Investigations on the Flow Behaviour in Intravenous Infusion Filters

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Abstract: To develop a quality control for intravenous infusion filters is the aim of the project. For that reason a test method and a test rig to investigate the flow behaviour are developed. After performing flow tests inoperable filter systems can be identified reliably.

Keywords: non-destructive quality control, infusion filter

Introduction

In medicine the intravenous therapy is the infusion of liquids into the vein of a patient. It corrects electrolyte imbalances, replaces liquids or delivers medical substances. An infusion filter (figure 1) ensures the purity of an intravenous solution and prevent air from entering the bloodstream. The development of a non-destructive and non-contaminating 100% quality control of the production volume of the infusion filters is the objective of this project. For that reason a method had to be developed to separate functioning filters from inoperable ones and a test rig which has to meet specific requirements were built. Furthermore the flow behaviour of the filter systems is investigated with high purity gases. After measuring a specific quantity the characteristic flow behaviour of each considered filter type is uniquely defined. From now on every system with deviating flow curve can be sorted out and defined as inoperable.

Methods

The test rig meets several requirements. It has to avoid the contamination of the tested filter systems, has a precision pressure control and is equipped with high accurate sensor systems. Figure 2 shows the test rig and every necessary component.

Results

Figure 3 shows the test reading and the resulting standard deviation of five filters of the same type. They all have the same characteristic flow behaviour and an amount of variation from the average less then seven percent.

In the next step two knowingly inoperable infusion filters were tested. Both were manipulated and had a hole in the air separation membrane. Images of the damaged membranes are shown in figure 5. Only one of the nonconforming filter systems could identified. The flow curve of the other one lays in the range of the functioning system.

Conclusion

In order to develop a quality control for intravenous infusion filters their flow behaviour has been investigated. For that reason a test method was developed, a test rig was built and the characteristic flow behaviour of each filter type was identified. In the submitted study two manipulated filters had been detected clearly as inoperable.

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