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Technology and Management of Traffic
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CONTRIBUTION TO THE FORTHCOMING MODERNISATION IN THE CROATIAN POSTAL TRAFFIC TECHNOLOGY

SUMMARY

Postal administration world-wide is improving the postal traffic also by introducing modern automation throughout its operation in mail transport.

The Croatian Post must also carry out this demanding and challenging project which must necessarily be well planned and implemented as soon as possible. The automation of the operating procedures in the technological phases of mail-pieces transmission provides a significant substitution for the slow and expensive manual work, resulting in substantial reduction of costs, rise in the quality level of services and cutting down of the time-limit control of transmission.

This is the aim of this article, as preliminary communication, which is based on the carried out research regarding important traffic parameters in the post centre Zagreb, as the largest one in Croatia. The results can also be used as adequate reference form for the research in other post centres of Croatia. After these studies and the obtained relevant information, a method of designing new rationally organised postal network of Croatia in all segments of mail-pieces transmission would follow, as well as forming of a suitable postal code and developing of the Croatian postal code map. This comprehensive work presents the preparation phase of the project and it is absolutely necessary for the success of the general automation in the Croatian postal traffic.

1. INTRODUCTION

Use of automation in postal traffic has its specialities which depend on the nature of the activity and characteristics of services. Therefore, in this case, it is not possible to talk about the complete system automation, example of which we have in modern telecommunications sector, but only about automation of the particular segments suitable for such operations. The main issue, therefore, is automation of the central technological phase of mail-pieces transmission, in bigger post centres of Croatia, where mail-pieces concentration and diffusion are large enough to make the use of automation fully economically justifiable.

The results of the performed research are systemised and evaluated compared to the expected effects of automation and they can be grouped as measurable (reduction of costs, rise of the quality level of services) and non-measurable (humanisation of work).

In this article, research is limited to the biggest postal centre of Zagreb (PC Zagreb) which directs mail-pieces and handles them in arrival.

The PC Zagreb is also a major postal centre for international traffic and large post office for mail-pieces delivery of Zagreb.

Relevant information about traffic important for the implementation of automation, are based on the measurable quantification in concentration and diffusion of mail-pieces, seasonal traffic fluctuations and daily traffic oscillation – all presented in the following text.

2. PHYSICAL CAPACITY OF LETTER SERVICES

Data on physical capacity of processed letter mail-pieces in PC Zagreb over the last five years, from 1993 to 1997 are presented in Table 1, and by chained index in Table 2.

Letter mail-pieces processed in PC Zagreb in the period from 1993 to 1997

Based on the information in Tables 1 and 2 it is possible to point out the four main characteristics:

- letter traffic, over the last five years, was increasing by the annual average rate of 9.4%;
- mail-pieces dispatch increase had chained index of 143 at the end of the five-year period and it equals the index of mail-pieces arrival increase;
- quantity relation between dispatched and arrived mail-pieces is 62% versus 38% in favour of the dispatched mail-pieces ;
- important seasonal traffic fluctuations can be noticed during the entire observed period.

Table 1 - Letter mailpieces processed in PC Zagreb in time from 1993 to 1997 (000)

