedaj lahko povzamemo, da je vpliv sistema homologacije na zmanjšanje škodljivih emisij znaten: zmanjšanje pri tovornih vozilih[4] je bilo konec leta 1997 približno 11% v primerjavi s stanjem, če bi uvozili enako število zastarelih vozil.

Osebna vozila

Škodljive emisije osebnih vozil na Hrvaškem uravnava predpis ECE št. 83. Povprečna starost osebnih vozil na Hrvaškem je približno 11 let. Testi so pokazali, da je škodljiva emisija takih vozil več ko 10 krat večja od škodljivih emisij vozil, ki so v skladu s smernico Evropske zveze 94/12/EEC (glede na predpis ECE št. 83.02), ki je za Evropsko zvezo obvezujoča od 1. januarja 1996 (predpis ECE št. 83.02 je na Hrvaškem v veljavi od 1. aprila 1999).

Kakor so pokazale analize, je povprečna starost uvoženih vozil (4 leta v 1997) znatno manjša od povprečne starosti v državi (11,05 let). Če bo v prihodnih letih uvoz osebnih avtomobilov na približno enaki ravni kakor v obdobju od 1996 do 1998 (povprečno 80.000 vozil letno), se v približno 8 do 10 letih pričakuje zmanjšanje povprečne starosti na 5 do 8 let. Vpliv zmanjšanja škodljive emisije je že opazen: emisija osebnih vozil se je zmanjšala[5] za približno 5% in se še zmanjšuje.

regarding harmful emissions of commercial vehicle engines is maintained, the almost complete disappearance of the obsolete commercial vehicles[3] may be expected in approximately 8 years' time, and their replacement by the vehicles of the new generation in which the harmful emission is reduced to less than 1/3. It may be concluded even now, that the influence of the reduced harmful emission as a consequence of the approval system implementation is significant: the reduction in cargo vehicles amounts[4] at the end of 1997 to about 11% in relation to the situation that would arise had the same number of obsolete vehicles been imported.

Passenger cars

The harmful emission by the engines of passenger cars in Croatia is regulated by the ECE regulation No. 83. The average age of the passenger car in Croatia amounts about 11 years. Testing has shown that the harmful emission of such vehicles is over 10 times greater than the harmful emissions of vehicles in accordance to the EU guideline 94/12/EEC (according to the ECE regulation No. 83.02) which has been obligatory in the European Union since January 1, 1996 (the ECE regulation No. 83.02 is being applied in Croatia since April 1, 1999).

As the analysis shows, the average age of the imported vehicles (4 years in 1997) is significantly lower than the average in the country (11.05 years). If, over the next years, the import of passenger cars continues at more or less the same rate as during the period from 1996 to 1998 (80,000 vehicles per year on average), in approximately 8 to 10 years the reduction in the average age to about 5 to 8 years is to be expected. The influence of the reduction of the harmful emission is already evident: the emission in passenger cars has been reduced[5] for approximately 5% and the positive tendency plays an encouraging element here.

[3] Glede na statistične kazalce (število prebivalcev in število vozil) lahko sklepamo, da je začelo število vozil mirovati, tako da bodo na novo uvožena vozila le nadomestila zastarela vozila izločena iz prometa.

[4] Ker je uveljavljeni sistem homologacije uvoženih tovornih vozil v skladu z zahtevami predpisov Euro 1 in Euro 2 (Euro 2 je precej strožji) in je zmanjšanje škodljive emisije ΔE približno enako (v primerjavi z razmerami leta 1997: 15.608 uvoženih in 101.051 vseh vozil):

$$\Delta E = \frac{n_{new} \cdot (E_{old} - E_{new})}{(n_{all} - n_{new}) \cdot E_{old} + n_{new} \cdot E_{new}} = \frac{15608 \cdot (3-1)}{(101051-15608) \cdot 3 + 15608 \cdot 1} = 0{,}115 = 11{,}5\% \quad (1)$$

kjer je: n_{new} – število novo uvoženih vozil, n_{all} – število vseh vozil na Hrvaškem, E_{old} – relativna emisija starih vozil, E_{new} – relativna emisija novih vozil

[3] Regarding statistical indicators (number of inhabitants and number of vehicles) it can be concluded that the number of vehicles is starting to stagnate, so that the number of newly imported vehicles will only replace the lack caused by the exclusion of obsolete vehicles from traffic.

[4] Since the introduction of the approval system all the newly imported trucks meet the *Euro 1* and *Euro 2* (*Euro 2* is much stricter) requirements, and the reduction of harmful emissions ΔE amounts to approximately (compared to the condition in 1997: 15,608 imported and 101,051 total vehicles):

where: n_{new} - number of imported new vehicles, n_{all} - number of all vehicles in Croatia, E_{old} - relative emission of old vehicles, E_{new} - relative emission of new vehicles

5 SKLEP

Z uveljavitvijo obvezne homologacije vozil 15. septembra 1997 je začela Hrvaška vpeljevati predpise, s katerimi v Evropi zagotavljajo kakovost vozil že od leta 1958. Tako so bili uveljavljeni uradni prevzemi za doma izdelana in uvožena vozila, ki so, glede na tehnične zahteve, na enaki ravni kakor v razvitih deželah. To bo vsekakor zmanjšalo trenutno dokaj visoko povprečno starost vozil v Republiki Hrvaški in izboljšalo tehnično kakovost, kar bo pripomoglo k večji varnosti, zmanjšanju škodljivih emisij in manjši porabi goriva po prevoženih ton-kilometrih. Vse to bo pomagalo pri znatnem izboljšanju ekološkega stanja v primerjavi z razmerami, ki bi nastale, če se ti ukrepi ne bi uveljavili na področju škodljivih emisij in ravni hrupa v mestnih področjih. Konkretni rezultati so že vidni. Povprečna starost vozil, ki so bila uvožena od začetka uveljavitve predpisa, se je že v prvem letu (1997) zmanjšala na 4 leta, kar je le 30% povprečne starosti vozil v letu 1997 (11,05 let). Škodljiva emisija tovornih vozil se je zmanjšala za približno 11%, osebnih vozil pa za 5%, v primerjavi z razmerami, ki bi se pojavile, če bi uvozili enako število zastarelih vozil. Dovoljena raven hrupa je za 3 do 4 dBA nižja. Na podlagi vsega tukaj napisanega lahko povzamemo, da so rezultati opogumljajoči in da opravičujejo uveljavitev homologacijskega sistema.

