

## RADIATION EXPOSURE OF PERSONNEL IN A REPROCESSING PLANT

Georg Herrmann

Gesellschaft zur Wiederaufarbeitung von Kernbrennstoffen mbH, Eggenstein-Leopoldshafen

Occupational radiation exposure and the associated collective doses due to the production of nuclear energy are besides the environmental impacts an important issue for its public acceptance. At nuclear power plants experience has already accumulated which encourages authors to develop prediction models, leading for instance to a predicted annual collective dose for a 900-MW PWR plant of about 550 man-rem (1). But also in reprocessing plants experience has been gained as to allow a forecast of their contribution to collective doses of the fuel cycle and possibilities of its reduction. The particular experiences in the pilot reprocessing plant Karlsruhe (WAK) are reported and some conclusions drawn.

### OCCUPATIONAL EXPOSURE AT WAK

The annual average occupational exposure at WAK was successively decreased during the ten years of plant operation, which is shown in following Table 1.

TABLE 1. Average annual doses due to professional exposure at WAK from 1972 to 1979.

Year	rem	Year	rem
1972	1,33	1976	0,31
1973	1,11	1977	0,44
1974	0,48	1978	0,45
1975	0,18		

To the total professional exposure, expressed as collective doses in man-rem for the purpose of risk comparison, exposures from different operations contribute. In this summary data from reprocessing campaigns and interventions periods are discussed (Fig. 1).

During reprocessing campaigns at WAK the personnel exposure was on the average not less than during intervention periods. Fig. 1 shows the man-rem per year due to reprocessing campaigns.

Of interest is the derivation of a specific quantity for the purpose of comparing the data from plants of different size. A specific collective dose in terms of man-rem/GW<sub>e</sub>.y is being used (e.g. 2) and is shown on Fig. 2, together with data from other facilities. It can be concluded, however, that this specific quantity does not allow quantitative comparisons and extrapolations.

During intervention periods there are other parameters influencing the resulting collective doses, which are analysed in (3).

The WAK is a reprocessing plant with direct maintenance. Six extended intervention periods lasting from 2 to 15 month during ten years of active operation have been scheduled for modifications and repair. Personnel exposure during these periods depends largely on the radiation fields, which in turn depend on the decontamination of that part of the installations where work has to be carried out.

It can be demonstrated from the experience so far obtained that personnel exposure can be kept adequately below dose limits even when equipment having been in contact with high active solutions has to be exchanged. An important further result, however, is the fact that the possibility of equipment decontamination must be improved, when its exchange or repair shall be carried out in due time. Of great importance is furthermore the organization and administrative control of personnel exposure.

Data of individual as well as collective doses obtained between 1972 and 1979 during interventions clearly show these dependencies. Collective doses due to interventions contributing to the total annual collective dose are shown in Fig. 1.

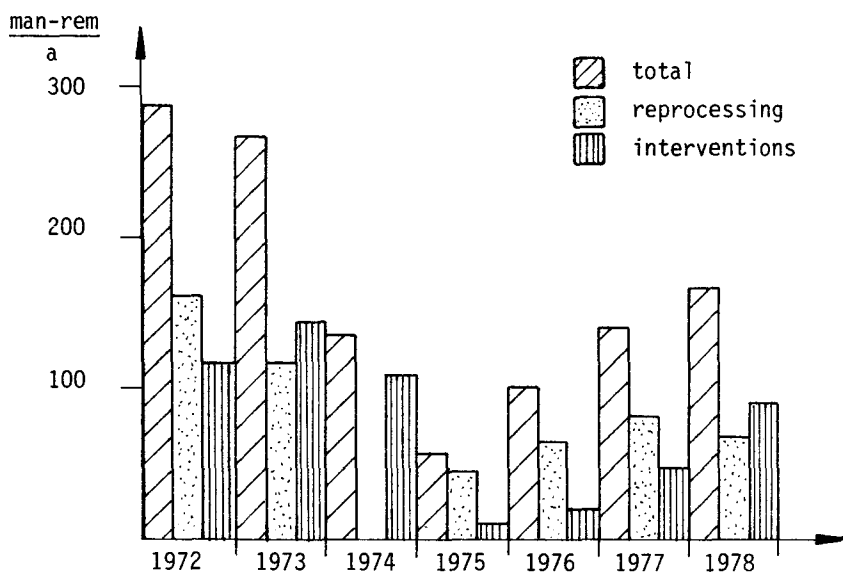


FIGURE 1. Total annual collective doses and due to reprocessing and interventions at WAK, 1972 - 1979

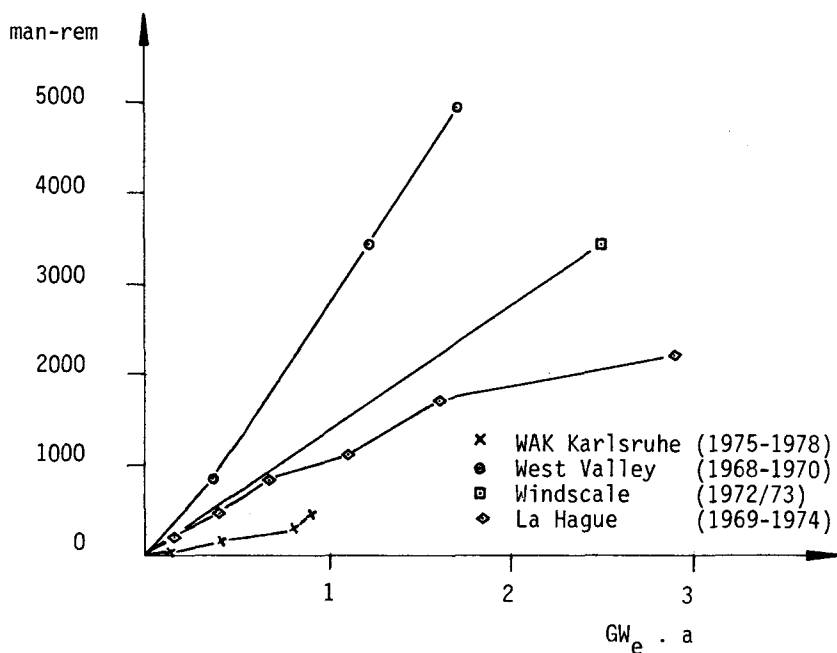


FIGURE 2. Collective doses as function of energy equivalent of reprocessed fuel at different facilities.

## DISCUSSION AND CONCLUSIONS

As it is well known, dosimetric data have only a limited accuracy. It can be, however, reasonably assumed that variations are sufficiently smoothed in the statistical collective. Nevertheless the statistical significance of differing data should always be evaluated, if it is argued with them.

A comparison with collective doses from other reprocessing facilities with reference to the energy equivalent of reprocessed fuel shows a rather large variation (Fig. 2). Quantitative extrapolations appear to be not yet possible with this quantity.

Collective doses due to interventions in a pilot plant like WAK can be considered in a first approach as equal to the doses during reprocessing for some ten years of operation. Since in a larger facility the possibility of intervention could be improved, the provisional conclusion can be drawn that personnel exposure due to interventions will be at a maximum of the same size as during reprocessing.

## REFERENCES

1. Beslu, P. et al. (1979): in: Occupational Radiation Exposure at Nuclear Power Plants, Nucl. Techn. Vol. 44.
2. Schüller, W. (1979): IAEA, Intern. Symp. on Occupational Exposure in Nuclear Fuel Cycle Facilities.
3. Herrmann, G. et al. (1980): GWK-Report TB-272, in preparation.