

Time trend and consequences analyse of radiographers exposure in the Czech Republic

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Abstract

The paper is intended to describe the results of ten years analyse of radiographers exposure in the Czech Republic (CZ). The radiographers as is also common in other countries create in the Czech Republic the significant group of radiation workers from the point of view of individual doses level. There is altogether about one hundred companies offering the radiographic service in the country, most of them with only one or two staff people. There is around fifteen bigger companies where we can find the most of workers with higher doses exceeding 20 mSv. During last ten years the average doses of radiographers and the number of them with doses higher than 20 mSv per year are growing. The number of radiographers has decreased from 1000 in 1993 to 700 in 2000, the average dose has increased from 1,89 mSv to 2,43 mSv during that period. The number of workers creates 3,6% of whole amount of radiation workers while their collective dose means 8,8% of the whole. Reduction of number of workers which is connected with economical pressure to this companies and another reasons of this reality are of course the amount, type, conditions and equipment of work performed.

Introduction

From year 1993 the system of central evidence of professional exposure has been created in CZ. In accordance with the change of the Czech legislation [1,2] when the management of this system was charged with the State Office for Nuclear Safety (SUJB), SUJB officially established the Central Registry of Occupational Exposures (CROE)[3]. All licensee have to report to SUJB their category A workers with their identification attributes and the results of their individual monitoring. Workers are characterised by their professions. CROE enables to evaluate and follow the individual doses of registered workers as well as to provide with the statistical evaluation of occupational exposure on the national level. One of separate profession category is radiography with subcategories for mobile and stable radiography. CROE keeps history of worker's employment and his individual dose. Data registered in CROE has started officially in 1997 year, but where it was possible also previous years (from 1991 year) were included. One of the duty of licensee established in recent legislation is to report every individual dose higher than 20mSv, means dose evaluated in monitoring period or evaluated annual individual dose, to SUJB with the result of consequences evaluation and with description of measures adopted. The duty of reporting is also on the side of personal monitoring service. The first step of investigation is the evaluation whether the value measured on the personal dosimeter was really personal dose. Especially in the case of radiographers there is a lot of cases with the result of evaluation – non-personal dose. The common circumstances of such cases is misuse of personal dosimeter – worker forgets his dosimeter close to the source on exposed place very often with taking off the upper working clothes or incorrect disposal of dosimeters. The doses evaluated as non-personal are not included in the occupational personal dose of worker. But the cases are of course registered, because if they are repeated for one worker or one workplace very often this case could be an indication for the control of radiation protection conditions from the side of SUJB.

In the case that the value measured on the personal dosimeter reflects the personal dose of worker and it is a result of non-expected event this value is not included in professional exposure of worker and it is registered separately in CROE. The licensee has to take care that the circumstances of such event will not repeat again. It is logical, that all doses exceeding or approaching the basic limits for professional exposure, should be the results of irregular situation. The practice where the professional doses normally approach or exceed the basic limits could not be justified and optimised and in this case should not be approved. The practices which are recently on this edge are the interventional radiology and industrial radiography. In these categories we can find the workers with doses close to the 50 mSv – valid limit of professional exposure till the end of 2000 year. For some of them could be a problem not to exceed the new limit valid from 2001 – 100 mSv/5years [2].