Month		1993	1994	1995	1996	1997	TOTAL
1	2	3	4	5	6	7	8
I	Dispatch	14185	13885	16451	18956	19693	83170
	Arrival	8960	8689	9763	11648	13065	52125
	Total	23145	22574	26214	30604	32758	135295
II	Dispatch	12395	13198	19179	17643	16745	79160
	Arrival	7553	8289	10688	11342	11412	49284
	Total	19948	21487	29867	28985	28157	128444
III	Dispatch	16393	17931	18279	19757	22223	94583
	Arrival	9293	10772	12127	12512	13968	58672
	Total	25686	28703	30406	32269	36191	153255
IV	Dispatch	14119	15638	17147	21301	20602	88807
	Arrival	8082	9187	10367	11766	13074	52476
	Total	22201	24825	27514	33067	33676	141283
V	Dispatch	13729	14913	16816	20379	20683	86520
	Arrival	9194	9197	10286	12657	13100	54434
	Total	22923	24110	27102	33036	33783	140954
VI	Dispatch	15073	16697	18704	19637	23463	93574
	Arrival	9894	10169	11456	11862	14117	57498
	Total	24967	26866	30160	31499	37580	151072
VII	Dispatch	19824	17831	19917	20903	26065	104540
	Arrival	13007	11347	12525	13306	15101	65286
	Total	32831	29178	32442	34209	41166	169826
VIII	Dispatch	15794	16666	17971	22600	28067	101098
	Arrival	11125	10083	11644	13625	15959	62436
	Total	26919	26749	29615	36225	44026	163534
IX	Dispatch	15651	17449	17184	19644	24227	94155
	Arrival	8562	10143	10570	11833	14150	55258
	Total	24213	27592	27754	31477	38377	149413
X	Dispatch	14641	15921	17594	18935	22743	89834
	Arrival	8290	9086	10220	11602	13560	52758
	Total	22931	25007	27814	30537	36303	142592
XI	Dispatch	15493	16794	17394	17229	21972	88882
	Arrival	8644	9759	10533	10704	13447	53087
	Total	24137	26553	27927	27933	35419	141969
XII	Dispatch	33661	33835	34704	36279	41026	179505
	Arrival	19980	19733	20938	21633	24427	106711
	Total	53641	53568	55642	57912	65453	286216
Σ	DISPATCH	200958	210758	231340	253263	287509	1183828
	ARRIVAL	122584	126454	141117	154490	175380	720025
TOTAL		323542	337212	372457	407753	462889	1903853

Source: Statistic data of PC Zagreb from 1993 to 1997

Table 2 - Chained index - data from Table 1

Month		1993	1994	1995	1996	1997
1	2	3	4	5	6	7
I	Dispatch		98	118	115	104
	Arrival		97	112	119	112
	Total		98	116	117	107
II	Dispatch		106	145	92	95
	Arrival		110	129	106	101
	Total		108	139	97	97
III	Dispatch		109	102	108	112
	Arrival		116	113	103	112
	Total		112	106	106	112
IV	Dispatch		111	110	124	97
	Arrival		114	113	113	111
	Total		112	111	120	102
V	Dispatch		109	113	121	101
	Arrival		100	112	123	104
	Total		105	112	122	102
VI	Dispatch		111	112	105	119
	Arrival		103	113	104	119
	Total		108	112	104	119
VII	Dispatch		90	112	105	125
	Arrival		87	110	106	113
	Total		89	111	105	120
VIII	Dispatch		106	108	126	124
	Arrival		91	115	117	117
	Total		99	111	122	122
IX	Dispatch		111	98	114	123
	Arrival		118	104	112	120
	Total		114	101	113	122
X	Dispatch		109	111	108	120
	Arrival		110	112	114	117
	Total		109	111	110	119
XI	Dispatch		108	104	99	128
	Arrival		113	108	102	126
	Total		110	105	100	127
XII	Dispatch		101	103	105	113
	Arrival		99	106	103	113
	Total		100	104	104	113
Σ	DISPATCH		105	110	109	114
	ARRIVAL		103	112	109	114
TOTAL			104	110	109	114

