Tool for Design and Evaluation of Air Flow Patterns in Industrial Halls with Heat and Contaminant Loads

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The present state of ventilation design for industrial premises follows rules of thumb or other rules based on sometimes questionable experience. During the last years increasing effort has been successfully invested into research work to enlarge the theoretical and practical knowledge of industrial ventilation. One of the practical results of that research work has been national guidelines (in Germany e.g. VDI 3802) which give more or less detailed recommendations for the design process. Unfortunately the given procedures seems to be still too theoretical and too far away from the daily reality and the needs of the people working in the industrial ventilation practice. Thus following work has been concentrated to the improvement of that „user-interface". The aim is to further improve and to illustrate the already existing knowledge about the design process to make it understandable and usable for the practice.

Therefore a tool has been developed which is running on a normal personal computer and which gives the user guidance throughout the concept development phase of the design process and offers the possibilty to try out different solutions and evaluate the results, also in direct comparison to each other. The evalutation procedure is based on a broad data base which has been calculated by thermal building and system simulation of industrial rooms with different air flow patterns. The simulations are covering a wide range of boundary conditions (e.g. for the heat loads or the work cycles) and include also a model for contaminant distribution. The results of the simulations are accessible to the design tool as parametric curve models. The user of the tool selects appropriate building, process and ventilation system data and will then get – if the selected data is inside the given boundary conditions – information about the energy evaluation of the selected system (e.g. the expectable annual energy consumption) and about the most important flow phenomena in the room (e.g. thermal flows with flowrates, estimated maximum air velocities) and also signals about major improvement potential.