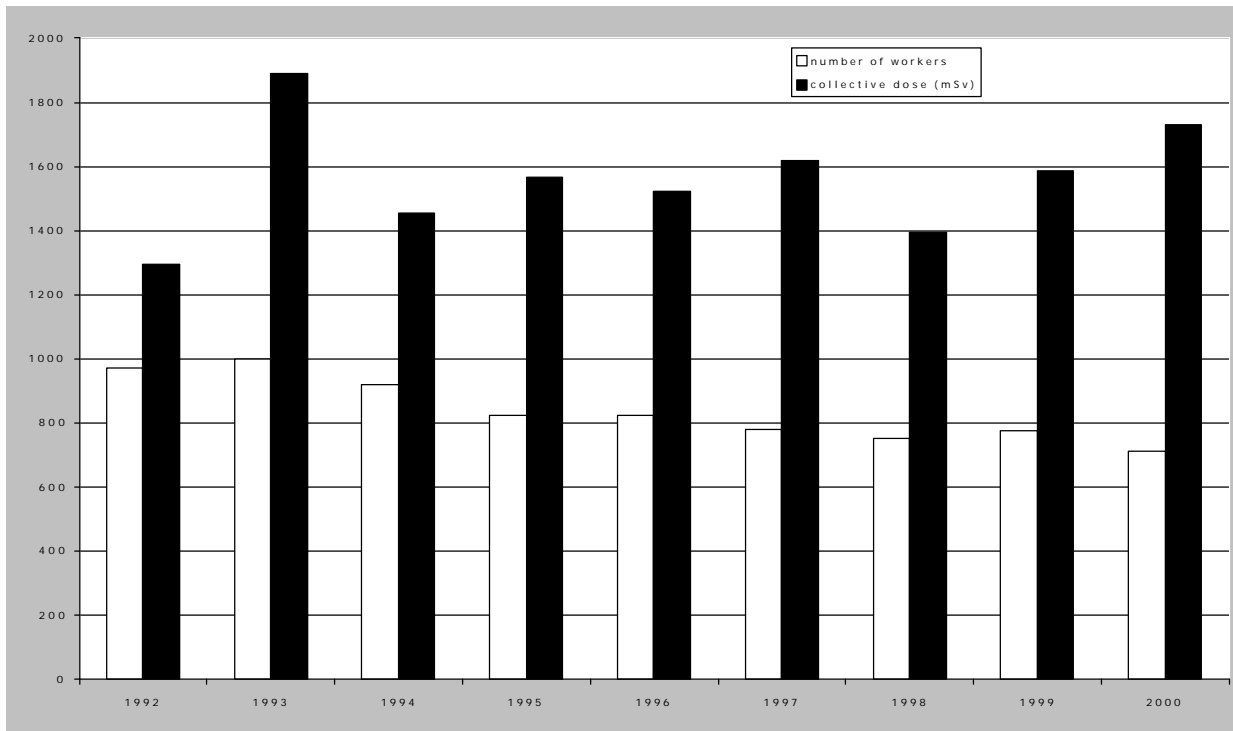
Data analysis

The personal monitoring of radiographers is issued by the approved personal dosimetric service by the film dosimeters. The period of monitoring is one month with some exceptions where is three month monitoring period. The monitoring period is not recently prescribed in the Czech legislation, it is only stated that category A workers should have systematic personal monitoring. However in the case when the circumstances of higher

dose are investigated and the period of personal monitoring is three months it is always difficult to make a detailed reconstruction of worker's activities for the passed three or four months. This is also a reason why the proposal of new legislation requires one monitoring period for all category A workers. During their work workers use also the operative pencil dosimeter.

The analysis of data registered in CROE shows that the number of radiographers varies around 800, for last three years we can observe decreasing to 700 workers. Their collective dose create about 10% of total collective dose from occupational exposure in CZ significantly increases during last three years (Fig.1).

Fig. 1: The time trend of numbers and collective dose of radiographers in the Czech Republic



The average dose has significantly increased from 1,33 in year 1992 to 2,43 in 2000 (Fig.2)

Fig.2: The time trend of the average personal dose of radiographers in the Czech Republic