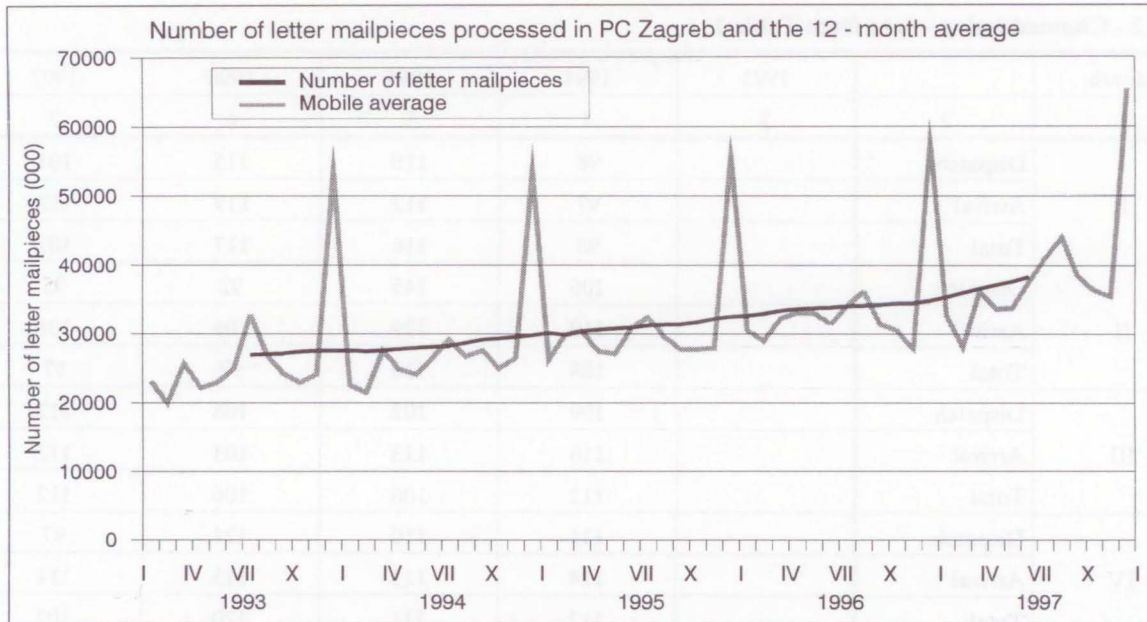


Diagram 1

Source: Collected statistical data of PC Zagreb for the period 1993 - 1997

3. SEASONAL TRAFFIC FLUCTUATION

The calculated seasonal traffic fluctuations are presented in Diagrams 1 and 2, and Table 3 based on data in Table 1.

Strong influence of the regular annual seasonal occurrences can be clearly observed in the leaping up-going lines, especially in December, in the period between 1993 and 1997. On the other hand, the straight-line value trend movement smoothed with mobile averages point at the irrelevance of other factor influ-

ences on traffic progression. It can be concluded without doubt that only seasonal influences have extremely strong impact on the leaping letter mailpieces traffic increase, while all the other factors have a mild influence on it.

The processed mail-pieces monthly index during a period of one year point at the strength of traffic changes quantification formats. For example, in December, traffic is almost always doubled in comparison with the other months which are not seasonally influenced.

Tab. 3. Monthly index of the processed letter mail-pieces for the period 1993 to 1997

Month	Index
I	89
II	86
III	100
IV	92
V	90
VI	96
VII	107
VIII	98
IX	91
X	86
XI	86
XII	178

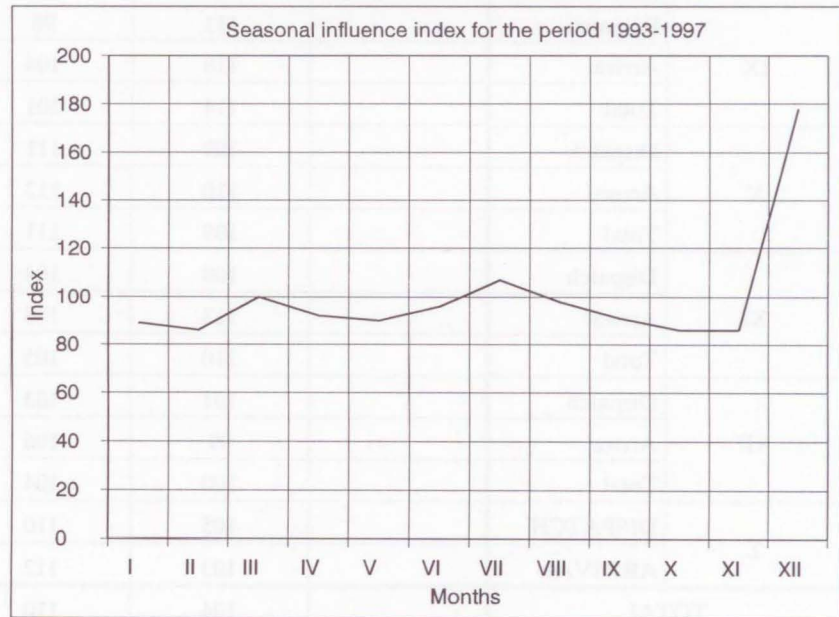


Diagram 2

Therefore, it can be concluded that these are the typical periodical appearances that are always repeated from year to year and that the intensity level from medium (March and July) to very heavy in December, especially in its second half.

