

DIMENSIONLESS ANALYZIS OF THE CLEANABILITY OF WOVEN FILTER MEDIA USED IN INVERTING FILTER CENTRIFUGES

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ABSTRACT

In the food and pharmaceutical industry strict requirements are necessary to guarantee high product qualities and a high level in consumer protection. It has to be proven that the product can neither get impurified by another product, which is called cross-contamination, nor by material migration from machinery [Wildbrett 2006]. Therefore hygienic design criteria are necessary for the design of the equipment which must be adapted to the manufacturing process as well as to the product flow. In consequence strict requirements concerning the cleanability of used equipment exist.

The bottle neck of the cleaning procedure is the filter media. In critical applications one way filters are state of the art. In certain cases opening of the process room to change the filter media has to be avoided, for example in manufacturing of toxic or highly active pharmaceutical products. Depending on the equipment and machinery financial considerations make cleaning of the filter media necessary. In order to determine or validate the cleanability of filter media, a reproducible test method has been developed and carried out for different kinds of filter media.

The focus of this study is the development of process strategies to guarantee a high level in cleanability of an inverting filter centrifuge. Therefore the main process steps like filling the drum, spinning the solid and the discharge by inverting the drum are analyzed. These process steps have an immense influence to the CIP-procedure (Cleaning-In-Place). This CIP-procedure is conducted with a riboflavin test.

The studies on filter media concerning its cleanability are carried out at a flow through setup. Therefore the filter media is fixed in a developed aseptic geometry and cleaned by back-flushing. Riboflavin, fluoresceine and insoluble particles which are marked by a fluorescent material are used as tracer for the contamination. The decreasing concentration over time leads to the mass transfer coefficient. A model which describes the cleaning behavior of a long tube [Hofmann 2007] is transferred to woven filter media. The developed model consists of the dimensionless Reynolds, Schmidt and Sherwood-number and results in an overall description for the cleaning of filter media. The study of the impact of geometric parameters, like the pore size distribution and the used fiber diameter on the cleanability is now possible.

KEYWORDS: hygienic design; cleanability, filter test, solid-liquid-separation, inverting filter centrifuge, woven filter media

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