[5] Analiza primera 28.810 vozil, uvoženih od uveljavitve registracijskega postopka 15. septembra 1997 do 1. aprila 1998 kaže razmerje 1 novega vozila na 1,9 rabljenega povpreče starosti 6 let. Ker največja starost ne sme presegati 7 let, je starost teh vozil nekje med 5 in 7 let oz. so bila izdelana med letoma 1991 in 1992. Velika večina teh vozil nima katalizatorja, kar pomeni, da uporabljajo osvinčeni bencin. Največje emisije za osvinčeni (g/test) in neosvinčeni bencin (g/km), zaradi različnih merskih enot, ne moremo primerjati, vendar pa so testi pokazali, da je škodljiva emisija osebnega vozila, ki uporablja osvinčeni bencin več kot 10 krat večja od emisije avtomobila (skupne teža do 1250 kg), ki uporablja neosvinčen bencin, kar je v skladu s predpisi ECE 83.01/83.02. Zato lahko predvidevamo, da je bila 1/4 uvoženih vozil opremljena s kakovostnim katalizatorjm, pri ostalih 3/4 pa je bila emisija 10 krat večja, ter da je bilo 5% ostalih vozil, ki so že bila na Hrvaškem, opremljenih s kakovostnim katalizatorjem, pri ostalih pa je bila emisija 10 krat večja od emisije novih vozil s katalizatorjem (v državi je tudi precej vozil s katalizatorjem, ki pa niso bila pravilno testirana pri tehničnem pregledu, in ni znano ali je njihova emisija na dovoljenem nivoju; ostala vozila so zelo stara in pogosto v slabem tehničnem stanju). V tem primeru se je škodljiva emisija zmanjšala le na račun uvoza novih vozil. Ob upoštevanju stanja v letu 1997 (109.144 uvoženih in 932.278 vseh osebnih vozil) in uporabi enačbe podobne enačbi (1), dobimo zmanjšanje škodljive emisije: $\Delta E = 4,9\%$

5 CONCLUSION

By introducing the obligation of the approval of vehicles on September 15, 1997, Croatia has started applying the regulations by which Europe has been insuring the vehicle quality already since 1958. Thus, the legal assumptions have been established, for the production and import of vehicles that are, according to their technological level, of equal value as those from the developed countries. This will certainly reduce the present excessively high average age of the vehicles in the Republic of Croatia and upgrade their technical level, contributing to greater safety, reduced harmful emissions and lower fuel consumption per travelled ton-kilometre. All this will result in significant improvement of the ecological situation compared to the condition that would have followed, had these measures not been introduced, both regarding harmful emissions and the noise level in urban areas. Concrete effects can already be seen. The average age of the vehicles that have been imported since the start of the approval was already in the first year (1997) reduced to 4 years, which is only 30% of average age of the vehicles in 1997 (11.05 years). The harmful emission has been reduced in cargo vehicles by about 11%, and in passenger vehicles by about 5%, compared to the condition that would have arisen, had the same number of obsolete vehicles been imported. The allowed noise level is by 3 to 4 dBA lower. Based on what has been presented here, it may be said that these results give courage and justify the introduction of the approval system.

[5] The analysis of a sample of 28,810 vehicles, imported after the implementation of the approval system on Sept. 15, 1997 until April 1, 1998, shows the ratio of 1 new vehicle per 1.9 used vehicles of average age of six years. Since the upper limit of age, due to other legal restrictions cannot exceed 7 years, the result is that the age of these vehicles ranged between 5 and 7 years, i.e. they were produced during 1991 and 1992. The great majority of these vehicles have no catalyst, which means that they use lead gasoline. The limit emissions for lead (g/test) and lead-free gasoline (g/km) cannot be compared due to different measuring units, but the tests have shown that the harmful emission of passenger cars using lead gasoline is more than 10 times higher than the emission of cars (of mass up to 1250 kg) using lead-free gasoline, and meeting the ECE regulations 83.01/83.02. Therefore, it may be assumed that 1/4 of the imported used vehicles was equipped by the well-operating catalyst, whereas in the rest of the 3/4, the emission was 10 times higher, and that the rest of the vehicles that were already in Croatia, 5% were with the well-operating catalyst and the emission of the rest of the vehicles was also 10 times higher than the emission of the new vehicle with the catalyst (there are, however, in the country, many vehicles with a catalyst as well, but they are not included in the appropriate testing at the MOT and it is not certain whether the emission is at the prescribed level, the rest of the vehicles are very old and often in bad technical condition). In this case the reduction of harmful emission has resulted only due to the import of new vehicles. Considering conditions in 1997 (109,144 imported and 932,278 total passenger cars) and using the formula similar to formula (1) we get the amount of the reduction of harmful emission: $\Delta E = 4.9\ \%$.

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7 REFERENCES

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