Knowledge about the previous facts is decisive for dimensioning of production capacity, necessary number of workers, number and schedule of work shifts etc., and all that in order to provide regular postal traffic and to keep up to the services quality level. Therefore, it can be easily said that without this knowledge, it would be hard to assume that it would be possible to avoid mistakes in implementing the auto-

mation, especially when it comes to the installed capacity sizing and its economic justification.

4. WEEKLY AND DAILY TRAFFIC DISTRIBUTION

4.1. Weekly traffic distribution

Weekly traffic distribution is presented in Diagram 3.

Diagram 3 shows the unequal arrangement of letter mail-pieces traffic during a workweek. Thursdays

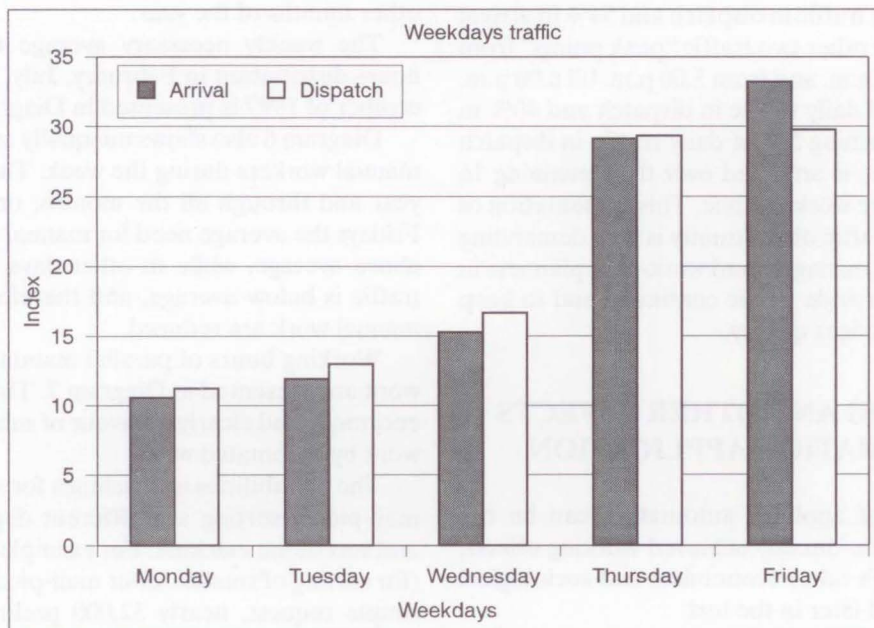


Diagram 3

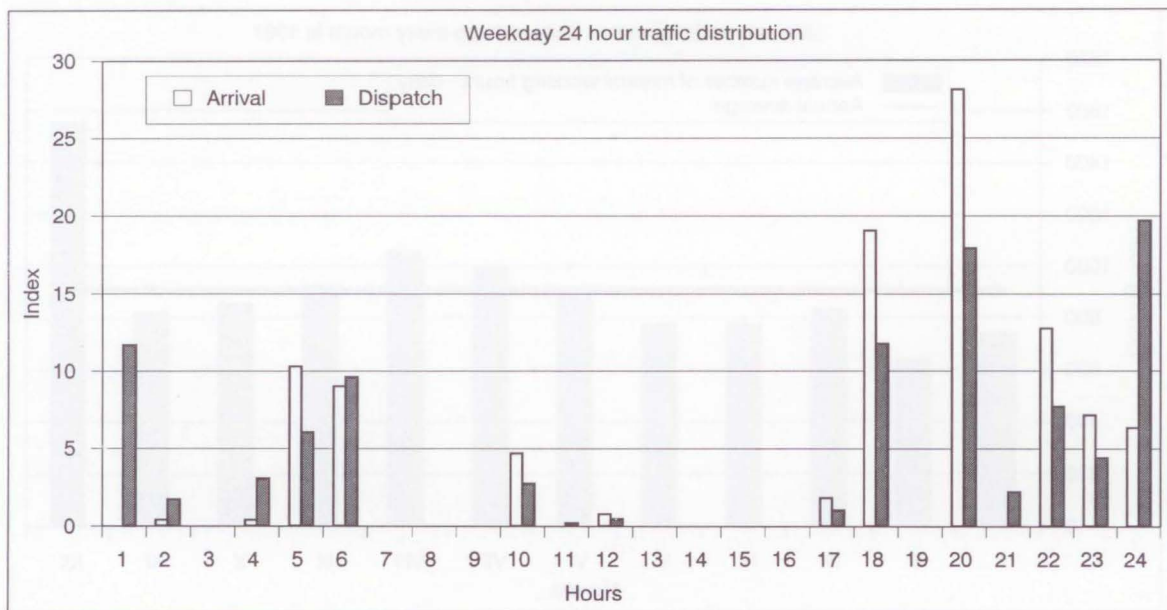


Diagram 4

and Fridays take about 60% of weekly traffic, while the other three days of the week (Monday, Tuesday, Wednesday) take the remaining 40%.

The example is representative, and therefore reliable, because it includes a great number of measurements performed over many years.

4.2. Daily traffic distribution

Traffic distribution during 24 hours of one workday is presented in Diagram 4.

The intensity of letter traffic during one workday, throughout 24 hours, shows traffic "peak points" (Diagram 4). In the period from 8.00 p.m. till 1.00 a.m. 64% of total daily traffic in dispatch and 54% in arrival are handled. The other two traffic "peak points" from 4.00 a.m. till 6.00 a.m. and from 5.00 p.m. till 6.00 p.m. take 31% of total daily traffic in dispatch and 40% in arrival. The remaining 5% of daily traffic in dispatch and 6% in arrival, is arranged over the remaining 16 hours of the entire working time. This presentation of the heavy daily traffic discontinuity is very demanding for the operating managers and work-shift planners in their efforts to provide traffic continuity and to keep up the proper services quality.

