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Special evaluation of odours in agriculture

Developments so far, immission predictions

The effects of odours can be judged by the opposition between livestock production and the building of domestic housing. The judgement according to the VDI guidelines 3471 and 3472 with values for distances between the two types of buildings dependant on the quality of the livestock accommodation, or reached through a diffusion computation through which the stress deemed to be reasonable is worked-out according to the periods during which the odours are unquestionably present. The VDI guidelines and the calculation methods are being reworked at the moment so that more precise statements and reliable evaluations are possible.

Farms expanding and neighbours reacting to odours make estimation and evaluation of probable emissions necessary even in preliminary planning of livestock housing. The VDI guidelines 3471 – 3473 were created in the 70s and are still, following necessary renewing in 1986, in effect today and can be used for the determination of correct distances between buildings. In more recent times, a quantitative odour evaluation according to odour units (GE) on-site is used. Here, 1 GE represents the point when an odour becomes apparent. The length of time deemed reasonable for the presence of odour is evaluated in annual hours.

With evaluation via VDI guidelines, the odour emissions are determined through the evaluation criteria of livestock production (points evaluation) and the odour-relevant number of animals. From this is produced a curvilinear for required distance. The respective distance must be retained as a protective circle around the sources of emissions. According to the situation of the livestock housing with respect to domestic housing, industrial buildings or surrounding grounds, a full or a half radius must be observed. This rule within the VDI guidelines for determination of distances still applies as technically safe for straightforward investigations nowadays. Following the introduction of the VDI guideline for beef cattle 1994, the limits to these distance predictions have become clearer. The VDI 3473 was introduced on a trial basis one year ago.

Evaluation according to GIRL

The methods of determination for distances between buildings where individual livestock housing is concerned are no longer sufficient in that odours from the buildings overlap one another. This is led to the odour immissions having to be used as evaluation criteria for large-scale built-up areas. Because of this requirement, odour immission guidelines (GIRL), which reflect the stress of immissions on commercial or domestic built-up area as target values, have been introduced successively, or are now being te-



Odour nuisances from farms increasingly lead, especially in built-up areas, to rejection of planning and building permissions

sted, in the federal states. Here, the immissions are evaluated as odour amounts. According to the area utilisation of the district to be evaluated, these odour amounts are compared with predetermined target values as percentage annual hours stress. Domestic housing areas are regarded as being slightly less able to stand stress compared with village areas. If such differentiation of odours and the given value of the percentage share are correct and appropriate is outwith the remit of this presentation of the system.

According to GIRL, the areas to be evaluated are divided into raster grids. The grids are then walked across by test persons according to strictly applied methods for the recording of odour immissions in such areas. Appropriate calculations then give the periods when the odour is apparent as percentage annual hours. The system can only be carried out in a very time-consuming manner with high personnel requirement which means it is very cost-intensive. For this reason, other methods are used where air samples from an area to be evaluated are presented in smell-neutral packaging to the test-personnel in the laboratory. Such olfactometrical systems are comparatively precise and mostly also reflect the actual odour-pollution of the area being evaluated. The measurement equipment is more dependable, so that samples from odour-polluted domestic housing areas are more easily and more quickly, and thus more cheaply, able to be evaluated.

Prognosis

The GIRL requirement covers, however, not only the determination of present odours, but also the possibility of being able to predict odours. An effect brought about by the presence, or the alteration, of emission sources

cal investigations, can be brought into the calculations to achieve as precise as possible numerical values for the predictions.

Values

For areas utilised in different ways, the odour immission guidelines now give maximum percentage stresses in annual odour hours, differentiated according to domestic housing, commercial or industry area, or also for single dwelling houses outside of built-up areas. The area raster-grid value can be matched to the limits of the area to be tested. Ground conditions, buildings or vegetation, ground surface elevations or depressions, open areas or foothills cannot as a rule, however, be taken into the predictions.

Weaknesses in the near-vicinity

The different programmes used at the moment for evaluating odour diffusion and immission stresses lead, after comparative calculations are carried out and according to the framework of the evaluation, to large and clear differences. The results often offer no dependable value for prediction of odour immissions on identified areas. They are, however, well suited for comparative judgements under the same conditions. Building permission officials who base their decisions for planning suitability on figures for annual hours of odour stress identified by the programmes as absolute immission values, are advised to study the problems of the different calculation programmes and their respective immission predictions.

For areas in the immediate vicinity, less than 100 m from the sources of the emission, there is, up until now, no diffusion calculation program for odours which deliver dependable values. Here, the differences between different programs are so variable that the identified results only deliver trends as to odour diffusion.

In the near-vicinity, however, it is possible with current equipment to be able to make approximate evaluations if the areas or object in question are evaluated with help from the wind regularity distribution. This wind regularity distribution can be taken from the weather stations' wind and weather data and also goes into the electronic calculation as wind parameter. Within a wind distribution opening angle of 60°, with the opening in the direction of the object to be judged, the percentage wind conditions from 30° sectors are added together. These added values can thus give a statement to the regularity of the wind-influenced immission stress from an emission source. The strength of the odour contribution given in the odour immission guidelines and their limits with given figu-

res, the so-called odour units (GE) can not, however, be determined with this evaluation method. Thus this method, too, can only be regarded as an aid that presents an approximate and not-secured evaluation for the near-vicinity in percentage figures.

In that all the calculation methods have some faults which prevent a dependable statement regarding odour immission stress up until now, such measures can only serve as assistance in immission protection statements in the care of large-scale evaluation areas. Calculated values, even with figures after the decimal point, should not therefore lead to complete trust in the figures with these regarded as absolute values upon which to base decisions and documentation for planning permission. These can, however, be utilised as comparative values and evaluated to identify trends when the necessary expertise is applied.

Waiting for the new VDI guideline

The previously described problems of distance determination and statements as to immission protection regarding the calculation program should be, at least in some parts, significantly reduced through the new VDI guideline 3474 livestock production. Since the end of 1999 this has lain by different committees for evaluation and comparative testing. This not yet passed version of the VDI guideline concerns itself with the leading livestock production sectors in agriculture with building-type-specific emissions and comparative odour equivalents as well as the odour awareness of humans (Hedonic of different emissions and also emission sources). With this VDI guideline the different influences of various parameters should be taken account of and, through simple manipulation, secured statements as to the distance regulations and immission protection conditions carried out. The distance function will be represented as envelope curve around the emission herd.

New improved immission prediction programs which can be calibrated for on-foot investigations for large area observation of utility districts must be available so that the ever-increasing areas for evaluation of immissions can be dealt with. Such programs will then be able to take account of the VDI guideline 3788 which is to be created. The judgement of odours find itself at the moment in flux with utilisation targets of improved determination and evaluation.

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