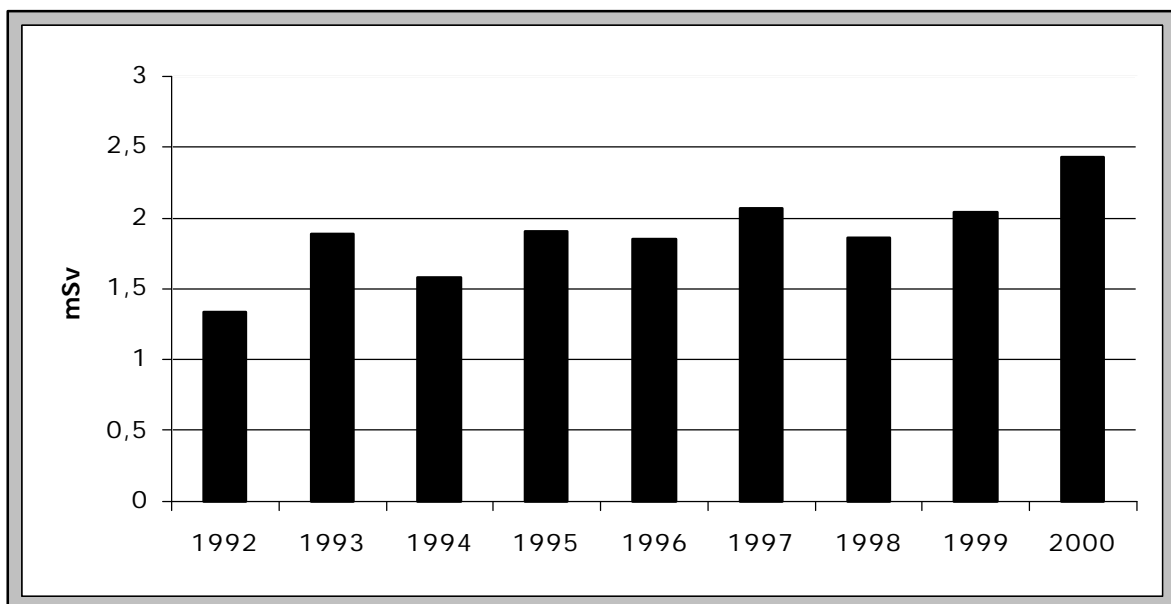
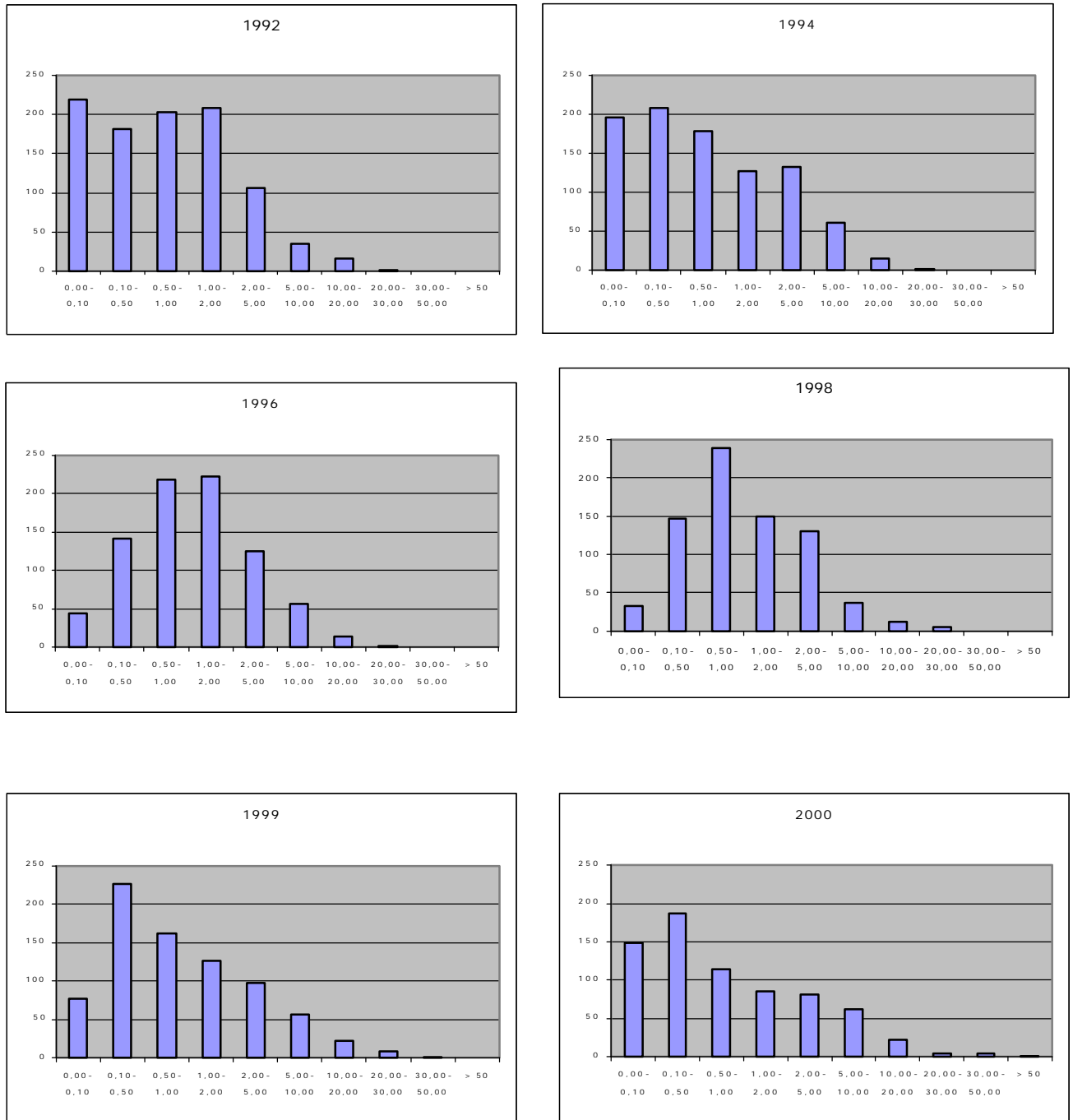