5. OPERATING AND OTHER EFFECTS OF AUTOMATION APPLICATION

The effects of applying automation can be observed through the directly achieved working effects, as well as through other economical and sociological profits, explained later in the text.

5.1. The comparison of the effects of manual vs. automated operation

Based on the information about letter mail-pieces traffic volume and the registered standard working hours, the Diagrams 5, 6 and 7 are made.

Diagram 5 shows that the necessary number of manual working hours is not equally arranged during one year. Three months are above average: July and August, and December shows nearly doubled number of working hours compared to the annual average.

It can also be noticed that June and September are at the average level, while the necessary number of manual working hours is below the annual average in other months of the year.

The weekly necessary average manual working hours distribution in February, July, August and December of 1997 is presented in Diagram 6.

Diagram 6 also shows unequally arranged need for manual workers during the week. Through the whole year and through all the months, on Thursdays and Fridays the average need for manual working hours is above average, while in other days of the week the traffic is below average, and therefore, the hours of manual work are reduced.

Working hours of parallel manual and automated work are presented in Diagram 7. The differences are enormous and clearly in favour of substituting manual work by automated work.

The possibilities of machines for automated letter mail-pieces sorting are different depending on type and sort of the machine. For example, FVM 771 AEG (for sorting of smaller letter mail-pieces) can direct, at simple request, nearly 32,000 preliminary prepared letters per hour.

