

## **Inhalation dose assessment, dust distribution.**

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### **1 Introduction**

This contribution deals with the dose as a result of inhalation of NORM-material when used during road construction.

Based on measurements during phosphorus slag operation a dose assessment is presented.

The assessment is based on dust measurements during a warm summer day without clouds (maximum heat input to the earth's surface) with just above wind-still conditions, and as a result of these circumstances, an extreme production of dust by lorries driving on an unpaved road of phosphorus slag.

Several dust-measuring devices were used such as cyclones with respirable and thoracic separation properties in agreement with EN-481.

With a cascade impactor also the particle size distribution of the dust cloud was determined.

### **2 Results**

It was found that the particle size distribution differed from the ICRP default values of an AMAD of 1  $\mu\text{m}$  for environmental or 5  $\mu\text{m}$  for workplace conditions and a GSD of 2.5. Actually two distributions were found which could be described by two log-normal distributions.

With LUDEP DCC's are calculated for the two log-normal distributions for lung absorption class 'S'. With this approach the 'worst-case' dose is calculated with regard to an annual occupational exposure time of 1600 hours. The dose is also calculated for the measured dust distribution using the mono-disperse DCC's as a function of the particle size.

Both methods give comparable results, as should be the case.

Cascade impactor measurements are complex and difficult to perform. For example, the total amount of dust (or activity) is not on 1 filter, but is divided over up to 8 filters. For this reason the amount of dust (activity) on 1 filter is very small and therefore difficult to measure.

As an alternative to the cascade impactor it is demonstrated that a thoracic cyclone in combination with a conservative DCC could be used to make an acceptable dose estimation.

Furthermore it is concluded that in normal workplace conditions the dusts fraction of particles from approximately 50  $\mu\text{m}$  up to 100  $\mu\text{m}$  can be ignored. This is not the case in the above mentioned conditions during road construction. In this case a correction to the amount of sampled dust has to be applied when using the cascade impactor or the thoracic cyclone. A paper elaborated by the authors on this subject is available electronically as a PDF file. It can be ordered at [Erkens@thermphos.com](mailto:Erkens@thermphos.com)

## References

ICRP International Commission on Radiological Protection. 1994 ICRP publication 66.