TEZĂ DE DOCTORAT

"MONITORIZAREA CAMERELOR CURATE, CONTROLUL CONTAMINARII SI ELABORAREA STRATEGIEI DE CONTROL"

DOCTORAN: Dipl.-Phys. Horst WEISSSIEKER
CONDUCĂTOR ŞTIINŢIFIC: Prof. Dr. Aurelia MEGHEA,
Universitatea POLITEHNICA Bucureşti
Facultatea de Chimie Aplicata si Stiinta Materialelor
Catedra Chimie Fisica Applicata si Electrochimie

"CLEANROOM MONITORING, CONTAMINATION CONTROL AND ELABORATION OF CONTROL STRATEGY"

Abstract

Clean rooms and clean environments are more and more needed to manufacture a large variety of products. Computer chips and semiconductor devices, optical media, drugs, medical devices, satellites, food and beverages are produced and handled in clean facilities.
Those facilities are operated nearly every where in the world in all climates and all environments and locations. In total around 2 million square meter are under operation and roughly also 2 million people are working under clean room conditions worldwide.
Contamination control or cleanroom technology is dealing with all measures to minimize or prevent harmful contaminations from the product or people.
Nowadays the cleanliness requirements still increase. Not only particles but colony forming units and airborne molecular and chemical contaminations have to be understood from their relation, interrelation, possible correlation, transport and dynamics as well as considered in the airborne and media phases.
For designing the cleanroom and contamination control measures the outdoor conditions and their influences on the cleanroom have to be understood. The environmental conditions in 2 neighboring areas in the south of Germany and in some locations of Romania are compared.
The cleanliness conditions have to be monitored. For these, based on the variability and size range of the parameters to be monitored, the necessary and sufficient measurement techniques, sensors and sampling locations have been identified. The hard- and software systems to perform the monitoring have been tested and evaluated for the identified data analysis requirements. Special tools for monitoring ultraclean environments are necessary. Standard statistical tools cannot be used for describing the monitoring data. Using fractal analysis and correlation analysis it has been possible to evaluate a control strategy and a control matrix, which is typical for each single cleanroom system. With this control matrix based on deduction and induction – meaning the chemical and physical laws and relation in combination with monitoring data – it is possible to define passive and active control measures for the cleanroom system in general and for the single cleanroom systems specifically. This enables the designers and owners of cleanrooms to balance investment and operating costs for the cleanroom installations.
The approach may be generalized to other media than air and detailed in other aspects than the focus of this thesis. For this future research the necessary environment and requirements is already layout for a research cleanroom at the institute.

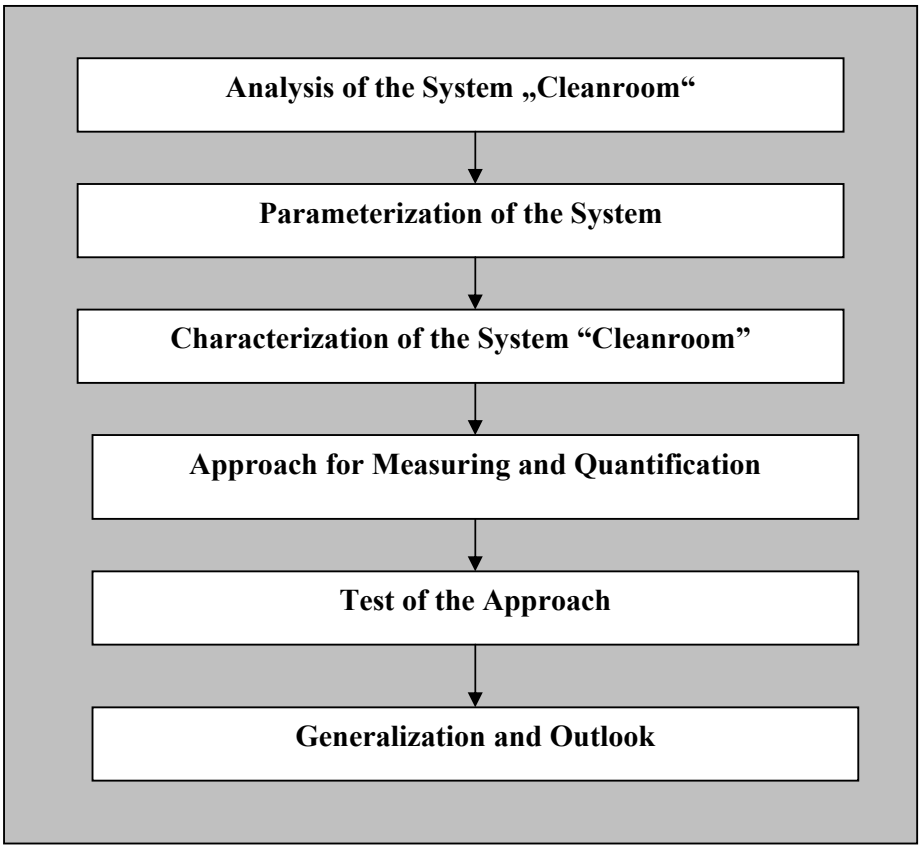

Figure 1: Approach for the procedure.