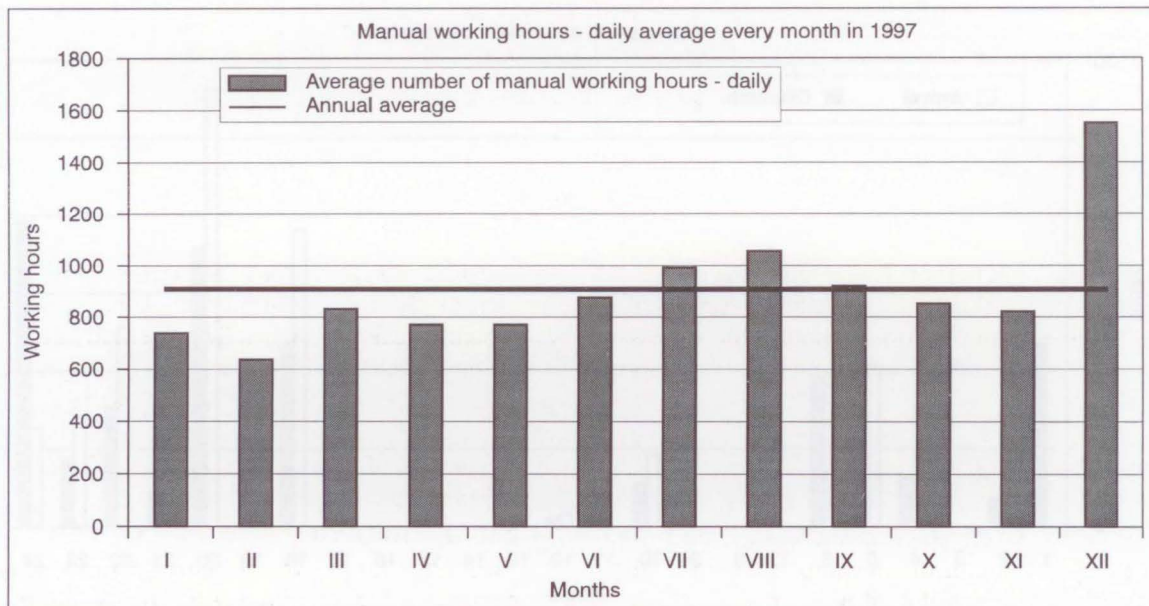


Diagram 5

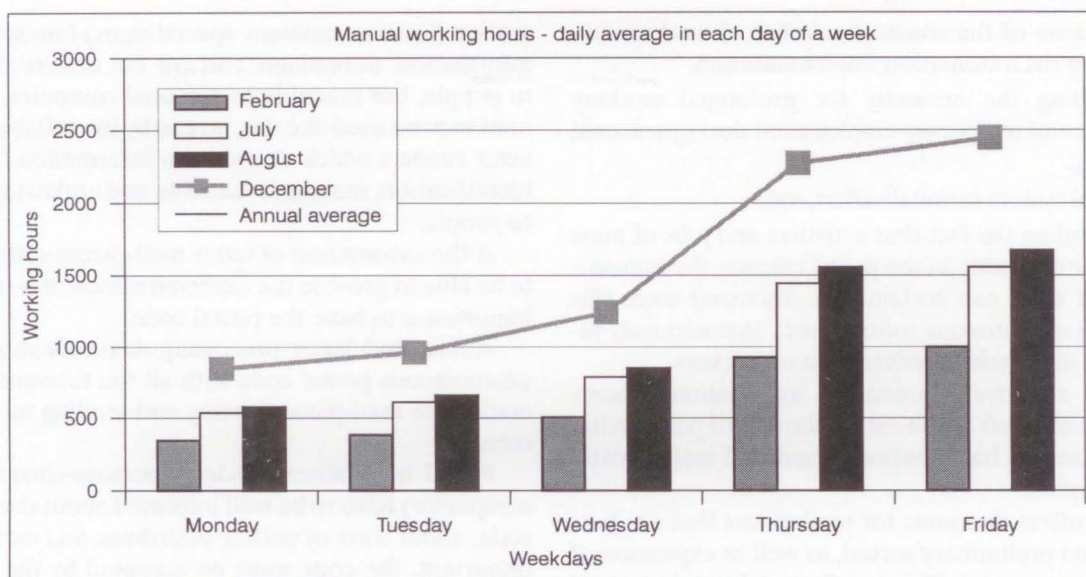


Diagram 6

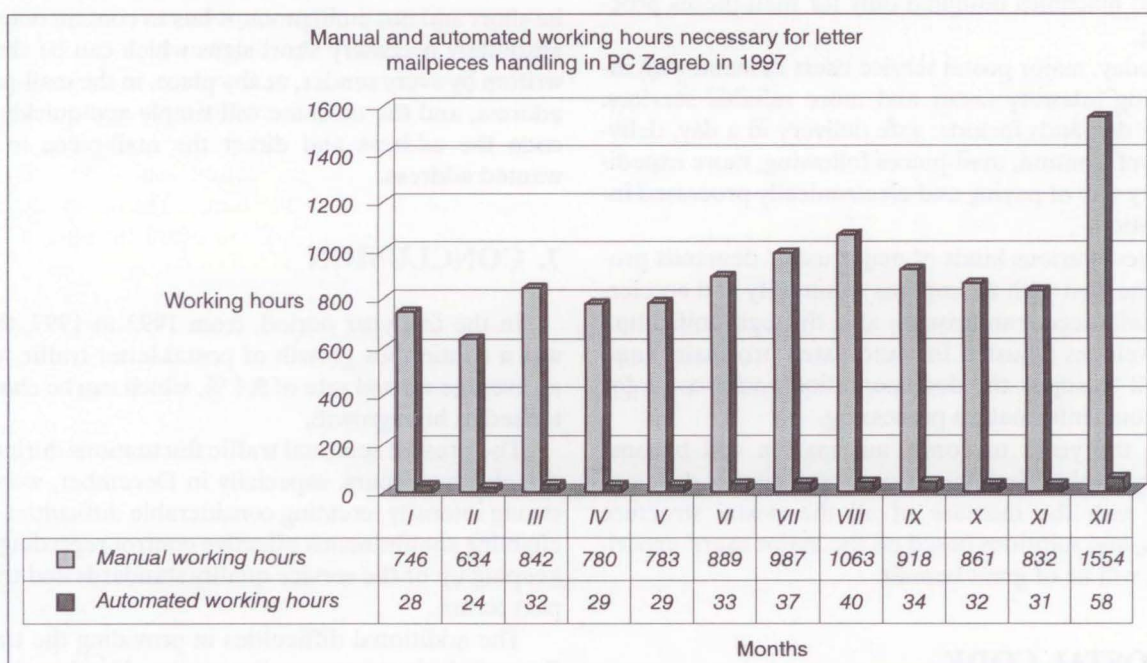


Diagram 7

It can be concluded that for handling the presented postal traffic with this type of machine, compared to the number of manual working hours, the necessary number of automated working hours would be many times smaller.

5.2. The effects of automation

During the last few years, postal services and postal service major users, in the developed countries have automated the process of mail-piece sorting, which resulted, on one side, in the increase of work productiv-

ity and speed as well as mail-pieces transport reliability, and on the other side, in some other economical and sociological profits, briefly presented here:

In short, with the automation in sorting the mail-pieces in major postal centres, the following can be accomplished:

1. Reduction of time necessary for mail-pieces sorting in the postal centre.
2. Productivity increase
3. Easier handling of traffic "peak points", especially significant for keeping up the regular terms and timely postal traffic activity.

4. Decrease of the constant number of workers following the automation implementation.
5. Avoiding the necessity for prolonged working hours and temporary employment during seasonal traffic.
6. Postal system rationalisation, etc.

Regarding the fact that activities and jobs of mass character dominate in the postal centres, the humanisation of work can certainly be discussed since this work is a monotonous routine work that seriously influences the psychological exhaustion of workers.

With effective solutions in automation process more space is left for re-establishment of partnership on commercial bases between post and major postal service users.

Post offers discounts for mail-pieces that are bar-coded and preliminary sorted, as well as expansion of services assortment. This is reflected, by major postal service users, through developing progressive sophisticated machines designed only for mail-pieces processing.

Today, major postal service users demand with increasing intensity faster and more reliable services. These demands include: safe delivery in a day, delivery confirmation, mail-pieces following, more expeditious way of paying and electronically processed information.

These various kinds of major users' demands provide the post with an impetus to simplify and accelerate mail-piece transmission also through unification of envelopes adjusted for automated processing, and as well to adjust the documentation and records for electronic information processing.

In the years to come, automation will become deeply involved in international post market development with the increase of all the postal structure needs, and solutions based on the major users' experiences will be of great benefit.

