Research program: LISA-STAT.2 – "Extension and implementation of an early failure detection system for water steam sterilizer"

Annex Code 9

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Research subject

Keywords: Statistical surveillance, predictive maintenance, functional data analysis, stochastic simulation.

Water steam sterilizers used in dentist's surgery are subject to periodical maintenance to ensure the very high quality sterilization output required by modern health service standards. On the other side maintenance stop is an undesirable event for dentist's surgery.

The project aim is a new statistical algorithm, able to be patented, for predictive detection of anomalies given by sm¬¬50ooth transitions or sudden changes of continuous physical parameters characterizing the behavior of water steam sterilizers produced by W&H sterilization.

Using the statistical technique known as "functional data analysis", the set of "sterilization curves" given by the continuous measurements of temperature, pressure, humidity during each sterilization cycle are handled, separating functional normal variability and assignable causes.

A three stages approach is considered. In the first stage, using historical and experimental data the statistical characterization of the multivariate sterilization curve (MSC) is given. At the second stage, extending statistical surveillance techniques to MSC, a detection algorithm is devised. This will be able to detect smooth transitions and abrupt changes while controlling the false detection probability and optimizing the detection delay. This predictive detection will send a message to maintenance center and hint the user to schedule a technical check up. Moreover, after a detection is signaled, in the third stage, the diagnostic component of the algorithm will identify the most probable causes helping customer service and reducing maintenance time and costs.