Fig.3 shows detailed dose distribution of radiographer's exposure in the period from years 1992 to 2000.

Fig.3: The dose distribution of radiographers occupational exposure in selected years



The pictures shows the evolution of doses and their redistribution and movement to higher doses during the years.

Fig.4 demonstrates the distribution of collective dose in the same period .

Fig. 4: The dose distribution of the collective dose (mSv) of radiographers in selected years

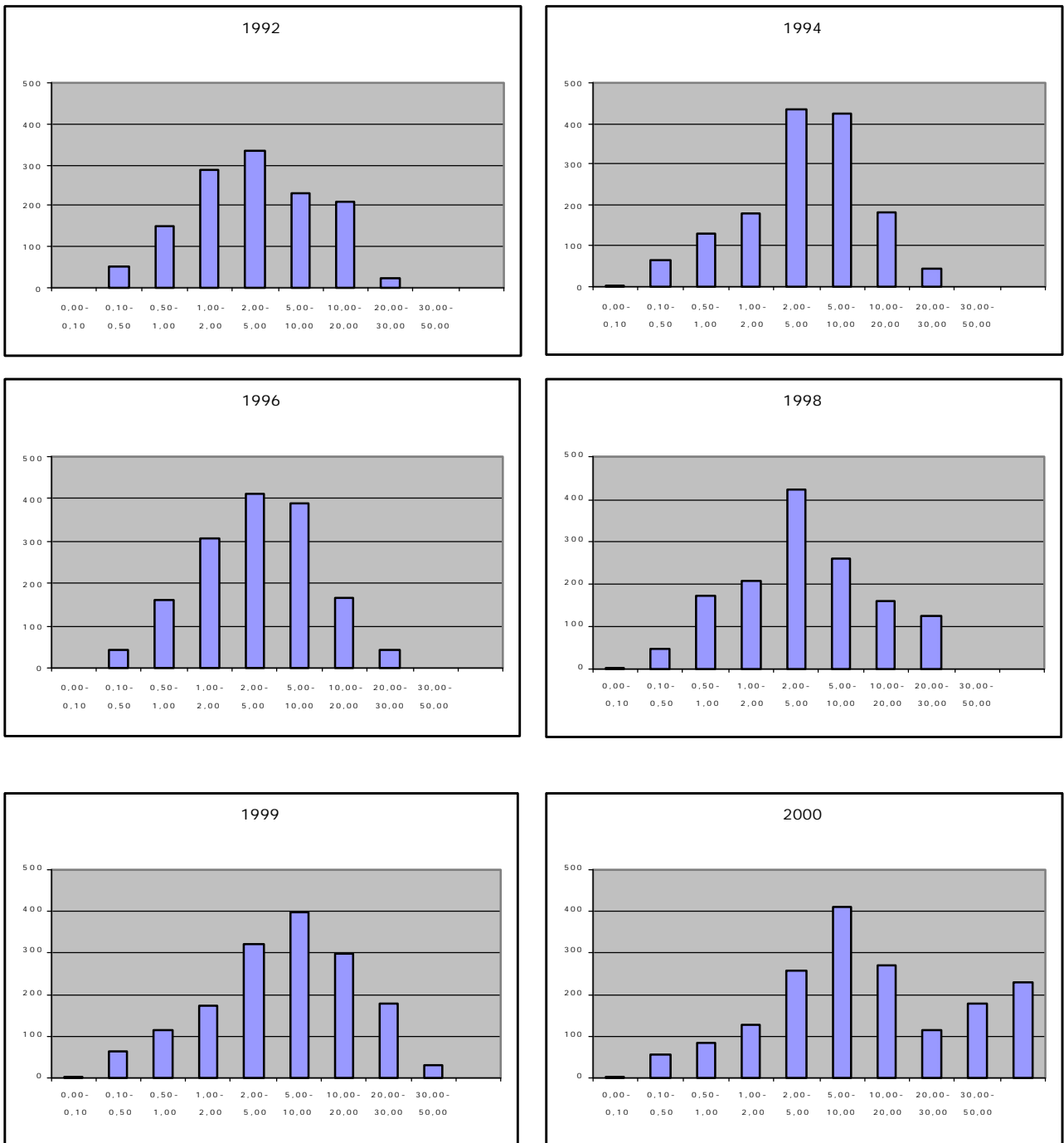
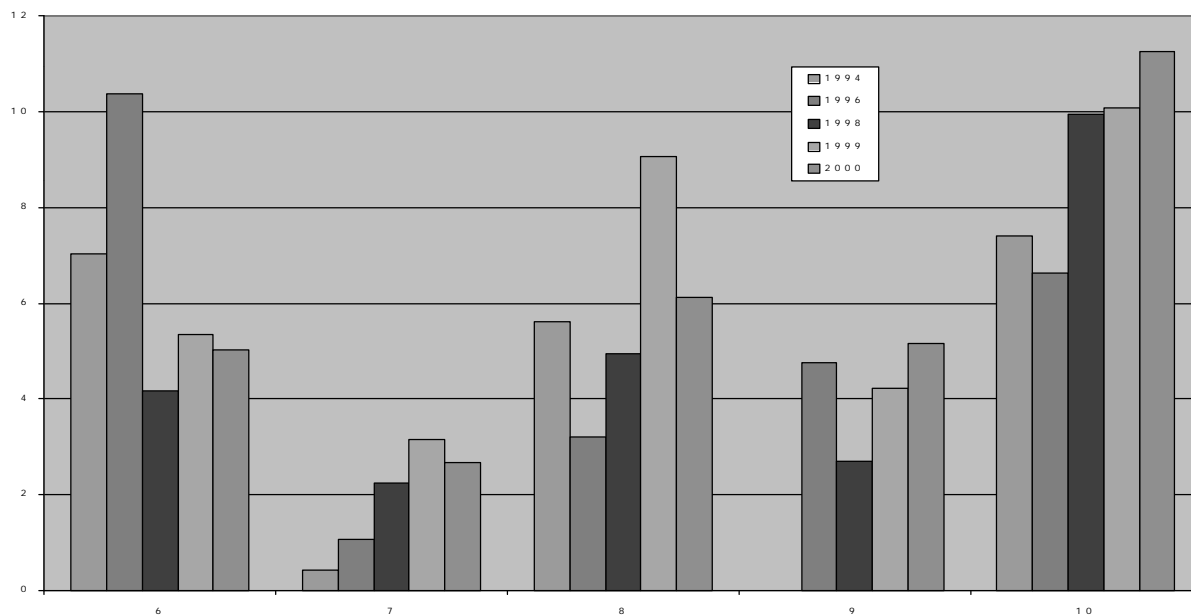
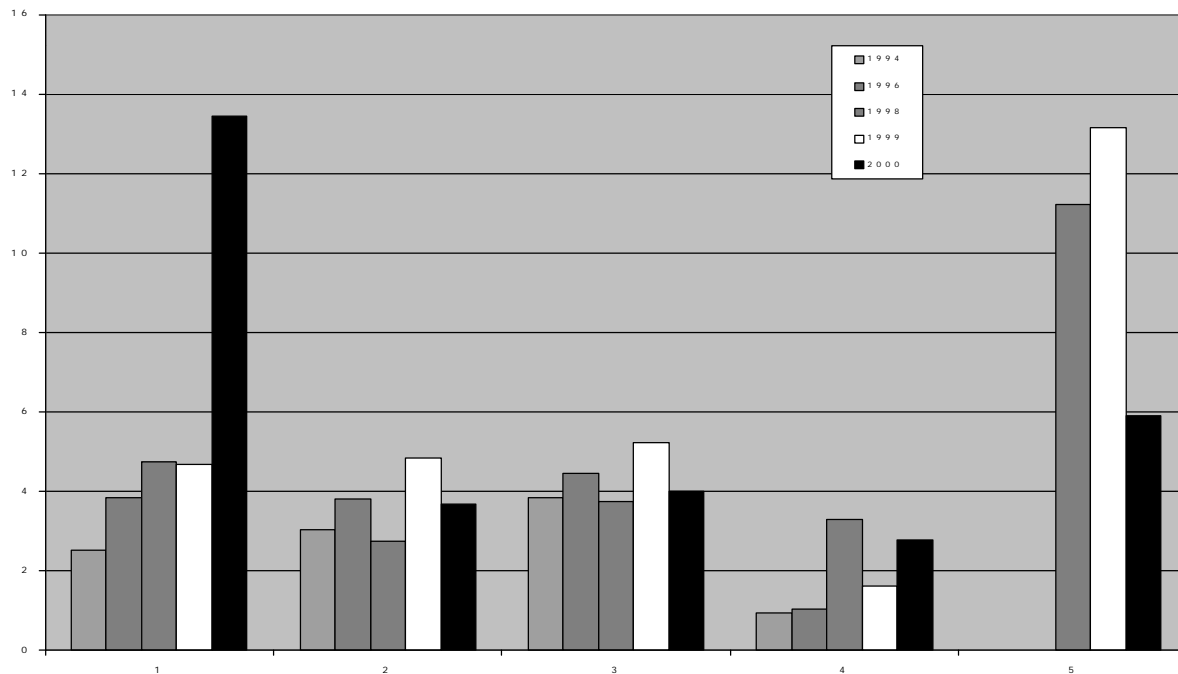


