The 90th percentile or the 98th percentile?

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There are two groups of odour impact criteria used in various European jurisdictions:

1. Countries with criteria based on a high concentration threshold and a low exceedance probability. Examples include the Netherlands, the United Kingdom, Italy, and Spain.
2. Countries with criteria based on a low odour concentration threshold and a high exceedance probability, evaluating ambient odour concentrations close to the perception threshold. This is the case in Germany, Austria, and Switzerland, among others.

The first criterion is based on studies of odour annoyance determined through surveys of people about their level of annoyance from odours. The results from those who were highly annoyed were compared with dispersion model results (Miedema and Ham, 1988; Miedema et al., 2000).

These researchers published curves to predict the percentage of highly annoyed people (%HA) by odour in the surrounding community. The curves provide the %HA as a function of the 98th percentile (2% probability) of the distribution of odour concentrations (P98) to which people are exposed. These studies were based on surveys of populations living near six very different types of industrial odour sources. Biogas or biomethane plants, being relatively recent, were not included in these studies.

The research found a strong relationship between the odour concentration threshold for a 2% exceedance probability (98th percentile) and the percentage of Highly Annoyed neighbours (%HA of 10%).

However, these dose–response studies need to be revisited since they are over 30 years old. The dispersion model used by Miedema was Gaussian-type. It is now well established that this type of dispersion model has serious limitations when modelling odour.

Following these studies, many regulations established air quality criteria for odour exposure based on the frequency of perceptible odour occurrences (98th percentile) or on modelled concentrations associated with annoyance levels among nearby residents. These dose–effect P98 criteria were published in a letter by the Dutch Minister of the Environment but were later withdrawn and repealed. Similarly, comparable criteria were indicated in the UK's H4 guidance, but they were never legally binding, meaning they were never published in any official gazette.

The second criterion group, with a low odour threshold and a high exceedance probability, is based on comparing the frequency of odour perception determined by field inspection methods (now standardized as EN 16841-1, 2017) with survey results from people affected by odour. For this comparison, it was necessary to convert the average hourly odour concentration into an odour concentration relevant to human perception.

In this case, such criteria remained in guidelines for approximately 40 years. This changed with the new German law on Technical Instructions for Air Quality Control, published in the German Ministerial Gazette—making it the world's first regulation addressing air quality standards for odour. This law establishes, in Article 3.1 of Annex 7, the following limit values in Table 22.

In this study, both criteria are compared for a biogas plants with different scenarios to assess the difference between applying one criterion and the other.

Topic: 8. Dispersion modelling.