6. POSTAL CODE

Postal code is the presumption for introducing the automation in postal traffic at today's level of technical and technological optical object identification development.

Therefore, one segment of automation consists in automated object identification, and the essential base for every identification system is the key which differentiates one object from the others. The key is made of information which make that object unique in relation to the other participants in identification.

In order to make this possible, the information necessary for mutual differentiation must be preliminary coded, for more certain and quicker identification. It is a procedure that transforms readable infor-

mation (letters, numbers, special signs) into symbolic information, unreadable and / or not understandable to people, but readable to personal computer. Information presented like this, is read by the suitable character readers which decode the information, during identification, making it readable and understandable to people.

If the automation of letter mail-pieces sorting has to be able to provide the expected effects, it is of great importance to have the postal code.

Automated letter processing demands short and unambiguous postal code with all the relevant information for mail-pieces sorting and sending to the receiver.

Postal mail-pieces senders (persons-citizens and companies) have to be well informed about the postal code, about ways of writing addresses, and extremely important, the code must be accepted by the postal service users.

Therefore, it can be concluded that the code has to be short and not ambiguous, it has to contain only the absolutely necessary short signs which can be simply written by every sender, at any place, in the mail-piece address, and the machine will simply and quickly decode the address and direct the mail-piece to the wanted address.

7. CONCLUSION

In the five-year period, from 1993 to 1997, there was a continuous growth of postal letter traffic, with an average annual rate of 9.4 %, which can be characterised as high growth.

The present seasonal traffic fluctuations during all the observed years, especially in December, were of strong intensity, creating considerable difficulties and enabling simultaneous effective control regarding the keeping up of the service quality standards and transport terms.

The additional difficulties in providing the traffic flow regularity (movement) are caused by the strongly present daily traffic "peak points" in the evening hours and early morning hours during which, practically the major part of daily concentrated traffic must be processed in only five hours of exhausting routine work.

It is not difficult to conclude from the facts presented in this article that the automation would in many ways contribute to the unburdening of work, along with its full economical justification.

The article does not only analyse the relevant traffic parameters, but it also shows the method for carrying out the automation effectively. Therefore, special emphasis is put on the importance of proper concept and consistent realisation of the preparation / preliminary phase of automation because, by its contents, the

article includes the complete preliminary work necessary for effective implementation of automation.

It is - first of all - necessary to solve certain organisational - traffic issues in the Croatian major postal centres, to design a suitable and simple postal code and to make the postal code map of Croatia.

SAŽETAK

PRILOG PREDSTOJEĆEM OSUVREMENJIVANJU TEHNOLOGIJE U POŠTANSKOM PROMETU HRVATSKE

Poštanske uprave širom svijeta unapređuju poštansko poslovanje i uvođenjem suvremene automatizacije u svoje radne procese prijena poštanških pošiljaka.

I pred hrvatskom poštom predstoji ovaj zahtijevan i izazovan projekt kojega je potrebno dobro osmisliti i čim prije realizirati. Automatizacijom radnih procesa u tehnološkim fazama prijena pošiljaka značajnije se supstituira spori i skupi rutinski manualni rad, što onda rezultira osjetnim sniženjem troškova, podizanjem razine kvalitete usluga i skraćenjem kontrolnih rokova prijena.

U tom cilju je i napisan ovaj članak, kao prethodno priopćenje, a temeljen je na provedenom istraživanju bitnih prometnih parametara u poštanskom središtu Zagreb, kao

najvećem u Hrvatskoj, što može poslužiti i kao prikladan obrazac i za istraživanja u preostalim poštanskim središtima Hrvatske. Nakon ovih istraživanja, i tako dobivenih relevantnih informacija, slijedio bi postupak osmišljavanja nove racionalno organizirane poštanske mreže Hrvatske u svim segmentima prijena pošiljaka, formiranje prikladnog poštanskog kôda i izrade poštansko kôdne karte Hrvatske. Ovaj opsežan posao predstavlja pripremnu fazu projekta i presudan je za uspješnost ukupnog zahvata primjene automatizacije u poštanskom prometu Hrvatske.

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