Fig.5 shows the detailed evolution of average personal dose of radiographers in some bigger companies in the country. We can observe that there is not dominating trend in any of them and the doses are mostly depended on the amount and type of contracted work in given year.

Fig.5: The evolution of average personal dose (mSv) of radiographers in selected (1-10) bigger companies in CZ



Conclusions

It is clear, from the results and facts presented above, that the group of radiographers is, similar to many others countries, in the Czech Republic significant group of radiation workers from the point of view of radiation protection and it is a group to which the radiation protection has to be focused. It is done by the character of the radiographic work, that it will be always connected with some exposure. However the doses approaching and exceeding basic limits established for occupational exposure cannot be realised in approved practice.

The reasons which are used for explanation of higher doses we can divide recently into two groups – economical and technical.

The economical reasons push the licensee

- to decrease the number of workers, what of course means the increase of load of the rest
- to manage occasionally long working hours (depends on the contact conditions), work in night,
- to contract big amount of work

The technical reasons include

- the difficult work conditions in - limited space, in height, in vessels, in spaces with high temperature (the potential influence to film dosimetry)
- the quality and availability of equipment

The measures taken for decreasing of doses from the side of licensee are:

- to use the sources with lower activity
- to train people for the work in extreme conditions

The tasks of regulatory authority is:

- to check the optimisation of work performed
- to control the evaluated doses by film also by operational dosimeters
- to try to improve the equipment for work
- to analyse and discuss the “good – order” of work

The process of improvement and optimisation of the work of radiographers is long time target. The measures mentioned above are adopted and recently it is difficult to evaluate the effectiveness of them. For the success it is necessary to co-operate in all sides, but from the side of regulatory authority it is necessary to refuse the compromises in the case of the adoption of basic radiation protection principles. The justification, optimization and basic limits should be apply in every practice.

References

1. Act No. 18/1997 Coll. on Peaceful Uses of Nuclear Energy and Ionising Radiation and on the Amendment of Some Acts (Atomic Act)
2. Decree of the SÚJB No. 184/1997 Coll. on radiation protection requirements.
3. Petrová, K., Prouza, Z.: The National Central Registries of Occupational and Medical Exposure in the Czech Republic. IRPA 9 Conference Proceedings, Vienna, Austria, vol. 4, 682-684 pp. 1996.